maritime history group

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ERRATA:

The Port of Yarmouth, Nova Scotia, 1840-1889.
David Alexander.

Table 6, p.90.
Headings should read:

All Vessels		Schooners			B'tines			Brigs			Barques			Ships		
No.	Tons	No.	%	Tons	%	No.	%	Tons	%	No.	%	Tons	%	No.	%	Tons	%

on the horizontal axis.

SHIPS AND SHIPBUILDING IN THE NORTH ATLANTIC REGION

PROPERTY OF
THE DEPARTMENT OF HISTORY
MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Editors

Keith Matthews Gerald Panting

Held by The Maritime History Group, Memorial University of Newfoundland

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K E I T H M A T T H E W S

Maritime History Group
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THE SHIPPING INDUSTRY OF ATLANTIC CANADA: THEMES AND PROBLEMS

Keith Matthews

Strictly speaking, in order to cover the varied dates of entry into Confederation we should talk of the Atlantic seaboard of British North America, but for the sake of simplicity this paper will use the title Atlantic Canada throughout. Our definition of "Atlantic Canada" matches what are now called the "Atlantic Provinces" of Canada and thus excludes the Province of Quebec although it most certainly has an Atlantic seaboard. We concern ourselves mainly with the provinces of Newfoundland, Nova Scotia, Prince Edward Island and New Brunswick.

Our theme is simple, we seek to examine, describe and as far as possible, explain the rise and fall of the shipping industry in this region, and we seek to do this in the wider context of Canadian development and the changes in world shipping in the period between 1830 and 1914. Of the fact that the shipping industry of Canada rose and fell there can be no doubt. In 1811 some 1300 vessels totalling 75,824 tons were registered as belonging to British North America. The colonies were expanding rapidly in population, production and foreign trade, but with the exception of a few ships regularly engaged in the fish trades of Gaspé, Cape Breton and Newfoundland, together with a share of the carrying trade to the West Indies, the bulk of Canadian shipping was confined to fishing and inter-provincial coasting. Both her import and export commodities were largely carried by British and, in the case of the West Indies, even Bermudan vessels. Let us compare this situation with that which has prevailed in recent years. In 1976 the Canadian fleet amounted to some two and a half million tons, which even in today's world would seem to be a respectable figure. However, almost the entire fleet now consists of vessels employed in and around the waters of Canada. In 1967, Canada's ocean going merchant marine consisted of four vessels totalling 65,000 tons and the percentage of her overseas trade carried in Canadian shipping was 0.7%.

Yet the fact remains that during the 19th century the Atlantic ports of Canada were for a generation or two, able to expand their merchant marine so far as to not only capture a large proportion of Canadian foreign trade, but to engage in far flung cross trades competing on the trade routes of the world, on equal terms with all comers. The comparative importance of Canada's shipping industry reached a peak in the period between 1878 and 1880-1883 when in terms of tonnage she consistently ranked fourth in the table of leading maritime nations. From 1895 onwards, she began to slip rapidly until by 1909 she ranked 10th. (See Appendix 4).

Canada's greatest importance in world shipping competition, occurred not surprisingly when her own fleet was at its peak. According to the official statistics which are extremely unreliable, this occurred in 1879 when the tonnage reached 1,332,094. From then onwards it declined to 1,000,000 tons in 1892 and more

rapidly to a pre-1914 low in 1902 of 650,000 tons. By 1910, expansion on the Great Lakes and in British Columbia had brought a slight revival up to 750,000 tons. (See Appendix 1).

From the published data it would seem that this rise and decline matched the fortunes of the Atlantic Canadian shipping industry. Missing data and obscure statistics make it impossible to ascertain the share of Atlantic Canada within the total Canadian fleet until the 1870s, but given that beyond the borders of Ontario growth was only just beginning, we can assert that the combined fleets of Quebec and Atlantic Canada must have accounted for almost all Canadian tonnage up to that date. With the development of shipping in Central and Western Canada – especially on the Great Lakes and in British Columbia – it was perhaps inevitable that the proportion of Canadian shipping registered in Atlantic Canada would tend to decline and decline it did.

TABLE 1

PERCENTAGE OF CANADIAN TONNAGE REGISTERED IN ATLANTIC CANADA (EXCLUDING NEWFOUNDLAND)

1875	71.64
1885	70.05
1895	58.74
1905	38.92
1910	29.33

The same process can be seen by examining the years of peak fleet size by province between 1860 and 1910.

TABLE 2

PROVINCE	YEAR	TONNAGE	% OF TOTAL CANADIAN FLEET
Nova Scotia	1881	558911	42.64
Prince Edward Island	1877	55547	4.23
New Brunswick	1879	340491	25.56
Quebec	1877	248399	18.91
Ontario	1910	227457	30.40
British Columbia	1910	105414	14.09

Thus if the expansion of the Canadian fleet up to 1880 was largely due to the Atlantic Provinces, the decline in that fleet after 1880 marked an ever greater decline in the fleet of the latter. This is clearly revealed in the following table.

TABLE 3

TONNAGE REGISTERED IN ATLANTIC CANADA

1875	856,743
1885	873,231
1895	485,096
1905	260,045
1910	219,474

The collapse of Atlantic Canada's shipping industry, therefore, occurred immediately upon the attainment of its greatest success as a shipowning region. A more or less continuous growth since 1810 gave way not to an equally gradual decline of the industry, but to a precipitous abandonment of it.

Newfoundland, then as now, did not fit into the general picture of Atlantic Canadian shipping. Her fleet growth followed its own logic, impervious to the fortunes of her neighbours. Published data for Newfoundland is incomplete, but that which we have to date would seem to indicate a fluctuating but nonetheless continuous growth throughout the entire 19th century. Her peak year was not reached until at least 1902 which ironically was the year in which the Canadian industry reached its lowest ebb. One has however to suspect Newfoundland tonnage figures even more than those published for Canada, and there is no doubt that the size of the fleet is much exaggerated. My colleagues are now trying to build more accurate adjusted statistics and will be reporting on them during this seminar.

In the above I have tried to sketch a broad picture of the Atlantic Canadian shipping industry during the 19th century. We readily see the broad outlines of its growth and decay, but we know nothing more. To explain this process we have to know much more about what sort of shipping industry this was. At this stage it is possible to make some generalizations. The industry comprised several separate segments. First and most continuous – indeed it continues to this day – was the offshore fishing industry, second was the coasting trade of each province and the coasting trade between the Atlantic Provinces and also with the rest of Canada. There were then what might be termed the "home trades", that is, the carrying trade between Canada and the United States and the Caribbean region. Finally, one may distinguish the true deep sea merchant fleet which engaged in the Canadian trades with Europe and as time went on entered into cross trading between regions outside Canada. The total fleet of Atlantic Canada which we discussed above, was a mixture of all these trades and we have to attempt to assess the relative importance of each over the period. What was the relationship between the ships and their occupation? Did the entrepreneurs in (say) the fishing industry, also engage in coasting, or even deep sea carrying? How interchangeable were the vessels? To what degree did fishing schooners also engage in coasting, or in taking cargoes to the West Indies? Was the entire region broadly engaged in all four "trades" or was there some specialization within the area? To what extent were the shipowners also merchants who owned the cargoes which their vessels carried? Was the labour force for the merchant marine a distinct group from those who engaged in fishing? Indeed, did

the coasting and home trade vessels draw their crews from the same pool of labour as did the deep sea vessels?

On the face of it there would seem to be no particular reason why the development of the fishing or coasting trades should follow the same path as that of the deep sea industry and thus we must examine each trade as a separate entity even though the Atlantic Canadian marine seemed, with the exception of Newfoundland, to follow a remarkably similar pattern of growth and decay.

Thus in order to examine the Atlantic Canadian shipping industry we have to begin with all the individual ships, owners, trades and crew men. We have to identify those which were engaged in one trade rather than another and seek to establish separate patterns of development for each segment of the industry. Unfortunately, this involves an examination of a multitude of documents dealing with thousands of ships, and even more owners, seamen and trade routes. Our research team has attempted to reduce this to (hopefully) manageable proportions by selecting five ports of registry which it is suggested will fairly represent the entire region. The ports of Charlottetown and St. John's were in fact the only ports of registry for Prince Edward Island and Newfoundland respectively and thus we are studying the entire shipping fleet of those provinces. Halifax was selected because of its great involvement in the fishing, coasting and home trades of Atlantic Canada, whilst Yarmouth, Nova Scotia, and St. John, New Brunswick were chosen because they were for most of the era the second and first ranking Canadian ports of registry, with an especially large involvement in the deep sea trades, although Yarmouth was also heavily concerned in certain fisheries, and the coasting and home trades.

For all ports we seek to identify and describe every registered vessel and every registered owner, and abstracting from this data, establish a fleet size over time, distinguishing characteristics of vessel size and rig, and of scale and variations in ownership. From the ownership data we hope to be able to compile the individual histories of all significant ship owners, thus laying bare the dates of entry and withdrawal from the industry, the pattern of expansion and decline, the organization of ship owning and the relationship between owners. We will also be able to estimate the total number of persons concerned in ship owning, and establish a basis for estimating how many generations of any particular family were involved in the business.

For all ports we seek to identify the trades in which the individual vessels were engaged so that we can identify the relative proportions which each trade had within the shipping industry, the relationship between the separate trades and the separate owners, and of the development and changes in trade routes which occurred during the period. However, documentation for this is vast in the case of the mainland ports and limited for Newfoundland, and thus our detailed examination of voyages will rest heavily upon data for the ports of Halifax, St. John, and Yarmouth.

As far as possible we also wish to examine the crews both as to areas of recruitment, and as to conditions of employment (including such matters as rates of pay, place of birth, rank and length of service per vessel). However, the nature of the surviving records tends to limit examination to the deep sea merchant marine,

and we will probably have to use generalizations concerning the other trades.

Our basic data sets consist of voluminous official records which have already been discussed in various papers by members of the Group, but, leaving aside for a moment the problems of assessing their meaning and accuracy, they will at most provide us with an accurate descriptive record of the industry. In order to explain the development of the industry we must place it in the context of Canadian life and times; we must assemble data on the demography of the region, its general economic development and its socio-economic structure. We must study the shipping industry in the context of Atlantic development. We must attempt to find out something about the minds of the shipowners, and why they made certain decisions, and especially why they expanded their fleets, or decided to engage in certain trades, why they changed their minds, and above all, why they eventually gave up the industry. In part, these decisions must have rested upon general trends in world shipping, but they would also depend upon conditions current in their region. We must also study the legislative and fiscal framework in which they operated since changes in taxing, tariffs, and legislation surely affected their deliberations. For this we are assembling, basic Canadian and Imperial legislation statistics on the import/export trades and the fisheries of the region, census returns, official reports and debates, and information culled from newspapers. We also hope to abstract information on selected shipping families from genealogical sources, wills and inventories.

The Canadian shipping industry insofar as it operated in an international context can only be understood by reference to the world shipping industry of the 19th century. We must compare the fortunes of Canada with those of such countries as the United States, Britain, Germany, France, Norway and Greece, and we must seek to understand changes in shipping organization, financial management, and trade routes in order that we may understand the arena in which our shipping industry operated. For this we are assembling national registry books, gross international trade data, and the most important enquiries and reports of the English speaking world during the period. We are also acquiring copies of many trade newspapers and journals in order to obtain informed comment on the state of the industry, and especially with such items as Lloyds List, and the shipping information in Canadian and other newspapers, to fill in missing data from our records pertaining to vessel ownership, life and voyages.

Inevitably we face great problems in handling this project. It is difficult and time consuming to assemble all our data, and even more difficult at times, to assess its accuracy, or even meaning. Such questions as "What is a ton?" which have bedevilled historians for generations, continue to bedevil us, whilst others like "What is the meaning of a registered ship?" and the host of questions which spring from attempting to understand the purpose for which the original records were compiled, force us to devote much attention to subjects which, whilst vital to the success of the project, do not in themselves help us get on with our descriptive and analytical work. These are problems which generate no enthusiasm amongst the researchers since they do not lead to further analysis. Our most important problems are intellectual and conceptual since they are in effect the whole meaning of the project. Obviously we must develop a conceptual framework which will place the

shipping industry both within the context of world shipping, and within Canadian society, and our assumptions about both will vitally affect our explanation of the rise and fall of the industry. Let us conclude by posing just a few questions about the decline of the industry. Was it an inevitable process – sail and wood giving way to steam and iron – a possibility which has all the simple attraction of determinism, but, which ignores the fact that all shipowners had to make that transition and that, for example, Norway managed to do so mainly by buying second hand sailing tonnage which Canadian owners were unloading? Was the decline a symptom or a cause (or both) in what was a relative decline in Atlantic Canada *vis a vis* the rest of the nation? Was the growth and decline basically a question of entrepreneurship *i.e.* a host of decisions made by individuals who, if they might share common assumptions about the world yet still acquired and dissipated their shipping capital as individuals? Did the industry collapse because the owners lost all their capital or did they get out with something saved? If they retained their capital what did they employ it in? Were both the capital and the entrepreneurial function impaired because of widespread migration south and west by the younger generation of the ship owning families? Therefore was it a question of relative labour and capital opportunities in Atlantic Canada as compared to the expanding economies of Central or Western Canada or the United States? Was it a result of Canadian national development policies with increasing government commitment to industrialization, tariffs and the development of land communications and The West, or was it a result of a general growth of economic nationalism which made it increasingly difficult for independent Canadian cross trades to continue? Was it affected by the development of liner trades and the centralization of shipping services in new huge ports with large hinterlands and communications which did not exist in Atlantic Canada? Were there problems of capital formation as the large public shipping companies were emerging?

Obviously the explanation of both the rise and the fall of the Atlantic Canadian shipping industry lies buried within these and other factors. Our problem will be how to ascribe a relative importance to each.

APPENDIX 1 – VESSELS ON CANADIAN REGISTER

YEAR	NFLD. NO.	NFLD. TONS	NOVA SCOTIA NO.	NOVA SCOTIA TONS	P.E.I. NO.	P.E.I. TONS	NEW BRUNSWICK NO.	NEW BRUNSWICK TONS	QUEBEC NO.	QUEBEC TONS	ONTARIO NO.	ONTARIO TONS	PRAIRIES NO.	PRAIRIES TONS	B.C. NO.	B.C. TONS	TOTAL CANADA NO.	TOTAL CANADA TONS
1830	465	28846	1299	83981	135	7661	434	43532	342	30608	–	–	–	–	–	–	2210	165782
1831	513	32024	1380	71282	154	6154	433	42453	347	30975	–	–	–	–	–	–	2314	150864
1832	545	36389	1100	64859	139	7689	522	52321	–	29408	–	–	–	–	–	–	–	–
1833	582	40746	1176	71281	133	7730	518	58302	316	27089	–	–	–	–	–	–	2143	164402
1834	631	44261	1243	55957	134	8419	600	75490	360	32336	–	–	–	–	–	–	2337	172202
1835	700	48770	1312	78528	151	10258	625	80929	372	35887	–	–	–	–	–	–	2460	205602
1836	677	46916	1377	81912	130	6397	599	87496	397	35310	–	–	–	–	–	–	2530	211115
1837	679	48065	1474	88255	156	10342	596	84130	390	32218	–	–	–	–	–	–	2616	214945
1838	698	45991	1538	96036	180	13631	–	88945	20	4653	–	–	–	–	–	–	–	–
1839	695	44383	1638	92030	174	12883	705	102327	398	32451	–	–	–	–	–	–	2915	239691
1840	702	43949	1727	103871	195	15696	608	109003	443	42232	–	–	–	–	–	–	2973	270802
1841	725	44376	1799	109495	192	16073	696	116240	464	31554	–	–	–	–	–	–	3151	273362
1842	751	46852	1820	107272	251	15853	658	95893	570	50018	–	–	–	–	–	–	3299	269036
1843	775	48610	1964	108067	214	15874	687	93300	539	51629	–	–	–	–	–	–	3404	268870
1844	847	53944	1890	103946	237	13861	595	82308	569	55358	–	–	–	–	–	–	3291	255473
1845	903	57650	1974	108799	252	14667	593	87833	571	61872	–	–	–	–	–	–	1490	273171
1846	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1847	950	60399	2072	133707	297	28005	682	111838	489	72001	–	–	–	–	–	–	3540	345551
1848	954	59638	2369	142530	292	25399	763	113825	508	63263	–	–	–	–	–	–	3932	435017
1849	970	59501	2467	153051	301	28587	775	117475	565	61992	–	–	–	–	–	–	4108	361105
1850	856	53666	2896	176300	310	27932	807	121996	–	–	–	–	–	–	–	–	–	–
1851	830	52078	2767	169269	323	31410	796	103877	624	69806	–	–	–	–	–	–	4510	374362
1852	888	59059	2299	227462	351	27928	788	103613	733	76589	–	–	–	–	–	–	4171	435592
1853	956	63630	3248	187083	346	25890	833	123618	835	91462	–	–	–	–	–	–	5262	428053
1854	995	66057	3085	200703	372	34513	860	134373	833	98351	–	–	–	–	–	–	5150	467940
1855	1055	71041	3085	200607	216	34754	894	141242	857	98570	–	–	–	–	–	–	5052	475173
1856	1115	73316	3100	222186	390	32595	880	164750	925	110082	–	–	–	–	–	–	5295	529613
1857	1206	82079	3190	234791	261	29830	857	160508	939	112606	–	–	–	–	–	–	5247	537735
1858	1315	90638	3310	242366	232	21495	819	142533	989	102791	–	–	–	–	–	–	5350	509185
1859	1342	89670	3378	251226	255	24512	811	134055	1493	100761	–	–	–	–	–	–	5937	510554
1860	1394	92639	3478	259867	253	27534	827	147083	1052	112539	–	–	–	–	–	–	5610	547028
1861	1447	95014	3343	252657	284	26619	825	163812	1085	122253	–	–	–	–	–	–	5637	565341
1862	1386	37030	3364	275910	304	31545	814	157728	1096	118574	–	–	–	–	–	–	5578	583757
1863	1429	89603	3515	320186	333	38717	891	211680	1076	126315	–	–	–	–	–	–	5815	696898
1864	1417	85738	3648	360859	371	46829	958	233225	1167	156633	–	–	–	–	–	–	6144	797546

APPENDIX 1 – VESSELS ON CANADIAN REGISTER

YEAR	NFLD. NO.	NFLD. TONS	NOVA SCOTIA NO.	NOVA SCOTIA TONS	P.E.I. NO.	P.E.I. TONS	NEW BRUNSWICK NO.	NEW BRUNSWICK TONS	QUEBEC NO.	QUEBEC TONS	ONTARIO NO.	ONTARIO TONS	PRAIRIES NO.	PRAIRIES TONS	B.C. NO.	B.C. TONS	TOTAL CANADA NO.	TOTAL CANADA TONS
1865	1486	87023	3438	376041	272	40549	959	232414	1189	153024	–	–	–	–	–	–	5858	802028
1866	1497	83204	2980	374747	295	40925	983	238945	1024	146805	–	–	–	–	–	–	5282	800792
1867	1557	82939	3359	381076	285	38595	1008	221431	1428	155690	826	200777	–	–	–	–	6906	997569
1868	1429	74204	3456	401993	279	39484	1043	229944	1069	135179	–	–	–	–	–	–	5847	806600
1869	1450	75443	3437	405543	266	37402	1043	228951	1058	135350	–	–	–	–	–	–	5804	807246
1870	1496	76947	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1871	1239	66115	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1872	1228	63574	–	–	–	–	–	–	–	–	–	–	–	–	–		–	–
1873	1301	67185	2803	449701	280	38918	1147	277850	1842	214013	681	89111	–	–	30	4095	6783	1073688
1874	1390	72976	2787	479669	312	48388	1144	294741	1837	218946	815	113008	–	–	35	3611	6930	1158363
1875	–	–	2786	505144	335	50677	1133	307926	1831	222965	825	114990	2	178	40	3685	6952	1205565
1876	1444	74083	2867	529252	338	50692	1154	324513	1902	228502	889	123947	2	178	40	3809	7192	1260893
1877	1514	77522	2961	541579	342	55547	1133	329457	1951	248399	926	134761	6	246	43	3479	7362	1310468
1878	1591	79203	3003	553368	322	54250	1142	335965	1976	248349	958	135440	17	1161	51	4482	7469	1333015
1879	1718	82564	2975	552159	293	49807	1435	340491	1975	246025	1006	136987	22	1924	60	4701	7471	1332093
1880	1830	86561	2977	550448	288	45931	1097	336976	1889	233341	1042	137481	21	1992	63	5019	7377	1311218
1881	1895	89655	3025	558911	273	45410	1087	333215	1830	224936	1081	139998	24	2130	74	6296	7394	1310896
1882	1938	90287	3026	546778	248	41684	1065	308980	1754	215804	1112	137061	23	2783	84	7687	7312	1260777
1883	1988	91767	3037	541715	241	49446	1107	315906	1733	216577	1138	140972	24	2778	94	9046	7374	1267394
1884	–	–	2942	544048	234	39213	1096	308132	1628	202842	1184	142387	55	5722	115	11403	7254	1253747
1885	2003	90475	2988	541832	227	36040	1060	288589	1631	208635	1223	144487	63	5439	123	11834	7315	1236856
1886	2044	90879	2929	526924	225	30658	1042	269224	1650	232556	1248	140929	66	5578	134	11900	7294	1217766
1887	2053	91289	2845	498878	225	29031	1027	255126	1586	189064	1275	139548	71	5811	149	12789	7178	1130247
1888	2106	94292	2851	485709	218	26586	1009	239332	1498	178520	1330	139502	69	5744	167	14249	7142	1089642
1889	–	–	2855	464431	224	25506	1013	218873	1455	168500	1352	141839	77	6091	176	15241	7153	1040481
1890	2208	99812	2793	464194	231	26080	981	209460	1399	164003	1312	138738	79	6475	196	16024	6991	1024974
1891	2256	100382	2778	461758	195	23316	969	193193	1404	162330	1345	138941	78	6197	246	19767	7015	1005475
1892	–	–	2731	425690	196	11706	946	181779	1408	162638	1347	141750	81	6118	298	23448	7007	964129
1893	–	–	2715	396263	188	20970	1010	156086	1426	161121	1370	146665	89	6534	315	24900	7113	912539
1894	–	–	2710	371432	191	19650	1003	136257	1427	160590	1480	148525	98	6715	336	26455	7245	869624
1895	–	–	2683	343356	190	19323	975	122417	1454	158776	1508	148609	106	7307	346	25988	7262	825836
1896	2340	104379	2669	317526	174	16540	964	115506	1469	158649	1525	146522	115	7934	363	26622	7279	789299
1897	2368	106118	2204	283056	174	15812	923	103584	1480	158077	1424	135349	115	7272	364	28604	6684	731754
1898	2429	109174	2167	262176	178	15979	903	89257	1378	144447	1452	134180	121	7439	444	40304	6643	693782
1899	2478	107168	2121	243457	171	14660	920	86288	1375	144586	1488	135234	126	9108	488	44415	6698	679352

1900	2591	112221	2121	226817	176	14251	927	78708	1247	138136	1610	141112	128	7147	515	51095	6735	659534
1901	–	–	1980	214560	180	14729	915	75293	1265	142664	1635	145227	130	7475	676	62102	6792	–
1902	–	–	2037	212967	156	13464	917	64605	1288	136660	1699	156449	139	7536	584	58292	6836	652613
1903	–	–	2069	216053	164	13739	929	59508	1288	138570	1778	169086	139	7695	639	76215	7020	638147
1904	–	–	2066	211972	161	12200	933	54855	1287	130339	1886	176430	141	7765	666	77105	7152	672838
1905	–	–	2121	198976	158	11924	938	49145	1301	141406	1942	178848	142	7809	712	79954	–	–
1906	–	–	2159	187328	149	10761	939	44471	1344	143340	1978	180340	150	8430	782	77746	–	–
1907	–	–	2074	173950	145	9815	927	69463	1338	166133	2011	184328	148	8537	872	83792	–	–
1908	–	–	2052	164919	154	10387	938	66402	1384	172975	2028	192970	91	4630	939	87056	–	–
1909	–	–	2058	160286	150	10154	937	62984	1432	175370	2061	208652	94	5377	1020	92746	–	–
1910	–	–	2054	149737	150	10100	951	59637	1499	189945	2027	227451	98	5855	1109	105414	–	–

Sources: B.T. Annual Lists of Shipping 1830-1840, 1850 and 1851
British Parliamentary Papers 1841-1849, 1852-1872
Canadian Sessional Papers 1873-1910

Note: All the returns for Newfoundland were taken from the Newfoundland House of Assembly Journals.
Cape Breton is excluded in the returns for Nova Scotia in the British Parliamentary Papers up to 1853 and included from 1853 on.
The 1837 returns for Quebec include only the Port of Quebec.
The 1838 returns for Quebec include only the Port of Montreal.
The 1839 returns for Quebec include only the Port of Quebec.

APPENDIX 2 – CANADIAN REGISTERED STEAMERS, 1870-1910

	NFLD.		NOVA SCOTIA		P.E.I.		NEW BRUNS.		QUEBEC		ONTARIO		PRAIRIES		B.C./N.W.T.		
YEAR	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	NO.	TONS	TOTAL
1873	–	–	20	1929	8	2588	58	6578	306	37680	158	19212	–	–	8	1773	558/69760
1874	–	–	27	4570	10	3983	59	10920	316	61995	211	40187	–	–	11	6650	634/128305
1879	27	6303	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1880	27	6303	56	5976	14	4343	66	10329	352	89689	385	71582	15	2345	30	5895	918/190159
1881	29	6849	65	6206	14	4323	66	10251	341	89087	410	73303	17	2558	41	7162	954/192890
1882	29	6750	64	6313	13	2978	67	9922	334	88235	430	71787	17	3638	48	8029	973/190902
1883	30	6756	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1884	27	5372	74	7775	13	3415	71	10113	322	87619	493	79686	32	5484	68	13577	1100/213041
1885	26	5366	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1886	25	5291	75	7391	14	3095	85	10983	349	138916	556	79034	38	4755	81	13644	1198/257818
1887	26	5079	84	7727	14	3114	80	9841	319	56516	610	81724	43	4846	90	14421	1240/178189
1888	31	5488	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1889	–	–	91	9009	18	3678	91	9355	304	74428	689	85029	49	5254	106	18879	1348/205632
1890	33	8595	104	10371	18	3678	93	9450	270	71962	709	88032	50	5365	120	17997	1364/206855
1891	34	8692	118	13992	17	4555	97	8913	267	74132	741	92785	51	5762	142	21540	1433/221679
1892	–	–	123	18743	21	4896	101	8950	275	75884	755	96497	54	6134	173	23607	1502/234711
1894	–	–	131	21117	23	5794	104	9169	295	75404	830	99092	61	6132	196	24198	1640/240906
1895	38	7421	136	21238	22	5263	108	9012	301	76392	885	102699	66	6338	200	26065	1718/247007
1896	32	5661	144	22080	21	4856	111	11312	304	76905	892	98665	74	7224	216	30134	1762/251176
1897	35	6919	142	19992	21	4043	115	8373	311	54059	896	91928	74	6427	226	29042	1785/213864
1898	38	8653	146	19747	21	4043	117	9858	322	75349	924	99419	80	6692	299	52199	1909/267237
1899	37	8426	150	18039	20	3957	118	9843	324	78535	952	102614	82	5961	323	58727	1969/277676
1900	–	–	155	18243	21	3966	122	10247	330	83530	1064	111083	84	6146	325	59881	2101/293096
1901	–	–	153	17764	21	3966	126	10303	351	86805	1076	110400	88	6751	362	62432	2177/298421
1903	–	–	184	22418	17	2375	136	10523	373	82875	1199	141801	97	7263	404	70996	2410/338251
1904	–	–	193	22038	16	2908	138	12433	384	87533	1288	151338	99	7359	425	69905	2543/353514
1905	–	–	205	24427	15	2649	147	13028	385	87313	1347	155221	100	7423	455	72827	2654/362888
1906	–	–	212	25159	16	3923	150	12480	406	89973	1401	162234	108	8279	507	70730	2810/375263
1907	–	–	232	30448	17	4110	173	56923	420	112914	1465	179229	107	8481	593	79690	3007/471795
1908	66	15218	236	31153	20	4492	184	54295	432	114711	1474	187264	82	6430	656	84686	3084/483031
1909	72	16706	249	35828	20	4465	190	52279	449	113338	1507	209814	82	7308	729	90649	3298/530387
1910	68	14041	267	34217	20	4465	198	46201	479	124573	1485	240658	88	7914	795	96906	3332/554974

Source: Canadian Sessional Papers

APPENDIX 3 – LEADING CANADIAN PORTS OF REGISTRY, 1867-1910

	HALIFAX			WINDSOR			PARRSBOROUGH			YARMOUTH			ST. JOHN, N.B.			QUEBEC			MONTREAL		
YEAR	NO.	TONS	Pos*	NO.	TONS	POS	NO.	TONS	POS	NO.	TONS	POS	NO.	TONS	POS	NO.	TONS	POS	NO.	TONS	POS
1867	1335	93919	2	243	62480	6	44	7066	7	434	87343	3	606	176659	1	706	76715	4	652	75396	5
1874	972	116505	3	190	75038	6	89	12517	7	413	134070	2	807	863401	1	754	99626	5	978	114125	4
1875	992	115456	4	198	78831	6	81	11931	7	409	146481	2	801	270762	1	808	101285	5	915	116290	3
1876	999	113636	4	203	86863	6	81	11338	7	415	152351	2	805	280073	1	833	104177	5	962	119114	3
1877	1017	111694	5	200	90378	6	80	11742	7	440	155007	2	776	279616	1	859	112320	4	988	131043	3
1878	1015	106281	5	189	90950	6	79	11881	7	453	166623	2	755	276016	1	869	112140	4	999	130636	3
1879	1001	98149	5	195	97813	6	76	10961	7	437	160075	2	737	279746	1	856	109632	4	1007	130133	3
1880	993	95359	5	193	101586	5	75	13433	7	430	156779	2	700	275879	1	859	107687	4	914	119205	3
1881	1012	96615	6	201	108130	4	83	14437	7	429	155809	2	684	270186	1	875	106068	5	840	112350	3
1882	1013	94244	6	195	106931	4	89	15921	7	418	146643	2	654	245345	1	876	102530	5	777	107714	3
1884	943	83669	6	192	116309	3	103	21765	7	405	133014	2	677	251136	1	899	101170	4	624	95853	4
1885	938	84334	6	186	117354	3	105	23650	7	318	130129	2	657	233947	1	907	101514	4	622	96744	5
1886	924	78747	6	189	124055	3	101	23161	7	369	123722	4	635	216959	1	914	101481	4	639	126286	2
1887	906	72458	6	186	124315	3	102	23768	7	355	114697	3	616	204256	1	909	98127	4	581	86202	5
1888	913	71776	6	186	122831	2	99	23111	7	338	109344	3	601	193254	1	903	93677	4	502	80157	5
1889	920	67482	6	185	124438	2	101	21816	7	330	104274	3	595	179740	1	875	84532	4	488	79206	5
1890	839	60601	6	194	130002	2	112	25366	7	321	103703	3	581	176159	1	844	78671	5	469	80915	4
1891	817	56975	6	196	134665	2	120	28058	7	316	97714	3	572	163222	1	865	79320	4	451	78489	5
1892	801	49364	6	191	128926	2	126	29507	7	294	79461	4	560	155221	1	854	77215	5	475	81354	3
1893	799	46659	6	181	118005	2	129	31399	7	281	68754	5	522	181909	1	872	74885	4	479	82352	3
1894	795	44201	6	167	107959	2	130	32160	7	272	60390	5	488	111888	1	867	72948	4	493	84169	3
1895	793	43694	6	149	96945	2	141	31528	7	266	52721	5	443	98750	1	875	70060	4	512	85499	3
1896	803	44713	5	143	88805	2	141	31408	7	262	41969	6	423	91271	1	875	67660	4	525	87883	3
1897	472	27245	7	138	83547	2	139	31689	6	213	39882	5	406	83069	3	882	65937	4	532	88976	1
1898	477	25129	7	129	74567	2	137	32000	6	208	33140	5	391	71227	3	780	54128	4	539	87593	1
1899	475	23415	7	121	65024	3	128	30469	5	203	29784	6	399	67705	2	774	52555	4	543	89338	1
1900	462	21630	7	110	57525	3	130	29612	5	197	25084	6	399	61072	2	625	43367	4	560	91308	1
1901	428	19952	7	109	55595	3	129	29367	5	201	22509	6	384	57301	2	638	43641	4	570	95798	1
1903	425	19777	6	113	50412	2	132	33931	5	195	18645	7	369	42566	3	640	41148	4	591	94526	1
1904	426	19475	6	107	46432	2	126	30631	5	201	18858	7	361	37962	4	634	39901	3	599	97689	1
1905	428	20651	6	106	43746	2	119	27976	5	247	17625	7	354	33353	4	634	39144	3	607	98691	1
1906	426	21347	6	100	40424	2	105	22681	5	297	17193	7	339	28588	4	636	39394	3	638	99502	1
1907	413	21222	5	90	346–5	4	96	20199	6	317	17005	7	334	54512	2	633	40811	3	647	119887	1
1908	83	7312	7	86	33460	4	93	19120	5	309	18328	6	333	51282	2	624	42826	3	687	124297	1
1909	415	22260	5	84	32523	4	92	17942	6	304	15547	7	329	46899	2	617	42483	3	736	126949	1
1910	424	21373	5	78	26222	4	95	17726	6	311	15906	7	332	43933	3	625	46271	2	789	136407	1

Source: Canadian Sessional Papers

*Pos = Position

APPENDIX 4 – THE TEN LEADING MARITIME COUNTRIES, 1870-1910

		BRITISH EMPIRE	CANADA	GERMANY	GREECE	HOLLAND	FRANCE	ITALY	JAPAN	NORWAY	RUSSIA	SPAIN	SWEDEN	UNITED STATES
1870	No.	–	–	–	–	–	–	–	–		–	–	–	–
	Tons	5690789	–	892355	–	389614	1072048	1022164	–	1022915	–	–	–	3194740
	Pos.	1	–	6	–	7	3	5	–	4	–	–	–	2
1874	No.	23540	6930	3703	2072	1525	4095	4453	–	4576	–	2886	2100	7482
	Tons	7374718	1158363	1040785	410439	455050	941817	1288627	–	1385843	–	614811	415459	2685360
	Pos.	1	5	6	11	9	7	4	–	3	–	8	10	2
1875	No.	22861	6952	3709	2103	1586	4178	4580	–	4835	–	3104	2225	7890
	Tons	7631593	1205565	1052201	423058	484232	953963	1284012	–	1395261	–	654828	448222	2880973
	Pos.	1	5	6	11	9	7	4	–	3	–	8	10	2
1876	No.	23564	7192	3682	–	1558	4172	4715	–	4871	1936	3145	2340	7892
	Tons	8023971	1260893	1052317	–	485696	944648	1355005	–	1450323	461059	675582	458677	2880038
	Pos.	1	5	6	–	9	7	4	–	3	10	8	11	2
1877	No.	20898	7362	3360	–	–	3572	4513	–	4257	1947	2988	2151	6849
	Tons	7677024	1310468	1053229	–	–	870255	1360425	–	1391877	486755	666643	462542	2564980
	Pos.	1	5	6	–	–	7	4	–	3	9	8	10	2
1878	No.	21610	7469	3421	–	1403	3247	3227	–	4278	1962	–	2083	6566
	Tons	7860692	1333015	1087606	–	443974	817732	1019137	–	1413503	482963	–	468694	2414418
	Pos.	1	4	5	–	10	7	6	–	3	8	–	9	2
1879	No.	22899	7371	3403	–	–	3206	3057	–	4312	2008	1803	2115	6434
	Tons	8139703	1332094	1112512	–	–	806478	992946	–	1426071	503034	444503	461896	2411243
	Pos.	1	4	5	–	–	7	6	–	3	8	10	9	2
1880	No.	22139	7377	3390	–	–	3107	3039	–	4308	2041	1804	2237	6500
	Tons	8259748	131218	1157178	–	–	819634	986595	–	1420788	509069	460850	468529	2438912
	Pos.	1	4	5	–	–	7	6	–	3	8	10	9	2
1880	No.	22509	7394	3315	–	–	3139	3126	–	4222	2292	2234	1805	6614
	Tons	8569304	1310896	1180356	–	–	816533	1006222	–	1449629	558339	471162	467132	2463583
	Pos.	1	4	5	–	–	7	6	–	3	8	10	9	2
1882	No.	–	–	–	–	–	–	–	–	–	–	–	–	–
	Tons	8796517	1310896	1194407	–	–	983017	990004	–	1520404	–	–	529613	4057734*
	Pos.	1	4	5	–	–	7	6	–	3	–	–	8	2
1883	No.	–	–	–	–	–	–	–	–	–	–	–	–	–
	Tons	9131448	1276440	1294288	–	–	1003679	973333	–	1547194	560554	–	519640	4235487*
	Pos.	1	5	4	–	–	6	7	–	3	8	–	– 9	2
1884	No.	–	–	–	–	–	–	–	–	–	–	–	–	–
	Tons	9314496	1253747	1294288	261496	–	1033829	971001	–	1853434	471210		529585	4291229*
	Pos.	1	5	4	10	–	6	7	–	3	9	– 8		2

1885	No.	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Tons	9323615	121776	1284703	–	–	993291	953419	–	1524076	492030	–	500395	4265934*	
	Pos.	1	5	4	–	–	6	7	–	3	9	–	8	2	
1886	No.	196190	7293	2857	–	1107	2604	2934	–	4088	2375	1806	–	6481	
	Tons	8853358	1217766	1381566	–	417554	879654	954937	–	1481312	577393	529886	–	2407707	
	Pos.	1	5	4	–	10	7	6	–	3	8	9	–	2	
1887	No.	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Tons	9135512	1130247	1240182	–	256310	972525	895625	–	1503572	–	–	500096	4105845*	
	Pos.	1	5	4	–	9	6	7	–	3	–	–	8	2	
1888	No.	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Tons	9209883	1089642	1233894	248974	245416	961073	853033	–	1534540	–	–	500010	4191916*	
	Pos.	1	5	4	9	10	6	7	–	3	–	–	8	2	
1889	No.	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Tons	9472060	1040484	–	–	–	–	–	–	–	–	–	–	430475*	
	Pos.	–	–	–	–	–	–	–	–	–	including Finland	–	–	–	
1890	No.	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Tons	7978538	1024974	1433413	–	255711	944013	740716	–	1705699	794685	618182	510947	4424497*	
	Pos.	1	5	4	–	11	6	8	–	3	7	9	10	2	
1892	No.	16374	7007	2487	–	–	2329	2177	–	3785	2502	1501	1825	3867	
	Tons	9279522	964129	1462987	–	–	760617	762269	–	1636122	607584	475442	465524	1895958	
	Pos.	1	5	4	–	–	7	6	–	3	8	9	10	2	
1895	No.	16013	7262	2247	–	–	2318	2009	–	3577	2113	1446	2079	4309	
	Tons	9650257	825837	1549983	–	–	731564	705488	–	1532192	514319	473855	486506	1850416	
	Pos.	1	5	3	–	–	6	7	–	4	8	10	9	2	
1898	No.	15874	6643	2303	–	–	2368	2084	–	3351	2868	1581	2157	4296	
	Tons	9760043	693782	1572665	–	–	801164	730953	–	1545822	676540	506455	502557	1837729	
	Pos.	1	7	3	–	–	5	6	–	4	8	9	10	2	
1900	No.	–	–	–	–	–	–	–	–	–	–	–	–	–	
	Tons	9304108	659534	1941645	–	346923	1028726	948008	–	1508118	974536	774579	613792	5164848*	
	Pos.	1	9	3	–	11	5	7	–	4	6	8	10	2	
1901	No.	15202	6792	2560	–	–	2595	1901	–	2913	3372	1112	2328	4614	
	Tons	10304338	664483	2106885	–	–	961259	947079	–	1393096	850695	561668	607862	2318876	
	Pos.	1	8	3	–	–	5	6	–	4	7	10	9	2	
1903	No.	15311	7020	2605	–	–	2680	1949	–	2743	3657	1049	2343	4755	
	Tons	11014790	683149	2254305	–	–	1156170	977515	–	1352725	919864	548119	609208	2600048	
	Pos.	1	8	3	–	–	5	6	–	4	7	10	9	2	
1904	No.	15403	7152	2705	–	–	2654	1950	–	2754	3146	1002	2338	4572	
	Tons	11225421	670666	2298902	–	–	1143661	982118	–	1390062	924772	541037	639422	2636281	
	Pos.	1	8	3	–	–	5	6	–	4	7	10	9	2	

APPENDIX 4 – THE TEN LEADING MARITIME COUNTRIES, 1870-1910

		BRITISH EMPIRE	CANADA	GERMANY	GREECE	HOLLAND	FRANCE	ITALY	JAPAN	NORWAY	RUSSIA	SPAIN	SWEDEN	UNITED STATES
1905	No.	15283	7325	2797	–	–	2646	1904	1991	2764	3910	–	2369	4808
	Tons	11333784	669825	2402499	–	–	1259431	911396	716572	1411826	995551	–	678021	2710824
	Pos.	1	10	3	–	–	5	7	8	4	6	–	9	2
1906	No.	15265	7512	2963	–	–	2627	1881	2059	2725	4114	–	2373	4744
	Tons	11742672	654179	2648362	–	–	1265105	983543	790820	1483802	1038855	–	700336	2701693
	Pos.	1	10	3	–	–	5	7	8	4	6	–	9	2
1907	No.	15122	7528	3032	–	–	2482	1879	2118	2616	3959	–	2409	4700
	Tons	12015623	698688	2744771	–	–	1284162	996043	847307	1491812	1076795	–	720784	2734609
	Pos.	1	10	3	–	–	5	7	8	4	6	–	9	2
1908	No.	14768	7602	3125	–	–	2435	1796	2117	2676	3982	–	2354	4639
	Tons	12101990	702324	2821844	–	–	1338340	989206	861417	1524885	1059520	–	741779	2735552
	Pos.	1	10	2	–	–	5	7	8	4	6	–	9	3
1909	No.	14815	7768	3163	–	–	2403	1813	2159	2625	3998	–	2427	4556
	Tons	12239102	718553	2799458	–	–	1307276	1009595	881572	1484767	1078106	–	785384	2635635
	Pos.	1	10	2	–	–	5	7	2	4	6	–	9	3
1910	No.	13952	7904	121	–	–	2345	1787	2147	2559	39977	–	2401	4531
	Tons	12319650	750929	2959933	–	–	1335049	969697	930477	1483576	1053143	–	774491	2631026
		1	10	2	–	–	–	7	8	4	6	–	9	3

Source: British Parliamentary Papers; Statements of Trade and Navigation
Canadian Sessional Papers; Report of the Department of Marine

APPENDIX 5 – TONNAGE BY PROVINCE OF CANADIAN REGISTERED VESSELS

	NFLD.		NOVA SCOTIA		P.E.I.		NEW BRUNS.		QUEBEC		ONTARIO		PRAIRIES		B.C.		TOTAL CANADA	
YEAR	No.	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	No.	Tons
1830	–	–	50.66	83981	4.62	7661	26.26	43532	18.46	30608	–	–	–	–	–	–	2210	165782
1831	–	–	47.25	71282	4.08	6154	28.14	42453	20.53	30975	–	–	–	–	–	–	2314	150864
1832	–	–	–	64859	–	7689	–	52321	–	29408	–	–	–	–	–	–	–	–
1833	–	–	43.36	71281	4.70	7730	35.46	58302	16.48	27089	–	–	–	–	–	–	2143	164402
1834	–	–	32.49	55957	4.89	8419	43.84	75490	18.78	32336	–	–	–	–	–	–	2337	172202
1835	–	–	38.19	78528	4.99	10258	39.36	80929	17.45	35887	–	–	–	–	–	–	2460	205602
1836	–	–	38.80	81912	3.03	6397	41.44	87496	16.73	35310	–	–	–	–	–	–	2530	211115
1837	–	–	41.06	88255	4.81	10342	39.14	84130	14.99	32218	–	–	–	–	–	–	2616	214945
1838	–	–	–	96036	–	13631	–	88945	–	32218	–	–	–	–	–	–	–	–
1839	–	–	38.40	92030	5.37	12883	42.69	102327	13.54	32451	–	–	–	–	–	–	2915	239691
1840	–	–	38.36	103871	5.80	15696	40.25	109003	16.60	42232	–	–	–	–	–	–	2973	270802
1841	–	–	40.05	109495	5.88	16073	42.52	116240	11.54	31554	–	–	–	–	–	–	3151	273362
1842	–	–	39.87	107272	5.89	15853	35.64	95893	18.59	50018	–	–	–	–	–	–	3299	269036
1843	–	–	40.19	108067	5.90	15874	34.70	93300	19.20	51629	–	–	–	–	–	–	34404	268870
1844	–	–	40.69	103946	5.43	13861	32.22	82308	21.67	55358	–	–	–	–	–	–	3291	255473
1845	–	–	39.83	108799	5.37	14667	32.15	87833	22.65	61872	–	–	–	–	–	–	1490	273171
1846	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1847	–	–	38.69	133707	8.10	28005	32.37	111838	20.84	72001	–	–	–	–	–	–	3540	345551
1848	–	–	41.31	142530	7.36	25339	32.99	113825	18.34	63263	–	–	–	–	–	–	3932	345017
1849	–	–	42.38	153051	7.92	28587	32.53	117475	17.17	61992	–	–	–	–	–	–	4108	361105
1850		–	–	176300	–	27932	–	121996	–	–	–	–	–	–	–	–	–	–
1851	–	–	45.22	169269	8.39	31410	27.75	103877	18.65	69806	–	–	–	–	–	–	4510	374362
1852	–	–	52.22	227462	6.41	27928	23.79	103613	17.58	76589	–	–	–	–	–	–	4171	435592
1953	–	–	43.71	187083	6.05	25890	28.88	123618	21.37	91462	–	–	–	–	–	–	5262	428053
1854	–	–	42.89	200703	7.38	34513	28.72	134373	21.02	98351	–	–	–	–	–	–	5150	467940
1855	–	–	42.22	200607	7.31	34754	29.72	141242	20.74	98570	–	–	–	–	–	–	5052	475173
1856	–	–	41.95	222186	6.15	32595	31.11	164750	20.79	110082	–	–	–	–	–	–	5295	529613
1857	–	–	43.66	234791	5.55	39830	29.85	160508	20.94	112606	–	–	–	–	–	–	5247	537735
1858	–	–	47.60	242366	4.22	21495	27.99	142533	20.19	102791	–	–	–	–	–	–	5350	509185
1859	–	–	49.21	251226	4.80	24512	26.26	134055	19.74	100761	–	–	–	–	–	–	5937	510554
1860	–	–	47.51	259867	5.03	27534	26.89	147083	20.57	112539	–	–	–	–	–	–	5610	547023
1861	–	–	44.69	252867	4.71	26619	28.98	163812	21.62	122253	–	–	–	–	–	–	5637	565341
1862	–	–	47.26	275910	5.40	31545	27.02	157728	20.31	118574	–	–	–	–	–	–	5578	583757
1863	–	–	45.94	320186	5.56	38717	30.37	211680	18.13	126315	–	–	–	–	–	–	5815	696898
1864	–	–	45.25	360859	5.87	46829	29.24	233225	19.64	156633	–	–	–	–	–	–	6144	797546
1865	–	–	46.89	376041	5.06	40549	28.98	232414	19.09	153024	–	–	–	–	–	–	5858	802028
1866	–	–	46.80	374747	5.03	40925	29.84	238945	18.33	146805	–	–	–	–	–	–	5282	800792
1867	–	–	38.20	381076	3.87	38595	22.20	221431	15.61	155690	–	–	–	–	–	–	6906	997569
1868	–	–	49.84	401993	4.90	39484	28.51	229944	16.76	135179	–	–	–	–	–	–	5847	806600
1869	–	–	50.24	405543	4.63	37402	28.36	228951	16.77	135350	–	–	–	–	–	–	5804	807246
1870	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

APPENDIX 5 – TONNAGE BY PROVINCE OF CANADIAN REGISTERED VESSELS

	NFLD.		NOVA SCOTIA		P.E.I.		NEW BRUNS.		QUEBEC		ONTARIO		PRAIRIES		B.C.		TOTAL CANADA	
YEAR	No.	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	%	Tons	No.	Tons
1871	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1872	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1873	–	–	41.88	449701	3.62	38918	25.88	277850	19.93	214013	8.30	89111	–	–	0.38	4095	6783	1073688
1874	–	–	41.41	479669	4.18	48388	25.44	294741	18.90	218946	9.76	113008	–	–	0.31	3611	6930	1158363
1875	–	–	41.90	505144	4.20	50677	25.54	307926	18.49	222965	9.54	114990	0.01	178	0.31	3685	6952	1205565
1876	–	–	41.97	529252	4.02	50692	25.74	324513	18.12	228502	9.83	123947	0.01	178	0.30	3809	7192	1260893
1877	–	–	41.23	541579	4.23	55547	25.08	329457	18.91	248399	10.26	134761	0.02	246	0.26	3479	7362	1310468
1878	–	–	41.51	553368	4.07	54250	25.20	335965	18.63	248349	10.16	135440	0.09	1161	0.34	4482	7460	1333015
1879	–	–	41.45	552159	3.74	49807	25.56	340491	18.47	246025	10.28	136987	0.14	1924	0.35	4701	7766	1332094
1880	–	–	41.98	550448	3.50	45931	25.70	336976	17.80	233341	10.49	137481	0.15	1992	0.38	5019	7377	1311188
1881	–	–	42.64	558911	3.46	45410	25.42	333215	17.16	224936	10.68	139998	0.16	2130	0.48	6296	7394	1310896
1882	–	–	43.37	546778	3.31	41684	24.51	308980	17.12	215804	10.87	137061	0.22	2783	0.61	7687	7312	1260777
1883	–	–	42.44	541715	3.87	49446	24.75	315906	16.97	216577	11.04	140972	0.22	2778	0.71	9046	7374	1276440
1884	–	–	43.39	544048	3.13	39213	24.58	308132	16.18	202842	11.36	142387	0.46	5722	0.91	11403	7254	1253747
1885	–	–	43.81	541832	2.91	36040	23.33	288589	16.87	208635	11.68	144487	0.44	5439	0.96	11834	7315	1231856
1886	–	–	43.27	526924	7.52	30658	22.11	269224	19.10	232556	11.57	140929	0.46	5578	0.98	11900	7294	1217769
1887	–	–	44.14	498878	2.57	29031	22.57	255126	16.73	189064	12.35	139548	0.51	5811	1.13	12789	7178	1130247
1888	–	–	44.57	485709	2.44	26586	21.96	239332	16.38	178520	12.80	139502	0.53	5744	1.31	14249	7142	1089634
1889	–	–	44.64	464431	2.45	25506	21.04	218873	16.19	168500	13.63	141839	0.59	6091	1.46	15241	7152	1040481
1890	–	–	45.29	464194	2.54	26080	20.44	209460	16.00	164003	13.54	138738	0.63	6475	1.56	16024	6991	1024974
1891	–	–	45.92	461758	2.32	23316	19.21	193193	16.14	162330	13.82	138941	0.62	6197	1.97	19767	7015	1005502
1892	–	–	44.15	425690	2.36	22706	18.85	181779	16.87	162638	14.70	141750	0.63	6118	2.43	23448	7007	964129
1893	–	–	43.42	396263	2.30	20970	17.10	156087	17.66	161121	16.07	146665	0.72	6534	2.73	24900	7113	912539
1894	–	–	42.71	371432	2.26	19650	15.67	136257	18.47	160590	17.08	148525	0.77	6715	3.04	26455	7245	869624
1895	–	–	41.58	343356	2.34	19323	14.82	122417	19.23	158776	18.00	148609	0.88	7307	3.15	25988	7262	825776
1896	–	–	40.23	317526	2.10	16540	14.63	115506	20.10	158649	18.56	146522	1.01	7934	3.37	26622	7279	789299
1897	–	–	38.68	283056	2.16	15812	14.16	103584	21.60	158077	18.50	135349	0.99	7292	3.91	28604	6684	731754
1898	–	–	37.79	262176	2.30	15979	12.87	89257	20.82	144447	19.34	134180	1.07	7439	5.81	40304	6643	693782
1899	–	–	35.93	243457	2.16	14660	12.73	86288	21.34	144587	19.96	135234	1.33	9108	6.55	44415	6689	677658
1900	–	–	34.51	226817	2.17	14251	11.98	78708	21.02	138136	21.47	14112	1.09	7147	7.77	51095	6724	659266
1901	–	–	32.41	214560	2.22	14729	11.37	75293	21.55	142664	21.94	145227	1.13	7475	9.38	62102	6781	662050
1902	–	–	32.77	212967	2.07	13464	9.94	64605	21.03	136660	24.07	156449	1.16	7536	8.97	58292	6820	649973
1903	–	–	31.73	216053	2.02	13739	8.74	59508	20.35	138570	24.83	169086	1.13	7695	11.19	76215	7006	680866
1904	–	–	31.61	211972	1.82	12200	8.18	54885	19.43	130339	26.31	176430	1.16	7765	11.50	77105	7140	670666
1905	–	–	29.78	198976	1.78	11924	7.36	49145	21.17	141406	26.77	178848	1.17	7809	11.97	79954	7314	668062
1906	–	–	28.71	187328	1.65	10761	6.82	44471	21.97	143340	27.64	180340	1.29	8430	11.92	77746	7501	652416
1907	–	–	24.99	173950	1.41	9815	9.98	69463	23.87	166133	26.48	184328	1.23	8537	12.04	83792	5515	696018
1908	–	–	23.58	164919	1.49	10387	9.49	66420	24.73	172975	27.59	192970	0.66	4630	12.45	87056	5544	699339
1909	–	–	22.58	164919	1.49	10151	8.80	62984	24.51	175370	29.16	208652	0.75	5377	12.96	92746	7752	715569
1910	–	–	20.01	149737	1.35	10100	7.97	59637	25.39	189945	30.40	227457	0.78	5855	14.09	105414	5838	748145

Source: As for Appendix 1.

Note: Where data is not available, percentages have not been calculated.

Note: "_____" denotes missing data

2. THE PORT OF ST. JOHN'S, NEWFOUNDLAND, 1840-1889: A PRELIMINARY ANALYSIS

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THE PORT OF ST. JOHN'S, NEWFOUNDLAND, 1840-1889; A PRELIMINARY ANALYSIS

Eric W. Sager

I

This study of shipping registered at St. John's, Newfoundland covers the period from 1840 to 1889.[1] The choice of dates, while somewhat arbitrary, nevertheless serves two immediate purposes. It allows comparisons to be made with the shipping of Yarmouth and Charlottetown, the two other Maritime ports presently under study by the Maritime History Group. And by commencing with the year 1840 we are able to focus upon a half century of primary importance in the history of shipping in Newfoundland. This was the period when the Newfoundland fleet expanded beyond the largely coastal-based schooner fleet of the early nineteenth century. And it was in this period that the non-schooner fleet again contracted, leaving a relatively large schooner fleet which lasted well into the twentieth century.

TABLE 1

ST. JOHN'S VESSELS, 1840-1889

	NO.	%	TONNAGE	%
Schooners	3895	80	168,466	54
Brigantines	630	13	78,509	25
Brigs	190	4	29,191	9
Barques	20	0	7,470	2
Barquentines	6	0	1,288	0
Ships	1	0	795	0
Sail/steam	59	1	17,453	6
Steamers	4	0	208	0
Cutter	3	0	85	0
Sloop	1	0	46	0
Other/unknown	62	1	6,444	2

Sources for all tables in this paper: BT 107, 108 Ship Registries. The ship registries for Newfoundland in 1854 are missing from both the Public Record Office and from the Public Archives of Canada. This table does not include 1854 vessels. For purposes of analysis, estimates of the number of each rig registered in 1854 have been used. These estimates are based on the known tonnage of all 1854 vessels, taken from the 1854 Annual Lists of British Shipping.

St. John's was not a typical Maritime port. It was a large port in terms of the number of vessels registered: between 1840 and 1880 there were 4871 new vessel registrations. But this large number of vessels remained a relatively small fleet in terms of tonnage and carrying capacity: between 1840 and 1889 24% less tonnage was registered in St. John's than in Yarmouth, and 49% less than in Charlottetown.

One need not look far to account for this relatively small tonnage. For most of the period under study the small two-masted single-decked schooner dominated the Newfoundland fleet. Schooners accounted for 80% of all new registrations between 1840 and 1889, and for most of the period over 50% of tonnage in the fleet lay under the decks of the schooner.[2]

The schooners of Newfoundland were often employed in trades beyond the coasts of the island itself, and some schooners were occasionally used for ocean voyages. But the Newfoundland schooner was built and designed mainly for short-run coastal voyages, for the support of the fishery, and for the annual run to St. John's for supplies. The vessel's characteristics were determined by the demands of this trade. Although the three-masted schooner may have appeared very early in Newfoundland, only a few of these were registered in the nineteenth century, and there were none of the 300-ton and larger schooners which appeared elsewhere in the Maritimes.[3] The average tonnage of the decked schooner was a mere 43 tons. The average tonnage of schooners actually declined after the 1840's, and in spite of the increasing size of other rigs, the average Newfoundland vessel also declined in size after the 1850's.

In supplying Newfoundland's outport communities the relative advantages of speed and manoeuvrability possessed by the small schooner appear to have outweighed any advantages of greater size. But whatever the relative advantages, there was another reason for the small size of Newfoundland vessels. Although there was sufficient timber at various places along the Newfoundland coast (particularly in Hermitage Bay and Notre Dame Bay), there were few very tall stands of timber within easy reach of the coastline. Schooners built in Newfoundland tended to be smaller than schooners built elsewhere and brought to the island, and smaller than schooners registered in Yarmouth and in Charlottetown. Since after the 1850's a growing proportion of the fleet consisted of schooners, and since Newfoundland builders supplied a growing proportion of the fleet, the average tonnage of the Newfoundland vessel declined accordingly.

TABLE 2

AVERAGE TONNAGE OF ST. JOHN'S VESSELS

	1840-49		1850-59		1860-69		1870-79		1880-89	
	No.	$\bar{x}$	No.	$\bar{x}$	No.	$\bar{x}$	No.	$\bar{x}$	No.	$\bar{x}$
All vessels	658	76	801	82	912	58	1200	59	1200	51
Schooners	421	53	448	43	768	40	1095	43	1151	43
Brigantines	179	106	264	121	90	139	62	154	26	213
Brigs	56	145	78	155	40	171	9	167	4	153
Barques	1	546	6	242	2	308	6	353	5	548
Sail/steam	1	35	5	120	12	248	28	394	14	201

Newfoundland's shipbuilders supplied 44% of new registrations in the 1840's, and this proportion grew to 80% in the 1880's. This reliance upon local shipbuilders did not decline until the twentieth century, when Newfoundland's shipowners tapped the market for old sailing vessels in the Maritime Provinces (only 55% of vessels first registered

between 1920 and 1926 were built in Newfoundland, and in this period 92% of new registrations were still sailing vessels). The Newfoundland builders were highly successful in meeting the demand for a coastal fleet: they concentrated almost entirely on schooners, and it was only in the 1830's and 1840's that some Newfoundland builders (such as Charles Newhook of Trinity Bay) produced a significant number of brigs and brigantines. In fact, no less than 33% of Newfoundland's brigs came from the hands of Newfoundland builders.

TABLE 3

PLACE OF BUILD OF ST. JOHN'S VESSELS

	NFLD.			NOVA SCOTIA			P.E.I.			NEW BRUNSWICK			GREAT BRITAIN			U.S.A.		
	No.	Col. %	Row %	No.	Col. %	Row %	No.	Col. %	Row %	No.	Col. %	Row %	No.	Col. %	Row %	No.	Col. %	Row %
Schooner	3126	95	80	392	56	10	193	39	5	18	38	0	46	33	1	78	87	2
Brigantine	83	2.5	13	252	36	40	245	50	39	18	38	3	25	18	4	1	1	0
Brig	62	2	33	46	7	24	56	11	29	7	15	4	18	13	9	0	—	—
Sail/steam	8	0	12	3	0	5	0	—	—	3	6	5	39	28	61	7	8	11
Other	5	—	—	4	—	—	0	—	—	1	—	—	12	8	—	4	—	—

Where the economy depended so heavily upon the efforts of fishermen in widely dispersed communities, it is no surprise to find that shipbuilding was also a widely dispersed activity. The building of schooners was almost exclusively an outharbour occupation – only 33 of the 4871 vessels registered, and only 12 schooners, were built in or near the port of registry itself. Most schooners, at least when they were first registered, were owned in the same bay in which they were built. Unfortunately the Newfoundland ship registries do not give builders' names after 1854. But the earlier registries suggest that the smaller schooners owned by planters or fishermen had often been built by their owner. Very often the smaller schooners had been built undecked and registered only after the planter-owner had himself decked the vessel. This was a very common practice in the first half of the century, and helps to explain why Newfoundland vessels were on average older when first registered than vessels in Yarmouth or Prince Edward Island. Only 74% of new registrations were newly built vessels.

Only when Newfoundland owners purchased other rigs did they look to builders outside the Island. Nova Scotia and Prince Edward Island were the preferred suppliers, especially of brigs and brigantines. Because many St. John's owners had close family and business connections in London, Liverpool, Bristol and Greenock, it is not surprising that Britain was the most important market for ships outside the Maritimes. Sailing steamers were as common in Newfoundland as in Yarmouth (1.3% of all registrations), and most of these came from Britain to be registered by St. John's owners or by owners resident in Britain. Thus when the Newfoundland fleet expanded to include rigs other than schooners, the island depended very heavily upon external suppliers.

While the schooner fleet was widely dispersed throughout the island, a different pattern emerges if we consider the distribution of larger rigs and of tonnage by region. St.

John's owners accounted for 52% of all tonnage registered but only 40% of all vessels. Only in Conception Bay was there another significant concentration of tonnage (the largest owner of St. John's-registered vessels was John Munn of Harbour Grace). Throughout our period only 41 non-schooner rigs were newly registered by Newfoundland owners who resided outside St. John's or Conception Bay. The non-schooner rigs were also heavily concentrated in St. John's: 60% of shares in brigs and 63% of shares in brigantines were held by owners who resided in St. John's.

TABLE 4

TONNAGE OF NEW REGISTRATIONS BY RESIDENCE OF PRINCIPAL OWNER

	TONNAGE	% OF TOTAL		TONNAGE	% OF TOTAL
St. John's	160,330	51.7%	French Shore	3289	1.1%
Conception Bay	57,136	18.4%	South Coast	2979	1%
Trinity Bay	12,944	4.2%	Fortune Bay	11,373	3.7%
Bonavista Bay	9,164	2.9%	Placentia Bay	5609	1.8%
Fogo-Twillingate	15,000	4.8%	St. Mary's & Trepassey	575	.2%
Notre Dame Bay	12,623	4.1%	Southern Shore	661	.2%
			Other	15,744	5.1%

The principal owner is defined as the owner with larger number of shares. Where two owners of different residence held an equal number of shares, the residence of the first-listed owner is given; but these amount to less than 1% of the total.

Even more striking perhaps is the concentration of ownership itself. There were fewer owners per vessel than in ports with larger ships, and where there were two or more owners they were usually members of the same family or business partnership. A total of 3035 individuals appear on the registries as owners of newly registered or *de novo*-registered vessels. Some 103 of this total had shares in ten or more vessels each, and for the purposes of this analysis we may consider these to be the large owners. These individuals, only 3.4% of all owners, accounted for 35% of all appearances on the registries, and they owned 44% of all tonnage registered in St. John's.[4] No less than seventy of these owners gave their residence as St. John's (or as St. John's and Britain). These seventy were a small proportion even of all St. John's owners, but they owned fully 31% of all tonnage registered in Newfoundland between 1840 and 1889.

There were also particularly important concentrations of tonnage among different occupational groups. Occupational categories are not always easy to define in Newfoundland, and we cannot assume a clear social and economic distinction between the merchant, the trader, the mariner and the planter. The distinction between merchant and trader was often blurred, particularly outside St. John's, and the ship registries often attribute several different occupations to the same individual within a short space of time.[5] For the purpose of this analysis occupations have been aggregated into the broadest categories. Any greater precision must await further research into social mobility and the social structure in nineteenth century Newfoundland. Twenty-one per cent of

vessel owners are described as merchants on the registries at least once during their shipowning careers; this 21% owned at least 65% of all registered tonnage. Merchants and traders together owned 67% of all tonnage. The planters, fishermen and mariners together owned 26% of all tonnage, and the average tonnage of vessels owned by these latter groups was slightly less than the average tonnage of the schooner. Clearly those describing themselves as merchants held a disproportionately large share of total tonnage.

Merchants also held a disproportionately large share of non-schooner rigs, and this fact has some bearing upon the probability (to be discussed later in this paper) that brigs and brigantines served a substantially different economic function from that of the schooner. The percentages in Table 5 indicate the proportion of shares in particular rigs held by various occupational groups.

TABLE 5

DISTRIBUTION OF RIGS BY OCCUPATIONAL GROUP

	SCHOONER	BRIG	BRIGANTINE	BARQUE	SAIL/STEAMER
Merchant	46.2%	80.8%	70.3%	76.5%	83.0%
Trader/dealer	3.5%	.7%	.7%	0	1.1%
Fisherman/mariner	10.8%	6.6%	4.0%	2.9%	1.1%
Planter	36.8%	5.2%	17.2%	0	3.4%
Shipowner	.6%	4.8%	3.4%	2.9%	5.7%
Shipbuilder	.4%	0	.7%	0	1.1%
Tradesman-marine	0	0	0	0	0
Tradesman-nonmarine	.5%	.4%	1.3%	0	1.1%
Professional	.8%	.4%	1.7%	11.8%	2.3%
Other	.4%	1.1%	.6%	5.9%	1.1%

It was the merchants, among whom the largest shipowners were heavily concentrated in St. John's, who were most likely to have a considerable direct stake in the external trade of the Island. And it was the merchants who held by far the largest proportion of rigs designed for ocean voyages and for long-distance coastal trading. Schooners were almost equally distributed between merchants on the one hand, and fishermen, planters and mariners on the other. While the schooner served the needs of most occupational groups, the non-schooner fleet expanded and contracted very largely because of investment decisions undertaken by merchants, and in particular by merchants in St. John's.

II

The pattern of new registrations in St. John's reveals fluctuations equally as sharp as those which occurred elsewhere in the Maritimes (see Figure 1). But in Newfoundland there were very basic differences. The number of vessels first registered increased gradually, from an annual average of sixty-six vessels in the 1840's to an annual average of 121 in the 1880's. But in Newfoundland the decline began later than elsewhere, and the downward trend was less steep (between 1920 and 1926 there was still an average of fifty

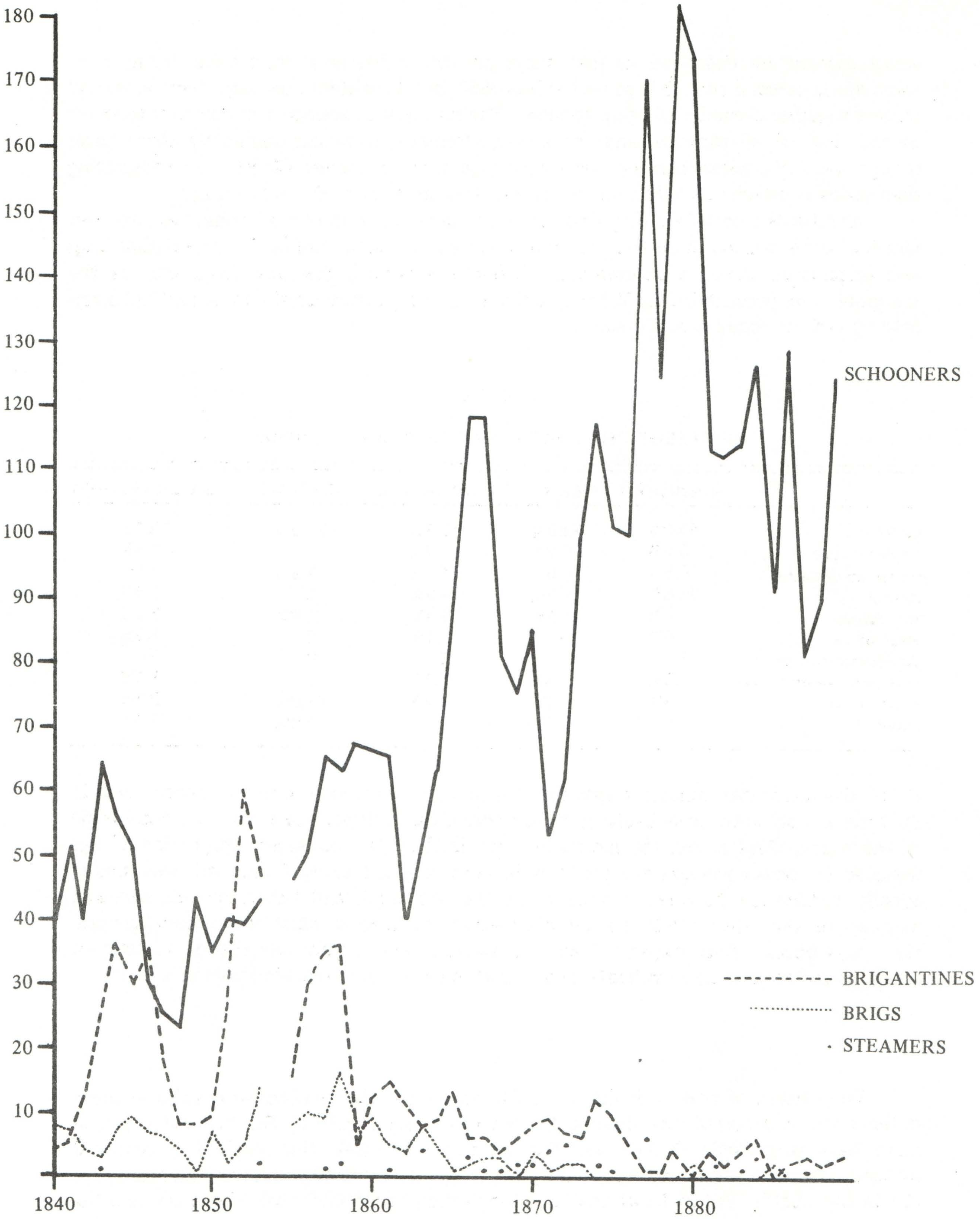

FIGURE 1: NEW VESSEL REGISTRATIONS, 1840-1889

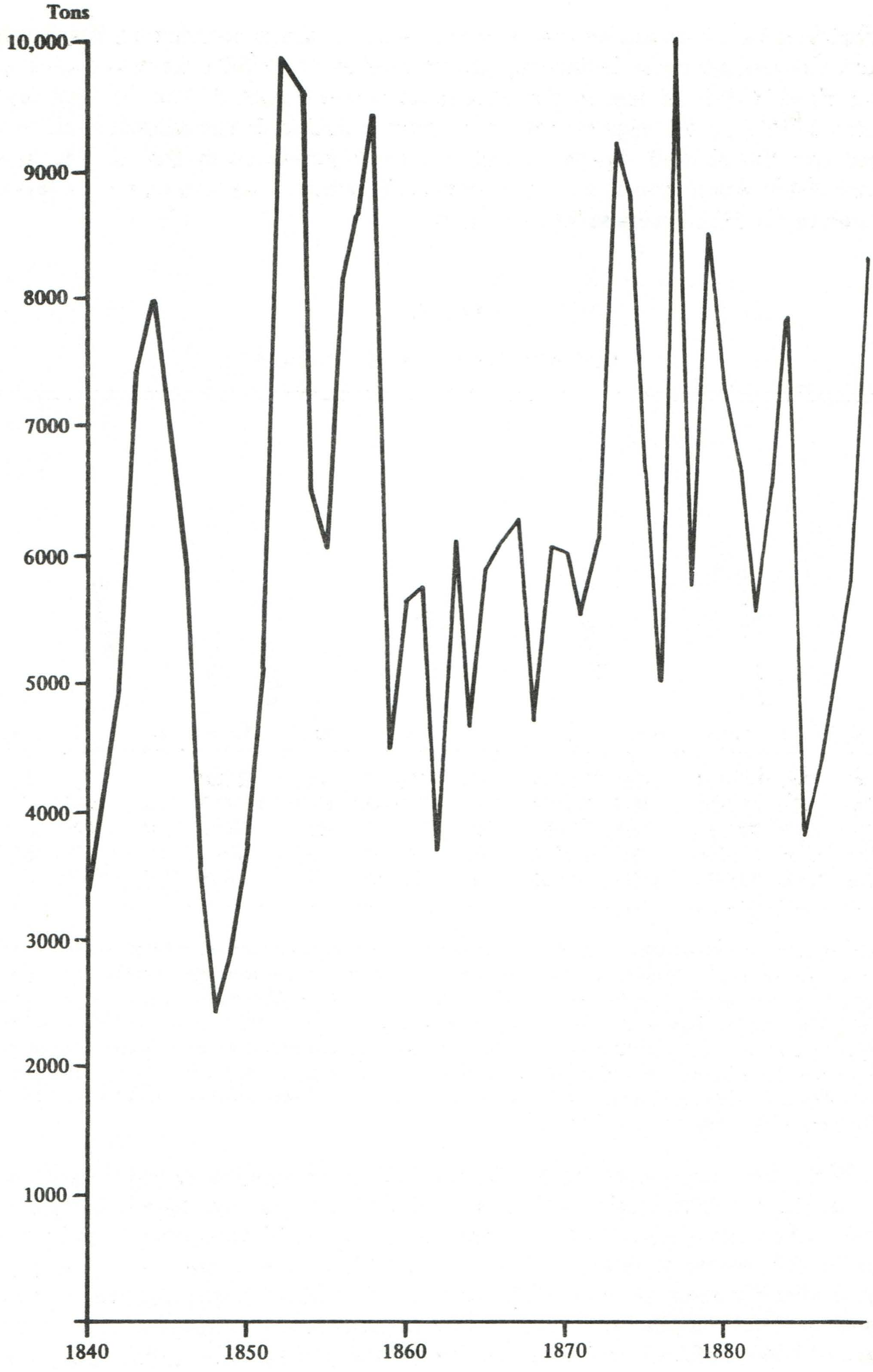

FIGURE 2: TONNAGE OF NEW REGISTRATIONS: ALL RIGS

new registrations of sailing vessels a year). And in sharp contrast to Yarmouth, for instance, the upward trend in new registrations before the 1880's did not result in a clear upward trend in the tonnage of new registrations (see Figure 2). The fleet was sustained after the 1850's by the registration of schooners, and it is the schooners alone which account for the marked upward trend in new registrations in the 1870's. It was a schooner fleet which lasted into the twentieth century, and all sailing vessels newly registered in the 1920's were schooner-rigged.

TABLE 6

NEW REGISTRATIONS BY DECADE

	ALL VESSELS		SCHOONERS		BRIGANTINES		BRIGS		SAIL/STEAM		BARQUES/BARQUENTINES	
	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons	No.	Tons
1840-49	660	50,054	421	22,346	179	18,954	56	8134	1	35	1	546
1850-59	886	71,820	460*	17,374*	273*	31,943*	81*	12,113*	5	599	7	1450
1860-69	913	54,026	768	30,300	90	12,511	40	6825	12	2978	2	617
1870-79	1204	71,876	1095	47,156	62	9,551	9	1507	27	11,024	8	2517
1880-89	1208	62,361	1151	49,589	26	5,550	4	612	14	2817	9	3628

*Copies of Newfoundland ship registries apparently do not exist for the year 1854 either in the Public Record Office or in the Public Archives of Canada. The names and tonnage of all vessels registered in 1854 are recorded in the Annual Lists of British Shipping. The rig of most vessels remains unknown, however. The figures above do not include registrations for 1854. For the purposes of analysis, estimates of the number and tonnage of 1854 vessels have been derived from decade averages for each rig, and from the known total tonnage registered in 1854. If these estimates are included, the figures for the 1850's would read: Schooners: No. — 495; Tons — 19,395; Brigantines: No. — 291; Tons — 35,210; Brigs: No. — 86; Tons — 13,353.

There were fairly clear cyclic fluctuations in new registrations in Newfoundland, with troughs in 1848, 1862, 1871, and 1887. But again the Newfoundland pattern appears to be unique: apart from the peak in the late 1870's and the trough in 1887, the cycles are the reverse of those in Yarmouth and the reverse of the new registration cycle in the United Kingdom. Again it is the schooner fleet which largely determined the cycles in Newfoundland shipping, for it was the decline in schooner tonnage which deepened the troughs of 1848, 1862 and 1871 and heightened the peaks of 1844, 1867 and 1879.

The schooner was always the typical vessel in the Newfoundland fleet, but it did

not always determine the character of Newfoundland shipping. In the 1840's and 1850's a different pattern emerges, and for twenty years the majority of shipping tonnage in Newfoundland was carried by other rigs. Of the 731 vessels on registry in St. John's in 1840, only seventy-six were brigs and only thirty-seven were brigantines. There were no other rigs but schooners, sloops and cutters. The change began in the late 1830's and continued through the 1840's, when 54% of new tonnage consisted of brigs and brigantines. In the 1850's brigantines alone accounted for almost 50% of new tonnage. Thereafter the decline of the non-schooner rigs was almost as steep as their earlier rise. By the 1860's each year saw the addition of only nine brigantines and only four brigs.

This was not a complete transformation in the structure of the Newfoundland fleet, but it was an important change nonetheless. The new rigs were substantially larger than the Newfoundland schooner. We know that a number of these brigs and brigantines were used in the seal hunt, but this would have occupied them for only a small part of each year. Brigs and brigantines could have been used in trade with the other Maritime Colonies, with the United States, or on the important trade route to the West Indies and Brazil. It is extremely difficult at this stage of our research to establish a precise relationship between the appearance of these new rigs and the pattern of Newfoundland's trade, whether coastal or ocean-going. But some suggestions can be made on the basis of the registrations themselves.

If the registration of new rigs was a response to the same factors which encouraged the registration of schooners, then we might expect to find a positive correlation between annual changes in schooner registrations and annual changes in the registration of brigs and brigantines. In fact the correlation coefficient for such changes over the period from 1840 to 1860 is low and negative: -.02. This does not by any means prove that the new rigs were serving a different function from schooners. It is possible, for instance, that there was an inverse relationship between the registration of the new rigs and the registration of schooners. The registration of a large number of brigs and brigantines may have been followed by a decline in the registration of schooners. But if we allow for a year's lag, and correlate annual changes in the registration of new rigs with changes in the next year's addition of schooners, the correlation coefficient is positive but still fairly low (+.3). Although the rate of schooner registrations did decline slightly in the 1840's, it is still possible that the brigs and brigantines existed independently of the schooner fleet. While schooner registrations continued their gradual upward climb after the trough of 1848, the new rigs followed their more erratic pattern, the brigantines reaching their peak in 1852 and the brigs in 1858.

Whatever the reasons for their appearance, the new rigs had a significant impact on the fleet as a whole. By the 1850's the schooners no longer determined changes in the registration of total tonnage, nor even changes in the number of vessels registered. The brigantines in particular had an important impact on total registrations in the 1840's and 1850's, but the brigs were also more influential in the 1850's than schooners. The influence of brigantines and brigs virtually disappears in the 1860's. In spite of the fact that barques and sailing steamers together accounted for a quarter of all tonnage registered between 1870 and 1875, the registration of these other rigs was not sustained and did not weaken the increasing dominance of the schooner fleet.

TABLE 7

CORRELATION COEFFICIENTS OF CHANGES IN NEW REGISTRATIONS BY VESSEL TYPE

DECADE	SCHOONERS		BRIGANTINES		BRIGS	
	No.	Tonnage	No.	Tonnage	No.	Tonnage
1840-49	+.83	+.70	+.62	+.74	+.01	+.17
1850-59	+.37	-.48	+.94	+.90	+.52	+.49
1860-69	+.98	+.73	+.17	-.01	+.13	+.28
1870-79	+.99	+.89	+.07	+.01	-	-
1880-89	+.99	+.86	+.02	-.68	-	-

The coefficients indicate the correlation between annual changes in total registrations and annual changes in registrations of each rig.

The importance of the brigs and brigantines becomes more clear when we consider the size of the fleet (vessels on registry) and net investment in the various rigs (additions to the fleet minus registry closures). It is particularly difficult to present an accurate estimate of the size of the Newfoundland fleet at any point in time. With schooners especially the date of registry closure is often an inadequate guide to the date when the vessel went out of service. In particular years – 1850, 1869, 1872, 1919, and in the 1920's – the registrar closed the registries of a very large number of vessels with the notation "Cancelled per Form 20", or "no information available". In some years as many as 30% of vessels on registry were almost certainly no longer in service. Fortunately the registries do give the date of actual disposal for at least 20% of all vessels, and on the basis of this sample it has been possible to estimate the average life of each rig by decade. This average life has been applied to the vessels whose disposal is unknown, and the result is a much more accurate estimate of the size of the fleet in service.

TABLE 8

NEWFOUNDLAND FLEET SIZE

	OFFICIAL		ADJUSTED	
	No.	Tonnage	No.	Tonnage
1840	731	46,468	530	35,741
1845	928	60,099	652	46,416
1850	993	60,441	684	45,929
1855	1069	72,265	834	60,993
1860	1383	93,170	1014	73,593
1865	1540	94,603	1038	66,178
1870	1567	84,183	1195	65,774
1875	1491	83,196	1274	73,287
1880	1870	93,100	1550	81,980
1885	2093	98,082	1679	83,418
1889	2205	100,273	1673	81,586

From 1844 to 1866, however, the schooner fleet accounted for less than half the tonnage in the fleet (see Figure 3). Between 1851 and 1863 brigantine tonnage alone was greater than schooner tonnage, and the proportion of schooner tonnage in the fleet dropped to 31% in 1858 and 1859. The estimate of fleet size also reveals the importance of the 1850's and 1870's as peak periods in the history of Newfoundland shipping. In terms of tonnage, the fleet reached a size in the late 1850's which was not exceeded until 1876.

Analysis of net investment confirms the importance of the 1850's and 1870's. The fleet as a whole grew at an annual rate of almost 3% in the 1840's – a growth rate led by the very high net investment in brigantine tonnage.

TABLE 9

ANNUAL GROWTH RATES (TONNAGE)

DECADE	ALL VESSELS	SCHOONERS	BRIGANTINES	BRIGS	SAIL/ STEAM	ALL NON-SCHOONERS
1840/1-49/50	2.9%	-1.0%	19.1%	-.41%	—	8.4%
1850/1-59/60	5.7%	1.6%	8.5%	6.4%	—	8.3%
1860/1-69/70	-1.4%	4.6%	-7.2%	-7.7%	37.6%	-6.2%
1870/1-79/80	2.4%	4.7%	-5.4%	-10.9%	10.2%	-1.8%
1880/1-88/89	-.3%	.9%	-5.5%	-9.0%	-6.3%	-4.7%
1840/41-88/89	1.75%	2.2%	1.1%	-4.2%	—	.5%

But the fastest growth rate occurred in the 1850's, the result of the accumulation of both brigs and brigantines. The non-schooner fleet declined as a whole in the 1860's and 1870's, in spite of the net investment in sailing steamers. Contraction was most rapid in the 1860's, and again it was the non-schooner fleet which determined the overall rate. The beginning of a permanent decline in the rate of net investment can be seen in the 1880's: the downward trend begins in 1885 and is at first very slow, although for the first time there appears a high rate of disinvestment in all rigs except the schooner.

The Newfoundland fleet expanded at a slow annual rate over our fifty year period, but this expansion was interrupted in the 1860's. Before that decade the expansion was determined by brigs and brigantines, and after that decade by schooners. It is possible that Newfoundland owners used all rigs in the same trades, experimenting with brigs and brigantines in the earlier decades, and then reverting to their earlier preference for schooners in the 1860's. Certainly the growth rate for schooners was slowest when the accumulation of brigantines was most rapid. But it is also possible that brigantines served a need which schooners alone could not meet. The growth of non-schooner rigs in the 1840's and 1850's is too rapid to suggest that one rig merely replaced another. Either the customary trades of the schooner experienced a rapid expansion which demanded an increased carrying capacity; or Newfoundland owners had entered trades for which they thought the Newfoundland-registered brig or brigantine was better adapted than any other type of vessel.

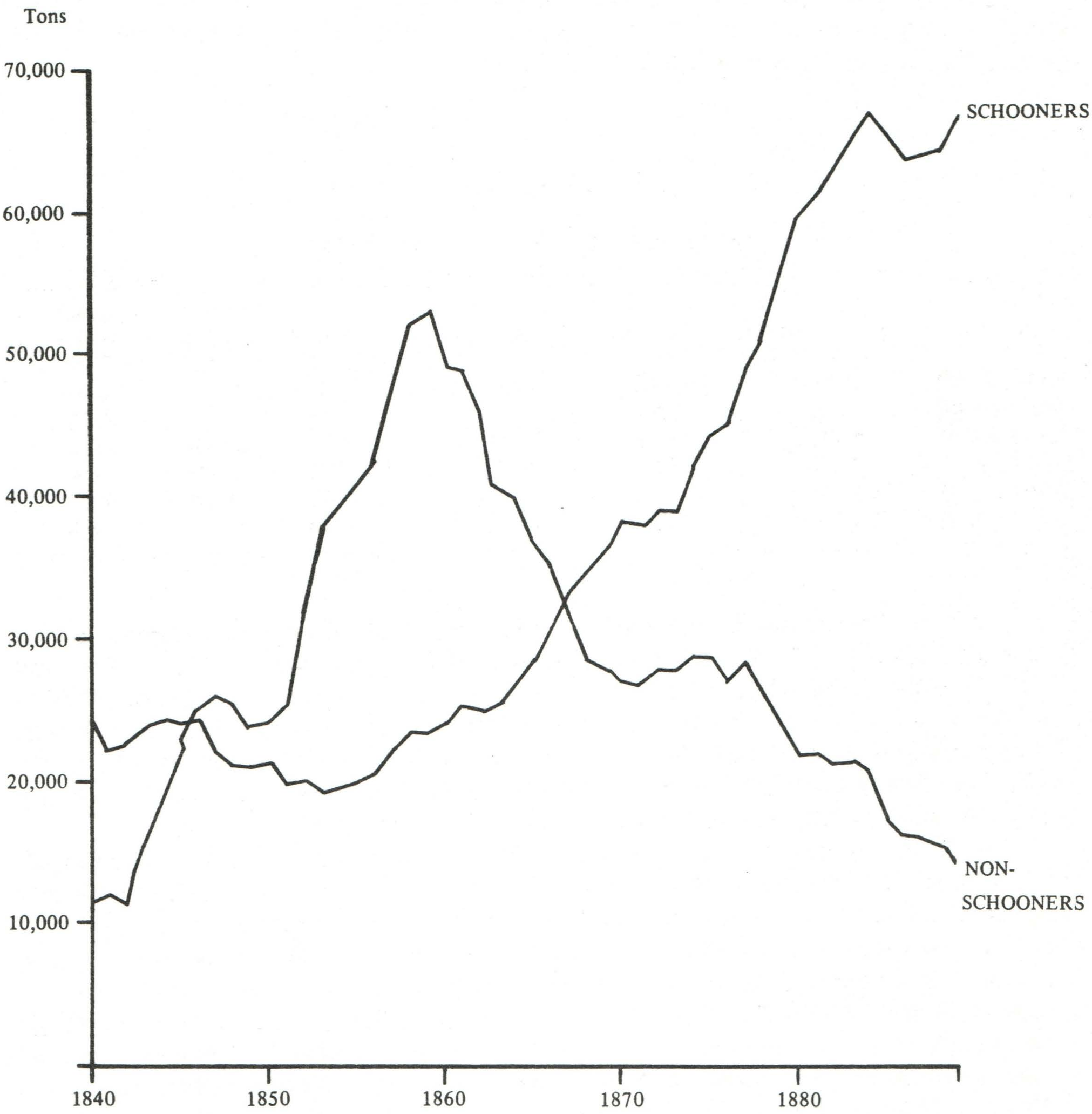

FIGURE 3: SCHOONER AND NON-SCHOONER FLEET SIZES (ADJUSTED)

It is unfortunate that the closing of registries in St. John's cannot tell us more about the different functions of the various types of vessel. Certainly the life expectancies of the various rigs were very different. And the St. John's registrar was obviously concerned to discover when his vessels went out of service. We have a sufficient sample from which to calculate life expectancies for each rig. But other details of the vessels' loss are too often lacking. The notations for the vessels' disposal are often very brief, and the word "lost" is so often used, especially with reference to schooners, that one begins to wonder whether the word implies "lost at sea", or that the vessel has been lost to the port for reasons unknown to the registrar. Details on the disposal of schooners are particularly suspect. No less than 1258 schooners – four-fifths of the entire schooner fleet of 1889 – remained on registry until 1919 or after, and were then removed from the registry with the notation "no information available". Most of these were probably beached or broken up (we may assume, perhaps, that a marine disaster was more likely to come to the attention of the registrar than a less sudden demise). While comparisons between the causes of registry closure may be of little value, some conclusions about the life experiences of Newfoundland vessels can be stated with confidence.

Over the period from 1840 to 1889 Newfoundland vessels had an average registry life of 12.4 years. The life expectancies of all rigs improved until the 1860's. The increased life of the schooner is particularly striking if we include samples from the 1820's and 1830's.

TABLE 10

AVERAGE REGISTRY LIFE OF NEWFOUNDLAND VESSELS

	SCHOONERS Years	BRIGANTINES Years	BRIGS Years	SAIL/STEAM Years
1820-29	5.2	4.5	5.5	–
1830-39	5.3	3.3	4.6	–
1840-49	10.1	8.9	6.4	–
1850-59	13.1	9.9	8.2	–
1860-69	12.1	9.3	7.0	11 (n=11)
1870-79	13.4	8.5	12.8 (n=8)	18.6
1880-89	15.6	5.6	–	19.8

All cases have been omitted where the registry was closed because the vessel was "no longer in existence" or when there was "no information obtainable". Vessels whose registries were closed de novo were included, and the vessel traced through subsequent registries until its final disposal. It seemed likely that a vessel having been rebuilt and reregistered for that reason would be longer lived, and that to exclude such vessels would deflate the estimate of life expectancy. To exclude de novo-registered vessels makes no significant difference, however, except in the case of brigantines in the 1840's (de novo-adjusted life = 6.1 years).

Without considerable further research it is impossible to suggest the reasons for the improvement in life expectancies. The registries do provide some evidence that an

increasing number of vessels were "wrecked and restored to registry" in later decades, and it is possible that the practice of restoring aged vessels increased with time. In the 1860's the life expectancy of all rigs dropped slightly, and it is possible that owners and captains were taking greater risks at sea in a decade when the fishing industry was depressed and when profit margins were threatened.

The brigantines and brigs had a shorter life than the schooner throughout the period. They were also more likely to be sold or transferred out of Newfoundland than were the schooners. Of the various rigs first registered between 1840 and 1879, 34% of the brigs, 29% of the brigantines, and only 4% of the schooners were transferred from Newfoundland. It is important to note that the lower life expectancies of the brigs and brigantines do not result from their being transferred when they were relatively new. If transfers are excluded, the life expectancy of the brigantine rises to only 9.6 years in the 1840's, and decreases to 9.8 years in the 1850's; the life of the brig increases to 7.2 years in the 1840's and 9.1 years in the 1850's. Newfoundland owners did not sell their brigs and brigantines quickly, and in Newfoundland these rigs were in service two or three years longer than were the same rigs in Yarmouth. It would appear that the brigs and brigantines of Newfoundland had a very different life experience from that of the schooner. It would appear that brigs and brigantines were more prone to marine disaster than were schooners. If we include the suspect "lost" notation within the "marine disaster" category (along with "wrecked", "sunk", "lost at sea", etc.), the figures for the period 1840 to 1879 are as follows: 42% of schooners, 56% of brigs, and 65% of brigantines were involved in marine disasters.

It is unlikely that the shorter life expectancy of brigs and brigantines was merely a function of their greater size. This is apparently not the case with Yarmouth vessels, and there is no reason to believe that a different result would be obtained for Newfoundland vessels.[7] It is possible that Newfoundland's brigs and brigantines were not so well built nor so well maintained as were the Island's schooners. But this is unlikely, since the brig or brigantine purchased from builders in Prince Edward Island or Nova Scotia appears to have lasted longer in the hands of its Newfoundland owners than if it had remained in its place of origin. Nor is their any reason to believe that the merchants of St. John's and Harbour Grace would have maintained their brigantines less carefully than their schooners. The merchant owners of brigs and brigantines were also in a position to employ the most experienced of Newfoundland's captains. The brigs and brigantines of Newfoundland may not have been subject to the same risks as the brigs and brigantines of Yarmouth. But it is equally clear that they were subject to greater risk than were the schooners of Newfoundland. If their shorter life did not result from early transfer, greater size, poor maintenance, or inexperienced management, then it is probable that their shorter life resulted from the greater risks of long-distance coastal voyages, or even from their occasional employment in ocean trades.

IV

It is extremely difficult to explain the trends in vessel registration in St. John's in terms of the function of shipping within the Newfoundland economy. All that we may do here is to suggest certain hypotheses which remain to be tested. It is broadly true that

prosperity in shipping coincided with prosperity in the cod fishery and, to a lesser extent, with the fortunes of the sealing industry. The upward trend in registrations in the late 1830's and early 1840's coincided with improved production in the fishery after the depression of the early 1830's.[8] The sharp upward trend in non-schooner registrations in 1851 and 1852 followed after a 23% increase in the value of cod exports between 1846/7 and 1849/50. The pattern breaks down in 1859, for the precipitous decline in new registrations in that year followed immediately after the peak years in the sealing industry, and preceded the depression in the cod fishery in the early 1860's. The registration of new tonnage did decline significantly during the depression of the 1860's, but there was an interesting exception to this pattern – the registration of schooners increased when the depression began, and continued even as the depression deepened (see Figure 1). Most of these schooners appeared in Fortune Bay and Placentia Bay, where there may have been an early attempt to develop the bank fishery. Improvement in the fishery, the introduction of a ship-building bounty in 1878, and the development of the Bank fishery appears to have stimulated the building of schooners in the 1870's. The serious decline in export prices for cod during the 1880's coincides with the beginning of the long downward trend in Newfoundland shipping. Net disinvestment in all non-schooner rigs in this decade, and a very low rate of investment in schooners, adds confirmation to the thesis that Newfoundland's traditional economy was undergoing a crisis in the 1880's.[9]

Since investment in new ships must have depended to a large extent upon a prosperous fishery, it is no surprise to find this broad correlation between the value of cod exports and gross investment in shipping. And if we compare net investment in shipping tonnage with the value of Newfoundland trade as a whole, we again find the same correlation. When the adjusted values of Newfoundland trade are correlated with shipping tonnage in three-yearly averages, the correlation coefficients are +.51 for the period from 1840 to 1864, and +.87 for the period from 1865 to 1889[10]. It would seem that the fleet expanded and contracted in step with expansion and contraction in foreign trade as a whole, particularly in the later decades.

But if we search for a more precise relationship between the fishery and the registration of particular rigs, the connections are not so clear. If the schooner fleet, for instance, was directly affected by prosperity or decline in the fishery, we should expect to find a good year in the fishery followed by an increase in schooner registrations over the next year or two. But whatever time lag one introduces, the correlation remains low. If the changes in the adjusted values of cod exports from one year to the next are correlated with the change in the average of the following three years' registrations of newly-built schooners, the correlation coefficients are as follows: for the 1840's, +.22; for the 1850's, +.29; for the 1860's, +.35; for the 1870's, -.23; and for the 1880's, +.26. There may be some direct response between cod values and schooner-building, but the negative result for the 1870's (when cod values had revived and schooner-building reached its peak) points out the great difficulty of establishing short-term influences on schooner-building. No more interesting results are obtained by correlating newly-built schooners with the volume of cod exports in quintals. Only in the early 1840's, the early 1870's, and in the late 1880's is there a close fit between trends in the building of new schooners and trends in the volume of cod exported. More satisfying answers must await

further research into regional factors and trends in the different branches of the fishery.

Population change was clearly of some importance for the registration of schooners. As the outport communities grew, so the schooner fleet which supplied them grew. The ratio of schooner tonnage to population is remarkably constant, remaining between .2 and .3 tons per capita for most of our period. If population increase is correlated with schooner fleet size in three-year averages, the resulting coefficients are +.90 for the period from 1840 to 1864, and +.99 for the period from 1865 to 1889. These are not correlations of annual changes but of total population with total schooner tonnage. This result is perhaps not surprising, but it is a result not obtained for any other type of vessel, and it confirms the very close interdependence between community life in Newfoundland and the schooner which supplied those communities.

Analysis of the non-schooner rigs presents even more thorny problems. In the 1840's and 1850's the brig and brigantine fleet appears to have been expanding at a much faster rate than the local economy would require. It was increasing at a much faster rate than was population, and much faster than the rate of increase in cod exports, measured either by volume or by value. If we assume that the new tonnage was indeed used in trades from or around Newfoundland rather than in some other part of the world (and there is no reason not to assume this), then it would appear that by the 1850's St. John's-registered vessels carried a greater share of Newfoundland's trade than ever before. We may further assume that the available schooner fleet was large enough to meet the needs of the Island's coastal trade: in the 1850's at least the schooner fleet was increasing at an annual rate of 1.6% while population increased at an annual rate of 1.9% and cod exports increased at a slower rate (0.7% a year). We are left with the likelihood that Newfoundland-registered brigs and brigantines were engaged in trades beyond the Island itself (except when they were used on sealing voyages), and that a greater proportion of Newfoundland's external trade was being carried in St. John's registered vessels than at any other time in the nineteenth century.

To test this hypothesis we should look for a relationship between Newfoundland's external trade and the Island's non-schooner tonnage. The adjusted values of imports and exports were first correlated with non-schooner tonnage in three-year averages. The correlation coefficient for the period from 1840 to 1865 is very high (+.86). While the value of trade continued in a steady upward trend from the late 1860's, the non-schooner fleet diminished, and the correlation coefficient is -.87 for the period 1866 to 1889. Thus the expansion of non-schooner tonnage and the growth in external trade were synchronized in the earlier period, and fell out of step in the later period. But we may be more precise. If Newfoundland's merchant shipowners were indeed responding to opportunities for increased investment in the external carrying trade, we should expect to see Newfoundland owners respond to an increase in trade by undertaking an immediate gross investment in non-schooner rigs. It appears that this was their response. If we take the difference between the value of Newfoundland's imports and exports in 1840 and 1841, and compare this with the change in non-schooner tonnage added to the fleet between 1841 and 1842 – in other words, if we introduce a one-year lag into the correlation – then a fairly clear pattern emerges (see Figure 4). The correlation coefficient for these changes is +.70 for the 1840's and +.59 for the 1850's. An increase in the value of trade was followed by increased investment in brigs and brigantines. From

(1) NON-SCHOONER NEW REGISTRATIONS (TONNAGE)

(2) ADJUSTED VALUES OF NEWFOUNDLAND IMPORTS AND EXPORTS

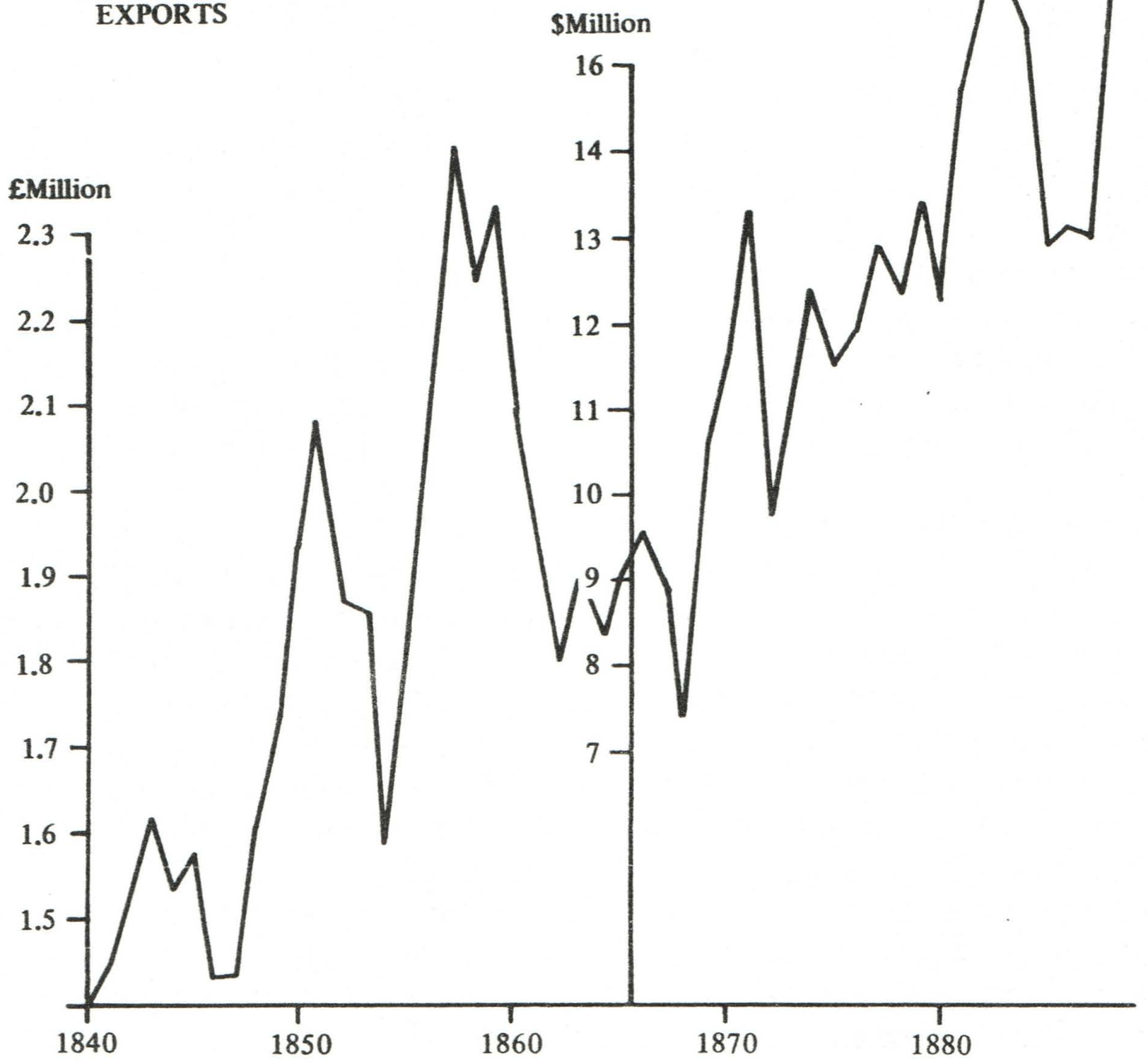

FIGURE 4

1859 there appears a marked downward trend in the values of imports and exports. Did diminishing returns in foreign trade encourage Newfoundland owners to withdraw from the external carrying trade? Again this is likely to have been their response, although the response this time was somewhat slower. If we correlate changes in trade values with changes in non-schooner tonnage over two-year periods from 1860 to 1874, and if we introduce a two-year lag, then the correlation coefficient is an impressively high +.87. This does not by itself prove a direct causal relationship between the two factors examined here. But such a strong coincidence between the two factors does suggest some form of relationship between variations in external trade and the investment strategies of Newfoundland's shipowners.

It is possible that the new brigs and brigantines were used in the important export trade of dried cod to the West Indies and Brazil. The addition of brigs and brigantines to the Newfoundland fleet from the late 1830's coincides exactly with the rise of the Brazilian trade, which continued its rapid growth in the 1840's and 1850's. The contraction in the cod trade to Brazil and the West Indies in the 1860's coincides exactly with the decline in the registration of brigs and brigantines. The trend in both cases begins in 1859. In 1858 Brazil and the West Indies together accounted for 45% of all exports of Newfoundland's dried cod, as measured in quintals. By the mid-1860's their share of cod exports had fallen to less than 30%. Between 1857/8 and 1867/8 dried cod exports to the West Indies and Brazil declined at an annual rate of 6.8%. The annual rate of net disinvestment in non-schooner tonnage in Newfoundland in the 1860's was 6.2%.

There is clearly a need for further research into the functions of Newfoundland's brigs and brigantines. The Crew Lists for Newfoundland vessels will perhaps provide answers to many of the questions posed here. We need to know more about the structural characteristics of all Newfoundland-built vessels. The newspaper reports of entrances and clearances from St. John's may provide more concrete evidence of the trades in which Newfoundland's brigs and brigantines were employed. We need to know more about the practice of chartering ocean-going vessels, since it is possible that an increasingly large share of Newfoundland's exports were carried in such vessels in the later 19th century. Above all we need to know more about the investment strategies of Newfoundland's shipowners, and more about the relative advantages of various types of vessel in various trades.

There can be no doubt that the results of such investigation have important implications for the history of the Newfoundland economy as a whole. The traditional resource-based economy survived because it was able to supply international markets with a valuable commodity. The expansion of the domestic resource base, and the application of technological advances to that resource base, required that capital be generated within the traditional economy. The alternative was a growing dependence upon external sources of investment capital. From the 1860's Newfoundland became increasingly dependent upon foreign vessels in meeting the demands of its international markets. At the present stage of our research it is impossible to calculate the loss in capital, incomes and employment opportunities which resulted from the failure to develop a domestic shipping industry to serve an export-led economy. But within the traditional economy such losses were likely to have been considerable, and they may help to explain the crisis which Newfoundland faced at the end of the nineteenth century.

NOTES

1. The data for this paper is taken from the Board of Trade series 107 and 108 colonial registries. Data on vessel shareholding is contained on an SPSS systems file based on data from the same registries. Data on Newfoundland vessels in the 1920's is taken from the B.T.110 series.

For their assistance at various stages of the research I should like to thank all members of the research and clerical staff of the Maritime History Group. I am particularly indebted to Keith Matthews, David Alexander, and Lewis Fischer for their advice and help.

2. The proportion of schooner tonnage would be even higher if undecked schooners were included. But since undecked vessels under 30 tons did not have to be registered, they do not appear in this study.

3. Basil Greenhill and Ann Gifford, *Westcountrymen in Prince Edward's Isle,* (Toronto, 1967), p. 201, refer to "a ship built in Newfoundland in 1783, the *Jenny,*. . .described in registration documents as a three-masted schooner when in 1792, now in Bristol, she visited the Pacific Coast of North America." I am indebted to Lewis Fischer for this reference.

4. In fact their share of total tonnage was probably a little more than 44%. Each owner's share of tonnage has been calculated by dividing the tonnage of each vessel owned by 64 (since shares in vessels were stated in 64ths) and multiplying by the number of shares the owner held. But about 20% of registrations in St. John's do not state the number of shares. In these cases the numerator used in the calculation is 64 – which gives each joint owner the entire tonnage of the vessel. This coincides with the legal reality: where the number of shares is not stated, the owners were a partnership, and each of the joint owners could claim full ownership of the vessel insofar as they were members of that partnership. The sum of total tonnage owned which is used to calculate percentages is thus much larger than the real total tonnage of registered vessels. The resulting percentages would be inaccurate, however, only to the extent that such joint ownerships were unevenly distributed among different occupational groups, and to the extent that they were unevenly distributed among large and small owners. In fact the 103 large owners had a slightly smaller percentage of such joint ownerships than did smaller owners. Thus their real share of total tonnage may be a few percentage points higher than is stated here.

5. I am much indebted to Keith Matthews for his assistance in dealing with the problem of occupational categories, and in distinguishing between Newfoundland owners with identical or similar names. I have made extensive use of Keith Matthews' *A Who Was Who of Families Engaged in the Fishery and Settlement of Newfoundland, 1660-1840,* (Memorial University, 1971), and of the Newfoundland name file contained in the archive of the Maritime History Group.

6. I am indebted to Keith Matthews for this information.

7. Estimates of the life expectancy of 1854 vessels have been used and are based on a simple life table for all rigs in the decade.

8. All information on the cod fishery in this paper is taken from Shannon Ryan, *The Newfoundland Cod Fishery in the Nineteenth Century,* unpublished M.A. Thesis, (Memorial University of Newfoundland, 1971). I should like to thank the author for permission to make use of the statistics contained in this thesis.

9. See David Alexander, "Newfoundland's Traditional Economy and Development to 1934", *Acadiensis,* Autumn 1974, vol. 4, no. 1, pp. 55-78.

10. Trade values have been adjusted by applying the Rousseaux price index, which is probably the best such index which could be applied to Newfoundland in the 19th century. Unfortunately no such price index exists for Newfoundland.

3. THE PORT OF PRINCE EDWARD ISLAND, 1840-1889: A PRELIMINARY ANALYSIS

L E W I S R. F I S C H E R

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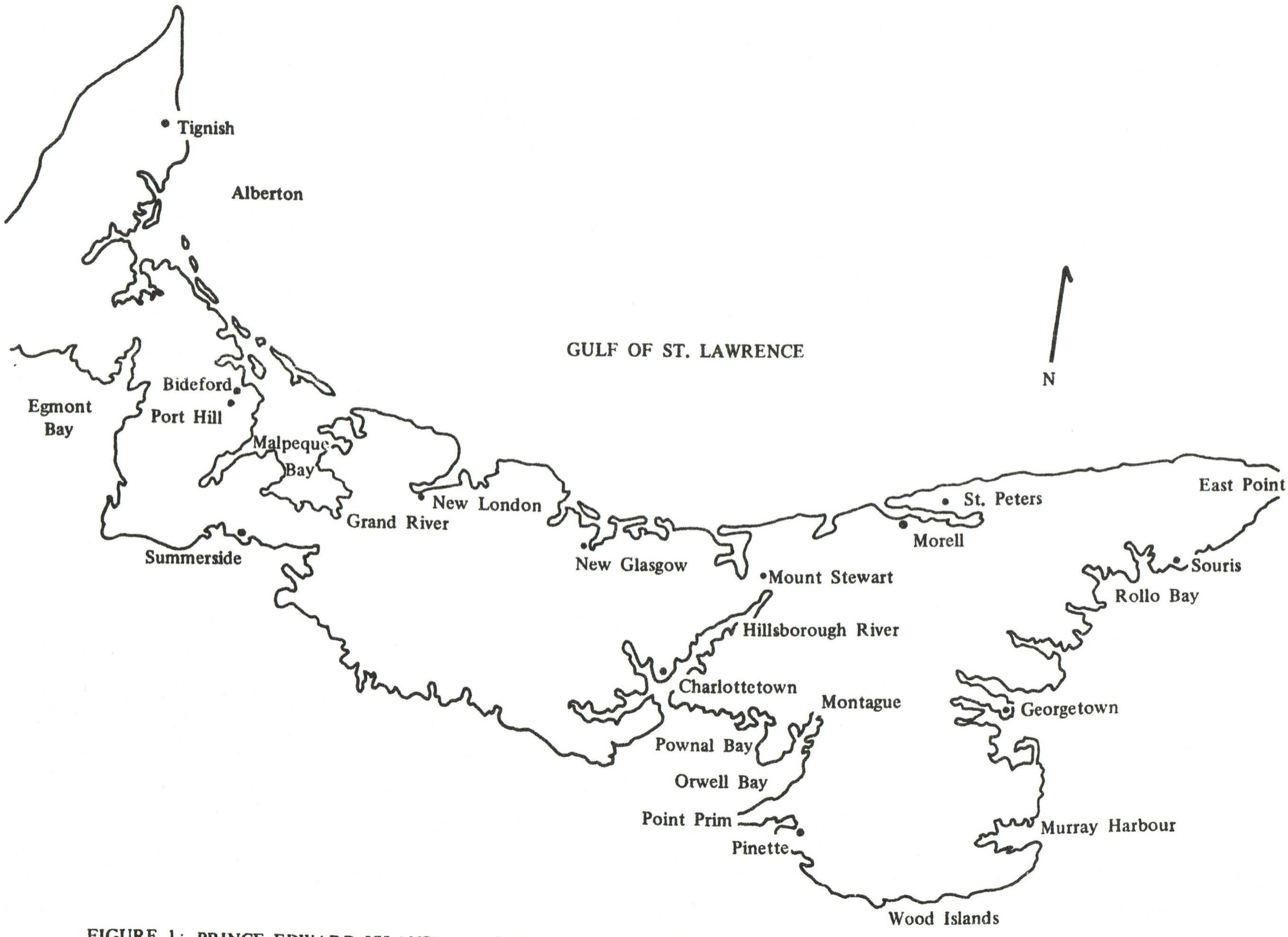

FIGURE 1: PRINCE EDWARD ISLAND Scale: 1 inch = 10 miles

THE PORT OF PRINCE EDWARD ISLAND, 1840-1889: A PRELIMINARY ANALYSIS[1]

Lewis R. Fischer

In his seminal work, *The Rise of the English Shipping Industry,* Ralph Davis called upon historians to undertake intensive studies of individual ports in order to more fully comprehend the growth and significance of the shipping industry.[2] While the current study does not correspond precisely to the challenge which Professor Davis posed to the profession, it does find its roots in that suggestion.

This paper is concerned with Prince Edward Island. Despite its limited geographic area and relatively small population, the Island has long been recognized as a major shipbuilding area during the "age of sail." Less attention, however, has been directed toward the importance of a related industry – shipowning.[3] Residents of the Island owned a large variety and number of sailing ships, but little reliable information exists about either the fleet or its operation.[4] This paper is a preliminary attempt to redress that deficiency. Despite its location, the PEI industry was integrated into the larger maritime economy. By comprehending the PEI experience during a crucial period in its history we may come a bit closer not only to responding to Professor Davis' concerns but also to advancing our understanding of the regional economy of eastern Canada in the 19th century.

I

The "pearl of the Gulf" was already well established as a port of registry by 1840[5]. The 1830's were a period of heavy registrations of new vessels, but almost all were small schooners. This rig predominated in the early years, with a sprinkling of larger rigs, mainly brigs and barques, growing in importance throughout the '30's. But the opening of the fifth decade of the century provides a logical place to begin an analysis. From 1840 onward, the registration of vessels was dramatically accelerated. Larger rigs became more common, and brigantines, an especially important rig in Prince Edward Island, were built in larger numbers.

A total of 3521 new registrations were opened in the port between 1840 and 1889.[6] While the fleet broadly resembled those of other ports in the Maritimes, analysis of the distribution by rig reveals some unique features. The schooner fleet made up a smaller percentage of the total than in other ports for which we have comparable data. In place of schooners, Islanders possessed larger numbers of brigantines than appears to have been the norm. However, if schooners and brigantines are aggregated, under the assumption that they were used for roughly similar tasks, 70% of all vessels registered fall into this new category.[7] This corresponds closely to the percentages found in both Yarmouth, Nova Scotia and Saint John, New Brunswick.[8] Prince Edward Island also operated a large fleet of brigs and continued to register them well into the 1870's, long after most ports in the region had abandoned brigs in favour of other, more efficient rigs. As well, the Island was the largest centre in eastern Canada for barquentines. While that rig was relatively rare in most parts of the world, its distinctive design was a fairly common sight to Island residents. Barquentines comprised only 1.5% of the new vessel totals over the period, but this figure looms larger when the fact that all of these vessels were registered after 1873 is considered. Over the last seventeen years under investigation.

barquentines accounted for almost 8% of all new registrations in the port.

TABLE 1

PRINCE EDWARD ISLAND VESSELS, 1840-1889

RIG	NUMBER	%
Schooners	1351	38.4
Brigantines	1113	31.6
Brigs	576	16.4
Barques	359	10.1
Barquentines	54	1.5
Ships	36	1.0
Steamers*	30	0.9
Sloops	2	0.1
	3521	100.0

*Steamers include steam and sail. Source: BT 107 and 108, Prince Edward Island Shipping Registries (Public Record Office, London)

It is also worth noting the small number of full-rigged ships registered. For a port that produced a sizeable number and variety of deep-sea rigs, the failure to build and own more ships may seem surprising, especially in light of the trend throughout the North Atlantic towards larger vessels as the century progressed. Almost half of the ships ever registered entered the fleet prior to 1860, before most similar ports had begun to acquire substantial numbers of these vessels. Thus, Islanders demonstrated an ability to both construct and operate this larger rig before many other ports which later far surpassed them in this regard. The explanation for this is necessarily tentative, but it is worth exploring here because it will also help to explain some other phenomena to be examined later.

Islanders probably rejected this largest of sailing rigs for three reasons. First of all, they put less of a premium on size in the vessels which they retained for their own use. Most of the vessels retained as long-term assets were engaged in the coastal trade, where attributes other than size counted heavily. Second, by mid-century the Islanders had established themselves in certain export markets for sailing vessels. They gained a reputation for inexpensive and relatively well-constructed smaller rigs, and their customers came to rely on them for those types of vessels.[9] The building and marketing of larger rigs would have forced the Islanders to develop different skills and expertise. Finally, as the years passed, supplies of wood suitable for the construction of larger rigs were being rapidly exhausted. This is not to argue that the Island was running out of wood; indeed, as late as 1890, wood and wood products represented over 20% of exports from the Island by dollar value.[10] The larger trees needed for the construction of big ships were almost depleted, however, by mid-century, thus forcing the builders and owners to make crucial decisions concerning the allocation of increasingly scarce resources. The Islanders, like so many groups in similar dilemmas, opted for the security of the familiar.

Not only did Islanders refrain from heavy involvement in the largest of the rigs, they also showed a tendency toward increasing the sizes of vessels within established rigs only moderately. The stability of vessel size is suggested in Table 2.

The small increases are somewhat surprising in view of the trend throughout most of the North Atlantic toward larger vessels throughout the century. However, the discussion above provides a rationale for the stability. The average vessel in the fleet increased by only 51.7% over the growth period (1840-1879).

TABLE 2

AVERAGE TONNAGE BY RIG, 1840-1889*

RIG	1840-49		1850-59		1860-69		1870-79		1880-89	
	No.	$\bar{x}$	No.	$\bar{x}$	No.	$\bar{x}$	No.	$\bar{x}$	No.	$\bar{x}$
All Vessels	758	142	923	157	941	179	691	215	208	165
Schooners	371	75	339	61	279	65	232	60	130	63
Brigantines	191	122	269	132	385	174	236	202	32	243
Brigs	117	208	210	203	173	235	75	266	1	328
Barques	72	392	92	387	83	369	100	490	12	721
Barquentines	—	—	—	—	—	—	32	375	22	359
Ships	5	715	12	856	15	666	4	814	—	—
Steam	1	57	1	76	6	291	12	278	10	132
Sloops	1	9	—	—	—	—	—	—	1	9

*New registrations only. Steam includes steam and sail. Tonnages are net burthen before 1854 and gross registered after that date. Source: Derived from BT 107 and 108.

Schooners actually decreased on average by 16.6% over the period. Particularly interesting in light of the finding that changes in tonnage measurement introduced by the Merchant Shipping Act of 1854 tended to inflate schooner tonnages after that date by about 10%[11] is the decrease in average tonnage of that rig by 18.7% between the 1840's and 1850's. Thus, the decrease in average tonnage for schooners in this decade is even more dramatic than the figures indicate. An examination of the rapid increase in the size of the brigantine fleet, particularly pronounced after 1845, provides a possible explanation for this seeming anomaly. In the early 1840's a number of vessels in the 100-150 ton class were being rigged as schooners; after mid-decade, however, these vessels were increasingly being rigged as brigantines, thus reducing the average tonnage of schooners. Also somewhat illusory are the modest increases in schooner tonnages in the 1880's, which are totally accounted for by the registration of seven large three-masted schooners in that decade.

While other rigs increased in size over time, such advances were generally modest. Ships, for example, increased on average only 13.9% between the 1840's and the 1870's. Brigs fared slightly better over the same period (28% increase), but even barques, which grew 83.9% between the 1840's and the 1880's, and brigantines (an increase of 98.8% over a similar period) increased in tonnage at rates which were well below those at the port of Yarmouth and probably the entire North Atlantic region as well.

As a major shipbuilding centre, it would be expected that a majority of the new vessel registrations at Prince Edward Island would consist of locally produced vessels.

Such proved to be the case: only 349 (9.9%) of all new registrations were of vessels built or previously registered elsewhere.[12] Most of these imports came from the Maritime provinces, with a sizeable complement coming from the United States, mainly New England. The largest number of transfers were schooners (83%) and brigantines (9%), which far exceeded the proportion of these rigs in the fleet as a whole (70%).

TABLE 3

SOURCES OF VESSELS TRANSFERRED TO P.E.I., 1840-1889

PLACE	NO.	%
Nova Scotia*	145	41.6
United States	121	34.7
New Brunswick	52	14.9
Canada*	13	3.7
Great Britain	11	3.2
Europe	5	1.4
Newfoundland	2	0.5
	349	100.0

*NOTE: Nova Scotia includes Cape Breton; Canada includes only Upper and Lower Canada (Ontario and Quebec). Source: BT 107 and 108

The transfers were heavily concentrated after 1850. Only five transfers to the port occurred in the 1840's, while 282 were accomplished between 1850 and 1880. While the bulk thus took place in the middle three decades under study, the importance of this source of assets to the fleet was greatest in the 1880's. The 62 vessels imported in that decade represented 30% of all new additions to the fleet in the period 1880-1889.

The 3172 vessels built on Prince Edward Island and added to the local fleet[13] were highly dispersed in terms of their place of build. Some 176 different towns and localities built vessels for the fleet, and most produced less than 1% of the total. But even the largest shipbuilding centre, the town of Mount Stewart, produced only 5.8% of the total. Four centres produced between 4 and 5% of the total, and an additional six contributed between 3 and 4%. Almost no section of the Island with access to the sea failed to build sailing vessels.

An analysis of place of build of the various rigs reinforces this impression of dispersion. Only the production of barquentines was highly concentrated, with just over 75% of the total built in the five leading centres for barquentine production. The building of brigs showed the least concentration, with only 27% being built in the leading centres for brigs, followed by schooners (30.4%), brigantines (32.4%), barques (32.6%), and ships (54.3%).

No centre ranked in the first five for all six of the major rigs. Mount Stewart and Grand River placed in the first five for four rigs (neither produced large numbers of schooners or ships), Summerside for three (schooners, brigs, and ships were not built in large numbers), Charlottetown for three (brigantines, brigs, and ships), and Bideford for

three (barques, barquentines and ships).

TABLE 4

LEADING SHIPBUILDING CENTRES IN P.E.I.

PLACE	OVERALL	SCHOONERS	BRIGANTINES	BRIGS	BARQUES	BARQUENTINES	SHIPS
Mount Stewart	1	—	1	1	5	3	—
Grand River	2	—	3	2	2	4	—
Summerside	3	—	2	—	1	2	—
New London	4	1	—	—	—	—	—
New Glasgow	5	2	—	—	—	—	—
Charlottetown	6	—	5	3	—	—	2
Hiilsborough R.	7	—	—	—	—	—	3
Souris	8	5	—	—	—	—	—
St. Peters	9	—	4	—	—	—	—
Murray Harbour	10	4	—	—	—	—	4
Rustico	—	3	—	5	—	—	—
Pisquid	—	—	—	4	—	—	—
Port Hill	—	—	—	—	3	—	1
Bideford	—	—	—	—	4	1	5
Egmont Bay	—	—	—	—	—	5	—

Some regions, however, specialized according to their economic interests. The production of larger rigs for example, was heavily concentrated in the area around Malpeque Bay, especially in the towns of Port Hill and Bideford. The dominant family in this region, the Yeos, also placed sizeable shipbuilding orders at yards along Grand River and Egmont Bay, accounting for the high rankings of these locations in the production of large rigs. On the other hand, schooner production, although widely dispersed throughout the Island, found focal points in New London, New Glasgow, Rustico, Murray Harbour, and Souris, which were centres of the small fishing industry.

A total of 1920 people were original investors in Prince Edward Island shipping over the period.[14] Of this number, 1707 were original investors in new registrations. Single proprietorship was the most common pattern of ownership in all vessel classifications, but the number of owners of individual vessels ranged to a high of 32 in one steamer. Over the period as a whole, the mean number of original shareholders per vessel was extremely low and varied narrowly by rig. Schooners tended most toward single-ownership, with an average of 1.39 original owners per vessel, followed closely by brigs (1.40), barques and barquentines (1.43), and brigantines (1.47). Only ships (1.94) and steamers (2.84) differed significantly from this pattern, although the 32 owner

KEY TO REGIONS

1	Tignish	9	Rustico
2	Cascumpec	10	Charlottetown
3	Egmont Bay	11	Orwell
4	Malpeque	12	Pinette
5	Grand River	13	Murray Harbour
6	Bedeque-Summerside	14	Georgetown-Three Rivers
7	New London	15	Souris-Colville Bay
8	Crapaud	16	St. Peters-Morell

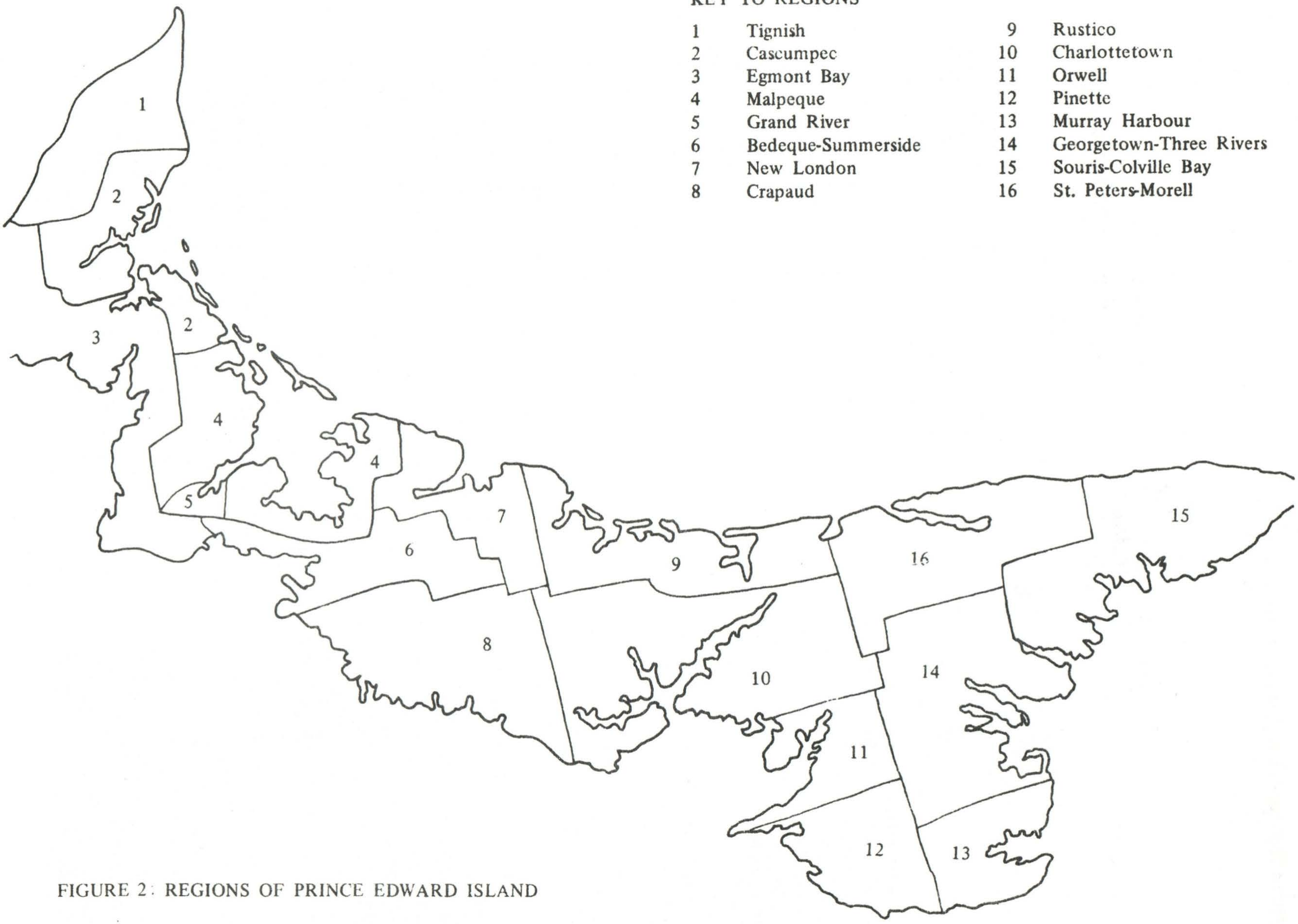

FIGURE 2: REGIONS OF PRINCE EDWARD ISLAND

(Source: Adapted from Andrew H. Clark, *Three Centuries and the Island: A Historical Geography of Settlement and Agriculture in Prince Edward Island, Canada* [Toronto: University of Toronto Press, 1959], 119; Journal of House of Assembly of PEI [1859], Appendix E; *Canada Census,* 1871, 1881]

steamer previously mentioned greatly skewed the latter average. In general, the number of owners per vessel varied directly with the increasing average size of rig. This probably demonstrates the greater capitalization needed to purchase the larger rigs. However, the generally low owner per vessel ratio seems most significant and is probably best explained by reference to the large number of vessels which were built and registered on the Island but quickly sold or transferred to other ports. In the 1840's, for example, almost 90% of new registrations were disposed of in this manner, and the mean time between registration and transfer was less than two years. If the ownership strategy was to quickly dispose of assets, there would correspondingly be less need to take in partners to facilitate financing or to spread the risks which long-term ownership would increasingly entail.

It is a simple exercise to isolate the fleet's major shareholders. The procedure followed was to select all owners whose names appeared on ten or more registries.[15] This technique identified 73 owners who met the criteria. James Yeo, Sr., had the most entries (135), followed by Lemuel C. Owen, James C. Pope, James Peake, Sr., William Welsh, and James Duncan, all of whom appeared over 100 times. Below them were a host of others with familial or business connections, which leads to the conclusion that concentration of ownership was extremely high in this port. In fact, the 73 leading owners, although representing but 3.8% of the total, accounted for 51% of the 5088 shareholdings in new registrations. In terms of tonnage owned, their dominance was even more dramatic: 440,258 tons, or 72.9% of all new tonnage registered over the period, were owned by these men. The large owners were clearly dominant.

Almost all of the large owners were merchants, and men of commerce were by far the leading occupational group in vessel ownership. Almost 60% of all shareholdings were accounted for by merchants. Farmers followed with 13.5% and shipbuilders with 11.5%. The underdeveloped state of the P.E.I. fishery is attested to by the fact that fishermen and mariners represented only 8.1% of all shareholdings.

The ownership of the fleet was unequally distributed geographically as well. In order to analyze regionality of ownership, Prince Edward Island was divided into sixteen regions. A compilation of exports published by the House of Assembly in 1859 served as the basis for the determination of regions. Data on exports, occupations and population derived from census material was then used to outline hinterlands around the major exporting centres. There is some artificiality in the process, since for purposes of analysis the regions were assumed to be static; in actuality, the hinterland boundaries were constantly shifting as a centre gained or lost prominence. Still, the procedure did not overly distort reality while it made analysis somewhat easier.

The regional concentrations stand out clearly in Table 5. Residents of the Charlottetown region, for example, accounted for 49% of all appearances on registries and 51% of all tonnage owned. Residents of the Malpeque region, which included Port Hill and Bideford, both centres with concentrations of larger rigs, provided 7.2% of shareholdings but 14.2% of the tonnage, the largest ratio of tonnage to shareholdings on the Island. The Bedeque-Summerside region also had a favourable tonnage to shareholding ratio, accounting for 5.5% of all shareholdings and 8.5% of all tonnage. The overwhelming majority of both registry shares and tonnage were held within the Island; only 2.9% of all registry appearances and 3.1% of tonnage were accounted for by non-residents.

TABLE 5

REGIONAL OWNERSHIP IN P.E.I. VESSELS

NO.	REGION	% OF SHAREHOLDINGS IN NEW REGISTRATIONS	% OF TONNAGE NEW REGISTRATIONS
1	Tignish	0.6	0.3
2	Cascumpec	1.4	1.0
3	Egmont Bay	1.3	1.2
4	Malpeque	7.2	14.2
5	Grand River	1.3	0.8
6	Bedeque-Summerside	5.5	8.5
7	New London	4.1	1.8
8	Crapaud	1.5	0.7
9	Rustico	4.7	3.0
10	Charlottetown	49.0	51.0
11	Orwell	1.9	1.2
13	Murray Harbour	2.0	1.5
14	Georgetown-Three Rivers	6.4	5.8
15	Souris-Colville Bay	5.1	3.0
16	St. Peters-Morell	3.0	2.2
	Outside P.E.I.	2.9	3.1

Source: BT107 and 108

II

The registration of new vessels at Prince Edward Island proceeded at an uneven rate throughout the period under consideration. No doubt this was caused at least partially by the integration of the shipbuilding and shipowning industries, since the former was characterized almost everywhere by wide fluctuations. If new vessel registrations are analyzed by decade, the 1850's and 1860's appear to stand out as growth periods. If the analysis is broken down into years, however, both these decades show extreme fluctuations in new vessels added to the fleet. In the 1850's new additions ranged from a low of 61 in 1859 to a high of 121 in 1854; the range in the '60's moved from 59 in 1869 to 137 in 1865, the largest number of new registrations added in one year during the period. The 1840's were more stable, and the growth in that decade served as a prelude to the hectic 1850's, while the number of new additions declined in the 1870's, with the trend particularly noticeable after 1877. The 1880's were the twilight of the port; only 208 new vessels were added to the fleet in that decade, with the yearly high only reaching 31.

The situation seems virtually identical if the tonnage added in each decade is similarly scrutinized, but there are clarifications. The rapid growth in tonnage in the 1850's is muted somewhat if 5-10% is deducted because of measurement changes introduced by the 1854 Act. The 1860's remain a peak decade, but the decline in the 1870's no longer seems so great, with tonnage added to the fleet roughly equal to the 1850's. The 1880's, however, seem, if anything, more of a disaster.

TABLE 6

NEW REGISTRATIONS AT P.E.I., 1840-1889*

Period	ALL VESSELS No.	Tons	SCHOONERS No.	Tons	BRIGANTINES No.	Tons	BRIGS No.	Tons	BARQUES No.	Tons	B'TINES No.	Tons	SHIPS No.	Tons
1840-49	758	107,573	49	26	25	22	15	23	9	26	—	—	1	3
1850-59	923	144,917	37	14	29	25	23	29	10	25	—	—	1	7
1860-69	941	168,340	30	11	41	40	18	24	9	18	—	—	2	6
1870-79	691	148,790	34	9	34	32	11	13	14	33	5	8	1	2
1880-89	208	34,224	63	24	15	23	0	1	1	25	11	23	—	—

*Rig columns are expressed as percentages. Source: BT 107 and 108.

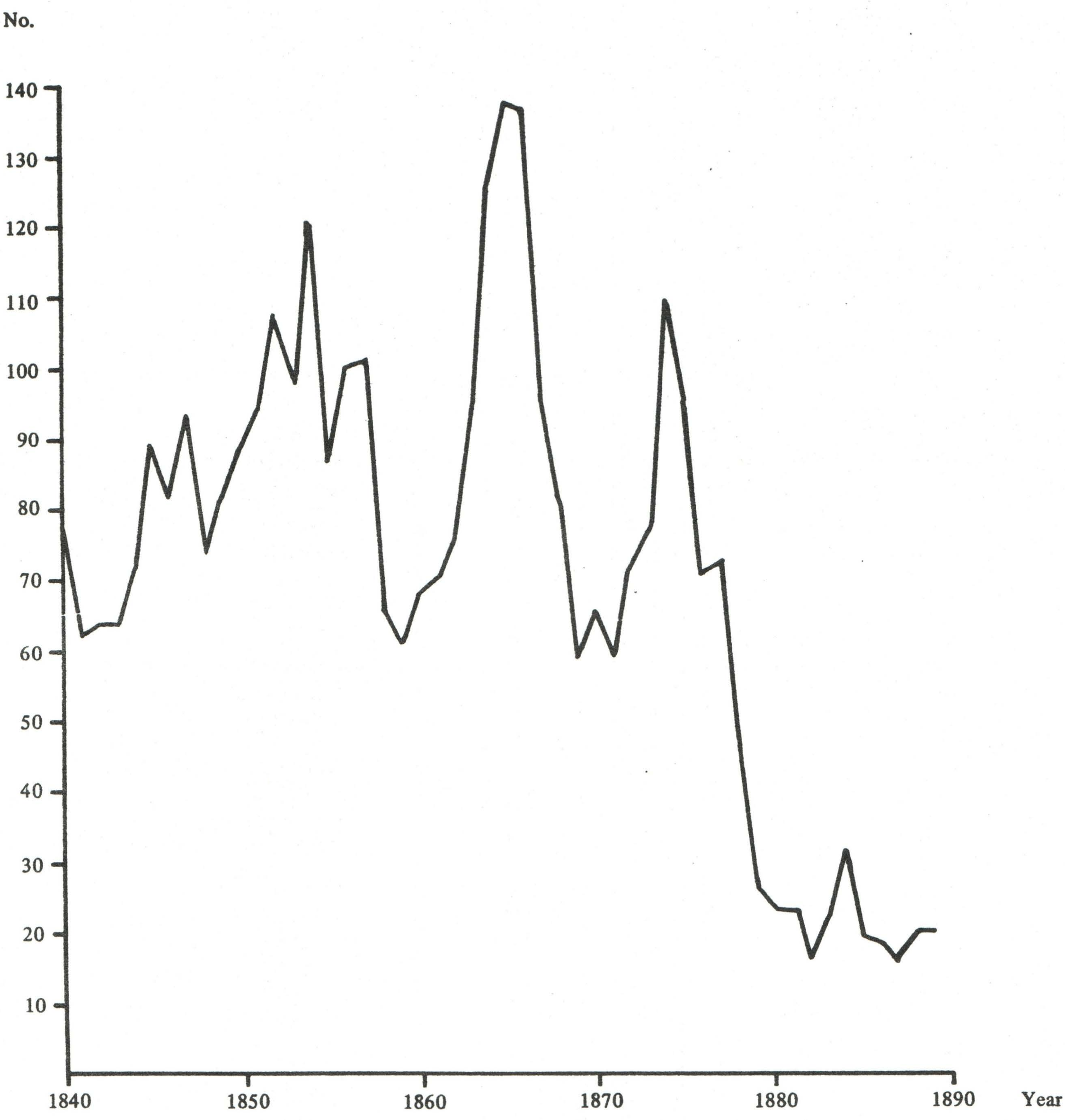

FIGURE 3: NEW REGISTRATIONS AT PRINCE EDWARD ISLAND, 1840-1889

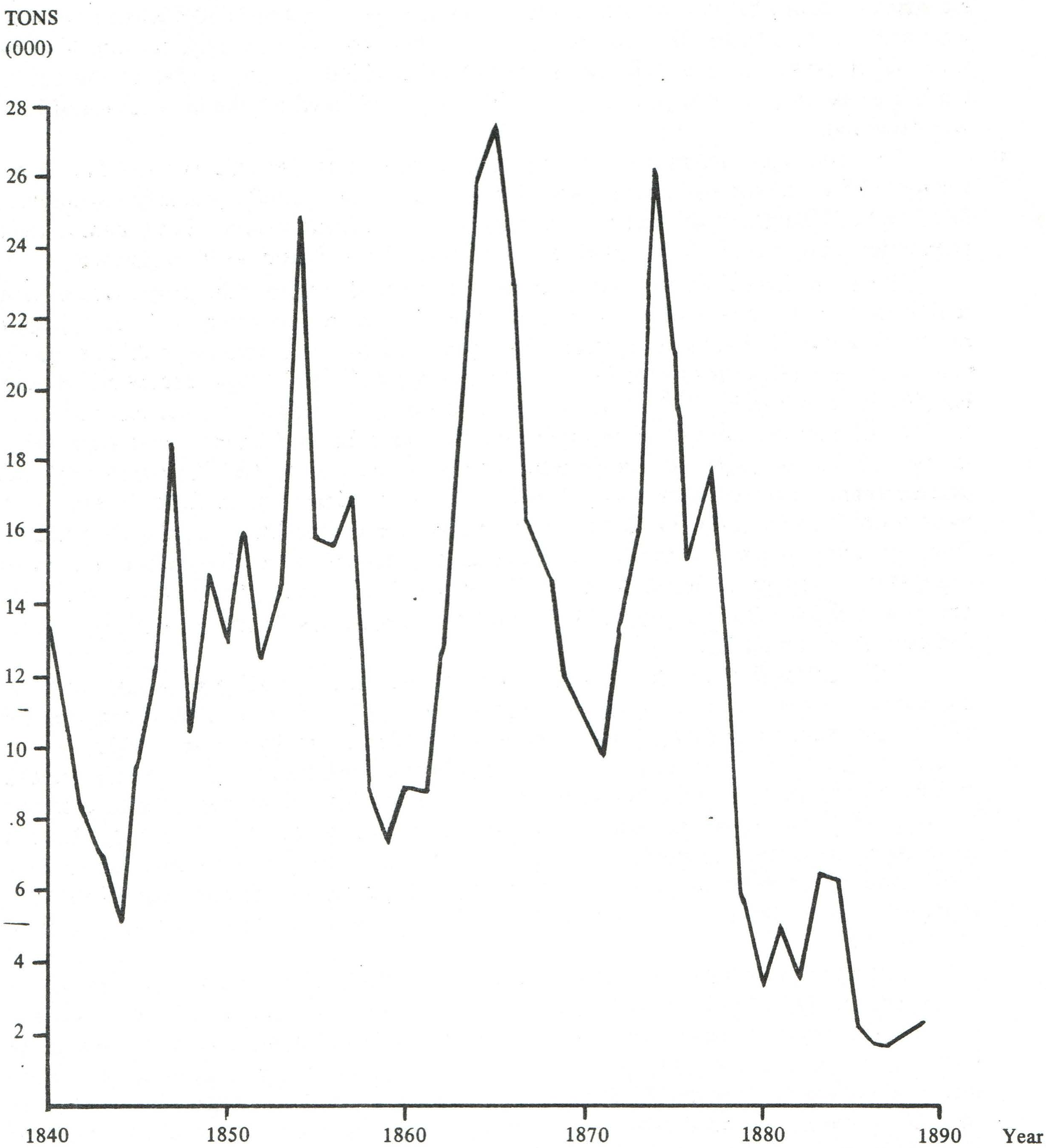

FIGURE 4: TONNAGE OF NEW REGISTRIES AT PRINCE EDWARD ISLAND, 1840-1889
(Note: Tonnages are net burthen before 1854 and gross registered after that date)

An analysis by rig, though, suggests that the fleet was far from static. Almost half of the registries in the 1840's were schooners, but this percentage declined to a low of 30% before rising again to 63% in the 1880's. Brigantine registrations moved almost exactly in counterbalance to schooners, rising to a peak in the 1860's when schooners were at their lowest ebb. Brigs and barques, the other rigs with large registrations, likewise followed different courses. The percentage of brigs added reached a peak in the 1850's while barques had their heyday in the 1870's, a period in which the importance of brigs was declining.

The tonnages accounted for by the various rigs also fluctuated. Schooners accounted for 26% of the tonnage added to the fleet in the 1840's but only 9% between 1870 and 1879. Other rigs responded to change in a less linear fashion, but generally their proportion of tonnage added related closely to their share of new vessels registered.

But such figures can be illusory. In fact, it can be shown that the proportion of new registrations and tonnage added in each decade was remarkably constant if we aggregate rigs by *function.* It has been suggested that by mid-century it should be possible to group schooners and brigantines together as "coastal vessels", and brigs, barquentines, and barques as "ocean-going".[16] There is a great deal of logic to such a transformation, as an analysis of voyages derived from crew lists of Prince Edward Island ships suggests. A sample of 284 voyages for brigantines and schooners after 1850 revealed that the overwhelming majority were engaged either in the coasting trade in Great Britain or in trade with Canada, the other Maritime Provinces, the United States or the West Indies. Only three vessels were plying the North Atlantic trade routes, while one brigantine was engaged on a voyage to South America. For larger rigs, however, the picture is reversed; out of a sample of 204 voyages, 87% were of the "ocean-going" variety to Europe, South America, Asia and Africa.

This reclassification by function shows that the coastal rigs varied little in proportion to the ocean-going rigs throughout the period. The coasters accounted for 66% of the vessels and 39% of the tonnage in the 1850's, reaching a high of 78% of the vessels in the 1880's and 51% of the tonnage in the 1860's and 1870's. As we showed earlier, the individual rigs fluctuated widely, but these fluctuations were counterbalanced by opposite trends among other rigs within the classification. This suggests that shipowners were making decisions on the functions to be served by new orders in a fairly similar manner at most times in the period. In this regard, the character of the port changed little; it could be argued that the P.E.I. fleet seemed almost in an arrested state of evolution.

This hypothesis may be tested in two ways. The first of these is by the use of correlation analysis. Table 7 provides series of correlation coefficients between *changes* in new vessel registrations and tonnage and *changes* in fleet registrations and tonnage for both coastal and ocean-going rigs. Aside from the 1850's, which have already been discussed as a depression period for coastal vessels, and the 1850's, when the registration of ocean-going rigs declined at an even more rapid rate than the fleet as a whole, it is clear that the numbers of new vessels added to the fleet were determined jointly in most decades by the coastal and ocean-going fleets. Similarly, changes in tonnage added were jointly determined, with only coastal vessels for the 1850's seriously out of line, although the relationship is stronger for ocean-going vessels in each decade. This differs markedly

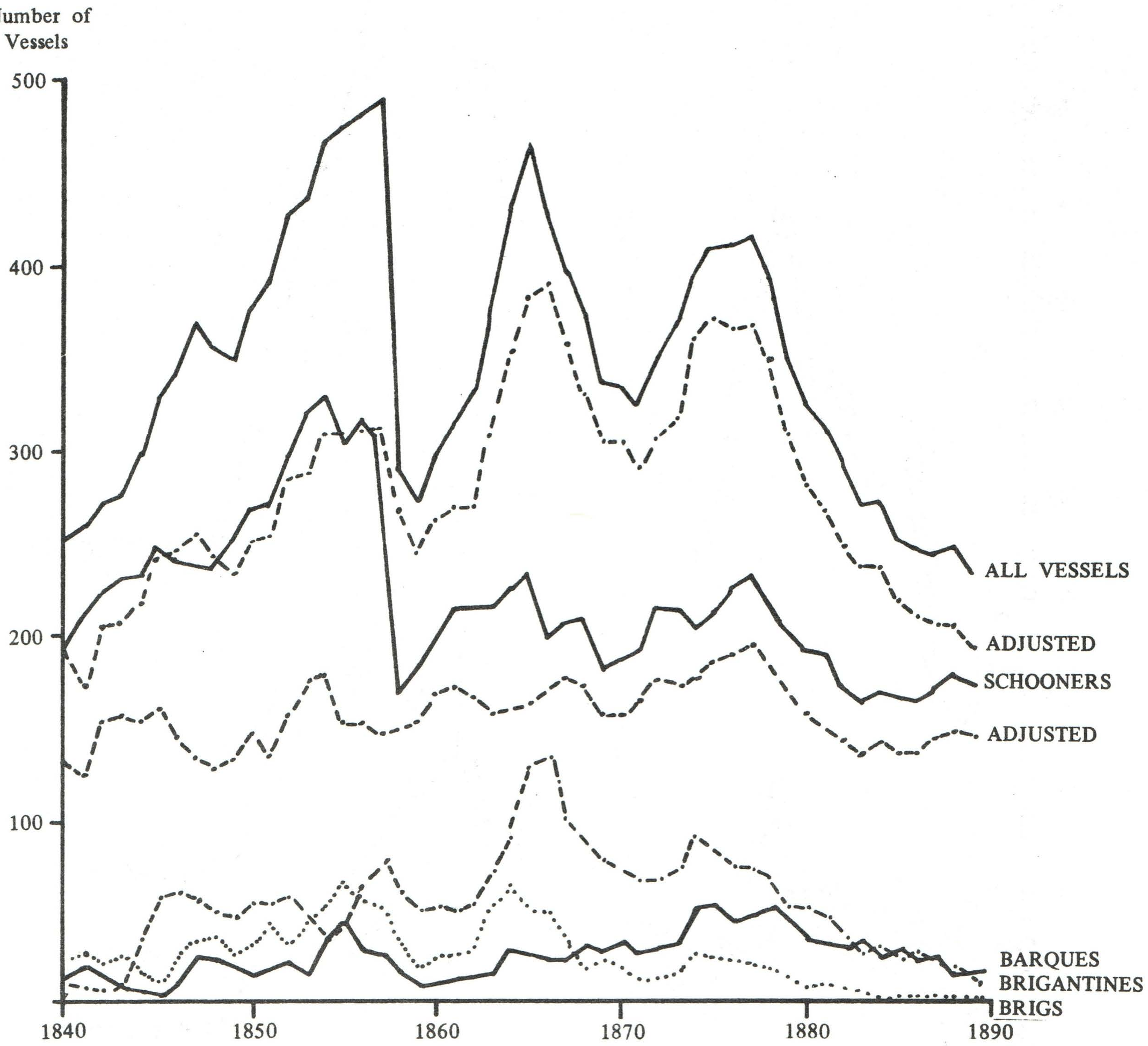

FIGURE 5: VESSELS ON REGISTRY AT PEI

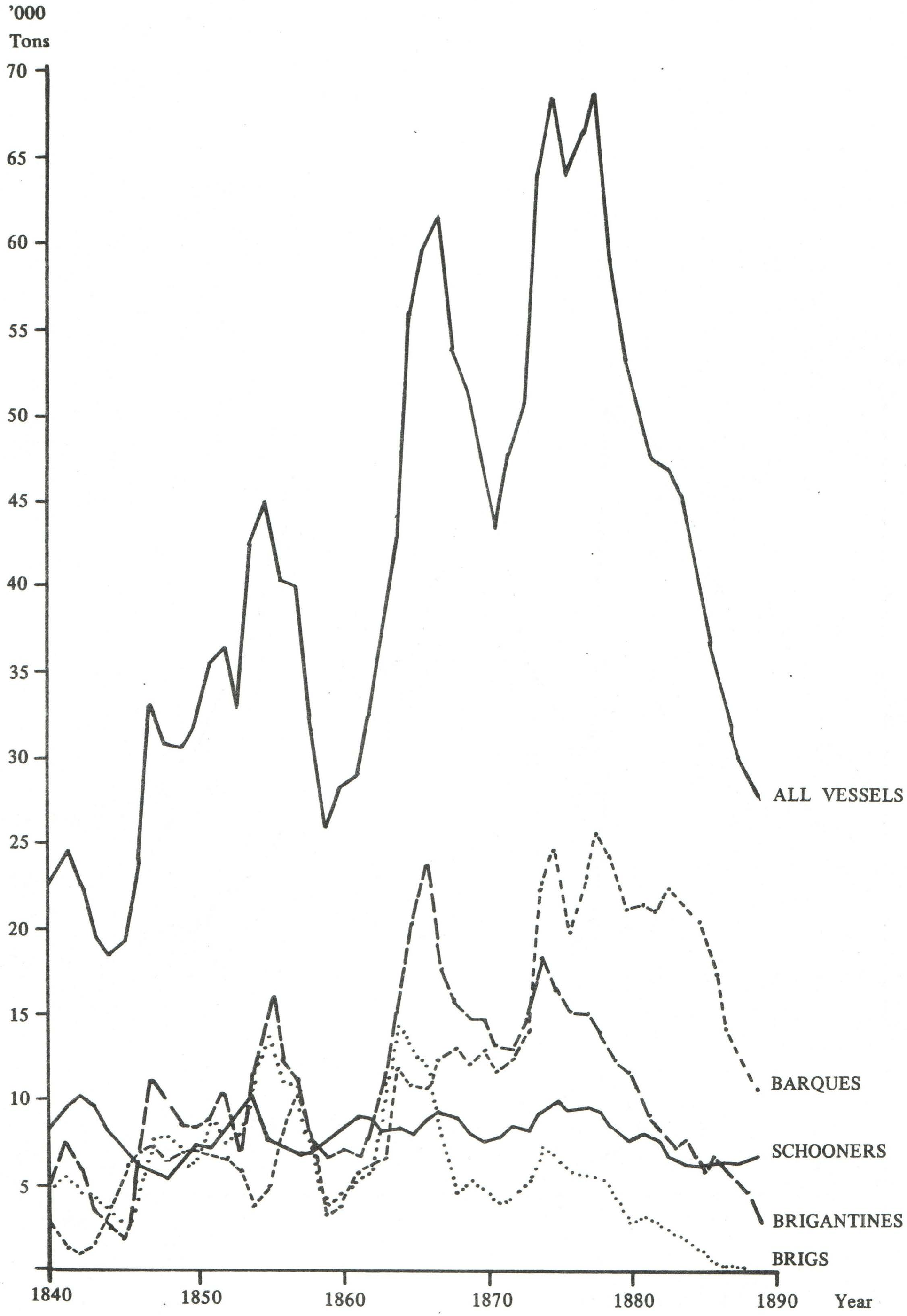

FIGURE 6 : GROSS TONNAGE ON REGISTRY AT PEI Note: Tonnages are adjusted figures.

from the findings for Yarmouth, where the coastal rigs generally determined changes in fleet size while the ocean-going rigs were far more positively correlated with changes in tonnage.

TABLE 7

CORRELATION COEFFICIENTS OF CHANGES IN NEW VESSEL REGISTRATION BY VESSEL TYPE

Period	COASTAL		OCEAN-GOING	
	Vessels	Tonnage	Vessels	Tonnage
1840-49	+.70	+.60	+.79	+.91
1850-59	+.39	+.29	+.72	+.97
1860-69	+.88	+.76	+.85	+.79
1870-79	+.94	+.92	+.86	+.97
1880-89	+.93	+.84	+.69	+.92

Source: BT 107 and 108

While the results of correlation analysis lend some credence to the hypothesis in a limited time frame (by decades), trend analysis can provide a longer term perspective on the twin components of the fleet. It would be possible to fit single equation trend lines over both the coastal and ocean-going fleets for the entire period, but neither line would be congruent with reality. An examination of the graph on new additions to fleet indicates that there really are two distinct trends for each aggregate. For the coastal vessels, a trend line fitted over the period 1840-1869 ($\bar{Y} = 51.24 + .36X$) indicates a modest increase of about one vessel every three years. A second equation, fitted for 1863-1889 ($\bar{Y} = 36.92 - 2.58X$) shows a rapid decline of more than five vessels every two years on trend. For the ocean-going fleet, the line fitted for 1840-1857 ($\bar{Y} = 25.44 + 1.83X$) illuminates the rapid growth of the early decades, while a second trend line ($\bar{Y} = 25.35 - .53X$) indicates a slow decline for the period 1861-1878. The almost nonexistent registrations of ocean-going rigs after 1878 makes trend analysis for the last decade meaningless, but this exclusion should be born in mind, since it makes strict comparability between the slopes of the second trend series ill advised.

What does all of this mean? In general terms, both the correlation and trend analyses validate the hypothesis that both components of the fleet vary little from each other. Each analytical tool, however, clarifies the picture of the port a bit more. One important fact is now clear: the growth period for ocean-going rigs ceased much earlier in Prince Edward Island than in other ports containing a similar mix of rigs. The rapid growth of the ocean-going fleet in the first decade and a half explains the divergences between the two fleets in the 1850's which were previously noted. Most likely overbuilding resulted, and as the building of larger rigs slowed in the later 1850's, the two sets of rigs began to move back toward synchronization. At any rate, by the mid-1860's, the two fleets can be seen to have resumed their general relationship.

Thus far, we have been analyzing what may be termed gross investment (new additions to the fleet), but a different perspective may be attained by turning to an analysis of net investment, which may be defined as new registrations minus registry closures. It is possible that the two measurements are closely related, but this did not necessarily have to be the case. If registry closures proceeded at different rates in different decades, for example, it is possible that the two perspectives would yield entirely different results.

Tables 8 and 9 present two sets of figures on net investment; the differences between the two must be explained before the analysis can begin.

The first table shows net additions according to the official date of closure on the registry; this may be termed the "official fleet size". With almost 20% of the vessels, however, the official date of closing bore little or no relationship to the actual time when the vessel ceased service. In some cases, the registrar included two dates with the closure information, one representing the date when the registry was officially closed and one which represented the actual date of termination of service. In those cases, the alterations made to produce the "adjusted fleet size" in Table 9 were straight-forward, involving merely a subtraction of the actual date from the official closure date to produce a more realistic estimate of fleet size.

In over 400 cases, however, the information on registry closure gave little hint as to when the vessel might actually have gone out of service. Affecting primarily schooners and brigantines, this problem was usually typified by registry entries such as "Missing per Annual List" (the most common), "Out of Existence", or "Disposition Unknown". These cases were largely concentrated in years when the registrar decided to cleanse from his lists those vessels which he reliably believed to be out of existence. In Prince Edward Island, the first of these cleansing years occurred in 1857, and a glance at the almost perpendicular slope from 1857 to 1858 in the official fleet size component of the graph showing vessels on registry will demonstrate the result; almost 200 vessels were removed from the official lists in a massive frenzy of adjustment. Other cleansing years were not nearly so dramatic, but major adjustments to the fleet were made in this way in 1865, 1868, and 1885.

The problem, of course, is in adjusting the fleet size in such a manner as to reduce the impact of nonexistent vessels between these cleansing years. It would have been possible to apply the average life expectancy of individual rigs by decade to each unknown, but such a procedure was rendered impossible by 37 vessels which needed adjustment during decades when an insufficient number of those rigs were registered to make mean life expectancies statistically valid. Another alternative would have been to apply a global life expectancy figure to effect the adjustment. While this might seem logical, it was concluded that it was unlikely that the vessels with unknown closings were either transferred or registered *de novo.* The large number of transfers and *de novos,* most of which occurred within a short time of the opening of the registry, would have seriously distorted the average downward. Instead, it was decided to use an average life expectancy figure which excluded these categories of closure. This figure was computed at 7.33 years; by applying this average to vessels with uncertain dates of closure, the remainder of Table 9 was calculated. While the life experiences of some vessels were undoubtedly misrepresented by the application of this technique, it seems unlikely that the distortion was severe. On the contrary, the net additions thus obtained seem far more likely to

depict reality than the official figures.

TABLE 8

NET ADDITIONS TO FLEET: OFFICIAL SERIES

RIG	1840-49	1850-59	1860-69	1870-79	1880-89
All Vessels	+103	-82	+65	+12	-113
Schooners	+ 60	-71	+ 1	+19	- 26
Brigantines	+ 26	+ 7	+25	-23	- 44
Brigs	+ 8	- 8	+ 1	- 8	- 15
Barques	+ 6	-11	+27	+ 8	- 26
Barquentines	—	—	—	+11	- 1
Ships	+ 2	+ 4	+ 6	- 5	- 4
Steam*	+ 1	0	+ 5	+10	+ 3
Coastal	+ 86	-64	+26	- 4	- 70
Ocean-Going	+ 17	-18	+39	+16	- 43

*Steam includes steam and sail. Source: BT 107 and 108

TABLE 9

NET ADDITIONS TO FLEET: ADJUSTED SERIES

RIG	1840-49	1850-59	1860-69	1870-79	1880-89
All Vessels	+45	+ 5	+62	+ 7	-114
Schooners	+ 4	+20	0	+13	- 27
Brigantines	+25	+ 3	+27	- 22	- 44
Brigs	+ 6	- 8	+ 1	- 7	- 15
Barques	+ 6	- 11	+24	+10	- 27
Barquentines	—	—	—	+11	- 1
Ships	+ 2	+ 1	+ 5	- 6	- 2
Steam*	+ 1	0	+ 5	+ 8	+ 2
Coastal	+29	+23	+27	- 9	- 71
Ocean	+16	- 18	+35	+16	- 43

*Steam includes steam and sail. Source: BT 107 and 108.

Comparison of Tables 8 and 9 shows the dramatic differences between official and adjusted investment. Concentrating on Table 9, it is clear that investment in coastal ships was strong in the 1840's and 1860's; net investment was also positive in the 1850's, despite the earlier suggestion based upon gross investment that this decade was depressed for coastal rigs. It is also worth stressing once again the counterbalancing effects of schooner and brigantine registrations in these decades. Disinvestment occurred in coastal rigs in the 1870's, but this was entirely accounted for by the rapid disinvestment in brigantines, since schooners showed a modest reinvestment trend. The disinvestment in both rigs was pronounced in the 1880's.

Despite the large gross investment seen earlier in brigs and barques in the 1850's there was actually net disinvestment in these rigs during this decade. Brigs held their own in the 1860's before beginning a slow decline in the 1870's. Barques were popular for investments in the 1860's, but investment slowed in the 1870's; disinvestment in barques occurred in all but two years after 1875. The 1870's were a boom decade for barquentines, but they were barely being replaced in the 1880's. Slow investment in ships occurred through the 1860's, but disinvestment began in 1868, with net losses occurring in all but one year after that date before the last ship left the fleet in 1881.

An analysis of net additions to tonnage complements this picture. The 1850's are clearly no longer a boom period, with disinvestment in tonnage for ocean-going vessels paralleling the decline in net additions to fleet for these rigs. Coastal rigs, despite the proportional decline in gross additions in the '50's, increased their tonnage by an amount almost equal to the 1840's.

TABLE 10

NET ADDITIONS TO FLEET TONNAGE: ADJUSTED SERIES

	1840-49	1850-59	1860-69	1870-79	1880-89
All Vessels	+8844	- 5040	+22096	- 11291	-31905
Schooners	- 1731	+ 790	+ 602	+ 399	- 2018
Brigantines	+3192	+ 221	+ 7964	- 2503	- 9407
Brigs	+1952	- 2606	+ 1102	- 809	- 4403
Barques	+3733	- 4878	+ 8496	+11818	-13722
Barquentines	—	—	—	+ 4509	- 517
Ships	+1641	+1414	+ 2222	- 3210	- 2067
Steam*	+ 57	+ 19	+ 1710	+ 1087	+ 229
Coastal	+1461	+1011	+ 8566	- 2104	-11425
Ocean-Going	+7383	- 6051	+13530	+13395	-20480

*Steam includes steam and sail. Source: BT 107 and 108

The 1860's continue to stand out as a growth period for ocean-going rigs despite the trends identified earlier, but now the 1870's appear comparable, owing primarily to increases in average vessel size and the large increases in tonnage to the barque fleet.

The Prince Edward Island fleet grew from 192 vessels and 21,833 tons of shipping in 1840 to a peak of 388 vessels in 1866 and 67,218 tons of shipping in 1878. The decline in number of vessels was relatively gradual from its peak year, reaching a low of 197 in 1889. The decrease in tonnage, however, was much more rapid after reaching its peak, declining to just over 27,000 tons in 1889. Only steam vessels showed a negligible increase in the 1880's; all other rigs declined. Almost two-thirds of the decrease after 1878 was explained in terms of disinvestment in barques (15,000 tons) and brigantines (11,000 tons).

TABLE 11

PRINCE EDWARD ISLAND FLEET SIZE

NUMBER OF VESSELS		YEAR	TONNAGE IN FLEET	
Official	Adjusted		Official	Adjusted
252	192	1840	23,638	21,833
326	241	1845	22,259	19,328
378	254	1850	36,112	31,650
473	309	1855	51,022	44,794
297	261	1860	27,582	27,034
463	382	1865	65,398	59,369
336	304	1870	48,842	46,453
409	369	1875	70,525	67,116
323	282	1880	57,395	52,235
257	219	1885	44,020	40,961
237	197	1889	29,818	27,119

Source: BT 107 and 108

TABLE 12

ANNUAL GROWTH RATES OF TONNAGE*

PERIOD	ALL	SCHOONERS	BRIGANTINES	BRIGS	BARQUES	SHIPS
1840/41-1849/50	+3.0	- 2.3	+11.2	+3.1	+ 3.0	N/A
1850/51-1859/60	- 2.2	+0.6	- 0.6	- 5.7	- 7.2	+9.2
1860/61-1869/70	+5.2	- 1.1	+ 7.6	+0.1	+10.5	+6.1
1870/71-1879/80	+2.2	+0.4	- 1.6	- 1.7	+ 6.0	- 4.0
1880/81-1888/89	- 6.2	- 2.1	- 10.9	N/A	- 6.6	N/A

*All figures expressed as percentages. Source: BT 107 and 108

Measured over the growth period to 1878, tonnage expanded at an annual rate of 3%. An analysis by rig and decade, however, reveals that the growth rate was not at all smooth. As we might have expected, the 1840's showed growth rates for all rigs except schooners. The increase in brigantines was inflated in that decade by the extremely low number of such vessels on registry at the start of the decade. The 1850's were a period of negative growth for most rigs, with only ships showing major growth; schooners and brigantines just about held their own on an annual basis. Growth was greatest in the 1860's, with only schooners having losses. The continued growth rate for barques in the 1870's was almost entirely responsible for the growth that occurred in that decade. In fact, the steady increase in barque tonnage in the 1860's and 1870's appears to have been about the only major concession that the Islanders made to the North Atlantic trend toward larger vessels.

The size of the fleet was not determined solely by the addition of vessels. It is obvious that the number of vessels lost to the port and the rate at which they left registry are crucial as well. If vessels are disposed of at a faster rate than they are added, even large gross additions to the fleet will not increase the number of vessels belonging to the port. Indeed, this seems to be precisely what happened to the ocean-going fleet in the 1850's. Despite large gross additions to fleet in that decade, we have seen that there was disinvestment in those rigs over the decade.

We may first turn our attention to the question of registry life expectancy. This was extremely short at Prince Edward Island. The mode, even eliminating all vessels with *de novo* registrations, was only one year. Over the period as a whole, the mean registry life was 3.63 years. Each decade witnessed an increase, with the mean for all vessels rising from 2.24 years in the 1840's to 9.03 years in the 1880's. In general this pattern was replicated by all rigs.

TABLE 13

MEAN REGISTRY LIFE EXPECTANCY BY DECADE*

RIG	1840-49	1850-59	1860-69	1870-79	1880-89	PERIOD AVERAGE
All Vessels	2.24	2.76	3.30	4.98	9.03	3.63
Schooners	2.60	4.25	5.58	7.98	10:32	5.49
Brigantines	1.82	2.10	2.32	3.06	5.73	2.43
Brigs	1.99	2.09	2.22	2.69	3.00	2.25
Barques	2.79	2.67	3.20	5.46	11.55	3.87
Barquentines	—	—	—	3.60	4.75	3.90
Ships	1.80	3.09	6.67	10.25	—	5.26
Steamers	5.00	15.00	19.00	17.43	14.67	16.11

*The low number of registries of steamers in 1840-49 and 1850-59, brigs in 1880-89, and ships 1840-49 make those averages meaningless. Source: BT 107 and 108.

Although the analysis of registry closure is not far advanced, a preliminary discussion of the reasons for closing the registries will give us some insights into the causes for these low but rising averages. As Table 14 shows, in the 1840's the decade with the lowest mean registry life, almost 90% of all vessels registered were either transferred or sold.

TABLE 14

REASONS FOR REGISTRY CLOSURE BY DECADE*

REASON FOR CLOSURE	1840-49		1850-59		1860-69		1870-79		1880-89	
	No.	%	No.	%	No.	%	No.	%	No.	%
Transferred/Sold	613	89.8	756	81.2	755	81.6	434	61.5	81	38.9
Marine Disaster	67	9.8	150	16.1	123	13.3	203	28.8	85	40.9
Condemned/ Broken Up	3	0.4	25	2.7	47	5.1	69	9.7	42	20.2

**De Novos* and Unknowns excluded. Source: BT 107 and 108.

TABLE 15

REASONS FOR REGISTRY CLOSURE BY RIG (%)

RIG	TRANSFERRED/SOLD	MARINE DISASTER	CONDEMNED/BROKEN UP
Schooners	57.3	30.0	12.7
Brigantines	88.5	10.9	0.6
Brigs	91.8	7.9	0.3
Barques	78.6	20.9	0.5
Barquentines	76.9	21.2	1.9
Ships	75.0	22.2	2.8
Steam	28.6	28.6	42.8

Source: BT 107 and 108.

This percentage declined in each succeeding decade, while the percentage of vessels whose registries were closed because of marine disasters or being condemned or broken up increased. Steam vessels and schooners, with the two highest mean registry life expectancies over the period, were the rigs least likely to be transferred or sold; brigs and brigantines, with the lowest mean registry lives, were the rigs with the greatest percentage of transfers. There thus seems to be an inverse relationship between registry life and percentage of transfers.

Before this relationship can be said to have had a significant impact on registry life, however, we need to know something about the ages of vessels whose registries were closed for the various causes. These figures indicate that the average registry age of transfers was less than two years in the 1840's and 1850's but rose to almost four years in the 1880's. This was accounted for by the brisk market for used vessels in the early decades; by the 1880's, however, the demand in these export markets had diminished considerably. Island owners found it more and more difficult to dispose of their vessels, and this is reflected in the rising age of transfers. The practice of disposing of assets quickly in the early decades combined with a high percentage of transfers must obviously

have had a tremendous impact upon registry life. As the period progressed, fewer vessels were transferred, and those that were disposed of in this manner were generally older than they had been in the earlier decades. Correspondingly, the percentage of vessels whose registries were closed either because of marine disasters or because they were condemned and/or broken up increased. Vessels in these categories were older, and this, too, helps to explain the rising registry life. Since at this point there is no evidence that the ownership strategies had changed over the period, it is likely that many of the owners in the 1880's still looked to export markets to dispose of their vessels; thus, the importance of the changing composition of registry closures would seem to merit further intensive investigation.

TABLE 16

REGISTRY LIFE BY CAUSE OF REGISTRY CLOSURE*

REASON	1840-49	1850-59	1860-69	1870-79	1880-89
Transferred/Sold	1.88	1.97	2.13	2.64	3.99
Marine Disaster	4.10	3.87	6.18	5.61	8.75
Condemned/Broken Up	13.80	12.00	13.88	17.53	19.60

**De Novos* and Unknowns excluded. Source: BT 107 and 108.

One other piece of information suggests the transcending importance of transfers in understanding the port. A series of correlation coefficients was calculated to test the relationship between new registrations of vessels in Prince Edward Island and the value of exports from the Island. Similar correlations were computed between registrations and new registrations in Great Britain. Since an overwhelming percentage of transfers from the Island went to Britain, it would not be unreasonable to assume that new registrations in Great Britain were roughly equivalent to the aggregate demand for P.E.I. vessels. The results indicate that there was almost no relationship between exports and new registrations on the Island. This suggests that whatever the reason for the owners' decisions on whether to place orders for new vessels, the expectation that they would be used immediately to carry Island produce to market was not likely one of them. The second series of correlations, however, provides a possible explanation for the timing of new orders. It now seems extremely likely that large numbers of Island owners carefully considered the state of the markets for ships in Great Britain before placing orders for new vessels. Breakdowns of the later series by rig confirms that this conclusion seems to be generally true for the various rigs in most periods.

It would be foolhardy at this point to suggest that the above analysis provides all of the answers. Doubtless there are other factors not yet analyzed which will augment this explanation. However, from the data available thus far it would appear that this hypothesis is worthy of serious consideration in any more sophisticated analysis.

TABLE 17

CORRELATION COEFFICIENTS BETWEEN NEW REGISTRATIONS IN P.E.I. AND P.E.I. EXPORTS AND NEW REGISTRATIONS OF VESSELS IN GREAT BRITAIN

PERIOD	EXPORTS FROM P.E.I.	NEW REGISTRATIONS IN G.B.
1840-49	+.13	+.91
1850-59	-.20	+.73
1860-69	-.03	+.89
1870-79	-.17	+.91
1880-89	+.27	+.96

Source: P.E.I. census materials (1851, 1871, 1881, 1891); B.R. Mitchell and Phyllis Dean (comps.), *Abstract of British Historical Statistics* (Cambridge: Cambridge University Press, 1962), Transport Tables I, IIB, III, 217-224.

IV

The decline in importance of the shipowning industry in Prince Edward Island roughly parallels similar trends in the rest of the Maritime Provinces and in Britain itself. Thus, there is a great temptation to conclude that the decline of the industry was inevitable, a product of historical forces which were beyond the immediate control of simple folk in the Gulf of St. Lawrence.

Such an argument, of course, would beg the question. As the Norwegians, Swedes, Dutch and Italians who eventually purchased much of the Prince Edward Island fleet demonstrated, it was quite possible to operate sailing vessels profitably for many more years, particularly the larger barques on trade routes where speed was not essential or where port facilities were too primitive to allow rapid unloading, thus negating the advantages possessed by steamers. Indeed, a number of PEI-built vessels operated successfully well into the 20th century, and Basil Greenhill and Ann Giffard discovered one Island-built brigantine which was still operated profitably in the coasting trade in the west of England until 1960.[17] Further, some of the large owners were far from "simple folk". A number of them founded "dynasties" which played a vital role in the economic life of Prince Edward Island in the 20th century. And these men were not isolated economically to the degree suggested by their geographic location – many were well-connected to mercantile and banking concerns in England and Wales. Finally, it is not sufficient to argue that the Prince Edward Island experience was similar to those of other ports in the Maritimes, since the reasons for these declines are as yet imperfectly understood. Therefore, it is necessary to advance some more specific hypotheses to account for the virtual extinction of shipowning on the Island.

Any such hypothesis, however, should stress the importance of trends elsewhere. It is apparent that a large percentage of the Prince Edward Island fleet was transitory in nature, consisting of assets marked for quick disposal in export markets. The decline of demand in these markets, which began in Britain in the late 1860's and spread to many other port areas in the next fifteen years, left the Islanders with the option of either

finding other markets or changing their mode of operation.

An analysis of the large owners provides some suggestive evidence that many of them never really attempted to make the transition. The exact reason for this is as yet unclear, but after 1878 the large owners began to rapidly withdraw from the industry. The percentage of shareholdings held by this group declined to 23.2% in the last decade, and tonnage owned declined to 29.3% The decline of the Charlottetown owners, from 61% of the tonnage in the 1870's to about 25% in the 1880's, was even more pronounced. Only the Yeo family and its connections, all non-Charlottetown based, continued to own large numbers of ships in the 1880's. It can be surmised that many of these owners feared that the shift from a brokerage to a management function would have been difficult or less profitable. At any rate, it is clear that most owners who had previously depended upon the export market left the industry.

It is also possible that financial constraints were instrumental in influencing owners to depart. Some of them may not have been realizing sufficient profits to amortize steamer replacements, for example. It is also possible that non-maritime investments were more attractive in the new Dominion or elsewhere during the 1880's and 1890's, thus attracting many shipowners to shift their investments to new fields. Not enough is known about this as yet to make any firm conclusions, but further research may clarify the picture.

If many of the first generation of large shipowners were reaching the ends of their careers at a crucial turning point in the industry, there may have been a crisis of "entrepreneurial transition". Despite our knowledge that some of the early owners successfully transferred their businesses to the second generation, this hypothesis should not be discarded too quickly. Biographical data collected thus far indicates that a large number of owners either retired or died in the late 1860's and early 1870's. This was a transition period for the industry on the Island; while there were some good years left, the increasing acceptance of steam was beginning to threaten their traditional markets. The need to adapt to radically different conditions combined with the transition to second generation ownership may well have been too formidable a task.

One possible explanation for the decline, however, makes less sense. The transition from wooden sailing ships to iron hulled or steam vessels may have presented problems of technological transition for owners in some ports, but it was far less likely to have caused major problems for Prince Edward Island owners. These men had been swift to take advantage of technological innovations for years; the transition to barquentines discussed earlier is just one of a number of examples. While such transitions would have mandated a greater reliance upon imported assets, it is unlikely that such tasks would have been beyond the competence of the owners.

Whatever the reasons, it is clear that an era had closed for Prince Edward Island. Increasingly, the Island came to be viewed (and, unfortunately, to view itself) as an economic backwater, a province which was a drain on the economic resources of the Canadian Confederation. While the dollars derived from agricultural exports provided a continued economic base, in the 20th century residents were forced to adapt in new ways to their geographic location. The very location of the Island, which had provided such an impetus to a major shipping industry, was used to attract tourists. Visitors on one of the ramshackle ferries operating to the Island today may be forgiven for reflecting

nostalgically about the glories of the "golden age of sail."

NOTES

1. The author would like to thank Drs. David Alexander and Eric Sager, both of the Maritime History Group at Memorial University, for their assistance and insightful comments during the research. Thanks are also due to Mrs. Hilary Rifkin who provided needed assistance on several of the research problems.

2. Ralph Davis, *The Rise of the English Shipping Industry in the Seventeenth and Eighteenth Centuries* (London: David and Charles, 1962).

3. See, for example, Andrew H. Clark, *Three Centuries and the Island: A Historical Geography of Settlement and Agriculture in Prince Edward Island, Canada* (Toronto: University of Toronto Press, 1959); Basil Greenhill and Ann Giffard, *Westcountrymen in Prince Edward's Isle: A Fragment of the Great Migration* (London: David and Charles, 1977); Lorne C. Callbeck, "Economic and Social Development since Confederation", in Francis W.P. Bolger *ed. Canada's Smallest Province: A History of Prince Edward Island* (Charlottetown: Prince Edward Island Centennial Commission, 1973), pp. 328-354. Of these works, only the book by Greenhill and Giffard devotes any space to shipowning. It's greatest utility, however, is as a case study since it confines itself to only a small but influential group of entrepreneurs. S.A. Saunders, *The Economic History of the Maritime Provinces* (Ottawa: King's Printer, 1939), though old has yet to be superceded on the general economic history of the region.

4. See the discussion in Greenhill and Giffard, especially pp. 194-199. The question of the importance of shipping to the Island economy is a major part of the author's ongoing research, but the results were too preliminary to be reported here.

5. The primary sources of data for this paper came from the Board of Trade record series 107 and 108, Prince Edward Island Shipping Registries, the originals of which are in the Public Record Office in London. This was supplemented at various points by the original port registries in RG12, A1, Vol. 159 at the Public Archives of Canada, Ottawa. Although this is primarily non-computer based, some of the analysis was done on an SPSS systems file.

6. The "port" of Prince Edward Island includes the entire Island. The registrations were accepted at Charlottetown.

7. This technique will be defended later in the paper. It was originally suggested to me by Dr. David Alexander.

8. The Saint John figures are based upon samples taken at five year intervals over the same period. This sample reveals that 67% of all registrations were schooners and brigantines. While this percentage may reflect the precise number, sampling errors may cause the figure to be revised slightly.

9. The Prince Edward Island newspapers throughout the period were filled with admonitions from brokers in the United Kingdom to concentrate on the smaller rigs. In particular, see the full statement by the Liverpool firm of Tonge, Curry and Company in *The Islander,* January 27, 1854.

10. Clark, *op. cit.* p. 145; Saunders, *op. cit.* p. 146.

11. David Alexander, "The Port of Yarmouth, Nova Scotia, 1840-1889" (paper presented to the conference of the Atlantic Canada Shipping Project, Maritime History Group, March 1977), p. 2.

12. It is possible that this figure underestimates the true totals. In the period 1855-59 particularly, the registrar did not systemmatically record previous registrations on the copy of the registry dispatched to the Board of Trade. At least sixteen cases have been isolated where a time lag occurred between date of build and date of registry at P.E.I., leaving open the possibility that these vessels were registered elsewhere. A search of the most likely ports, however, failed to support this supposition.

13. Before the regulations were revised by the Merchant Shipping Act of 1854, at least 24 vessels,

and probably more, were built on the Island but never formally registered there. Instead, they were issued warrants to be transferred to other ports in the United Kingdom for registration. Although this practice was altered by the 1854 Merchant Shipping Act, it is possible that misinterpretations of the Act allowed the practice to continue. The BT 108 series for Saint John, New Brunswick, contains examples of shipping under warrant throughout the 1850's, which lends some credence to this suggest. The laws on registry will be clarified greatly by the work in progress of Olga Prentice of the Maritime History Group.

14. This figure includes all of those owners who purchased shares in *de novo* registrations. No effort is made, however, to analyze ownership changes which occurred without the opening of a new registry.

15. This task was accomplished by the creation of an SPSS systems file.

16. See David Alexander, "Cycles in Yarmouth Vessel Registrations, (Maritime History Group Research Paper: Yarmouth Vessels Number 5.) (November 1976).

17. Greenhill and Giffard, *op. cit.* p. 226.

4. DISCUSSION FOLLOWING THE PAPERS OF K. MATTHEWS L. FISCHER E. SAGER

CRAIG pointed out the danger of looking at treating Newfoundland ship registrations from an assumption that Newfoundland "was in some sense at the centre of something rather than at the periphery." The bulk of Newfoundland's carrying trade was always dominated by non Newfoundland registered vessels, and her commerce was "predominantly a United Kingdom rather than a Newfoundland oriented operation."

Looking at Prince Edward Island he stressed the point that that region was predominantly a ship exporting factory rather than a ship owning area *per se,* and outlined the strong financial connections with banks and ship brokers in the United Kingdom who provided both the markets for the vessels, and perhaps the finance for the new building. Thus Prince Edward Island, like Newfoundland, existed on the periphery of a British dominated economic system.

FISCHER agreed that further study was needed on the subject of ship financing and especially mortgaging, not only for Prince Edward Island, but for all ports being studied, but thought on a subjective basis that in the period before 1854 mortgaging was not a predominant feature in Prince Edward Island vessel registration.

CRAIG agreed that as far as the Prince Edward Island end was concerned this was probably true, but thought that since the vast majority of Island vessels were exported almost immediately to the U.K., the Prince Edward Island owners were only temporary or "intermediary" owners for the purposes of getting the vessel across the Atlantic and that an examination of transactions once the vessel was sold in Britain would reveal a much greater degree of mortgage financing.

SAGER agreed with the importance of non Newfoundland and chartered vessels in the general trade of Newfoundland, but argued that the accumulation of brigs and brigantines indicates a possibility for Newfoundland owners to have entered the carrying trade of the Island, and saw as a vital question the failure to have sustained a deep sea fleet within an export led economy. However, connections between Newfoundland fish merchants and the United Kingdom were strong and many of the merchants registered their trading vessels in the U.K. rather than in Newfoundland. He also pointed out that (unlike other parts of British North America) a substantial number of Newfoundland registered vessels were built in Britain.

PARKER emphasized the dangers of trying to differentiate between the possible employment of vessels on the basis of their rig. Rig was to some degree interchangeable. Brigs and brigantines were from the 1860's onwards going out of fashion, whilst the schooner was tending to increase in size. The decline of the brig was due to improvements in schooner rig which made the running costs of the brigs disproportionately high, owing to the high costs of rigging, and greater manpower/tonnage ratios.

FISCHER pointed out that despite this Prince Edward Island builders continued to register brigs in large numbers up to the late 1870's and wondered why this was so, and what employment they were designed for.

PARKER thought that they may have been sold to European owners for coastal trades.

GREENHILL wondered whether they were truly brigs at all, since he had not noticed any influx of Prince Edward Island brigs onto the British register during this period. He pointed out that they may well have been brigantines. He then addressed himself to the question of Newfoundland participation in its own carrying trade during the second half of the century. He pointed out that there was an age old connection between the West of England and Newfoundland, and that changing circumstances in that area and North Wales saw the creation of a complex and integrated shipping business which was extremely flexible and readily available on a charter basis for Newfoundland fish merchants, and thus was a more economical means of transporting fish than by means of Newfoundland owned vessels. "You don't in those circumstances, build up an expensive indigenous industry when you can draw on a cheap one that already exists."

On the decline of Prince Edward Island he argued that it was not only a ship building factory, but because of the proprietory system of land holding it was a unique factory. This was because the land tenure system provided very cheap timber, and the labour involved in working the timber was nearly free because the farmers were so much in debt to the merchants that they had to work off their balances in the ship yards and thus Prince Edward Island built vessels were a very low cost product.

After the 1860's this situation began to change with the end of proprietorship, the increasing circulation of money and a tendency to break away from the domination of local merchants.

Why did the shipping and shipbuilding families drop out of the industry in the late 19th century? Partly because they were very specialized – producing certain types of vessels out of specific materials, using only traditional manufacturing techniques. But even more important perhaps, because the families did not act as perfect economic man. After three generations "the drive had gone out of them" and they were unwilling to adapt to changing economic conditions, being content to roll on as prosperous people. There was probably dissipation of capital due to multiple inheritance and the existence of the rest of Canada and the United States provided an easy outlet for both people and investment of capital.

JANNASCH pointed out that just as the brig was increasingly superseded by various schooner rigs, so by the end of the century, the ship was being replaced by the barque which was a cheaper vessel to rig and man. He also stressed that from the 1880's onwards, Newfoundland fish merchants were chartering vessels from Scandinavia as well as Britain, and their running costs were very low.

SAGER returned to the problem of Newfoundland deep sea shipping. He granted that the carrying trade was an international one and that European and British vessels seemed to have possessed comparative advantages by the last 20 years of the 19th century, but that this was not necessarily true of the middle decades. Newfoundland did have certain advantages itself, having cheap labour, access to timber and a tradition of vessel building. Most vessels registered in Newfoundland were also built there, and the

owners thought of themselves as builders as well. However, they lacked technological sophistication and this placed a limit on the type and number of larger vessels they could produce. He argued that technology remained primitive throughout the entire Newfoundland economy during the 19th century, although certain foreign fishing innovations, such as cod traps and trawls, were introduced. When Newfoundlanders became aware of their need for modern technology during the 1880's and 1890's they chose to import it not for maritime industries but for railways, and mineral and lumber industries. In addition to this, the Newfoundland economy was badly weakened by 1880 due to the decline in the value of the fishery, and thus capital formation in the shipping and fishing sectors declined very seriously.

MATTHEWS summarised the development of Newfoundland's carrying trade. Until the French Revolution, the merchant ships which took the fish to market were mainly owned by the same men who organized the fishery and all were centered on the West of England. In 1790 at least 75% of the vessels coming from England to the fishery were owned by English merchants in the fish trade.

There was little or no shipping owned in Newfoundland, neither was there much chartering from independent owners in England. Although the resident population of Newfoundland had been increasing steadily since about 1750, it was still insufficient to produce all the fish needed and thus much of the labour was hired on a short term basis from England and Ireland, whilst the English fishery on the Grand Banks produced large quantities of fish. Thus the fish merchants could use their vessels to bring supplies to Newfoundland and take produce to market and also had a ready source of income from the carriage of passengers out and home, and could use the smaller vessels to fish throughout the summer on the Grand Banks.

By 1815 this situation had changed drastically. The Bank fishery had practically disappeared, whilst the population had increased to such an extent that the passenger trade was declining. There were still people coming out to Newfoundland, but far fewer were returning to the U.K. in the fall of the year. This presented the fish merchant-shipowner with great problems since he lost the profit from the passenger trade and could no longer hope to gain much return from putting his vessels into the Bank fishery. At the same time, mainland British North America was developing quickly and thus it was easy to obtain space for cargo on vessels coming out from Europe. Thus a difference emerged between shipping availability for Newfoundland's imports and that for her exports. It was easy to freight goods into Newfoundland, but much more difficult to find vessels which could take fish to Southern Europe.

By 1820 the Newfoundland merchant's involvement in shipowning had generally diminished but they had really split into two groups. One section, basically merchants who still resided in South Devon or Dorset, and traded to the Outports or kept up the Bank fishery, still own their own fleets of merchant and fishing vessels, and still transported some of their labour out and home. Thus the firm of Robert Slade and Company of Trinity hardly ever chartered shipping either to bring cargoes out from the U.K. or to take fish to Southern Europe. This group of "Outport merchants" were however, a steadily declining force in the fishery and most had disappeared by 1870. The power lay with the entrepreneurs in St. John's and Conception Bay, where increasingly the trade of Newfoundland became centred as the century wore on. These men were only

marginally involved in the production as distinct from the marketing of fish, and with the availability of space on vessels trading between Britain and the mainland, did not need to own their own vessels in order to import goods. Increasingly they found it made no sense to own large fleets of sea going vessels if the main point of employment was merely to carry fish to market.

Thus arose the situation whereby the fish merchants imported goods in vessels which happened to be passing Newfoundland on their way somewhere else, whilst they exported fish on vessels which were generally employed in European trades, the fruit trade being the most satisfactory, but which were available to make one run a year out to Newfoundland, with salt from Portugal, Spain or Sicily.

Despite this, however, the merchants did continue to own a certain number of sea-going vessels, probably because this gave them a certain stability and control over their trades. This was certainly true of the large "Water Street" merchants such as Job's, Bowring's, Baine Johnston, J. and W. Stewart and Allan Goodridge. Most of these companies had head offices in Britain and tended to register their sea-going vessels in Liverpool, Greenock or London rather than St. John's, but there were merchants in Newfoundland who did not have close connections with Britain. The firm of Harvey and Dunscombe, for example, were Bermuda based and dominated the West Indies trade, whilst others, such as Archibald or Tobin, were offshoots of families established in the Maritime Provinces. These men sometimes registered vessels in Newfoundland but equally might register them in Bermuda, Cape Breton or Halifax. It was in the West Indian, Brazilian and Canadian trades that Newfoundland owners had the best opportunity to employ their vessels.

However, as SAGER pointed out, the Newfoundland ship owners managed to take a considerable share of the carrying trade during the 1840's and 1850's. Why was it feasible for them to be in deep sea shipping at that period? Why does this trend fail to strengthen after 1860?

DAVIES warned against the danger of becoming too involved with "ships as ships". They should be regarded as "operating units" in the same manner as we might now evaluate railway freight cars. The owners were concerned mainly with obtaining a return on capital and on average regarded their vessels "with a lot less enthusiasm than we do with hindsight". He pointed out that the decline in the Canadian shipping industry should be considered along with that of the United States of America. The decline of the latter was not due to lack of capital, entrepreneurship or the technological ability to build iron and/or steam vessels, it was much more because there were better opportunities for investment in other fields.

KNOPPERS in discussing the problem of adapting to technological change pointed out that the Dutch, who had been leaders in shipping technology and operation in the 17th century, stagnated in the 18th, and this was due partly to the influence of ship building guilds which fought the importation of designs from England and France.

Regarding the ownership of Canadian registered vessels, is it possible to differentiate between active and passive shareholders? The active owner had a different attitude to investment in shipping compared with the passive owner to whom it was simply one of perhaps several alternative investments. Is it possible to determine the rate of return on investment, and if so, how did returns from shipping compare over the

period with other possible investments, assuming that investment capital existed to begin with?

FISCHER thought it would be possible to differentiate between active and passive share owning, at least to some degree. For example, the managing owner would certainly be active, and perhaps the higher a person's name appeared on the list of owners, the more likely he or she was to be an active participant. For example, where widows appear as part owners in Prince Edward Island, their names are always low on the list.

PARKER pointed out that in the United States after the 1870's many inactive shareholders were not merely "passive" in that they usually were connected with the shipping industry as builders, brokers, chandlers or sailmakers. They invested not so much to receive a return on the trading investment but rather to secure the business of the vessel and thus whilst a truly silent partner in a vessel might fare badly "this gang of forty thieves did quite well". A similar situation may well have existed in Eastern Canada.

JANNASCH, commenting on the problems of technological innovation, pointed out that even with the system of wooden sailing ships, building materials and equipment such as anchors, chains, windlasses, steering gear *etc.* were generally imported from Britain, and yet a large number of patents connected with shipping were taken out in Canada before 1867, and thus both an interest and a design capability did exist in Maritime Canada.

PALMER, on the question of active and passive ownership asked whether the Maritime History Group had as yet analysed the actual number of owners per vessel and whether this changed over time. Studies of Liverpool and London, in Britain, seemed to indicate that over the 19th century there was a tendency for the number of owners per vessel to decrease and for inactive partners to drop out of this form of investment.

FISCHER had examined the question but had not yet analysed ownership by decades. His impression was that in Prince Edward Island there tended to be an increase in the number of owners per vessel until the collapse of the industry in the 1880's, which left only active owners in the shipping industry.

SAGER raised the problem of whether, behind the names which appeared as owners of a vessel on the registry, there existed a system of hidden ownership, or mortgage investment and whether this might be discoverable.

CRAIG, in a discussion of the role of sailing vessels in the late 19th century, where steam was clearly beginning to predominate, pointed out that in the British industry at least, the survival of sailing vessels was partly dependent upon the loading and unloading facilities of ports, and of the particular demands of cargoes. Thus where the port of call had few means of rapid loading and discharging as in much of the coal trade, sailing vessels could still operate successfully, due to their low capital investment *vis a vis* the steamer which had to operate as continuously as possible. Thus the late 19th century sailing ship was primarily a bulk carrier, Demurrage, which was a serious problem for steamers, was negligible for sail. The two British trades which remained open for sail into the 20th century, were the coal trade and the Baltic timber trade, but many cross Atlantic bulk trades remained open to sailing vessels up to the First World War, operated by Scandinavian owners using "clapped out British (including Canadian) sailing vessels".

This was certainly true of the lumber trade. "Transit time does not matter very much either, as long as you have a continuous stream of vessels once the St.Lawrence is

open''. This factor might also help to explain the survival of the brig and barque construction in Prince Edward Island, especially since many were built and nominally owned by Mr. Richards, who had relatives in Swansea who were deeply interested in the bulk coal and copper ore trades – both ones in which the sailing vessel had a role throughout the period.

On the question of the failure of builders and owners to adapt to new technology, he agreed with Greenhill, that they may well have been innately conservative – carrying on their business until the trades for which sailing vessels could operate were inevitably taken over by steam. His suspicion was that almost all of the larger Prince Edward Island vessels built from the mid 1870's onwards were probably sold to these Swansea relatives.

GREENHILL took up the arguments of Jannasch that in the Atlantic seaboard of North America there had been in fact vigorous technological development in so far as it pertained to wooden sailing vessels, and thought that Prince Edward Island builders shared in this experience, but mentioned the possible role of Lloyd's Register of Shipping in either encouraging or discouraging this process.

5. THE PORT OF YARMOUTH, NOVA SCOTIA, 1840-1889

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YARMOUTH AND REGION

GLOSSARY OF STATISTICAL SYMBOLS

$\bar{X}$	The arithmetic mean
s	The standard deviation, a measure of dispersion
V	The coefficient of variation, a measure of dispersion relative to the arithmetic mean
Chi-square	A test of statistical significance
F	The F ratio in one way analysis of variance, a test of statistical significance
Eta, Eta^2	A measure of association and of the proportion of variance explained, between a nominal level independent variable and an interval or ratio level dependent variable
r, r^2	Pearson's correlation coefficient, and the coefficient of determination, between two interval or ratio level variables
R, R^2	The multiple correlation coefficient, and multiple coefficient of determination, among more than two interval or ratio level variables

THE PORT OF YARMOUTH, NOVA SCOTIA, 1840-1889*

David Alexander

Yarmouth opened as a Nova Scotia port of registry in 1840, and from that year until 1889 some 1,645 *new* vessel registrations were recorded.[1] While not necessarily typical, it was a recognizable Maritime port in terms of the distribution of vessels it owned and operated: there was little steam tonnage, a large fleet of small schooners and brigantines, and a respectable collection of brigs, barques and ships.

TABLE 1

YARMOUTH VESSELS, 1840-1889

	NO.	%
Schooners	872	53%
Brigantines	213	13%
Brigs	115	7%
Barques	272	16%
Barquentines	6	0
Ships	138	8%
Steam and Sail	8	0
Steamers	15	1%
Sloops	2	0
Unknown	4	
	1645	

The schooner fleet was dominated by the small two-masted, single-decked vessel, for only five had three masts and only two had more than one deck. This was also true of the brigantines, where only five had two decks, and also of the brigs where only seven had more than a single deck. With the barques and ships, the balance was tipped in the opposite direction, for 170 of the 272 barques had two decks, while only ten of the fully-rigged ships were single-deckers, 123 had two and five had three decks.

Changing measurement rules rampage through the period, but the evidence points unmistakably toward an increasing average size of vessel at Yarmouth. In length the average schooner rose from forty-nine feet in the 1840's to sixty-five feet in the 1880's; and in the case of brigantines from seventy-one to 107 feet. The barques jumped from an average of 104 feet to 196 feet, and the ships (which were only significant in number from the 1860's) from 165 to 214 feet. In the ratio of length to breadth, the smaller rigs tended to be beamier than the big vessels, and showed little change over the fifty year period. With the barques and ships, however, there was a distinct increase in the ratio from around 4.5 in the 1840's to 5.3 in the 1880's.

**The data for this paper is contained on an SPSS systems file created from the Board of Trade series 107 and 108 of colonial registries.*

TABLE 2

AVERAGE LENGTH AND BREADTH OF YARMOUTH VESSELS 1840/49 – 1880/89*

	1840-49			1850-59			1860-69			1870-79			1880-89		
	L	B	L/B	L	B	L/B	L	B	L/B	L	B	L/B	L	B	L/B
All	61.6	16.4	3.8	83.6	20.5	4.1	96.1	23.9	4.0	120.2	27.4	4.4	95.2	23.3	4.1
Schooners	49.3	13.9	3.5	57.4	15.9	3.6	59.0	17.9	3.3	59.5	18.5	3.2	64.9	19.3	3.4
Brigantines	70.9	18.8	3.8	82.9	21.2	3.9	89.5	23.9	3.7	96.4	25.5	3.8	106.5	27.1	3.9
Brigs	84.8	21.3	4.0	108.2	24.8	4.4	113.0	27.3	4.1	—	—	—	111.0	27.0	4.1
Barques	104.3	23.6	4.4	133.0	28.5	4.7	140.4	30.7	4.6	165.8	34.2	4.8	195.5	37.3	5.2
Ships	123.0	27.0	4.5	159.5	34.0	4.7	164.5	34.2	4.8	188.3	37.3	5.1	214.3	40.3	5.3
N =	487	487		275	275		410	410		297			175	175	

*The variance in average *length* ($V = S/\bar{X} \cdot 100$) was high and increased over time for schooners (23% in 1840s and 33% in 1880s) and for brigantines (9% to 20%), but fell for barques (11% to 9%) and was low for ships at 7% to 6%. The variance in *breadth* was also high for schooners but relatively constant (19-22%), falling for brigantines (13% in the 1840s-50s to 7, 9 and 11% in subsequent decades), falling sharply for barques (13% down to 5% and 2%) and low for ships (at 7-4%).

Douglass North has identified increasing vessel size as an important element in rising productivity in ocean shipping in the 19th century,[2] and Yarmouth shipowners placed their newbuilding orders to reap the advantages. Tonnage measurements were affected by the changes introduced in the 1854 Merchant Shipping Act, and the figures in Table 3 represent net burthen before that date and gross registered tonnage after it. On average, the effect was to inflate the later tonnage measurements by about 10 per cent. Measurement rule changes, however, can account for only a small fraction of the almost 500 per cent increase between the 1840s and 1870s in the average tonnage. Until the 1880s there was no significant increase in the average tonnage of the schooner fleet; but the brigantines were at least two-thirds larger by the 1870s. The most dramatic changes, however, were in the fleet of brigs, barques and ships. The tonnage of the average brig had increased by some 40 per cent by the 1860s, and the barques by some 50 per cent. But the relentless drive to larger vessels led owners to abandon the brig for barques and ships in the 1860s, and then in the 1870s to abandon barques for ships. The effect of the relative growth of barques and ships in new registrations, together with their growing size, was to increase dramatically the tonnage of the average Yarmouth vessel. In the 1880s, when new investment began to fall, survival in the business still dictated a bigger vessel and the twenty-three ships registered in the 1880s were 80 per cent larger than the first generation of vessels built in the 1860s, and 30 per cent larger than the 1870s generation.

TABLE 3

AVERAGE TONNAGE*

	1840-49		1850-59		1860-69		1870-79		1880-89	
	No.	$\bar{X}$	No.	$\bar{X}$	No.	$\bar{X}$	No.	$\bar{X}$	No.	$\bar{X}$
All Vessels	483	93	271	187	408	265	292	530	152	364
Schooners	300	43	139	50	199	47	124	49	108	63
Brigantines	91	109	43	139	43	141	24	181	12	239
Brigs	57	183	33	254	23	268	—	—	1	239
Barques	34	332	54	513	106	522	69	837	8	1198
Ships	1	559	2	796	37	858	75	1191	23	1555

*After 1854, tonnage measurement changes from net burthen to gross registered tonnage. The change appears to have inflated schooner tonnage after 1854 by about 10% and barques by about 5%. The effects on brigantines and brigs may be of the same order, but cannot be estimated because of the small sample size, the registration of a few very large vessels of that rig, and a sharp rise in the size of these vessels during the period, as reflected in length and breadth measurements.

The coefficient of variation for average tonnage ranged between about 35% to 100% for schooners, 15% to 50% for brigantines, 10% to 50% for brigs, 20% to 50% for barques, and 10% to 25% for ships, as measured in terms of annual variance in tonnage registered.

Among the new registrations, some 80 per cent were newbuildings, and those which had been registered elsewhere and transferred to Yarmouth were mainly brought in from nearby ports. Almost 85 per cent of the transfers (284 vessels) had been previously registered in Nova Scotia, and fully two-thirds of these were transfers from Halifax after the Yarmouth registry was opened. Vessels – mainly schooners – were sometimes

transferred in from the neighbouring ports of Shelburne, Liverpool and Digby, but these were only sixty-nine in number. Yarmouth had close commercial contact with the big New Brunswick port of Saint John, but only twenty-six vessels were transferred to Yarmouth from that Province, of which nineteen came from Saint John. The rest of the world provided only derisory numbers to the fleet – Canada and Prince Edward Island only six, the British Isles five, the West Indies two, and New England some fourteen – and probably the eight vessels of unknown foreign origin. The two most exotic imports were from Mauritius and South Africa. The transfers to Yarmouth, however, were overwhelmingly schooners (78 per cent) and brigantines (12 per cent), which was disproportionate to the share of these rigs among new registrations (66 per cent).[3]

Since transfers were overwhelmingly from Nova Scotia, and since the Maritime Provinces were a major centre of world shipbuilding, it is not surprising to find that Yarmouth vessels were, with few exceptions, built in the Provinces. Only three per cent were built outside of the Maritimes, and virtually all of these had a New England origin. But the vessel supply business was even more parochial than these figures suggest. All but ten per cent of the vessels, and four per cent of the Nova Scotia vessels, were built in Yarmouth County and its three neighbours. It is apparent, moreover, that if vessels transferred into the port are removed, and the vessels registered at Yarmouth by owners in Shelburne and Digby Counties before their own ports of registry were opened, then the overwhelming bulk of newbuildings for Yarmouth shipowners were constructed within a few miles of their homes.

TABLE 4

PLACE OF BUILD

Shelburne Co.	9%
Yarmouth Co.	49%
Digby Co.	34%
Annapolis Co.	3%
Other Nova Scotia	4%

N = 1549, Unknown and Unknown Nova Scotia = 18

While vessel construction for the port was regionally concentrated, it was highly dispersed in terms of communities within that region. Some 110 different centres contributed vessels to Yarmouth's fleet, and ninty-one of the communities produced one per cent or less of the total, eleven communities from one to three per cent, six from three to five per cent, two from five to ten percent, and only one, the town of Yarmouth, over ten per cent – in fact some 20 per cent. Regional concentration coupled with community dispersion in newbuildings reflected some basic realities of the Maritimes industry. With the smaller vessels, and especially the fishing vessels, the dispersed fishermen-owners were their own builders. With the larger vessels, owners financed construction and had an incentive to place orders in proximity with their residence. Moreover, the production function of Maritime shipyards minimized immobile capital structures and maximized fixed supplies of wood and mobile labour.

In terms of vessel rig, there is evidence of community specialization in newbuildings.[4] Schooner construction was the least concentrated, with 47 per cent of these vessels being built in the leading five centres; ships and brigantines occupied a middle level of dispersion with 52 and 54 per cent respectively; and barques and brigs with the least dispersion at 60 and 63 per cent. But even this is misleading. The leading location for schooner building was the town of Yarmouth, but it only produced 15 per cent of this rig. Yarmouth was also the leading centre for brigantines (24 per cent) and barques (25 per cent), but it built 40 per cent of the brigs. Only seven per cent of the ships were built at Yarmouth, but 28 per cent were built at nearby Tusket Wedge. Yarmouth was in the list of the first five building centres for all rigs; Argyle for four (it did not produce large numbers of ships); Tusket for three (brigantines and brigs were not built there in large numbers); and Digby for three (it was not a centre for barques and ships). A list of eleven ports in the arc around the town of Yarmouth contains the leading five building centres for the different classifications of vessels: the town of Shelburne; the Yarmouth County communities of Tusket, Yarmouth, Argyle and Pubnico; the Digby County ports of Clare, Digby, Beaver River, Belliveau's Cove and Salmon River; and the Annapolis County town of Clementsport, which was an important building centre for brigs.

The number of original investors in Yarmouth's new registrations[5] ranged from single owners up to a total of eighteen owners in the case of one small schooner. The most common pattern for each classification of vessel was one owner only. But sole ownership ranged from 39 per cent of the brigantines and 36 per cent of the schooners, down to 28 per cent of the ships and 24 per cent of the barques. There was obviously some association between the number of owners and the magnitude of the investment, for while 86 per cent of brigantines, 87 per cent of brigs and 79 per cent of schooners had four owners or less, only 61 per cent of ships and 70 per cent of barques had four owners or less[6]. As the proportion of large vessels in the fleet increased over the years, so did the average number of owners.[7] Table 5 indicates that the average number of owners increased sharply in the 1850s and stabilized in the 1860s. It then increased sharply in the 1870s (especially for barques and ships) when larger vessels required wider partnerships to finance the investment and spread the risk.

Some 2,500 people were original or *de novo* investors in Yarmouth ships.[8] The port's principal investors have been identified by isolating all first and second listed owners who appear on more than two registries, and all third to eighth listed owners who appear on more than three registries. This procedure (which makes it highly unlikely that any significant shipowner would escape the cull) identifies some 500 individuals, or 18 per cent of the total, as "major" or at least multiple, shareholders. But 61 per cent of these were listed shareholders on five registries or less, and from the remaining names some 84 can be identified who appeared on ten or more registries. Within this group, the dominant figures stand out: Thomas Killam with 64 appearances, Abel C. Robbins with 47, and Benjamin Ellenwood, Aaron Goudey, John K. Ryerson, Samuel M. Ryerson and Augustus F. Stoneman with between 30 and 35 appearances each. Below them were nests of Killams', Ryersons', Hatfields', Rogers' and Lovitts', and the level of intra- and inter-family connections point to a significant concentration of ownership at the port. For example, the leading eighty-four owners, while representing only 3 per cent of all owners,

TABLE 5

ORIGINAL INVESTORS IN YARMOUTH SHIPPING

RIG	1840-49 N	$\bar{X}$	V*	1850-59 N	$\bar{X}$	V*	1860-69 N	$\bar{X}$	V*	1870-79 N	$\bar{X}$	V*	1880-89 N	$\bar{X}$	V*
Schooner	730	2.4	67%	523	3.7	83%	756	3.8	89%	498	4.0	105%	335	3.1	106%
Brigantine	221	2.4	71%	150	3.5	66%	102	2.4	75%	51	2.1	52%	20	1.7	71%
Brig	146	2.6	62%	102	3.0	60%	63	2.7	74%	—	—	—	1	1.0	—
Barque	78	2.3	61%	178	3.2	59%	334	3.2	63%	337	4.9	57%	25	3.1	126%
Ship	3	3.0	—	3	1.5	—	112	3.0	70%	373	5.0	68%	106	4.6	93%
	1178			956			1367			1259			487		

*V is the coefficient of variation, ($V = S/\bar{X} \cdot 100$) The small numbers of brigs in 1870-89 and ships in 1840-59, make the averages statistically without meaning.

accounted for some 25 per cent of all appearances on registries, and the ships which they owned were heavily concentrated among the larger vessels.

Local residence was a dominant feature among Yarmouth shipowners. There were over 6000 shareholdings (ranging from one share to sixty-four) and 80 per cent of these were held by residents of Yarmouth County, and 35 per cent within the town of Yarmouth itself. Over 95 per cent of the shareholdings were held within Shelburne, Yarmouth and Digby Counties, and less than one per cent were held outside of Nova Scotia by foreigners and expatriates. Residents of the two major commerical centres of the region, Halifax and Saint John, were not at all significant direct investors in Yarmouth's fleet. Place of residence was, however, related to whether an individual was a major (1st to 4th) or minor (5th to 8th) shareholder. Expected frequencies were calculated for all Nova Scotia shareholdings by region. In the case of the Cape Breton-East Coast Counties, Shelburne County, and the Bay of Fundy-Northumberland Straits Counties, observed and expected frequencies were identical. But there was significantly more minor shareholding among Yarmouth County owners than would be expected, and significantly less among Digby County residents.[9] The explanation is that vessels registered at Yarmouth by Digby residents (before Digby was opened as a port) were generally smaller vessels, and thus more closely held. Yarmouth County residents increased their representation as owners as Nova Scotia ports of registry proliferated in the late 1840s and '50s, and also with the growing vessel size and the spread of minority investments.

II

New registrations at the port of Yarmouth underwent sharp fluctuations over the fifty year period. In terms of decennial additions to fleet, the 1840s and '60s stand out as decades of most rapid growth. The number of vessels registered fell back sharply in the 1850s, but the tonnage registered (deducting some ten per cent for measurement changes) was virtually the same at around 45,000 tons. At best, then, the port appears to have marked time in the 1850s, before doubling its tonnage of new registrations in the 1860s to over 110,000 tons, and in the 1870s to over 155,000 tons, then falling sharply in the 1880s to only 55,000 tons of new registrations. In each decade the number of vessels registered was strongly affected by additions of schooners and brigantines, while tonnages registered were increasingly determined by the accumulation of barques and ships. But the character of the port did undergo a major change between the 1840s and '70s. In the 1840s some 80 per cent of vessels registered and 50 per cent of tonnage was comprised of schooners and brigantines, while in the 1870s this had dropped to 50 per cent of vessel registrations and only seven per cent of tonnage.

Yarmouth's emergence as the leading deep-sea port of the Maritimes can be located in the late 1850s and '60s. Although schooners and brigantines operated in the North Atlantic trades, from the mid-19th century they were relegated increasingly to coastal activities, ranging from fishing to freight runs down to the United States and West Indies. Hence, from the mid-century it is not a serious error to categorize the schooners and brigantines as the "coastal fleet" and the brigs, barques and ships as the "ocean-trading fleet". In these terms, in the 1840s only 19 per cent of vessels registered were of the

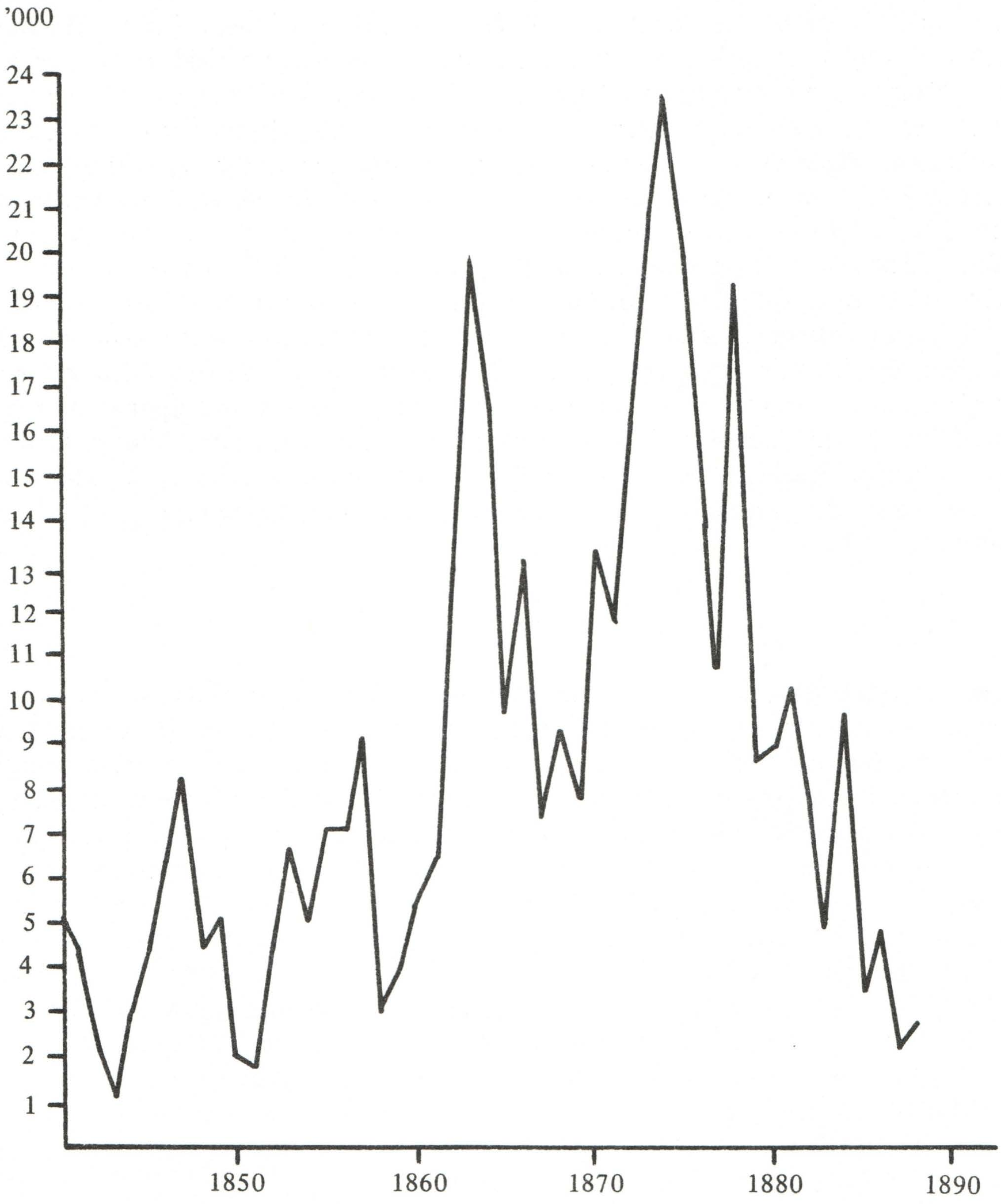

FIGURE 1: GROSS TONNAGE OF NEW REGISTRATIONS

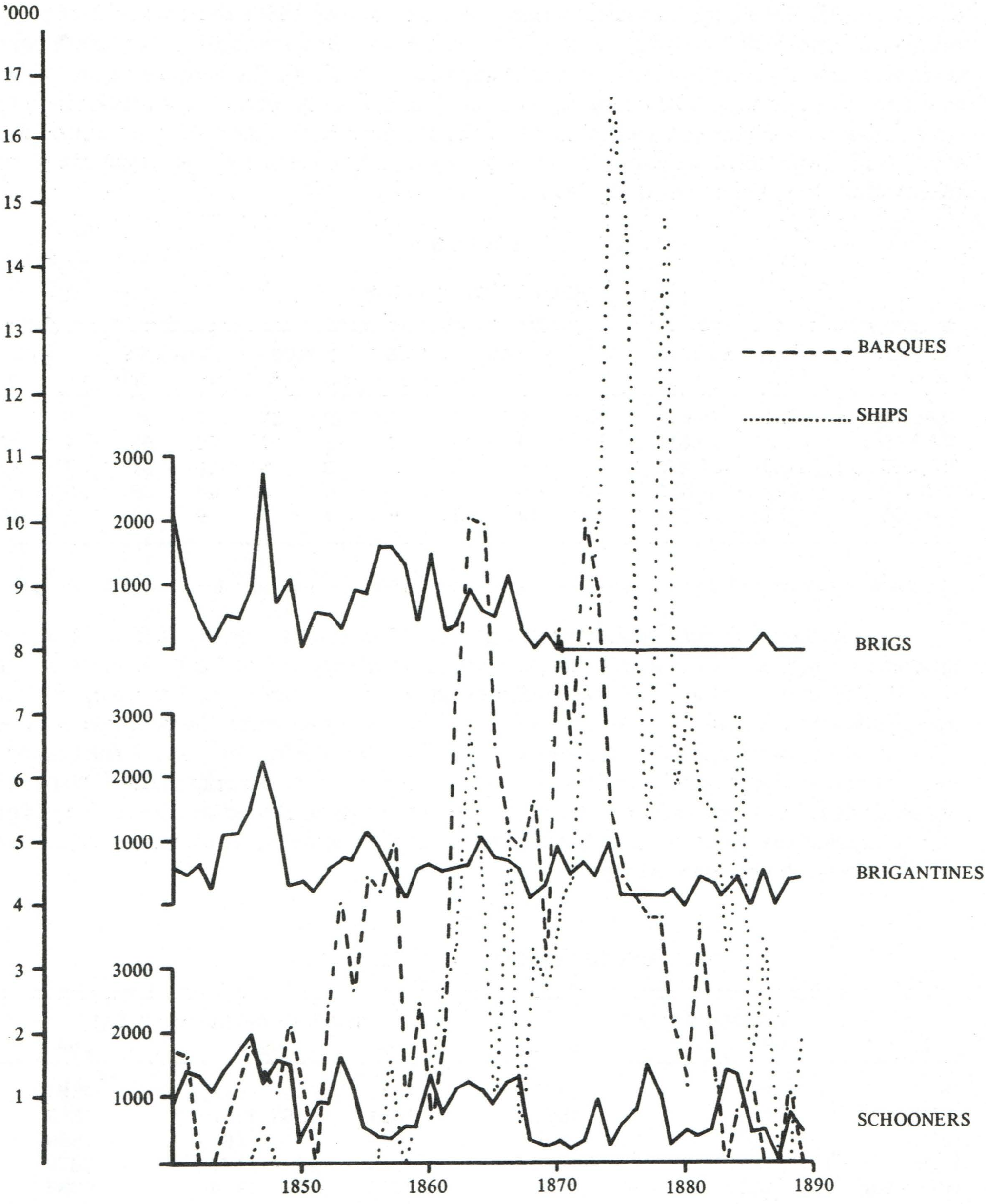

FIGURE 2: TONNAGE REGISTERED BY RIG

ocean-trading classification, but this rose to 33 per cent in the 1850s, 41 per cent in the 1860s and reached a peak of 50 per cent in the 1870s. At the same time there was an increasing shift into larger tonnage within the group. In the 1850s there was a shift away from brigs into 500 ton barques; the 500 ton barques predominated in the 1860s, but there was now a movement into 850 ton ships; and in the 1870s the barques began to give way to ships averaging 1100 tons. In the last decade of the period, the schooners and brigantines were restored to prominence in registrations with almost 80 per cent of the total, and their relative share of tonnage was muted only by the registration of twenty-three big ships in the early years of the decade.

TABLE 6

NEW REGISTRATIONS*

DECADE	ALL VESSELS		SCHOONERS		B'TINES		BRIGS		BARQUES		SHIPS	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1840/49	483	44,915	62	28	19	22	12	23	7	25	0	1
1850/59	271	50,679	51	14	16	12	12	17	20	55	1	2
1860/69	408	111,285	49	9	11	5	6	6	26	50	9	30
1870/79	292	157,473	42	4	8	3	0	0	24	36	26	57
1880/89	152	55,314	71	12	8	5	1	1	5	17	15	65

*Excludes steamers and barquentines. Tonnages before 1854 are net burthen and after that gross registered.

The pattern of new registrations did not, of course, fit neatly into a decennial progression, and in fact it closely tracked the newbuilding and registration cycle of the United Kingdom. As in the United States, there was a boom at Yarmouth in the mid-1840s and recession in the 1850s due to the overbuilding of the previous decade. While new registrations were impressive in total in the 1860s, the annual fluctuations were considerable, possibly reflecting the vagaries of the American Civil War and uncertainties about British North America's reciprocity agreement with that country. The 1870s, despite the onset of the "Great Depression", represented in tonnage the peak of the Yarmouth shipowning industry.

TABLE 7

CYCLE PERIODS AT YARMOUTH

NO. REGISTRIES*			TONNAGE OF REGISTRIES*		
Low	High	Low	Low	High	Low
1842	1846, 1847	1850	1843	1847	1851
1850	1853	1858	1851	1853, 1857	1858
1858	1863	1869	1858	1863	1869
1869	1873, 1877	1879-1882	1869	1874, 1878	1879
1879-1882	1883	1887	1879	1881, 1884	1887

*Number of registries includes all vessels; tonnage includes schooners, brigantines, brigs, barques and ships. Before 1854 tonnage is net burthen, and after that date gross registered tonnage.

Whether measured by number of vessels or new tonnage registered, distinct cycles of nine to twelve years duration characterized the port. In descriptive terms Table 8 tells much the same story as the analysis by decades.

TABLE 8

NEW REGISTRATIONS IN CYCLE PERIODS

PERIOD	YEARS	NO.	ANNUAL MEAN	TONNAGE	ANNUAL MEAN
1843-51	9	396	44	36,855	4,095
1851-58	8	232	29	44,666	5,583
1858-69	12	453	38	115,628	9,636
1869-79	11	316	29	164,422	14,947
1879-87	9	163	18	58,909	6,545

It does indicate, however, that the 1850s recession was of relatively short duration, while the boom cycles of 1858-69 and 1869-79 were relatively long. Table 9 confirms the earlier interpretation of the relative impact of coastal and ocean-trading vessels on aggregate registrations. Annual changes in the number of vessels registered were strongly determined by changes in schooner and brigantine registration in 1843-51 and 1851-58. In the 1858-69 cycle the coastal and ocean-trading vessels jointly determined the aggregate series, but in the last two cycles they fell out of synchronization. The correlation coefficients for changes in aggregate tonnage, however, indicate that throughout the entire period the ocean-trading registrations determined annual changes, with the coastal tonnage in close synchronization in 1843-51 and 1858-69. The two sections of the industry, therefore, seem to have responded jointly to stimulation in the growth periods (1843-51 and 1858-69), followed dissimilar paths in recession cycles (1851-58 and 1879-87), and very different paths in the cycle of Yarmouth's "golden age" (1869-78).

TABLE 9

CORRELATION COEFFICIENTS OF CHANGES IN NEW REGISTRATIONS BY VESSEL TYPE*

PERIOD	SCHOONERS AND BRIGANTINES		BRIGS, BARQUES, SHIPS	
	No. Vessels	Tonnage	No. Vessels	Tonnage
1843-51	+0.92	+0.28	+0.67	+0.93
1851-58	+0.93	+0.49	+0.26	+0.96
1858-69	+0.81	+0.19	+0.76	+0.99
1869-78	+0.76	+0.02	+0.21	+0.96
1879-87	+0.43	+0.05	+0.23	+0.98

*The coefficients indicate the correlation between annual changes in total registrations with annual changes in aggregate registrations of schooners and brigantines and aggregate registrations of brigs, barques and ships.

In longer term perspective, it can be seen that the coastal and ocean-trading sections of the industry were developing along different trends. A single trend equation can be fitted for schooners and brigantines over the period 1843-87 ($\bar{Y}$ = 21.6 - 0.61X) which indicates that on an annual average basis new registrations were falling by more than one vessel every two years. For the ocean-trading fleet, on the other hand, two trend periods are apparent, with the fulcrum located in the mid-1870s. The first, fitted for 1843-79 ($\bar{Y}$ = 12.9 + 0.23X), indicates that new registrations were growing on average by one vessel every four years. The second, fitted for 1871-89 ($\bar{Y}$ = 8.83 - 1.09X), shows a rapid decline of more than one vessel a year on trend. Since the average tonnage of the schooner fleet was relatively stable over the period, the first trend equation suggests the coastal fleet was undergoing a slow, long-term decline almost from the year the port was opened. But since the average tonnage of the ocean-trading fleet grew rapidly over the period, its trend expansion into the mid-1870s was more dramatic than indicated by the number of new vessel registrations, and the decline from the mid-1870s more muted. In general, both the cycle analysis and the trend analysis indicate that the history of the port of Yarmouth is the history of its ocean-trading investments.

It is broadly true that gross investment (new registrations) and net investment (new registrations minus closures) is positively correlated, for the turning points in the new registration cycles coincide within a year or two of turning points for net additions to fleet. For the various rigs, however, the turning points are sufficiently different to abandon analysis by cycle periods in favour of decennial analysis. Table 10 offers two series on net additions to fleet: panel A is the difference between new registrations in a decade and the number of registry closures; panel B is adjusted for errors in the reporting of closures. With a large number of schooners, and a smaller number of brigantines and brigs, the official date of closure bore no relationship to the actual date when the vessel went out of service. Periodically, such as in 1861, 1874, 1883 and 1888, the port registrar would conduct a massive cleansing of his books. With some vessels he could determine when they had gone out of service, but frequently he closed the registry with the notation "no longer in existence" or, in the case of the 1861 cleansing, "condemned per annual list". Over the years the accumulation of "ghost ships" on the registry seriously inflated the number of vessels on registry, although because they were mainly small vessels there was less distortion in terms of tonnage. The adjusted panel in Table 10 attempts to correct the official record in two ways. For those vessels which were closed, say in 1883, but where it is known they were out of service in the 1850s, the adjustment is straightforward. But there is a large number of cases where the real departure date of the vessel is unknown, and in these instances the vessels have been closed by applying the average life expectancy for Yarmouth vessels against their year of registration.[10] The net effect of the procedure is to introduce an upward bias to the 1840s and a downward bias to the 1850s. A ghost ship registered in 1840, wrecked in 1846 but not closed until 1883, will on the basis of average life expectancy not be removed until 1851. Nonetheless, on a decennial basis of analysis, the biases introduced in the 1840s and '50s, and any net errors for subsequent decades, will be less serious than proceeding with an analysis of figures which are heavily weighted by ghost ships.

Analysis of net investment as suggested in Table 10 provides a different perspective on events at the port from the gross investment sense. With schooners and brigantines, or

the coastal fleet, there was disinvestment in the 1850s and '60s, with a movement back to replacement of vessels in the 1870s, to modest net additions to fleet in the 1880s. There were net additions to the fleet of brigs in the 1850s, but thereafter the fleet was run down to extinction. It is now clear that the 1850s were not a period of recession for investment in barques, but by the 1870s these vessels were only being replaced, as investments shifted to ships. On an annual basis, however, it is apparent that owners stopped replacing their barques as early as 1873, for in every year but two subsequent to that date, there was net disinvestment. With the ships, the turning point came in 1880, after which there was net disinvestment in every year.

TABLE 10

NET ADDITIONS TO FLEET

	1840-49	1850-59	1860-69	1870-79	1880-89
A-OFFICIAL					
All Vessels	+235	+51	+36	+41	-86
Schooners	+156	+10	+8	+25	-14
Brigantines	+35	0	-10	-8	-2
Brigs	+26	+8	-21	-14	+1
Barques	+17	+32	+32	0	-48
Ships	+1	+1	+27	+38	-23
"Coastal"	+191	+10	-2	+17	-16
"Ocean"	+44	+41	+38	+24	-70
B-ADJUSTED*					
All Vessels	+235	-38	-7	+5	-57
Schooners	+156	-71	-41	-11	+15
Brigantines	+35	-7	-4	-8	-1
Brigs	+25	+6	-20	-14	+1
Barques	+16	+33	+31	0	-48
Ships	+1	+1	+27	+38	-23
"Coastal"	+191	-78	-45	-19	+14
"Ocean"	+42	+40	+38	+24	-70

*See text for explanation of the "Adjusted" Panel.

Since the average size of vessels was increasing over the decades, it is necessary to consider net investment in terms of tonnage as well as the replacement of vessels. By this measurement, Table 11 shows that the 1850s no longer stand out as a period of severe contraction. Additions to fleet were not as large as they were in the 1840s, but this was entirely attributable to the long term decline in the fleet of schooners and brigantines. The rate of growth of ocean tonnage in the 1850s was relatively greater than in any other period, although the major absolute gains in tonnage came in the 1860s and '70s. Moreover, in contrast to the findings on replacement of barques and ships, analysis by way of tonnage indicates that net disinvestment for both rigs coincided in the year 1879.

TABLE 11

NEW ADDITIONS TO TONNAGE

	1840-49	1850-59	1860-69	1870-79	1880-89
Schooners	+9,599	-2,557	-481	+688	+308
Brigantines	+6,419	-2,228	-847	-19	-877
Brigs	+1,619	+1,602	-3,754	-4,253	+43
Barques	+4,922	+18,978	+25,796	+14,882	-31,500
Ships	+599	+2,246	+23,573	+68,866	-28,199
Coastal	+16,018	-4,785	-1,328	+669	-569
Ocean	+7,140	+22,826	+45,615	+79,495	-59,656
All Vessels	+23,158	+18,041	+44,287	+80,164	-60,225

Derived from the estimates of annual net addition to tonnage.

TABLE 12

YARMOUTH FLEET SIZE

	NO. VESSELS		TONNAGE	
	OFFICIAL	ADJUSTED	OFFICIAL	ADJUSTED
1840	55	55	5,551	5,551
1845	223	222	16,923	16,898
1850	360	359	31,248	31,116
1855	357	327	39,482	37,974
1860	430	341	56,794	52,531
1865	456	432	93,798	92,218
1870	427	359	100,862	96,760
1875	441	342	157,285	148,768
1880	447	339	172,166	167,367
1885	429	323	142,119	138,845
1889	362	275	119,144	116,347

When Yarmouth opened as a port in 1840 it possessed fifty-five vessels and some 5,500 tons of shipping, jumping by 1845 to 222 vessels and almost 17,000 tons. The peak year in terms of numbers of vessels in the fleet was reached in 1866 with 436, after which it gradually fell. The peak tonnage was reached in 1879 with 174,200 tons, after which the rapid disinvestment in barques and ships brought rapid decline. Measured over the entire growth period (1840-79) tonnage expanded at an annual average rate of 8.1 per cent. But this growth rate was heavily weighted by the low initial tonnage and the rapid growth (in large part through transfers out of Halifax) involved in establishing the port. If 1847 is chosen as the appropriate base year, then the long term growth rate to 1879 falls to 5.8 per cent per annum. This corresponds more closely to the strikingly constant growth rate of the 1850s, '60s and '70s of about 5.5 per cent. This rate was comprised, of

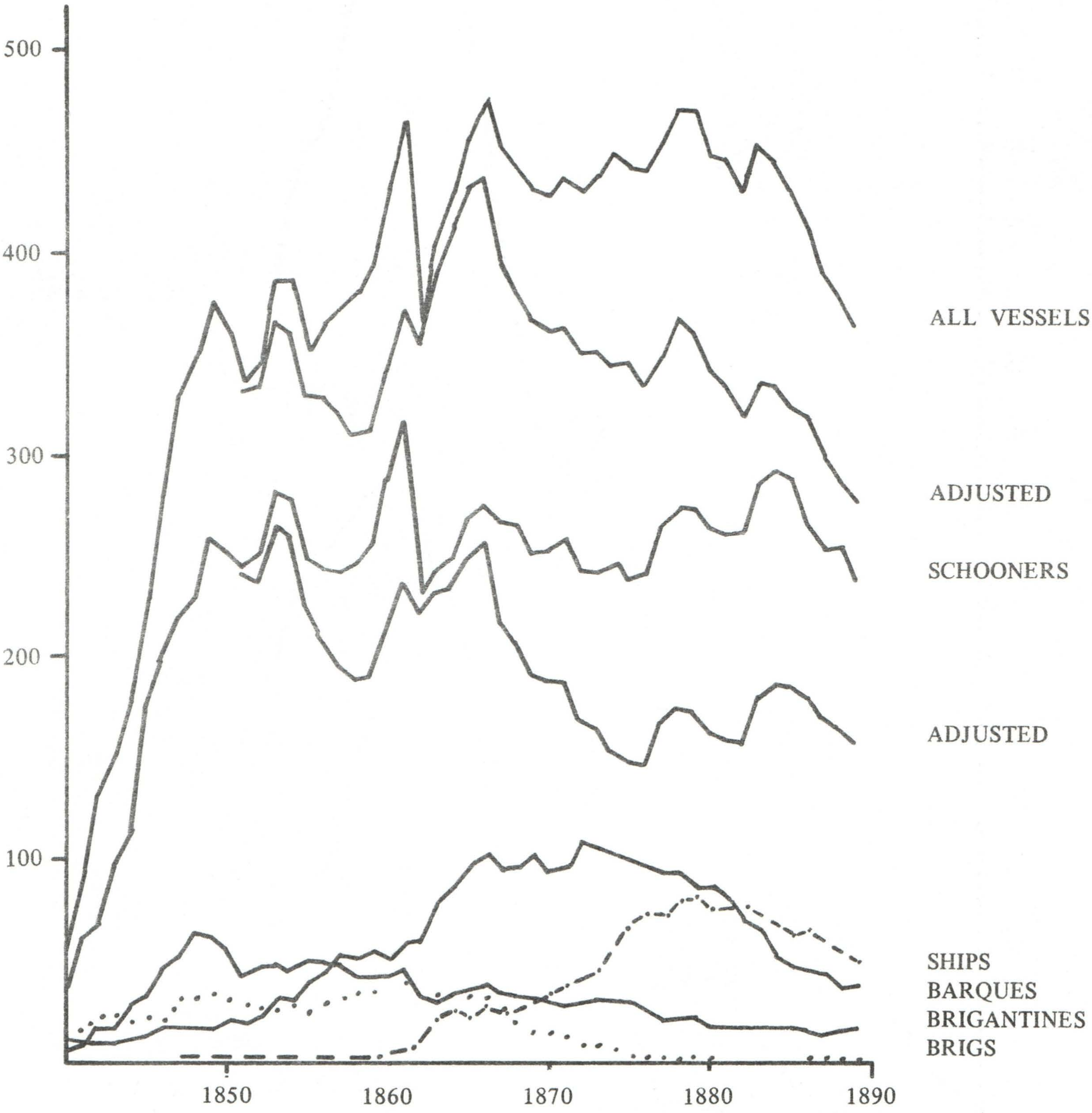

FIGURE 3: VESSELS ON REGISTRY AT YARMOUTH

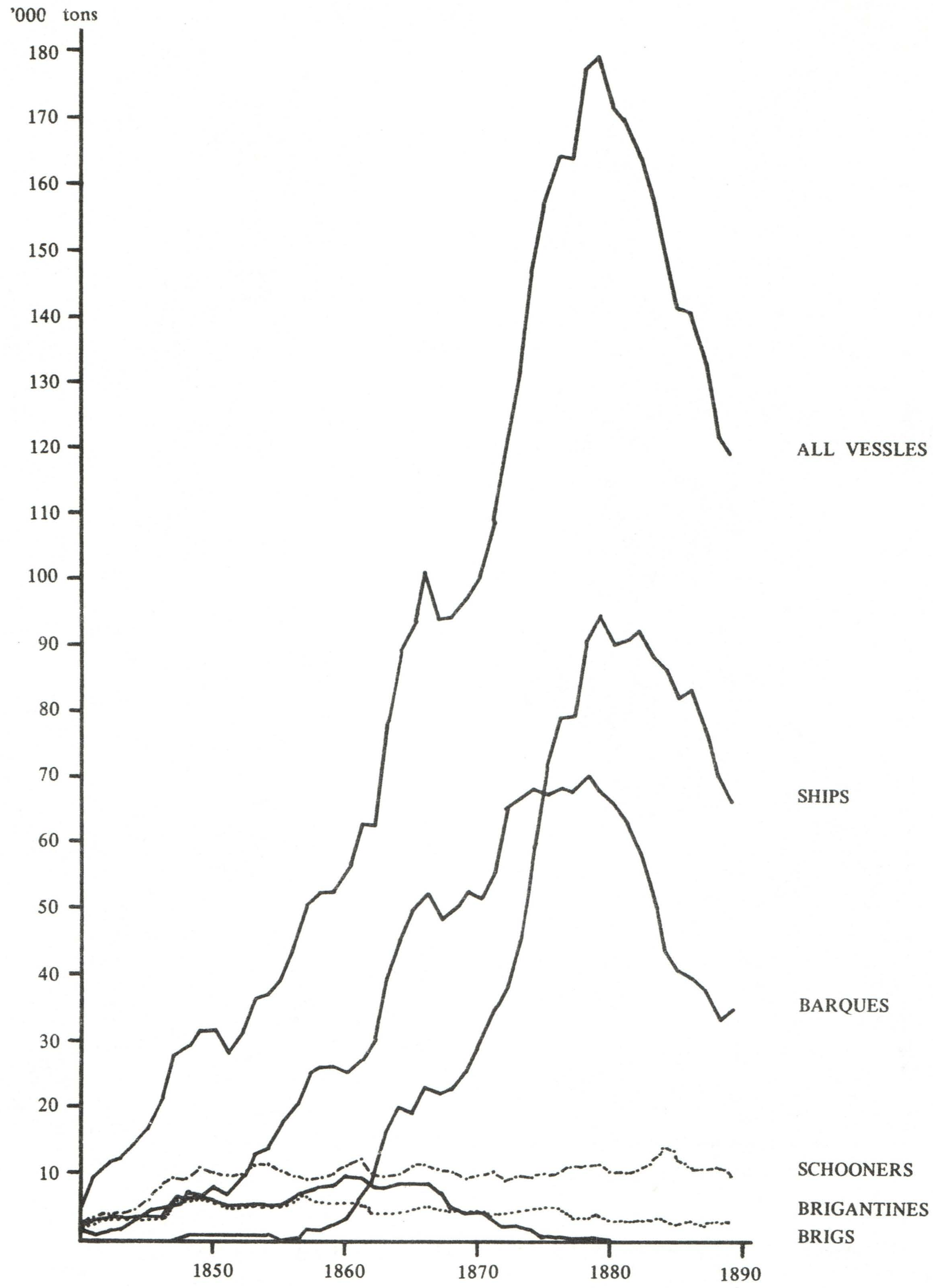

FIGURE 4 : GROSS TONNAGE ON REGISTRY AT YARMOUTH

course, of very different trends among the various rigs, with schooners, brigantines, and eventually brigs showing negative growth rates for most of the period, and the barques and ships moving in the opposite direction.

TABLE 13

ANNUAL GROWTH RATES OF TONNAGE*

	ALL	SCHOONERS	BRIGANTINES	BRIGS	BARQUES	SHIPS
1840/41-1879/80	8.1%	3.9%	3.6%	-5.6%	8.6%	13.6%
1840/41-1849/50	15.4%	19.4%	24.4%	9.7%	11.6%	—
1850/51-1859/60	5.5%	-1.4%	-2.1%	4.1%	12.9%	18.0%
1860/61-1869/70	5.5%	-2.4%	-2.9%	-8.4%	6.8%	18.8%
1870/71-1879/80	5.4%	0.4%	-2.1%	-29.0%	2.2%	11.2%
1880/81-1888/89	-3.5%	1.3%	-1.1%	—	-6.4%	-9.2%

*Growth rates calculated by end-point ratios

There were strong cycles in newbuilding and gross registrations at Yarmouth, but these fluctuations were counterbalanced by opposite trends in vessel retention rates. The aggregate growth rate establishes that the port experienced a remarkably steady rate of expansion over a thirty-five year period. The shipbuilding industry must have experienced radical alterations from expansion to recession; but this does not appear to have been the experience in shipowning and operating.

III

How long did Yarmouth shipowners keep their vessels, and what were the reasons for closing registries? The rapidity with which the fleet contracted, once net investment turned negative, is an indication that the port's vessels experienced a relatively short life.[11] The typical vessel, in fact, was registered for only one year (and this is true after eliminating *de novo* closures) but the mean registry life was 10.6 years with a large standard deviation of 9.1 years. The life experience of the various rigs, however, was quite different: schooners, barques and ships had average lives about twice that of brigantines and brigs,[12] and the variance around the mean life for the larger vessels was significantly less than for the smaller ones.

But was this difference in average life statistically significant, and was the vessel's rig a significant explanatory variable for differing life histories? One-way analysis of variance generates an $F = 13.92$, which is highly significant at the $p = .001$ level. Analysis of variance, however, requires the categories to have roughly equal variances, and in this instance the schooner variance is much larger than that of the other rigs. If schooners and barquentines are removed from the sample, then the "F value" rises to $F = 30.5$. Both results lend weight to the argument that there was a statistical significance between average life and vessel rig. But significance is relatively easy to establish when there is a large number of cases and degrees of freedom, and the relationship may not be very

strong. This is apparently the case with the Yarmouth vessels, for the Eta-squared statistic is only 0.12, indicating that 12 per cent of the variance in average life is explained by the vessels' rig.

TABLE 14

AVERAGE REGISTRY LIFE*

	NO.	MODE	MEDIAN	MEAN	STANDARD DEV.	RANGE
All Vessels	1246	1.0	8.84	10.62	9.05	0-58
Schooners	574	1.0	10.67	12.75	10.92	0-58
Brigantines	171	1.0	4.58	5.92	5.82	0-31
Brigs	94	1.0	6.13	6.62	4.57	0-19
Barques	252	10.0	9.64	10.10	6.13	0-35
Barquentines	5	10.0	9.00	6.60	4.45	0-10
Ships	131	18.0	11.38	11.39	6.31	1-28

*Average Registry Life is the difference between the date of the vessel's registry opening and its closing. All cases have been eliminated where the registry was closed because the vessel was "no longer in existence" and where registries were opened and closed *de novo*.

Since there was considerable variance in vessel size within any rig classification, a more fruitful approach might be to explore average life in terms of vessel size as measured by tonnage. The result, however, is disappointing, for the regression of vessel tonnage on the vessel's life yields a coefficient of determination of $r^2 = .00001$. It would be difficult to conceive of a less interesting result.

TABLE 15

AVERAGE REGISTRY LIFE BY CYCLE PERIOD*

	NO.	MEDIAN	MEAN	STANDARD DEV.	RANGE
1843-50	230	5.1	7.2	7.1	0-47
1851-57	162	9.1	9.5	6.6	0-40
1858-69	372	8.9	10.9	8.6	0-47
1870-81	309	11.6	12.5	8.7	0-39
1882-89	129	11.1	13.4	10.4	0-43

*Cycle period benchmarks are determined in terms of vessel new registration totals, rather than tonnage indicators.

A third hypothesis would be that a vessel's life was a function of the period in which it was registered. Table 15 seems to confirm this hypothesis for it shows a marked growth in average life in terms of the period in which the vessel was registered, rising from 7.2 years in 1843-50 to 13.4 years for 1882-89 with relatively constant variances. But there is a problem of "identification" in this analysis, for the brigantines and brigs – the

vessels with the shortest average life – were a declining fraction of the fleet in each succeeding cycle. One may ask, therefore, whether the rising average vessel life was indeed a function of time, or simply a function of a decline in the number of vessels in those classifications with short average lives. And indeed, one may also ask whether the short life of the brigs and brigantines was simply a function of the period in which most of them were registered.

In an attempt to answer these questions, average life was controlled for both rig and time.[13] The Eta-squared correlation statistic was generally low, ranging from 0.02 for 1843-50 to a high of 0.11 in 1869-71 and 0.19 for 1882-89. This suggests that vessel rig was not of major significance in determining average life within cycle periods, but that it may have been gathering significance by the last period. The more certain conclusion, however, is that average life of vessels of all rigs improved over time, but more markedly for schooners, barques and ships than for brigs and brigantines. As the latter two vessel types declined in importance, this gave added strength to the rising average life of Yarmouth ships.

There are obvious implicit hypotheses involved in an analysis of registry life, vessel type, and period of registry. One is looking for evidence of a differential risk of early registry closure in terms of the trades in which a vessel would normally be employed and the quality of construction and manning at various periods of time. It follows that one should attack the beast in its den: was average registry life related to the cause of registry closure, and if so, was this related to the vessel's rig and period of registry?

Over the years 1840-89 some 30 per cent of the vessels were sold or transferred to another British port; a quarter were registered *de novo* at Yarmouth; a third were involved in marine disasters; and some 13 per cent were condemned and/or broken-up. With the schooners, the reasons for registry closure were quite evenly spread across these four grouped causes. Brigantines were much more likely to be sold or transferred (37 per cent) than schooners (25 per cent), and were also more prone to marine disaster (35 per cent compared with 25 per cent). All other rigs faced a lower probability of being condemned and/or broken up than schooners (18 per cent compared with 5 to 7 per cent). Brigs were less likely to be sold or transferred (31 per cent) than brigantines (37 per cent) but more prone to marine disaster (43 per cent compared with 35 per cent).

TABLE 16

REASONS FOR REGISTRY CLOSURE

	1843-50	1851-58	1858-69	1870-81	1882-89
No.	330	228	446	359	111
Sold/Transferred	52%	34%	36%	35%	42%
Marine Disaster	27%	50%	52%	50%	37%
Condemned/Broken Up	21%	16%	12%	15%	21%

With the barques and ships the pattern is clear: almost 90 per cent of these vessels were either sold and transferred or involved in marine disaster. Some 50 per cent of the

barques and 54 per cent of the ships ended their lives in a marine disaster, and about 36 per cent through sales and transfers. In general, the probability of a vessel being registered *de novo* or condemned and/or broken up was inversely related to its size (as measured by rig); while the probability of a vessel being involved in a marine disaster varied positively with its size. The probability of a vessel being transferred or sold out of the port (with the exception of schooners, where the occurrences were relatively few) was not related to the rig or size of the vessel. This suggests that the life histories of the large and small vessels may have been differentially affected by the risks of the trades in which they were employed.

De novo closures were heavily concentrated in the years before the 1854 Merchant Shipping Act, and these kind of closures did not involve the loss of the vessel to the port. Table 16 re-calculates closures with *de novos* excluded and in terms of registry cycles. It can be seen that sales and transfers were very heavy in the 1840s, fell considerably in the 1850s through the 1870s, and rose again in the 1880s. This begins to shed light on the issue of rising average life. If there was a weaker market for vessels after the 1840s, or alternatively, greater inducements to run the ship rather than sell, then the average life at the port would rise. Moreover, if vessels were worked longer as they aged the probability of a marine disaster would increase, as apparently it did between the 1850s and '70s. In the last period, Yarmouth shipowners began to sell and leave the industry, and the marine disaster rate fell. The increasing sales of the 1880s must be interpreted in a different way than the sales of the 1840s. In the first period there was a vigorous demand for serviceable used vessels, while in the 1880s owners were disposing of assets for whatever price could be fetched.[14]

TABLE 17

AVERAGE LIFE BY CAUSE OF REGISTRY CLOSURE

	NO.	MEDIAN	MEAN	STANDARD DEV.
De Novo	506	2.3	4.4	4.6
Transfer/Sale	615	6.0	7.9	7.4
Marine Disaster	676	6.9	8.9	7.9
Condemned/Broken Up	265	15.7	16.8	0.8

We may now return to the question of the impact of cause of registry closure on average life, and this is summarized in Table 17. The vessels whose registries were closed to effect a *de novo* transaction were relatively new, but they cannot be advanced to explain the rising average life since they were eliminated from the earlier analysis. Vessels condemned and/or broken up tended to be old, but as Table 16 showed this cause of disposal was not increasing with time. Vessels involved in marine disasters were, on average, about a year older than those sold or transferred (and this represented about 10 per cent of the average life of all vessels) with similar standard deviations. Since the proportion of closures caused by marine disasters was higher in the 1850s through 1870s, some of the explanation for rising average life could be attributable to this factor.

Unfortunately, it is not. While the global average age of vessels involved in marine disasters was higher than those sold or transferred, this was not true of the vessels registered in the 1860s and '70s, for those being sold or transferred were on average older than those involved in marine disasters. Thus, while cause of registry closure is an interesting variable in explaining differences in average life within cycle periods, it is not a convincing explanation of differences between time periods. We are left with the unexplained fact of a steadily advancing average length of service, whatever the cause of registry closure.

How strong was the relationship between average life and the date of the vessel's registration? As a first approach, the date of the vessel's registry was regressed against the date of its removal, yielding an $r^2 = 0.75$ and suggesting that 75 per cent of the variance in closure dates is accounted for simply by the date of registry. There is, however, a large standard error (9.4 years) which indicates that the equation ($X_c = 1.2X_o - 1.79$) is a poor predictor for any particular vessel. Similar regressions were run for each of the rigs, yielding coefficients of determination ranging from a low of $r^2 = 0.62$ for ships to a high of 0.86 for brigantines. A multiple regression, using the date of registry opening, and as dummy variables vessel rig and cause of registry closure, yields an $R^2 = 0.91$, thus leaving only nine per cent of the variance in date of registry closure unexplained.

This result is numerically impressive, but not very interesting. It is akin to finding that a person born in 1900 will be dead in 1976 plus or minus a few years for a strong constitution and a sober life. But it does point the direction to a more meaningful analysis: how well do these variables explain the differences in the length of life? This is what we want to know, and by transforming the dependent variable from year of registry closure to years of life on registry, the effect of parallel trends between the variables is removed. The resulting dummy variable regression was run against the length of registry life, removing the cases where the vessel "no longer exists" and the steamers.[15] The resulting multiple correlation, $R^2 = 0.24$ is not large, and the only variables with substantial simple correlation coefficients are "condemned and broken up" ($r = 0.37$), "date registered" ($r = 0.27$), and "brigantines" ($r = 0.37$). This does provide some confirmation, however, that vessel rig, period of registration and cause of registry closure were factors determining average life, even if the bulk of the variance remains to be explained.

To account for only a quarter of the variance in average vessel life is not utterly depressing. There are many variables which one presumes would affect it but which are difficult to capture and measure, such as the quality of construction, the constancy of repairs, the quality of seamanship and management, and the vessels' employment. It may also be that a good deal of the variance is attributable to unpredictable events such as fire, storm and other perils. But when the ownership characteristics of the vessels and their employment is better established, it may be that more of the variance in average life will be explained.

IV

Like a nova, the port of Yarmouth expanded and expired within a few years. Its shipping industry was a distinctly local one, with the vessels being built, owned, and

managed within the County. With a County population of little more than 20,000, Yarmouth's emergence as the leading shipping port of the Maritimes was a remarkable phenomenon. The lack of "mass" in the local economy, however, may be an explanation of the port's rapid demise. The years of growth comprised little more than one entrepreneurial generation, and towards the end of the careers of that first generation of big shipowners a critical investment decision was at hand. As Gerald Graham showed many years ago, the 1870s was the last decade in which sail indisputably dominated the great bulk trades.[16] There were some profitable years left in the big wooden sailing ships, as the Scandinavians, Italians, Germans and Russians who bought Yarmouth's ships in the 1880s and '90s were to show. There were even more years left in the big steel hulled barques, but by the 1880s new investment opportunities in wooden sailing ships were deteriorating rapidly.

Yarmouth's shipowners recognized this, as the data on net investment shows; but they did not re-invest in the new technology. It is possible they had been losing money for years, in the sense that their earnings were insufficient to amortize steamer replacements for the wooden barques and ships. It is also possible that non-maritime investments were more attractive in the new Dominion of the 1880s and '90s, both for shipowners and rentiers. It may also be that the strong localism of the industry was a mental barrier to placing orders in the United Kingdom for steamers. But this should not have represented any great wrench, for while Yarmouth shipowners built their vessels in the County, once launched they rarely saw their home port. The Yarmouth fleet of ocean-traders in the 1860s and '70s worked out of the United Kingdom, Europe, and the United States, with a local master, frequently a local mate, but invariably with a crew collected from every corner of the world. In these respects this local industry was very international and highly independent of its home base.

If Yarmouth's first generation of big shipowners were at the end of their careers at a crucial turning point in the industry, then there may have been a problem of entrepreneurial transition. The very short average life of the big ships meant that only a few years of net disinvestment would dissipate the capital stock, and with that the knowledge and skills involved in running an ocean fleet. In this respect the constant underlying growth rate from the mid-1840s to the end of the 1870s is important, for it indicates the maintenance of a continuity of experience, notwithstanding fluctuations in industry profitability. But once that continuity was broken, as it was in the 1880s, the industry could rapidly disappear. In such a tiny community there was little breadth and depth in the shipping trades and professions to provide a permanent base from which to launch new ventures and new directions. Yarmouth and the Maritimes thus entered the new century with memories of a "golden age".

NOTES

1. The precise number is uncertain. There were 486 *de novo* registrations, and 32 registrations where it is uncertain whether the vessel was new to the port or simply being re-registered. In this, as in almost all other instances of data uncertainty, the problem is concentrated among the small schooners.

2. Douglass North, "Sources of Productivity Change in Ocean Shipping, 1600-1850", *Journal of Political Economy,* LXXVI, 1968.

3. Although probably not so widely disproportionate to the distribution of rigs in the first few years after the opening of the port, when a large fraction of the transfers took place. In 1840-43 about three-quarters of the new registrations were schooners and brigantines.

4. Crosstabulating place of build with vessel rig generates a Cramer's V = 0.33.

5. No attempt is made is this paper to analyze the changes in owrnership of vessels during their registry life at the port.

6. Crosstabulating number of owners with vessel rig yields an Eta = 0.18. The square of Eta represents the proportion of variance explained — in this case an insignificant three per cent. Since the dependent variable ranges very narrowly in this case, it is difficult to establish a high correlation coefficient.

7. Registrations of schooners, brigantines and brigs were concentrated in the 1840s and '50s, with barques and ships in the 1860s and '70s. The number of vessels, other than schooners and ships, registered in the 1880s renders the averages for that decade unreliable.

8. At this point it is impossible to be more precise. The spelling of names, especially Acadian names, was decidedly various, and in the first instance a variance in spelling was taken to indicate two different individuals. Errors of this kind may number several hundred at the very worst. In the discussion that follows, the data base differs from that of the preceeding discussion, in that *de novo* registrations have been included. This means that the ownership file includes both initial investors who registered the vessel when new to the port and *de novo* investors when ownership changed.

9. Chi-square equals 110, which is significant at the 99 per cent level with four degrees of freedom.

10. This smoothing procedure is obviously rough, but a more sophisticated probabalistic smoothing is unlikely to yield results of demonstrably greater utility relative to effort. In the case of schooners, 257 official closure dates did not represent the actual closure date. Of the 257, the actual closure date is known for 105 cases. In 199 cases the known or estimated closure date required an adjustment to produce the estimates in panel B. With brigantines there are twenty-three vessels for which the official closure date is wrong or unknown; and with brigs seven, barques sixteen and ships sixteen. In the case of the barques and ships the error normally involves only a year or two, and hence there was little change in the official series.

11. It is necessary to stress that the following material is tentative and subject to revision. The problem lies in known errors in the data base which have yet to be corrected. The most serious lie in the errors in the official date of registry closure for the smaller vessels, which has been discussed above, and which are the dates used in the analysis.

12. Corrections to the data may well significantly lower the average life of schooners.

13. The details of this analysis are available in David Alexander, "The Average Registry Life of Yarmouth Vessels, 1840-1889" (Maritime History Group Research Paper: Yarmouth Vessels, No. 6, December 1976).

14. This is apparent from the transactions in the B.T. 110 series and the instructions given to United Kingdom ship brokers on the certificates of sale.

15. The *de novo* cases and the barquentines were retained in the model to serve as the "reference categories" required by the procedure.

16. G.S. Graham, "The Ascendancy of the Sailing Ship, 1850-85", *Economic History Review,* IX, 1956-57.

6. DISCUSSION FOLLOWING THE PAPER OF D. ALEXANDER

CRAIG opened the proceedings by examining the problem of the length of life of vessels. He thought that this might, in part, be influenced by the classification system of Lloyd's Register. As far as Canadian built vessels were concerned, he wondered whether the standard of construction was improving since by the 1870's, vessels were being classed for seven or eight years and as in some of the Yarmouth vessels, for even longer. This was a contrast to the earlier years of the century when North American soft wood ships had "an appalling reputation".

ALEXANDER pointed out that a large proportion of the Canadian fleet was not classed at Lloyd's but at Bureau Veritas or the American Bureau of Shipping, and an examination of those registers might be more useful as far as the project was concerned.

CRAIG agreed that it was thought by contemporaries that Lloyd's were biased in favour of iron and steel and thus many North American owners preferred to use the other societies, and yet many of the Prince Edward Island vessels, being destined for the British market, had, in fact, to be built under Lloyd's special survey.

ALEXANDER asked how we could be sure that a gradually changing classification at Lloyd's reflected an improvement in the quality of construction rather than simply changing prejudices of the classification societies.

CRAIG agreed that there was in the early years of the 19th century, a serious problem of bias, which continued indeed throughout the period, as shown by the establishment of the Liverpool Register and the later creation of the separate Liverpool Iron Register, whilst other shipowners thought that Lloyd's were too slow to recognise the potentialities of steam and iron. Nevertheless, Yarmouth shipowners were involved in international cross trades and shippers and insurers increasingly looked up the classification given in Lloyd's before they offered freights or insurance, and thus Nova Scotia owners had some incentive to keep up their class in Lloyd's Register.

With regard to the changes in the rate of registering new vessels in Yarmouth, he felt that these would reflect very closely changes in any index of international freight rates which might be established for the 19th century, and thus reflect the absolute dependence of the Yarmouth fleet upon the open and competitive international shipping market. He asked whether in the down turns of the cycle the ship builders tended to build smaller vessels because of a shortage of capital and the need to diminish risks on the part of the owners. Conversely, as the trade cycle rose, was there a tendency for builders to construct and owners to purchase larger vessels?

ALEXANDER was unable to discern any such cycle, it appearing that the average size of vessels of all rigs increased steadily throughout the period. In the down-turn of the trade cycles the merchants cut back not by purchasing smaller vessels, but by ordering fewer vessels.

CRAIG pointed out that this was in some contrast to the British shipbuilding

industry, but thought that this resulted from the difference between the North American and the British shipbuilding industries. "The North American shipyard was a bit of beach. . . .but a British shipyard was a high capital intensive operation and therefore there was a great deal of shipbuilding carried on in times of declining freight rates merely to keep the labour force and the machinery going". If this were the case then perhaps the "speculative" ship builder was virtually eliminated in the region which built for Yarmouth owners.

FISCHER considered that in Prince Edward Island there may well have been a tendency to build smaller vessels in times of economic down turn. Certainly the average size of all rigs registered in the 1880's was considerably lower than that of earlier decades, whilst in 1869, which was at the bottom of a cycle of registration in Charlottetown, only 9 vessels out of 69 registered were barques or ships.

ALEXANDER commented that the ports of registry which were being discussed were not homogenous. Prince Edward Island basically built ships for export, Newfoundland registered ships for use in fishing and coasting, whilst Yarmouth registered ships for deep sea cross trading and this illustrated the diversity of the shipping industry of the whole of Atlantic Canada.

BURLEY wondered whether the degree of shipping activity could be measured purely by an examination of registrations of vessels. Is there information on the intensity of use of the fleet once it exists? Is there sufficient information in the records to show whether the fleet was constantly employed or at times under employed or perhaps partially laid up?

ALEXANDER pointed out that the paper given at this time merely dealt with data obtained from the registries, but a second data set was being prepared which would deal with the voyages of the fleet and this should enable us to examine the degree of utilization. As yet this data has not been analysed but a preliminary impression would be that in the period between 1850 and 1880 the owners had no problem finding employment for their vessels.

BURLEY was surprised at the conclusion that, given the rapid technological changes in shipping and ship operation, the length of life of Yarmouth vessels tended to increase. Surely, given increasing modernisation in ship construction, port facilities etc., the average life of the Yarmouth wooden fleet might have been expected to drop. Thus because of the rate of technological change, Yarmouth owners might have been expected to have disposed of their obsolete assets more rapidly.

ALEXANDER thought that the only discernable response in technological change on the part of the Yarmouth owners was to increase the average size of their vessels. Certainly they made no effort to move into steam. His impression of the Yarmouth shipowning community, was that despite the international nature of their trading and the relative size of their individual firms, there was a curious parochialism at the Yarmouth end of the industry. They apparently operated well in terms of employing their vessels around the world in a completely international market, but in Canada "they are in this tight little town" and their only technological response was to purchase from traditional suppliers, larger vessels, and to increase the size of their fleets.

BURLEY drew a parallel with the situation of the last dozen years where once again technological innovation in shipping has caused many companies to scrap and

change to new types of vessels. Perhaps one of the reasons that Yarmouth owners did not do this was because of the burgeoning Canadian economy, which from 1880 onwards, offered several alternative channels for investment.

ALEXANDER pointed out that this possibility had not yet been examined closely, but might well be an important factor. Certainly many of the Yarmouth shipowning families did take capital out of shipping and place it into other sectors of the Canadian economy. However this may well not have involved a shift of capital out of the Atlantic region. "I think, instead, they were fooled by the national policy of 1879" which created an industrial boomlet in the Maritimes in the period between 1880 and 1900, which collapsed in the decade before the first world war. We may well find that the ship owning families of the 1870's moved into the tariff protected industrial sector which in the end failed to develop.

Why did these people abandon the shipping industry, which they knew a lot about, to go into manufacturing underwear, about which they were ignorant?

BURLEY wondered whether they might not have invested in bonds or railway development which might have given them a larger and safer return.

ALEXANDER answered that we only have to examine the development of a local manufacturing sector of the Maritimes during this period and we know that the capital did not come from central Canada, and we should assume that it came from the traditional sectors amongst which were shipping.

JANNASCH pointed out that changes in the local economy, and the attitudes of its residents can be seen through correspondence involving the voyages of one vessel the N.B. Lewis over a twelve year period. The vessel commences life by carrying profitable general cargo, declines to the carriage of bulk commodities, and after ten years is in bad condition, but the owner refused to repair her on the grounds that she is not worth it, whilst the ship master on one of his last voyages, responds by asking the owner to sell shares in the Yarmouth Tramway Company "because Yarmouth is a dying town anyway."

He asked whether the existing records contained much information on the type of cargoes carried, or the profit and loss per voyage.

ALEXANDER replied that although some information on cargoes was given in the Official Log Books, it was vague and scattered, whilst there was no information on the rate of return.

CRAIG pointed out that the U.K. Bills of Entry, which were available for filming in England would provide a great deal of information on cargoes, whilst the Shipping and Mercantile Gazette provided copious information for many ships. Thus one could certainly construct gross freight rates for the periods during which Yarmouth vessels obtained their cargoes.

MATTHEWS stated that arrangements were being made to have both these documentary sources copied.

CRAIG took up the matter of technological changes in the shipping industry. This was not particularly rapid in sailing vessels and by building larger vessels it was possible to minimise the problem of obsolescence by deploying larger vessels on longer sea routes in which the steamer was as yet unable to compete. Thus in the 1860's the Canadian deep sea fleet was moving cotton, wheat or lumber across the Atlantic but gradually they

moved into the West coast of South America, into the nitrate and guano trades where sailing vessels held a dominant position until 1914.

ALEXANDER stated that on the basis of several hundred voyages already coded, the employment of Yarmouth vessels during the 1860's and 1870's was surprisingly limited and predictable. On the North Atlantic side, the ports of call are Philadelphia, Savannah, the Gulf ports, Boston and New York. Occasionally a vessel might call at Quebec City, rarely into St. John, New Brunswick and never into Halifax. On the other side of the ocean, they are in La Havre, Bordeaux, Rotterdam and Antwerp to discharge and then to Shields and Cardiff to load. Occasionally they might take a cargo from Northern Europe to Cuba or Brazil. However in the 1880's we suspect this pattern will shift southwards.

DAVIES wondered how comprehensive and accurate the volumes of ship registers were and whether they might be supplemented from other sources including newspapers. Are these sources available for Canadian ports? Can we obtain access to such local records as parish registers, wills or inventories? Does the team intend to utilize oral history?

ALEXANDER stated that as far as the registry books of Yarmouth, Nova Scotia are concerned, there are no missing years and no missing data, and from them we have obtained a data set of about 150 variables. For Yarmouth, we have the Yarmouth Herald which does include a considerable amount of information on shipping and related matters. The other ports to be studied also had vigorous newspapers, but only some have been microfilmed and, as in the case of Yarmouth, only for certain periods. Wills and inventories are available but must be sought out and copied. With regard to oral history, this is a five year project but there are massive documentary sources to be acquired, evaluated and utilised before we can afford to think about oral history.

KNOPPERS raised the question of how to interpret net accessions to the register of Yarmouth, Nova Scotia, as a means of estimating net investment in the fleet. He considered that 10 yearly moving averages would be a superior method of calculation to that of 10 year aggregates upon which the paper had been based.

ALEXANDER agreed that this was a superior statistical method, but pointed out that the measurement by decades which was used, does correspond fairly closely to turning points in the ship registration cycle.

KNOPPERS, referring to the longevity or otherwise of vessels in Yarmouth's fleet, wondered whether this might have depended upon the owner's propensity to repair the vessels. Thus, under some circumstances an owner might refit a vessel of 8 or 9 years, but under others might sell her, or run her down.

ALEXANDER agreed that after 8 years of trading these vessels would need considerable refits but that the vessels which stay on the register for longer than this and are finally broken up, tended to be the smaller schooners. Most of the large vessels were disposed of by the owners before they reached the stage of being condemned and broken up on the beach.

KNOPPERS asked whether the records allowed one to distinguish between a vessel which was sold for refit, and then re-entered onto the register again.

ALEXANDER confirmed that they did.

PARKER mentioned the strong familial connections between Yarmouth Nova

Scotia and the Cape Cod area from which many of the shipping families had emigrated after the American Revolution. As a result there were strong commercial ties with brokers and others in Boston and an examination of this group in so far as it played a part in the shipping industry of Maritime Canada would yield great benefits. Conversely, by the 1860s many migrants from Nova Scotia and New Brunswick had settled in Boston and to some extent New York and were important in the shipping industries of those ports. American based ship brokers played an important role in placing Canadian vessels for freights, and voyages and the Canadian business was of some importance to them and "if you could have gone into Boyd and Henkin's office in New York you would have found somebody from Yarmouth looking after the Yarmouth Ships." In Boston George Hunter who came from Yarmouth during the 1850's was another broker who played an important role in connection with Yarmouth and St. John shipowners. The correspondence of Hunter is now in Captain Parker's possession, and he will make it available to the Maritime History Group for photo-copying.

He also pointed out that Yarmouth owners did in fact purchase a few steel sailing vessels towards the end of the era, and that Boston men put money into them. He thought that a certain amount of Boston money may have been invested quietly in Nova Scotian shipping through the agency of brokers like Hunter. The total investment was probably not large but it did exist.

7. MEASURING BRITISH DOMINANCE OF SHIPBUILDING IN THE 'MARITIMES', 1787-1890

RICHARD RICE

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MEASURING BRITISH DOMINANCE OF SHIPBUILDING IN THE 'MARITIMES', 1787-1890

Richard Rice

This paper centres on the problem of the measurement of British dominance of wooden shipbuilding in the Canadian Maritime provinces. To the extent that it is concerned with measurement, this essay can be described as a technical one. But it also has the substantive objective which is implicit in the title: to single out in precise terms what appears to me to be the longterm, fundamental economic influence on Maritime shipbuilding – namely British dominance. The importance of studying dominance within the British imperial economic context is taken here to be self-evident.

A perspective on the problem can be gained by posing it in extreme terms. On the one hand, a general assessment of British dominance (or the lack of it) could be made. This approach would entail a critical survey of such factors as the provision of capital, entrepreneurship, modes of production, vessel technology, social relations of ship construction, market, and so on. But it would also call for a tremendous amount of research since none of these factors has been examined in any depth. On the other hand, there is the possibility of a much more narrowly focussed procedure, one which, for example, would take as its subject only one of the mentioned factors, whose historical relations are at once crucial to the problem and manageable.

My method leans heavily towards the second, and is hinged on the notion of the market. The latter clearly has certain attributes which, when taken with the nature of the surviving sources, establish its primacy in my mind as the practical key to the problem. Since we are dealing with a capitalist economy, we can safely assume that such matters as the start of construction, kind of vessel built and rate of construction were all dependent upon market decisions, reckoned in relation to prices of new tonnage, freights, building costs, credit, etc. Therefore, there exists a basic indication of the operation of the market in the evidence provided by the rate and type of construction – an indication, which, it is important to note, is measureable. This is the first point on the use of market here. The second casts it in the role of the determinant of the structure of Maritime shipbuilding. In other words, the actual production and its modes are seen to flow from the market. The third point is that if we can identify the main market for which ships were built in the Maritimes, over time and at critical moments, then we can identify the main influence on shipbuilding – in short, the dominant influence. The three points make up a simple idea, but hardly a simple-minded one, for, amongst other reasons, it expresses the common sense of the adage, 'he who pays the piper plays the tune'. The tunes of Maritime shipbuilding, as I try to show in some detail, were mainly British. In a way, of course, I have been sufficiently unsporting to announce my principal conclusion at the outset of the paper, thereby relieving those readers who are only interested in results from the drudgery of working through my prose and figures. At the same time, however, I have offered a challenge to those hardy readers who, on proceeding through, will have the chance of unhorsing the conclusion at every turn in the argument.

A significant aspect of this paper is that it is based in large part on rich sources which have not previously been tapped to any extent. The sources, of which the basic document is the certificate of (ship) registry, date essentially from 1787. They provide the historian with a rare opportunity for detailed examination of a sector of the British American economy. Because they have not been widely used before, those which are employed in this study are described and evaluated for their reliability, in Part 2. Be it noted that the data I have derived – relating to production figures, vessel type and port of registration at the aggregate level – are only a sampling of the wealth of these sources. A secondary objective of this paper is to increase the appreciation of the importance of these sources, since, as records of production and of control of capital goods in the British American economy, they are far more comprehensive, continuous, reliable and aged than, for example, are the various Canadian and provincial censuses.

Part 3 of the paper is concerned with the argument proper, and it involves a two-stage approach. The first attempts to demonstrate that the individual Maritime provinces were for all practical purposes part of the same ship market. The second tries to cap the argument by setting out estimates of the proportion of tonnage built in the Maritimes for the British market. These purport to show that during the periods of growth and the years of peak production the market was mainly British. And conversely, in the stages of decline and depressed years, the British market was only a minor, or even negligible, influence.

The idea of British dominance is scarcely original, though much neglected by Canadian historians. It is what we should expect to find given the similar situations in the history of the Canadian political economy. Such historiography as we possess clearly, but only implicitly, reveals dependence on British technology, finance, manufactured goods, industrial or cheap labour, markets etc., in such instances as wheat, canals, railways and, especially pertinent here up to the 1850's, timber. If we can judge from the scraps of evidence which have survived, the idea in relation to shipbuilding seems to have been common among contemporaries, not least the working class. One example will suffice. The 'St. John Ship Carpenter's Society' in the spring 1849 closed its organization meeting with 'Three hearty cheers. . .given to the British Ship Owners'.[1] There are a number of works by an earlier generation of Canadian historians pointing to, but not analyzing, the importance of British influence on Maritime shipbuilding.[2] More substantial evidence on the subject is to be found in recent writing.[3] Still, with the minor exception of the Craig article, the literature on Maritime shipbuilding has not addressed the question of dominance squarely over the extent of its chronological and geographical spans. Nor has it specified the nature of the relationship, demonstrated a knowledge of the sources and evidence, or reached satisfactory conclusions. An old and common idea it may be. But until it is examined in light of the evidence, as I try to do in this paper, it has no more claim on historical validity than any other bubble of theory.

Denomination of the general political entities in Canada bedevils this as it does other studies. Two terms are given special use here: Quebec for the four antecedents of the present province of that name, and British America for both British North America and Canada. Also on a point of definition, Newfoundland has been excluded from analysis for the reason that, excepting during the first decade of our period, it was not a significant centre of ship construction.

II

The purpose of this part of the paper is firstly to describe, briefly, the sources underlying this study, and secondly to provide an examination of their reliability. The discussion which follows is mainly focussed on the latter, and it can conveniently be grouped under four headings: granting of certificates, administrative accounting, missing information, and comparability of tonnage measure.

In order to resolve the problem of reliability, we must review in general terms why and how the data were created, and which bits of them have survived. The why aspect is dealt with readily enough. To confer the benefits of protected trades upon British ships and to exclude foreign vessels from the same, the system of ship registry was developed. It has a long history, but all we need note in this instance is that dating from 1786 British vessels (including those of British colonies) that were sea-going were required to take out a certificate of registry in order to receive the 'advantages. . .given. . .to ships owned and navigated by his Majesty's subjects', and further that the only vessels eligible for such a certificate were those 'wholly built and fitted out in his Majesty's dominions'. The statute concerned, 26 Geo III c. 60, comprehensively extended earlier and partial registration practice, and, in a move especially important for later historians, established routine administrative procedures in the granting of certificates and in central reporting.

The primary document was the certificate of registry, of which two copies were made (the original went with the master): one copy was retained at the port of registry, there bound into the 'port book'; and the other was forwarded to London. Thus two files were established, one by port, and the other as a central archive (these survive in two sets for British America: the port books in the Public Archive of Canada, and the central group in the Public Record Office). The proof of a ship's 'Britishness', until the ending of the Navigation Acts, was demonstrated in a 'builder's certificate' wherein the builder attested that she had been built in British territory, at a specified place and time – information recorded on the registry certificates. They also contained a physical description of the vessel, an enumeration of the owners by name, residence, occupation, and, from the end of 1823, the proportions of ownership (in sixty-fourths), and certain other details such as the closing entry, and endorsements resulting from changes in ownership, alteration in the vessel's description, command, and in the matter of mortgages (excluding bottomry). Annual reports on the state of registry were compiled for each port of registry and send to London. An extensive series of such colonial reports survives as the Plantation Annual Lists in the PRO (BT 162). The sheer number of certificates makes it unlikely that anyone working alone will be able to do more than take samples from this source. In my own case I made detailed notes on all the certificates for Saint John and Quebec up to 1855 and for every five years thereafter up to 1885, as well as on the Plantation Annual Lists for all the British American ports. The size of the task can be indicated by the example of Saint John for which port in the 1830's the number of certificates exceeds 1300. Thus until such time as a Canadian equivalent to the 'Master File of European Shipping' is established, scholars will be forced to bypass the rich resources of the certificates of registry and to rely for aggregate information (of a sharply restricted variety) on the various annual accounts made up by the customs officers who administered registration. In some instances the researcher has no choice but to employ

the general accounts because the certificates have been lost. This applies fairly generally to the British American case before 1817-1818, the years which mark the start of the more or less intact central file. Readers are referred to Jarvis and Craig for a more extensive and general review of British-ship-registry practice. In conclusion to this description, we should note that of course there are a multitude of other original sources, public and private, which bear on Maritime shipbuilding and which have not been mentioned here. But there is none, to my knowledge, which even begins to approach the completeness of the certificates and their associated accounts. This is their outstanding feature, and the reason why they are singled out here.

The statutory requirements of registry is one thing, and the administration of them another. The question arises whether or not the officers of the Customs, spread over time and stationed at widely separated ports in British America well removed from London, did their duty honestly and efficiently. Of course there can be no easy answer, and I would be rash to claim that what follows is definitive since I have not made a thorough study of the subject. However, a number of observations can be made. First, I know of no blatant evidence of corruption insofar as the registration of new tonnage is concerned. It must be noted that the certificates of registry are themselves unlikely to reveal malpractice, given the inherent difficulty of detecting false statements on them. Shipbuilders' names did not have to appear on the certificates for much of our period, and apart from being a nuisance to historians who would like to know who built vessels, this feature, or non-feature, no doubt provided a comfortable anonymity to those who wished to circumvent registry law. Even when the builder's name is given, one's credulity can be occasionally stretched, as, for example, with the small barque, *Rimouski,* 210 tons (121 Quebec 1853). According to the certificate she was both built and owned by Joseph Charles Taché, physician of Rimouski. This was presumably the physician and surgeon of Rimouski, brother of archbishop Alexandre Taché, member of the Legislative Assembly, subsequently newspaper editor, pamphleteer and writer of several books, professor of physiology and deputy minister of agriculture. Indeed my source on Taché, *The Macmillan Dictionary of Canadian Biography* (1973), might have moved to declare the discovery of a Canadian 'renaissance man' had the distinguished editor been aware of Taché's practical skill as a shipwright. Catching gentlemen building barques are rare and relieving events in registry research, but in order to discover at a more general level the veracity of statements on certificates, it is obvious that a careful search of the pertinent Customs letterbooks and legal records will have to be made.

On another tack, we can take note of two considerations of a broad nature which I think would have militated against large-scale breaking of the registry law, and these are in addition to the wide variety of statutory strictures and penalties. First, the United States was the only major source of foreign tonnage that could have been slipped onto British American registry, and that was the very state whose shipping the key act of 1786 was principally designed to exclude. The cleavage between it and Britain, if anything, widened in the first quarter of our period due to the near and actual state of hostilities attendant upon the French Wars and the War of 1812. The second point is that it is difficult to concede that British shipbuilders would have tolerated any extensive extra-national incursions into their market. Even colonial construction was regarded as a threat, and on two occasions – regarding Indian building early in the 19th century and

British American later during the depression of the mid 1840's – British builders brought pressure on their government.[4]

The registration of new vessels, particularly larger ones, appears to have been carried out efficiently in the Maritimes – that is, if we define efficiency as the comparatively complete application of registry. Such problems as are posed in determining the efficiency of the system in this respect would appear to relate entirely to small vessels, vessels which fell into a grey area of registry law where, depending upon employment, they were, or were not, required to obtain a certificate. Vessels excused from registry in the British American context were as follows: those less than 15 tons; those undecked; those, which, after 1823, were engaged in the British American fisheries and being without a whole or fixed deck and not exceeding 30 tons; and all those in inland navigation. (After 1823, only those of less than 30 tons were granted this exemption). Our particular concern is to learn whether the registry system under-recorded new vessels, either through outright omission, or late registration. The first aspect is difficult to judge, although it does not seem likely that significant quantities of tonnage were missed out. Late registration, however, was not uncommon, and was probably due to the distance between the home port and the port of registry, or, more frequently, to the kind of employment or size which did not require registry.

TABLE 1

LATE FIRST REGISTRATIONS AT SAINT JOHN AND HALIFAX
IN SELECTED YEARS

PORT	YEAR	NUMBER OF LATE REGISTRATIONS	MEAN PERIOD OF LATENESS	MEAN TONNAGES OF VESSELS REG'D LATE	TONNAGE REG'D. LATE	TOTAL NEW TONNAGE	% LATE TONNAGE
Saint John	1812	2	4.0	19.0	38	4776	0.8
Saint John	1813	2	1.0	70.0	140	2282	6.1
Halifax	1825	5	5.4	29.8	149	4325	3.4
Saint John	1825	47	5.4	61.6	2895	22932	12.6
Saint John	1848	2	1.0	46.0	92	16793	0.5
Halifax	1850	4	4.3	25.4	102	2025	5.0
Saint John	1865	5	1.7	66.8	334	34717	1.0

Source: Saint John, notes taken from PRO BT 107 & 108, and PAC RG 12; Halifax, notes from PAC RG 12, generously supplied by Charles Armour, Dalhousie University.

The certificates themselves offer a check in this respect. Because they contain both the date of build and date of first registration, the interval between the two gives a precise

indication of late registration. The incidence of it is sampled in Table 1, which gives the results of seven registry years, in total, for Halifax and Saint John – the years selected on a (non-statistically) random basis. Judging from the amounts of tonnage involved, late registration was generally an insignificant factor. The kinds of vessels missed out were small, ranging between one fifth and one seventh of the mean sizes of the new vessels registered at the same ports in the same years. And they were modestly rigged; only one in the 67 was even partially square-rigged (the brigantine *Star Castle:* 112 Saint John 1865). The only and not very serious deviation from the pattern in the table is Saint John in 1825, and it is probably explained by a stipulation of the new registry act then coming into force. Whereas formerly all vessels solely engaged in inland navigation – i.e. in the Saint John River – had been excused from registry, now the exemption applied only to vessels of 30 tons or less.[5] Thus even the case of the deviation appears to reinforce what is abundantly clear in the rest of the table – that the registration process was remarkably efficient in registering new vessels, and that the tonnage missed out was in trifling amounts. We can conclude, therefore, that the records of registry – at least at the level of the certificates – offer a reliable record of shipbuilding production in British America.

So far the discussion has been confined to the granting of certificates, but since much of the shipbuilding data used in this paper, and virtually all of it elsewhere, relies on the aggregated reports prepared by the various Customs officers, it is necessary to inquire into the extent to which these can be considered reliable. An obvious way of doing this is by comparing the two sources. Table 2 is such a comparison for Halifax and Saint John. It includes all the years for which I have figures from both the certificates and an 'official' compilation.

Two points should be made before examining the table. The number of years that the two sources could be checked against each other is limited by the difficulty of finding reports which break down provincial totals before the mid 1850's, and by shifting year-ends. The latter is, of course, just one of the hazards encountered in long time-series. Although the data employed in this study have not been substantially adjusted to account for this factor, readers should be made aware of the problem. It is illustrated by the following selected examples, drawn from the Confederation period. The Plantation Annual Lists of the imperial government used the calendar year; New Brunswick's reports did likewise, but on the eve of Confederation introduced a half-calendar year; Nova Scotia's shipping reports employed a year ending on the 30th of September; in 1865 Canada moved from the calendar year to a fiscal year ending 30th June; and this last became a Canadian standard, but that was soon compounded by the reports of the department of Marine and Fisheries, which from 1873 contained shipping statistics according to the calendar year. Negotiating British American shipping data can thus be seen to be akin to the contemporary problem posed in driving a standard-guage train over the broad-guage 'Grand Drunk' – as certain wags labelled the Grand Trunk Railway. The second point concerns those vessels built but not registered in the Maritimes. Such were said to be 'built under certificate' between 1824 and 1855, and, from the latter year, under 'Governor's pass'. The difficulty stems from the distinction which was made, not uniformly, between 'built and registered', and simply 'built' – the two categories by which new tonnage was commonly reported. The former heading by definition excluded 'certificated' vessels, while it is not always clear if under the second heading such vessels

have been included. Thus it is a wise but laborious procedure to verify the 'certificated' vessels by recourse to both collections of the certificates of registry – since neither is complete in this respect (The Ottawa holdings seem particularly deficient in the first twenty years or so after 'certificates' began to be granted, and this poses special problems for our interpretation of the reliability of the Halifax data, as we see below).

TABLE 2

COMPARISON OF TONNAGE COMPUTED FROM CERTIFICATES WITH TONNAGES GIVEN IN OFFICIAL ACCOUNTS

YEAR	TONNAGE FROM CERTIFICATES	SAINT JOHN TONNAGE FROM ACCOUNTS	% DIFFERENCE	TONNAGE FROM CERTIFICATES	HALIFAX TONNAGE FROM ACCOUNTS	% DIFFERENCE
1818	2515	2554	+1.5			
1819	4467	4054	-10.2			
1820	3409	3292	-3.6			
1821	2399	2785	+13.9			
1822	3943	4342	+9.2			
1825	22932	22976	+0.2	4325	6979	+38.0
1846	28904	28660	-0.9	(1830) 5117	6154	+16.9
1847	38711	38112	-1.6	(1835) 7193	9795	+26.6
1848	16792	16107	-4.3			
1849	31647	25784	-1.2			
1850	27296	19133	-34.6	2025	2188	+7.4
1851	38209	28628	-1.5			
1853	56576	47178	-0.1			
1854	81074	70801	+3.7	5359	10850	+50.6
1855	43093	39486	+0.4			
1860	30222	29798	-1.4	3923	4017	+2.3
1865	47891	48239	+0.7	9323	10357	+10.0
1875	22923	21748	-5.4			
1880	13972	14014	+0.3			
1885	7161	7205	+0.6			

Source: Column 2 – Certificates of registry; Saint John, PRO BT 107 and 108, PAC, RG 12; Halifax, PAC RG 12 only.

Column 3 – Saint John: 1818-22, GBSP 1837-8, LXV 358-9; 1825, **ibid.** minus figure for St. Andrews, taken from unpublished paper by R. Lloyd, McGill 1976; 1848-1865, PRO BT 162, plus tonnages for 'certificated' vessels; 1875-1885, Canada SP: 1871, 1876, 1881 and 1886; Halifax: 1825-35, G.B.S.P., 1837-8; LXV, 358-9; 1850, PRO BT 162; 1854, 1860 and 1865, NSSP.

The results in Table 2 are mixed, at least superficially so. Saint John was obviously

a much more important port in the registration of new vessels, and, given that the years on which our sample for that port is drawn span nearly seven decades, the tallies are encouragingly close and consistent. The positive percentages, ranging from 0.3 to 13.9 can be explained in my opinion mainly by arithmetical error, either on my part or on the part of some now-nameless clerks of the Customs service. The negative percentages may suffer from the same problem, but two particular sources of discrepancy can be identified. The first is that in recording new tonnage from the certificates of registry, I made the decision to include tonnage that was launched up to roughly three months before the new year, and to use the date of registration as the criterion for determining new tonnage. The length of time is admittedly arbitrary, but, taken with the registration date, it meets the practical problem of ensuring the inclusion of virtually all new tonnage while avoiding the problems inherent in organizing the data around either the date of launch (not consistently available) or builder's certificate. For example, if either of the latter were employed, then a vessel like James Smith's clipper, *Queen of the Seas,* could well have been missed out in the record of new tonnage because, launched at the end of 1853, and with a builder's certificate date in December, she was not registered until 5 January 1854 (1 Saint John 1854). While not of general occurrence, such examples nonetheless happened often enough to explain in part at least marginal statistical variation between my data series and official compilations. The second source of error is simply that the slowness and hazards of communication before steam navigation meant that the British books could be, and sometimes were, closed before the British American returns were in.[6] Still, the exceptionally large variation for Saint John in 1850 is not explained. For whatever reason, the compiler of the Plantation Annual List missed 13 new vessels, and they probably account for the difference.

Halifax, on the other hand, has results which inspire little confidence, at first sight. I would argue, however, that these figures, as far as they go, are probably as reliable as those for Saint John, and that the differences between the compiled and register data represent 'certificated' tonnage missed out by the former source. Despite clear evidence for years other than those in Table 2 that Halifax customarily granted 'certificates', there is no sign of these in my notes, which, for the years in question, are based on the PAC holdings. This is surprising if one appeals to the New Brunswick and Quebec experience, for these provinces veritably poured out 'certificated' tonnage during such boom years as 1825 and 1854, but then the evidence of this particular traffic is best revealed in the PRO collection. Assuming for the moment that my basic contention in the paper about the British dominance of Maritime shipbuilding is correct, then it follows that Halifax, the premier Nova Scotian port for most of our period, should closely reflect the rhythms of British shipbuilding – that Halifax would have exported much 'certificated' tonnage during feverish times and very little in dull. It is pertinent here to compare the Halifax percentages of Table 2 with the cyclical pattern of Nova Scotian shipbuilding production in Figure 2. It may not be unreasonable to suggest, therefore, that the percentages for Halifax in column 4 are not so much a measure of the unreliability of the compiled tonnages, but are, rather, a rough index of the British American *cum* British shipbuilding cycles.

We come now to missing information in our consideration of the reliability of shipbuilding data. It represents a much clearer, although similar, problem to the one with

which we have just finished. We have seen that in general there are two levels, closely related, in the sources of production statistics. There is an unusual luxury in having access to both as one can be used as a check on the other, as we have done. However, there are difficulties with both varieties in the early years. The certificates of registry are largely incomplete before 1817. The important exceptions to this are in the PRO collection, which covers 1812 and 1813, and in the PAC holdings which contain an apparently complete set for Cape Breton. And the general accounts exist in consecutive and published form only from 1814, in the British Parliamentary Papers. There are a number of general accounts relating to the earlier period, but they are not entirely satisfactory.[7]

Previous studies have avoided these difficulties by simply ignoring the years prior to 1814. This study, by contrast, attaches importance to the pre-1814 period as comprising the beginning stage of Maritime shipbuilding, and, accordingly, has developed a series of production data to fill in the gap – the data are found in Appendices 1 & 2. The construction of the series requires discussion.

There are two elements in the putting together of this series: first, the employment of the data from the 'States of navigation, commerce and trade'[8] for the years 1787–1808, and second, the provision of estimates for the remainder of the gap, 1809-1813. They are taken up in turn.

The reason for the selection of Customs 17 is that, to my knowledge, it is the only comprehensive source available for Nova Scotia and New Brunswick. When it comes to judging its reliability, we can start by noting that in relation to British shipbuilding there exists a close correspondence between it and the differently derived statistics in Mitchell & Deane.[9] The colonial connection can be checked because of the fortunate survival of the 'port books' – in the PAC as RG 12 – for Cape Breton and Quebec. I have not researched the former, but it was not an important shipbuilding area. Quebec, on the other hand, was the leading British American shipbuilding port, and the data based on its certificates thus offer a suitable test of Customs 17. Table 3 lists both sets of figures, and sets out the differences between the two by percentage, revealing a pattern of extreme variation in one-third of the observations, as well as fairly consistent under reporting by Customs 17. Considerations of arithmetic error and of fraudulent administrators aside, the first-mentioned trait is not as serious when the actual tonnage differences are noted; and the second was probably due in part at least to the practice already mentioned – that of closing the tally at the London Customs House before the final colonial report had come in. In looking at the trend, it is clear that there is a close relationship between the two sets of figures – an impression which is confirmed by regression analysis, which gives a high correlation of 0.9333. We can conclude, on the supposition that the Customs 17 record of shipbuilding at Quebec was representative, that this source can be confidently used for the Maritimes with regard to trend, although individual observations may stray widely.

The key to the method in estimating data for the remainder of the gap, 1809-1813, is again the continuous set of production figures for Quebec, around which others can be built and tested. In this exercise, the New Brunswick data for 1812-1813 (PRO BT 107) were employed as a control case in the estimating process. The results indicate, not surprisingly for the times, that these were years of unusually violent swings in production. Even more important, the volumes of tonnage launched in the Maritimes began to take a

sharply increased portion of the imperial market – here defined as the sum of the production of the United Kingdom and British America. In moving from 5.8 to 14.8% in just four years, the Maritimes achieved their steepest growth rate against the United Kingdom (not the greatest change, for that was to come seven decades later in the chute of the 1880's). Moreover, this taking of an increased share of the imperial market during boom years was a recurrent, cyclical phenomenon of British American shipbuilding, now given its first distinct impression.

TABLE 3

TEST OF CUSTOMS 17 TONNAGE DATA FOR QUEBEC, 1787-1808 BY COMPARING FIGURES OBTAINED FROM CERTIFICATES OF REGISTRY

YEAR	TONNAGE BY CERTIFICATE	TONNAGE BY CUSTOMS 17	% DIFFERENCE
1787	267	786	+66.0
1788	166	569	+70.8
1789	179	83	-115.7
1790	630	521	-20.9
1791	345	345	0
1792	617	615	-0.3
1793	398	524	+24.0
1794	816	856	+4.7
1795	1035	661	-56.6
1796	1137	323	-252.0
1797	1357	122	-1012.3
1798	781	872	+10.4
1799	2497	1886	-32.4
1800	3621	3557	-1.8
1801	3269	3196	-2.3
1802	3266	3200	-2.1
1803	2957	2586	-14.3
1804	2539	2060	-23.3
1805	1503	1596	+5.8
1806	2158	1856	-16.3
1807	2287	2126	-7.6
1808	4186	4175	-0.3

Sources: PRO Customs 17; and PAC RG 12.

We move now to the fourth subject in the discussion of the reliability of shipbuilding data, tonnage measure. So far in the analysis, tonnage figures have been accepted in their raw form. This *laissez faire* will not do, however, since the method employed in the calculation of registered tonnage was substantially changed three times. The problem is a fundamental one. Does a ton of the first period (1787-1835) equal a ton of the second (1836-1854),[10] and are they the same as a ton of the third (1855-)? The answer is patently no. Fortunately, I think the three can be connected by a system of equivalencies, and I have developed formulae to that end. My programme is at best

makeshift, however, and I hope others will be able to refine it, or push it aside for a better scheme.

A good deal of ink has been spilled on tonnage measure, both by contemporaries in the 19th century and historians since.[11] But as interesting as it might be in other respects, the writing contains little that we might find helpful since the authors have not addressed our problem. The Old Rule of 1773 (often referred to as the Carpenter's Measure), which was made general by the 1786 act, and endured until 1835, has been roundly damned for nefarious effects on naval architecture – that it encouraged the construction of unnecessarily short, deep, and thus, unseaworthy hulls. Yet, so far as I know, no one had bothered to systematically check vessels' dimensions in order to substantiate the charge. W. Salisbury, whose material is probably most relevant, seems to be on the right track in writing that 'Ships were then short because, on the whole, economic conditions and port facilities then favoured small ships'. But one must wonder if he examined any of the relevant records, namely our old acquaintances the certificates of registry, or if he meant his statement that the measurements given on the certificates 'were not the dimensions from which the "registered tonnage" was calculated'.[12] Surely he would have been surprised by the results of a test that I carried out on a sample of 125 Quebec and Saint John vessels, of 41,808 registered tons and selected by complete year. Taking the certicate measurements for length (L) and breadth (B) and applying the Old Rule ($L - 3/5\ B \times B \times 1/2\ B \div 94$), I calculated that these vessels had a combined tonnage of 42,378, or only 1.4% more than the registered total – a difference that is insignificant and can probably be attributed to rounding. This example suggests we dispense with further consideration of the literature on this subject.

In devising a system of equivalencies, there are at least four alternatives, the first three being one of the historic measures, and the fourth a new one which might have theoretical attractions. Certainly of the four, it readily appears that the Old Rule seems to offer the least potential, for, as reference to the formula above will show, tonnage was calculated by it without relating to depth, or hull shape. Both of the other official formulae, the 'New Measure' of 1835 and 1854 system, calculated hull volume, and the latter was undoubtedly superior because it was capable of adjusting to a wider range in the size of vessels. However, there is a practical objection to these, or any other system which would be preferable on mathematical grounds, for they would require measurements long since vanished – if ever they were recorded. Whereas 'New Measure' called for six sections of the hull, and the 1854 method from six to twelve according to the length of a vessel – specifications not generally available – the Old Rule merely required length and breadth. Since these dimensions are given on all the certificates with which we are concerned (the actual manner of recording the measurements varied slightly), then it is clear that the least desirable measure, theoretically, is much the most practical. Nonetheless, while it may please the historical sense of recalling an old practice into service, the glaring deficiencies of the Old Rule call for caution in its application. In particular the problem of depth must be kept in mind, especially since there was a marked trend in later decades in the Maritimes towards the construction of longer and shallower vessels. It should also be noted that a major problem which faces historians of British shipbuilding in the same era, that of measuring the tonnage of steamers[13] does not seriously concern us because so few such vessels were constructed in the Maritimes.

TABLE 4

COMPARISON OF REGISTERED TONNAGE AND TONNAGE COMPUTED BY THE OLD RULE

YEARS FROM	TO	PORT	NUMBER OF VESSELS	REGISTERED TONNAGE	TONNAGE COMPUTED BY OLD RULE	% DIFFERENCE	REGISTERED MEASURE
*1820-35		Q	50	20239	20356	-0.6	Old Rule
1825		SJ	75	21569	22022	-2.1	
*1840-50		Q	97	73773	52678	+28.6	New
1845		SJ	51	21670	16781	+22.6	Measure
*1855-80		Q	103	96351	102393	-6.3	Merchant
1865		SJ	62	32226	38464	-19.4	Shipping
			438				Act of 1854

*Vessels taken from every fifth year with these dates as outside limits.
Sources: Certificate of registry, PRO BT 107 and 108; PAC RG 12.

TABLE 5

FREQUENCY DISTRIBUTION OF THE DIFFERENCES AT SAINT JOHN & QUEBEC IN 1865 BETWEEN REGISTERED & COMPUTED TONNAGE, ACCORDING TO THE REGISTERED DEPTH OF VESSELS

	SAINT JOHN				QUEBEC			
Depth	Registered Tonnage*	Measured Tonnage*	No. of Vessels	% Difference	Registered Tonnage*	Measured Tonnage*	No. of Vessels	% Difference
24′	1272	1318	5	-3.6	1262	1320	9	-4.6
23′	1040	1108	7	-6.5	1155	1170	5	-1.3
20′	—	—	—	—	772	785	6	-1.7
19′	629	702	5	-11.6	—	—	—	—
18′	526	604	3	-14.8	—	—	—	—
17′	463	527	3	-13.8	—	—	—	—
16′	354	423	3	-19.5	—	—	—	—
13′	299	427	21	-42.9	319	444	9	-39.0
12′	245	372	9	-52.1	—	—	—	—
11′	194	344	3	-77.1	—	—	—	—

*Mean tonnage values. Sources: PRO BT 107 and 108; PAC RG 12.

Table 4 gives the results of my comparison of registered tonnage and tonnage computed by Old Rule for 438 vessels, falling roughly into thirds according to the historic measures. The first two reveal a degree of consistency which may be considered satisfactory, but there is a problem in the third, in the diverging patterns of Quebec and Saint John. While it can be easily shown (as in Table 5) that the degree of divergence is related to depth, and that so long as we are dealing with depth measures common to

vessels during the period of the Old Rule there is no substantial difference between the results for the two ports, there remains a considerable amount of shallow tonnage for which we apparently have no ready factor of conversion. This applies particularly to Prince Edward Island and Nova Scotia, as can in the latter case be inferred from Table 6.

TABLE 6

FREQUENCY DISTRIBUTION OF NEW VESSELS BY SIZE AT SELECTED PORTS IN NOVA SCOTIA IN 1865

PORT	0–300 TONNAGE	MEAN	301–500 TONNAGE	TONS MEAN	501– TONNAGE	MEAN	TOTAL TONNAGE	MEAN
Digby	1345	135	669	335	540	540	2554	196
Halifax	6153	104	1824	365	2380	595	10357	152
Liverpool	2467	164	1731	346	nil	nil	4198	210
Lunenburg	945	79	nil	nil	nil	nil	945	79
Parrsboro	2544	134	786	393	554	554	3884	160
Pictou	2138	178	2162	360	683	683	4983	262
Windsor	5391	163	2215	369	2342	781	9948	237
Yarmouth	1029	86	3599	400	5643	705	10271	354
					Total of selected ports		47140	210
					Total for the province		56768	193

Source: NSSP, 'Trade Returns', 1866; for the year ending 30 Sept. 1865: 248 & 62-7.

For the purpose of deriving a factor of conversion, let us assume that the mean result for the deep vessels (15-24') of Saint John and Quebec will serve, a procedure which yields a factor of +105.6. This leaves the problem of shallow tonnage, and the method I use to get around it incorporates two assumptions: first, that hull shape was only of marginal influence, and so can be disregarded; and second that the key dimension to establish the relation between Old Rule tonnage and shallow tonnage is depth, a ready measure of which is provided by the formula of 1854. Precisely what the factor should be is virtually impossible to say without testing these assumptions, but given the limitation of time and for the sake of arithmetic convenience, I have simply resorted to the same factor, +105.6.

To conclude this discussion, now overly long, a similar problem remains, that of developing a factor of conversion of New Measure to Old Rule tonnage for the smaller vessels that were more or less typical of production in Nova Scotia and Prince Edward Island in the period concerned, 1835-1854. The inclusion of the latter province with the former may be inappropriate considering that Prince Edward Island built proportionately more of its shipping for the British market than did Nova Scotia. However, I would hold for the present at least that such differences would be insignificant, especially as applied to a factor of conversion. The kind of sliding scale that we saw in the last problem is present here, as we might expect considering that New Measure, like the 1854 system, was a volume measure. On the basis of a close analysis of the new vessels on the Saint John register for 1845, I found that the smaller the vessel the nearer to 1:1 is the

relationship between the two measures. Assuming that 20.2% is a standard surplus of New Measure for the larger variety of vessel concerned, we can proceed to estimate the desired factor of conversion by the following method modelled on the Nova Scotian evidence. The number we are looking for will fall somewhere between 0 and 27, being the range in mean tonnages of 121 and 790 respectively. We might be able to scale directly from one to the other except for the skewed nature in the distribution of vessels by size. One might simply choose the half-point, lower the head and charge, since a thorough sifting of the evidence is out of the question. But there is perhaps a better way. Assuming that Halifax, Pictou, Windsor, and Yarmouth were the ports which registered larger vessels, and allowing that the proportion of their combined tonnages of the provincial total over time might serve as an indication of the extent to which the larger vessels were registered in Nova Scotia, then the operation simply consists of applying numerical values to the equation. Employing the years for which I had data relating to New Measure in Nova Scotia (1843, 1846-51 and 1853-4) I found that these ports contributed a mean of 70% of the tonnage, or, on our scale of 1 to 27, 14.1.

TABLE 7

DIFFERENCE IN OLD RULE AND NEW MEASURE TONNAGE ACCORDING TO THE NEW VESSELS REGISTERED AT SAINT JOHN IN 1845

TONNAGE RANGE	NUMBER OF VESSELS	MEAN NEW MEASURE TONNAGE	MEAN OLD RULE TONNAGE	% DIFFERENCE
0 – 300	26	121	120	+0.8
301 – 500	3	388	350	+10.0
	*(14	354	425	+20.2)
501 –〉20.2	22	790	576	+27.1

*Figures in parentheses include a further 11 vessels to bolster up this range.
Source: PRO BT 107.

We can now summarize in tabular form the factors of conversion:

Old Rule:	1787-1835: Conversion: nil;	
New Measure:	1836-1855: New Brunswick, –23.0;	
	Nova Scotia and Prince Edward Island, –14.1;	
1854 system:	1855-1890: All the 'lower' provinces, +105.6.	

Let me conclude this part of the paper with a number of observations. The first is that in this analysis of the certificates of registry and allied, general accounts, I have attempted to find a way by which they could be used to provide a basic measure of shipbuilding production. While the particular interpretations and methods that I have employed may be open to objection, there can be no denying the utility of the objective. The situation is akin to a human population. We may know a good deal about the individual members, but until we arrive at a position where we can assess the absolute levels of, and the rate of changes in, that population, then some of the essential information – the evidence of fundamental processes at work – is lacking.

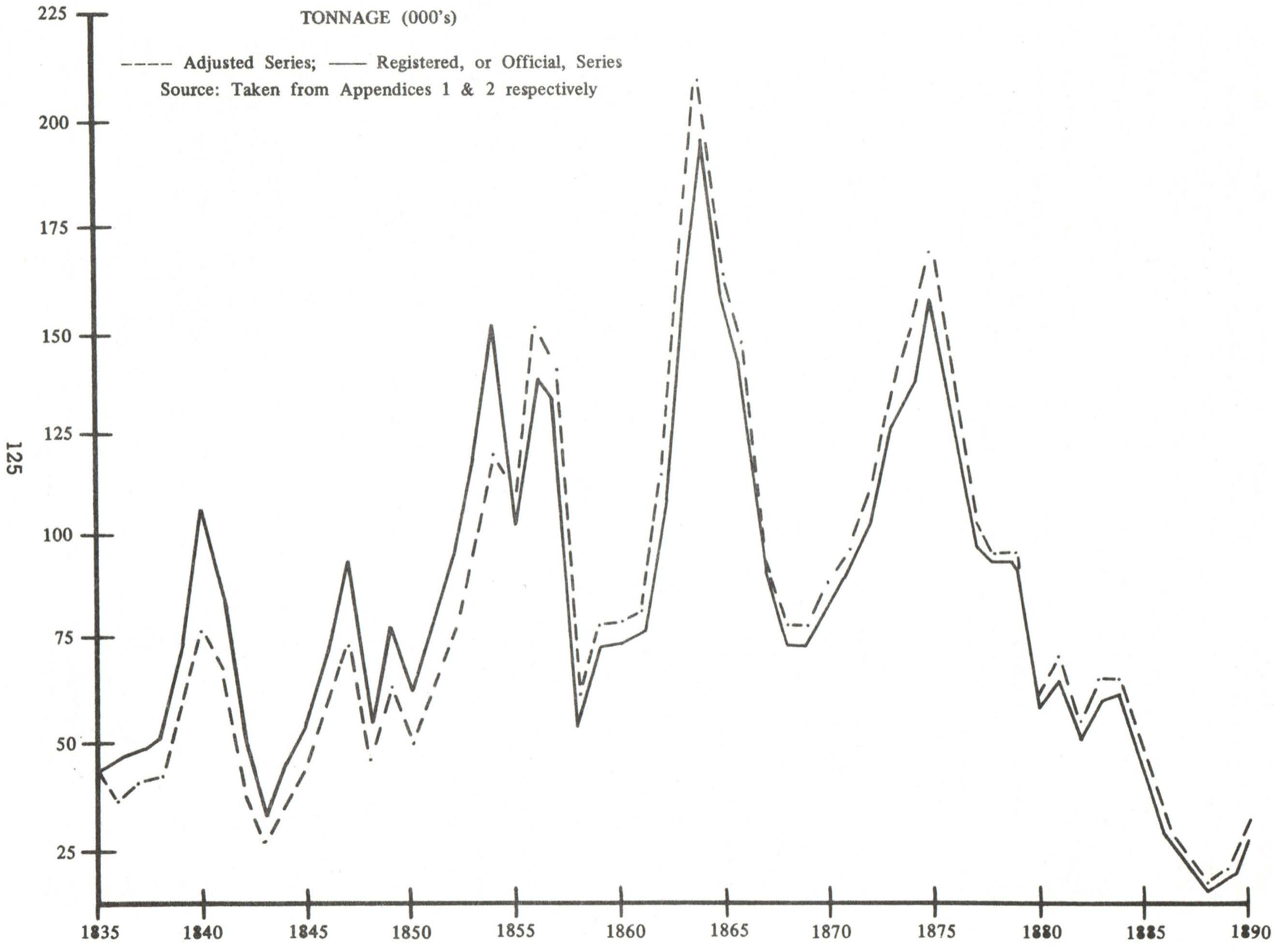


FIGURE I: MARITIME SHIPBUILDING, 1835-1890: Adjusted, and Registered-Tonnage Series

While the interpretation of the developed series is left to Part 3, there are differences in the two series that might appropriately be mentioned here. In general, the two building cycles, 1831-1843 and 1844-1858, are reduced in magnitude, and increased are the two cycles which immediately followed, 1859-1868/9 and 1868/9-1880. Three further, specific changes catch the eye: the 1830's no longer show a steady increase in production; the vessels built at the end of the 1830's do not reveal such a sharp rise in mean size; and the crest of the 1850's is advanced from a dramatic peak in 1854 to a summit less sharp two years later. Thus, while the basic configuration of the data is much the same in both series – indeed, identical up to 1835 – the variations are important when it comes to interpretation. Unfortunately, there are certain situations in the analysis below, where the adjusted series can not be employed. The main feature of the adjusted series is, of course, that its tonnages are calculated according to a single formula, and they are, therefore, comparable.

The second point is that the wide range of documentation, from widely spread depositories, spanned over a long period, and the routine nature of much of it present a series of problems more or less technical in nature, but of considerable consequence if the wealth of evidence contained therein is to be abstracted. The methodology that I have employed leaves much to be desired under optimal conditions, and my choice of questions and approaches has necessarily been constrained by the limits imposed in working alone. Nonetheless, the problems in dealing with these sources are important enough in themselves to call for discussion of them.

As the third point there is the value of the developed series as an index of economic activity. The series are now organized around provincial aggregates and the year as time unit. The clustering of data around ports of registry, in certain respects occasionally more legal than economic entitities, could be re-arranged according to ports of build, or ownership. And similarly, the chronological ordering could be made a good deal more precise, since the data could be organized by the year, by the season, weeks, or even days. Either way, or in combination, the economic-index potential is obvious.

Finally, the fourth point is a substantive one, that we have already touched on. New Measure, according to the Customs Department for the first few years after its enactment reduced the amount of British registered tonnage.[14] Therefore to the extent that a vessel's registered tonnage affected its running costs in harbour dues and the like, New Measure implicity lowered the costs of ship operation. For the British American ports, the Plantation Annual Lists reported totals of tonnage registered by both the Old Rule and New Measure. Clearly Customs officials were using some sort of artificial conversion factor between the two, since there was not wholesale re-registration of the vessels already registered under the former. Halifax, for example, shows New Measure tonnage to have been reduced 4.7% in the first year of double reporting, 1937, and the reduction extended to nearly 15% in the last, 1842. By comparison, Saint John (which we know registered much larger vessels) reveals smaller differences, hovering about –3%. There is a problem in reconciling these figures with the results in the cases of individual vessels, for as we saw in Table 7, those of 300 tons and upwards experienced, according to my calculations, a substantial inflation – not deflation – of 20% plus. Because reductions appear to have been effected on the smallest category of vessel, the explanation of this problem perhaps lies in the specific composition of a port's stock of registered shipping – whether or not there was a significant proportion of its fleet made

FIGURE 3: BRITISH-AMERICAN TONNAGE RELATIVES:
INDICES OF CHANGING RATES OF PRODUCTION

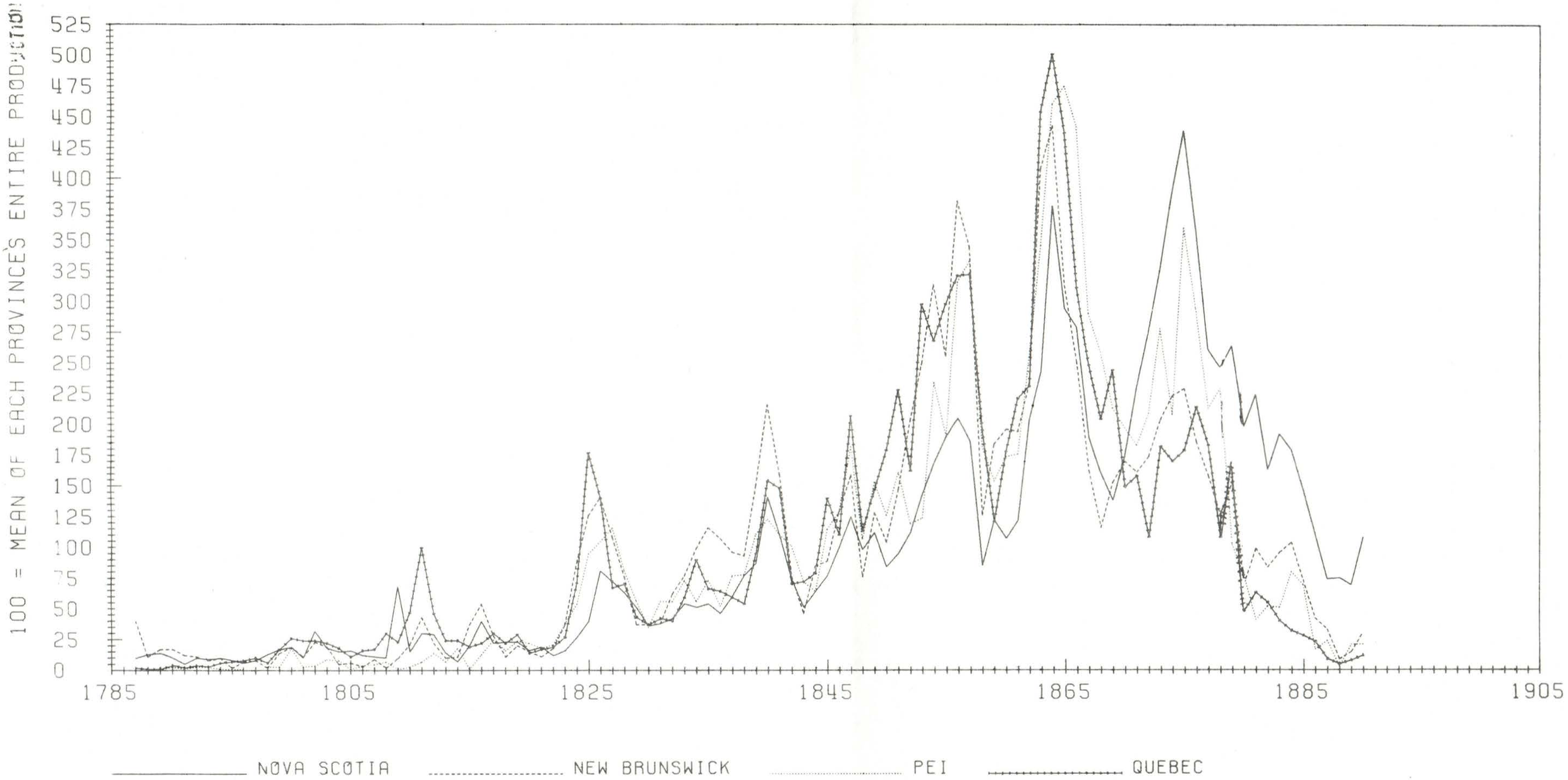
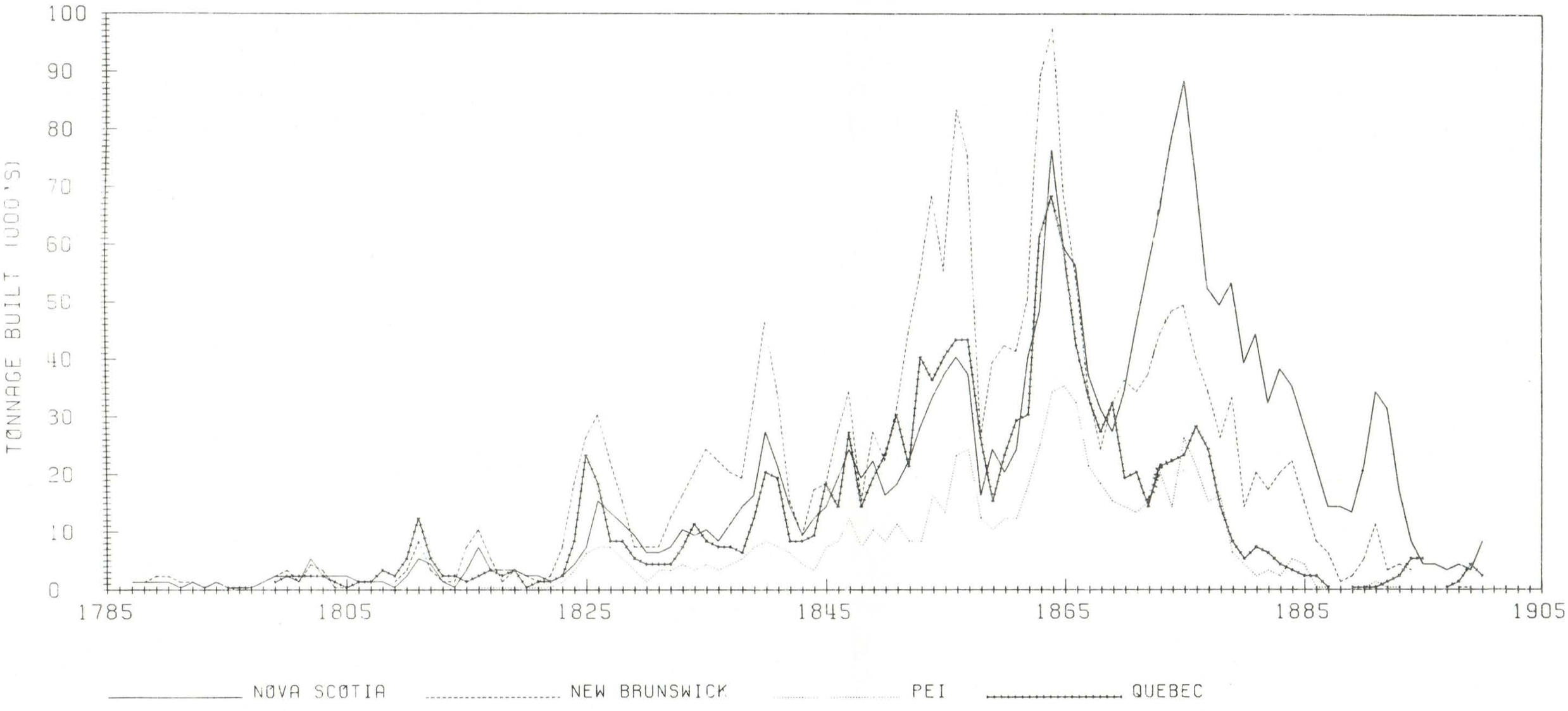


FIGURE 2: BRITISH-AMERICAN SHIPBUILDING BY PROVINCE (ADJUSTED DATA)



up of such-tiny vessels. That is something which could be tested using the Plantation Annual Lists themselves, since they enumerate every vessel registered at a particular colonial port and time. What is more interesting, however, is to speculate on both the motives and effects of New Measure, since it distributed its bonuses in the form of reduced operation costs to small vessels and its penalties to large vessels. If the act were intended to discriminate against colonial shipbuilding, it is difficult to know on the evidence that I have seen. But this must have been the result for there was then a concentration of big (British) shipbuilding in British America.

III

Having laid the thesis down in Part 1, and the evidence in Part 2, it remains for me here to try and knock them together. The first step attempts to demonstrate that the market for which ships were built in the Maritimes was essentially common, and the second endeavours to show that the dominant market influence was the British, by estimating the quantity of tonnage constructed in the Maritimes for sale, more or less directly, in Britain. The latter point, is for the purpose of the paper, the measury of British dominance. In the final section I survey the vessel that I have launched, noting her good and bad qualities so far as I can be the judge of them.

The frame of the first step rests on the simple premise that if ships were built in the Maritimes for a common market, then the production of the constituent provinces should reveal similar rates of change, rhythms and stages of growth (and decline). I do not deny the existence of a local market, but merely assert that it was, in the main, secondary. In order to illustrate the nature of the common market in the sense that it was a general phenomenon on the eastern shores of British America, I again employ Quebec, as a kind of control case.

TABLE 8

FREQUENCY OF AGREEMENT IN THE POSITIVE & NEGATIVE CHANGES IN THE DIRECTION OF PRODUCTION, 1788–1890.

	NUMBER	%
Instances all signs agreed:	42	41
Instances 3 signs agreed:	38	37
Instances of split:	23	22
	103	100
Frequency N.S. the Odd Province:	7	
Frequency N.B. the Odd Province:	4	
Frequency P.E.I. the Odd Province:	18	
Frequency Que. the Odd Province:	9	
	38	

Source: Derived from Appendix 1.

The time series of Maritime shipbuilding production are amenable to a variety of analyses. Here I will confine them to changes in the rate of construction, rhythms in production, and stages of growth.

Changes in the rate of construction submit readily to examination. In the first place we can determine whether or not production in individual provinces generally moved in the same direction by toting up the frequencies of agreement, partial agreement or splits in the signs of production movement. The main observation about Table 8 seems to be that shipbuilding in the four provinces was most often headed in the same way. One might have expected Quebec to have been the exception, but clearly the deviant (if such can be said of the pattern) was Prince Edward Island, although even this province was in step for 62 of 103 years. The timing of the splits in signs is noteworthy since it occurs mainly during turnabouts in the direction of production: in troughs on 13, and peaks on 4 instances; only once in 23 times did the split happen during the decline.

More significant, however, than the common direction in construction is the rate of its change. Here one has to be careful to distinguish between the short and medium term measures that could be applied. It seems advisable to adopt a measure of the second variety in order to illustrate the general character of the rate of change in production across the provinces over meaningful stretches of time. While one could opt for some such complicated procedure as taking a correlation of first differences,[15] a simple index of production for each province appears to be the most straightforward method; and the results of such an exercise are plotted in Figure 2. Again we see close similarities in the patterns of production, although this time it is Nova Scotia which, to a minor extent, departed from the norm. The deviation is likely due to the fact that Nova Scotia reached its all-time peak in production one cycle later than her sister provinces. But this does not substantially alter the pattern of propinquity in production pulsations, both in the short and over the longer term. Clearly the economic forces acting on British American shipbuilding were much the same.

TABLE 9

COMPARISON OF CYCLICAL PEAKS AND TROUGHS IN THE PROVINCES OF BRITISH AMERICA AND IN THE UNITED KINGDOM.

TROUGHS						PEAKS					
N.S.	N.B.	P.E.I.	Q.	M.*	U.K.	N.S.	N.B.	P.E.I.	Q.	M.*	U.K.
1796	1795	1797	1798	1795	1794	1802	1802	1803	1800	1802	1802
1809	1808	1809	1805	1808	1808-9	1816	1816	1817	1811	1816	1815
1822	1821	1821	1820	1821	1822	1826	1826	1827	1825	1826	1825
1830	1829	1830	1830	1830	1831	1840	1840	1840	1840	1840	1840
1843	1843	1844	1842	1843	1843	1856	1856	1857	1857	1856	1855
1858	1858	1859	1859	1858	1859	1864	1864	1865	1864	1864	1864
1869	1868	1871	1872	1868-9	1867	1875	1875	1875	1876	1875	1875
1880	1880	1881	1880	1880	1879	1883	1884	1884	—	1884	1883
1889	1888	1888	1888	1888	1886	1891	1891	1891	1894	1891	1992

Sources: British-America, derived from Appendix 1; U.K., Mitchell & Deane, 220-2.
*M = Maritimes

Even more striking is the unison of the provinces in their rhythms of shipbuilding. It is a characteristic that has been in strong evidence throughout the paper, and here it is given examination. Visual inspection of Figures 1-4 reveals a wave-like pattern that is clearly in the classic mould of the 19th century trade cycle. The waves, measured in the customary way from trough to trough, vary in length from 7 to 14 years. The syncronized registering of these and the peaks is nothing short or remarkable – like so many buoys together riding the swell of the imperial market. We might note, in passing, that the ups and downs in the Maritime production cycles closely align with those in British shipbuilding. The harmonious pattern of highs and lows is plain to be seen, in Table 9. Such deviation as occurs is minor in the sense that divergent years often were separated from the norm by only a few tons. Of course, seasonal rather than yearly analysis would allow us to determine the turning points with precision. We might observe that the cyclical factor could be isolated, not by the technique of moving averages since the interval of the cycles is uneven, but by 'detrending'.[16] For our purposes, however, the use of the data in its present form is sufficient.

If the amplitudes of the cycles of the provinces had been markedly at variances, then the argument being advanced here would have been considerably weakened. But as can be readily seen in Figure 3, the provinces registered broadly similar changes of expansion and contaction. There is a modest departure in the instance of Nova Scotia, attributable in part to the fore-mentioned late climax in production, and possibly in part to the first registration of much Nova Scotian built tonnage at Saint John, New Brunswick. This was apparently the only British American port to pick up major quantities of new tonnage built in another province; in the three decades following the mid 1820's, up to a quarter of the annual production of Nova Scotia was first registered at Saint John, although, as a general rule, the proportion was closer to a tenth (based on analysis of new registrations at Saint John).

The mean tonnage of vessels built in the Maritimes was sensitive to cyclical influence. Generally, on the upswing it increased, and, on the downswing, decreased. The Saint John experience in the cycle peaking in 1840 suggests that these fluctuations were not a change in the real size of vessels, but were, rather, a reflection of the changing proportion of ships and barques within the overall composition of the tonnage built; as peaks were approached, the relative quantity of such vessels rose, and as they were distanced, it fell – hence the mean tonnage moved accordingly. This pattern is to be distinguished from the secular trend in vessel size, which, until the middle of the 1870's, was on the rise.

We should observe the tremendous bunching effect in the cycle – on investment, employment, imports related to shipbuilding and so on – and that in consequence the satiety of one peak led by its own logic to dearth and then on to another bunching. It is important to note that, in terms of the argument of this paper, demand as a function of replacement tonnage and of changing trade levels is to be associated primarily with British (as opposed to British American) markets.

Lastly, cyclical fluctuation implies the existence of a basic lag factor, a constant lag in the adjustment of output to the real (contrary to perceived) demand. In the instance of British American shipbuilding, separated by the Atlantic from its market, there is the added consideration of possible lags due to distance – relating to market advice and

decisions, financial transfers, etc. Even though there was a radical acceleration in communication, there is no discernible trend in the lags, in Table 9, which can be associated with this transformation. If, as mentioned before, the data were organized around seasonal, or more finite time units, then we might be able to detect production lags which resulted from the time taken by information in crossing the Atlantic.

The financial aspect of British American shipbuilding is obviously of crucial importance. Yet the desultory nature of this department of Canadian historical writing is such as to offer us little that is helpful, and the subject is sufficiently large within the confines of shipbuilding alone to call for a separate study. The particular question here is whether or not the financial mechanisms in British America and in their connection to Britain caused production lags, on account of distance, or structural obstacles, or both. Without making a thorough canvass of the subject, we can take note of two points which indicate that financial lags were not of major consequence. The first is that a very large portion of ship materials used in British American shipbuilding were imported from Britain. The result was that a significant part of the investment in British American shipbuilding was actually effected in Britain. Such imports could represent a major item in trade. For example, ship's materials were much the largest import at Prince Edward Island in 1826 – three times greater in value than the runner up and traditional Maritime staple, rum.[17] And it was estimated in the 1862 New Brunswick Report on Trade and Navigation that the proportion of imported materials employed in the construction of 1,000 ton ship to class A1 at Lloyd's for seven years amounted to 30% of the value of the ship. The second point refers to the general practice of loading new British American vessels with timber and deals for the United Kingdom – the 'homeward' freight being placed against the cost of building. A rough estimate indicates that this was equal in value to 3–4 per ton, or from 30–40% of the worth of a new British American ship. Freight was frequently paid into the account of the shipbuilder, or shipowner, at the house of his British correspondent. Under the assumption that Britain was the main source of the capital employed in British American shipbuilding, we can see that given the practice in ship's materials and payment of freights half or more of the investment was made in Britain. Accordingly, the possibility of financial lags was sharply reduced.

In general, the lags between the United Kingdom and the Maritimes can be explained by the interpretation offered by Robin Craig, that the Maritimes were a secondary source of tonnage for the United Kingdom, and hence production lagged on this side of the Atlantic as orders came later in the cycle.[18] This notion can be applied to the peaks of 1816, 1826 and 1856, and to such troughs as 1858. However, there is contrary evidence. The Maritimes appear to have been the first to clamber out of the valleys of 1808, 1821 and 1830, when the tide of shipbuilding was running strongly in favour of British America. And if we look at the apparent lags by the Maritimes in troughs after 1860 in relation to the annual levels of sailing-ship construction in the United Kingdom, we find the lags disappear. That the building of sailing vessels lagged behind steamers in the later decades of the century was noted by A.K. Cairncross. He accounted for the situation mainly in terms of coal freights, these being directly, but in a lagged manner, related to the enlarged quantities of steam tonnage coming into service.[19] My point here is simply to note the strong possibility that Maritime shipbuilding was similarly keyed, although, as time went on, increasingly less directly.

The problem of the cycle, we may conclude, was known to some contemporaries. Glutted markets were commonly observed as the root of difficulties in shipbuilding during periods we now can recognized as troughs of business cycles. Various palliatives were touted, from a duty on colonial-built shipping (which was implemented) to the exercise of self-restraint by shipbuilders in respect of speculative construction. The final steep drive up to the peak, which R.C.O. Matthews has termed the maniacal phase of the cycle, finds precedent in the comments of that observer of New Brunswick shipping and trade, W.M. Smith. 'Many of our most intelligent Merchants and Shipowners', he wrote in 1863,

> are of the opinion. . .that the business of shipbuilding is being overdone at present throughout these British North American Colonies, and that ere long the supply will be found to be in excess of the demand, and a general crash will be the result. Such periodical reverse have occurred before.[20]

When a few years later the expected 'general crash' had arrived, Smith explained it in terms of British market conditions:

> Our Export Trade with the United Kingdom was much effected last year by the general stagnation of trade in that country, caused by the monetary collapse which took place last summer [1866] and the numerous strikes among the working classes, thereby seriously interfering with building and other operations which are the means of consuming large quantities of our wood. . .The interest on money continued unusually high in the United Kingdom during the first half of the year, which had a very prejudicial effect on the trade of this country, as both wood and ships generally become much depreciated in the English market when money is high.[21]

The object of this section is to determine the extent of the similarity between the stages of growth, or strictly speaking, the stages of life, of shipbuilding in the various British American provinces with which we are concerned. As is the established practice in this paper, we are not concerned with finding the first, last or any particular vessel, but rather with aggregate, provincial levels of production. We can define stages of growth as periods in which the provincial rate of change in production levels was roughly constant relative to its history there, or compared to an external measure. Here I think both must be used, since either measure taken alone would be misleading. In determining the peak year of British American production, for example, reference solely to British American data would yield 1864; but, the use of an appropriate external standard, say the output figures of shipbuilding in the United Kingdom, produces 1854 as the climax.(The latter is based on 'official' figures).

The calculation of constant rates of change is mechanical to a considerable extent, and is secondary to the problem of the selection of turning points. Even a slight change in the end dates of a period can substantially alter the 'growth' rate. For example, let us compare the results for Quebec taken over the same length of time with only marginally different begin and end dates. The formula for growth is $r = \left(\sqrt[m]{\left(\frac{Xn}{Xt}\right)} - 1 \right) 100$ where r is the desired rate of growth; Xn is the production for the last year and Xt for the first; and m is the length of the period.[22]

1811–1858: annual rate of growth = 1.4%
1810–1857: annual rate of growth = 4.2%

The difference between the two rates can be considered extreme. I deliberately chose years which would emphasize the range of variation and the sensitivity of the calculation to the dates employed. It is preferable to employ a more sophisticated measure of growth rate, one which takes into account not just the end observations, but the intervening ones as well. Regression analysis offers such a procedure, but cyclical effects and the absence of linearity over the long term pose difficulties of application. Even if this method had been used formally in the paper – I rejected it in this instance because of the difficulties outlined above – the selection of the end dates would remain the key to a successful approach. It calls for an exercise of historical judgement in the wide sense, based on all the varieties of evidence.

We can identify five stages in the life cycle of British American shipbuilding, and they are advanced tentatively, as they must be given the nature of the problem. They are as follows: the beginning phase; two stages of growth; a period of maturity; and the time of decline.

The beginning phase can be dated *circa* 1787–1808. It is difficult to fix the opening year with precision. There was apparently little building before the American Revolutionary War, and that was mainly confined to Newfoundland.[23] But by 1787, it was well underway, judging from ship-registration data first available for that year. Therefore we can assign the beginning of construction to sometime between 1776 and 1787, and suppose that it occurred at the end of hostilities between the Thirteen Colonies and Britain. The use here of 1787 is arbitrary, and perhaps a bit tardy, but convenient because of the availability of quantitative data. It is pertinent to point out that the inauguration of the British registry system, that created the data, and of British American shipbuilding were closely related developments; both were spawned by the American achievement of independence, the one laying the formal legal foundation for the imperial economic process of the other. Within the beginning phase, given these outside dates, there is no marked trend in production, although in the case of Quebec there is modest growth. Increased shipbuilding there was doubtlessly linked to the rising timber trade in the St. Lawrence valley, and the not unrelated drive by British shipbuilders to circumvent acute timber shortages. This probably explains the migration to Quebec city of the Beatsons from the Thames, and the Munns – Alexander and John Sr. – likely from Scotland. This does account for the extension of the shipbuilding firm of Scotts of Greenock to Saint John in the late 1790's; according to letterbooks in the company's possession, a younger member of the Scott family, Christopher, was in charge, and he soon had a sizeable shipbuilding operation underway in the New Brunswick port.[24]

On the turning points, 1809 is one of two about which there can be little debate (the other being 1875). It has been described many times, in terms of the take-off of the timber trade, and here we need only remark that there was a similar acceleration in the rate of ship construction. Even Prince Edward Island showed flickers of building at this time.

For both the second and third phases, the prime determinant in delineating their dates is in my opinion the Maritime share of the imperial market for new ships. This is an easier idea to express than to demonstrate, because of the cyclical pattern of production,

and the somewhat different results which obtain from the official and the reconstructed data series. Nonetheless, it can be seen fairly conclusively that the Maritimes increased their share of the imperial market in both troughs and peaks with some regularity up to the crest of the middle 1850's. Whether the year of the turning point at the end of the period is 1854 or 1856 is a moot point statistically. Because of the tremendous optimism that ran through Maritime shipbuilding in the winter of 1853-4 and during the following spring and summer, and because the Maritime performance against the United Kingdom was more impressive in the earlier year, my choice is that year, 1854.

Thereafter up to the next peak, Maritime production rose absolutely, but declined relative to British production. This short period of ten years, 1855-1864, I denote the third phase.

The fourth, maturity, can be identified as the next cycle, taken from peak to peak. It might better be described as the first period of decline, but the indicators are mixed. Nova Scotia struck her all-time high in the crest of the cycle. However, for the Maritimes as a whole, production fell off, and the decline relative to the United Kingdom, both in quantity of tonnage launched and in vessel technology, was now accelerating.

There is no mistaking the vertiginous descent after 1875. That turning point, as clearly marked as 1809 was for the start of the ascent, establishes the last phase. There were some minor flourishes at recovery, but the trend was sharply downwards. Whether we can declare shipbuilding dead by 1887, the end of the 1880's, or some later date does not much matter. By either of our measures, the construction of wooden merchant ships was now moribund. Of course the ten cent schooners would be built for decades to come, but they were a late and insignificant product.

Let us look at the results of the measures of growth, in Table 10. Because of problems of serial correlation and linearity in regression analysis, the measures are confined to the simple calculation of growth rates, and thus the interpretation of the results must be tempered by the effect that end dates can have. The first stage was left out because of the absence of conspicuous trend.

TABLE 10

ANNUAL GROWTH RATES IN THE 'STAGES OF GROWTH' OF BRITISH AMERICAN SHIPBUILDING

PROVINCE	STAGE 2: 1809-1854	STAGE 3: 1854-1864	STAGE 4: 1864-1875	STAGE 5: 1875-1887
Nova Scotia	7.4	8.4	1.4	−16.0
New Brunswick	8.0	2.7	−6.1	−17.4
P.E.I.	7.2*	7.0	−2.3	−25.5
Quebec	5.5	6.4	−9.7	−27.8

*The beginning date used in calculating this figure was 1820, selected as a representative figure since Prince Edward Island entered Stage 2 later than the other provinces.

Source: Derived by the formula given on p. 133 and from the data in Appendix 1

There is a clear similarity of provincial performance on the basis of the stages I have established. It should be noted that the turning points selected mean that the rates have

been measured from a valley up and across three peaks down to the last valley, and that therefore the rates in stages 2 and 5 have an upward bias. The departures from the norm are worth comment. Prince Edward Island was late into the growth stage, as indicated in the note to the table; New Brunswick's growth was the first to slow; and Nova Scotia was the last to enter the chute. It is an indication of the validity of the inclusion of Quebec as a test province in that it conforms most closely to the general pattern.

To summarize, if the data and dates that have been used are accurate, then it appears that the four provinces produced new shipping in close harness. Whether or not the harness was there we leave to the last section of the paper. While the violence of the short-term fluctuations in production has posed a certain difficulty in the precise description of the longer-term performance, nevertheless the readily apparent synchronization of the short-term swings, cyclical movements, and trends leaves little doubt that the provinces were in the same market area. The question now becomes, was the market British?

There are at least two ways by which the market of our concern could be reduced into its 'national' components, one by the residence of the ownership of new vessels, and the other by the relationship between the existing stock of shipping and production. The ideas underlying both are straightforward. The former would comprise, within given periods, the simple toting up of the quantity of tonnage built for owners resident in British America, and, separately, the amount for those in the United Kingdom; and the latter would consist of disaggregating a particular production into portions according to two national criteria – services of the native stock of registered shipping, and export. The first approach is, however, disqualified by the problems encountered in determining the actual, geographical residence of ownership and in disentangling real ownership – both on a numerically large scale. We are left, then, with the second approach, which, while less precise theoretically, tackles both the central issue of the nature of the market and the practical problems in working it out. And it raises a number of points of some technical complexity and interest, in particular the assessment of the size of the British American stock of shipping over time, of the rates of its wastage, and of the mean lifespan of British-American-built vessels.

The quantity of tonnage exported is taken for our purposes as the indicator of the Britishness of the market. It is derived, on an annual basis, by the formula:

$$T_{uk} = T_b - T_r - T_c$$

where T_{uk} is the desired tonnage, T_b is tonnage built, T_r is replacement tonnage, and T_c is the tonnage comprising the change in stock size. And the actual measure of British dominance is calculated by:

$$M = \frac{T_{uk}}{T_b} \times 100$$

where M is the desired measure. Two assumptions made in the formulae are that all tonnage registered in the Maritimes was built there, and that all tonnage exported was destined for the United Kingdom. Neither is strictly true. During the War of 1812 and the American Civil War, a certain amount of extra-Maritime-built tonnage found its way to registry in Maritime ports; and throughout the period there was a continuous trickle of Maritime-built shipping to Newfoundland and the West Indies. The only possible

significant statistical intrusion posed by any of these was limited to the short period, 1812-1813, in the accession of prize vessels to registry at Halifax and Saint John; but, over the longer term they can be ignored, as they are in the above equations.

The derivation of T_b, T_r and T_c require discussion. The value of T_b for British America are simply transposed from the official series, as given in Appendix 2. These data, rather than that from the adjusted series, are selected on the basis of comparability with registered-tonnage figures, which are in official values, and which could only be translated into adjusted numbers by a most laborious operation based on a year-by-year analysis of the Plantation Annual Lists, or reconstruction of the registry. The values for T_r and T_c are keyed to the stock of British American shipping at particular times, i.e. to the figures of annual registered tonnage; and their derivation, especially the former, is rather complex.

The problem of replacement is in fact the problem of wastage, and it is closely akin to the matter of calculating the 'crude death rate' of an human population. Ideally, to discover the wastage rate of British American ships, one should be able to determine for particular points in time the size and composition of the cohorts, but, despite the excellence of the raw data available from registry, these objects because of the labour required to organize the data lie well beyond what is possible here. In practice, it is necessary to work with the accessible information – registration aggregates and mean lifespan of vessels. And in order to compute wastage, it is essential to have reliable registration figures with which to work.

It was (and is) the nature of the British registry to over record the quantity of shipping registered due to two elements in the system. The first was the practice of maintaining vessels on the register until proof was offered to the contrary. Thus if administration of closures was lax, either at the port or central level, inflation in the size of the registered stock could gain serious proportions. It caused considerable hand-wringing among Customs officers, to say nothing of the difficulties it has posed for historians. Periodic customs-house cleanings occurred in attempts to tidy up registration, and a more thorough study of these is needed in order to assess their effect. The re-registration of the entire British merchant marine in the middle 1820's is a well known instance of registry tidying. In consequence, upwards of 10% of the registered tonnage was swept out of the total for the United Kingdom. This, which is an effective measure of over-recording in the British context in 1824 and 1825, was a good deal more modest than that which was obtained in British America at the same time, judging from the example of Quebec (then the only port of registry in Lower Canada). This is not surprising, perhaps, considering the relatively enormous flux in registrations experienced by British American ports on account of the high ratio of tonnage built to tonnage registered. At Quebec in 1825, some 24,500 tons of newly built shipping were registered (derived from PRO, BT 107). This very large production gives perspective to the data listed in Table 11. Nominally the stock of Quebec registered shipping in 1825 (as of 31st December) was 31,689 tons – the sum of the first two categories enumerated in the table. But the quantity of over recorded tonnage identified by the Quebec compilers of the Plantation Annual List under the heading, 'Vessels neither entered nor cleared but on register', amounted to no less than 62% of the nominal total (that category was maintained for a further two years, at which time the vessels concerned were struck off

the register). A letter from the Quebec collector to the commissioners in London provides a particular explanation of the Quebec situation, as well as a more general insight into the difficulties of maintaining an accurate account of shipping registered at active shipbuilding ports in British America.

> With respect to those outstanding on our books previous to that date [1824] we beg leave to observe that we have no reason to believe any now exist, with the exception of a small Steam Boat plying as Ferry Boat at Montreal. The greater part of these vessels appear to have been river craft and fishing vessels employed in distant parts of the Province, not any of whom have been at this Port for years past. . . .the larger vessels outstanding prior to 1824 proceeded originally to the United Kingdom where they no doubt have been sold and registered *de novo,* but as we have not received an intimation thereof, they continue to remain borne on our Books.[25]

The upward bias of the system remained, despite an increasing frequency after this of checks by Customs officials.

TABLE 11

ABSTRACT OF THE 1825 PLANTATION ANNUAL LIST FOR QUEBEC

	NUMBER	TONNAGE
Vessels in existence for certain	115	12,014
Vessels neither entered nor cleared, but still on register	382	19,675
Vessels 'per certificate'	13	3,814
Vessels cancelled	125	30,613

Source: PRO, BT 162, Plantation Annual Lists

The second disquieting feature regarding the accuracy of registered tonnages derives from the practice of 'transactions'. These, introduced as a result of the Merchant Shipping Act of 1854, were quasi certificates of registry. Subsequent to the first registration of a vessel after 1854 (effected by the taking out of the accustomed certificate), many if not most of the changes in its description and, more important here, ownership were recorded by 'transaction' (rather than by obtaining a new certificate as was often the case previously). Thus vessels could, and frequently did, remain registered at a port long after their ownership, and operation, had shifted away. A further, pertinent stipulation of the 1854 act allowed registration at any British port, in contrast to earlier statutes which required vessels to register at their home ports. The situation was compounded by the registration duty in Britain (during the early 1860's if not before) of 1 s. per ton on colonial-built ships. Thus the system of registry allowed, and the duty encouraged the retention of British American vessels on British American registry even though their ownership and operation were likely to have moved to a British port. As far as New Brunswick is concerned, W.M. Smith reckoned that such tonnage amounted to nearly 20% of the provincial total on occasion. It is one thing to recognize the problem, but another to document it, for in the instance of 'transactions', their format and the method

NOTES

- Shaded areas is the range of the estimate
- Top line gives annual production, in 000's
- Tonnages are in official values
- Raw data is missing for 1871-2

SOURCE

- My worksheets T4.852, copies of which are available on request

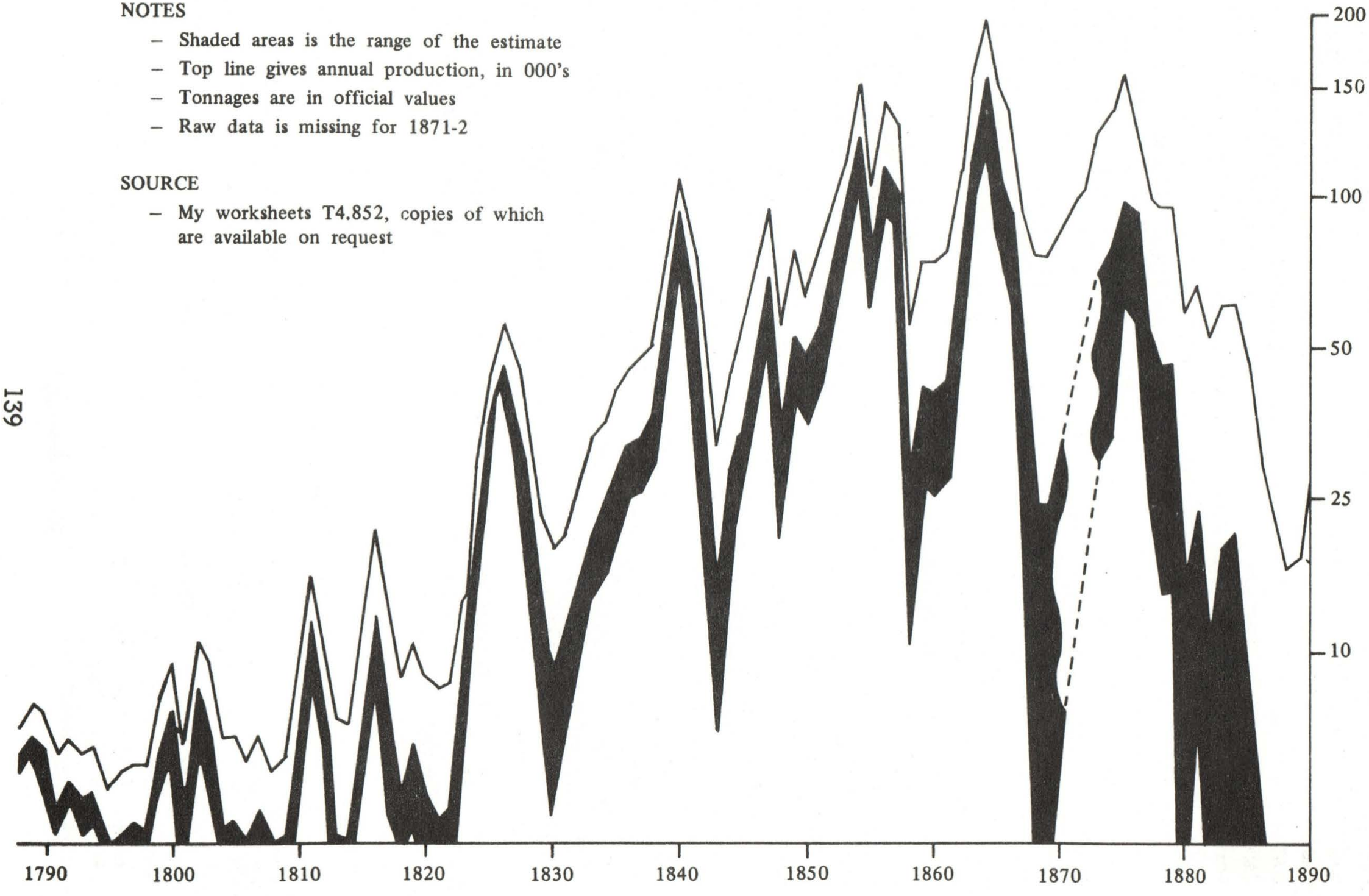


FIGURE 4: BRITISH-MARKET SHARE OF MARITIME SHIPBUILDING, 1788-1890: An Estimate Giving the Range of the Share

by which they were filed make the tracing of the history of their ownership in the large numbers required prohibitively time-consuming. There is the further consideration whether or not registration procedures, including 'transactions', accurately reflected the comings and goings of Maritime *cum* British shipowners. Taking the example of Saint John in 1874, how do we know David V. Roberts, James Nevin, James H. Moran and the multifarious Vaughans, all with substantial tonnages registered at that port, were not only residents there, but, as well, shipowners whose ships operated from the port? It seems to me that these men could easily be described as Liverpool shipowners, and that the tonnage which is ascribed to them in the Saint John list[26] could well be enumerated under Liverpool or some other British port. To what extent this situation was paralleled at other Maritime ports is not clear, but for Saint John in 1874 about one-quarter of the port's tonnage can be so identified. It is important to note that in this respect we have only been dealing with registered owners, and that, therefore, the afore-mentioned difficulty – the effect of transactions on the record of ownership and the port of operation – is not even touched on.

We have seen in general terms the more serious shortcomings of the registration system insofar as producing accurate accounts of registered tonnages. Since we are anxious to obtain reliable registration figures, we arrive at the question: how do we translate these shortcomings into numerical values? Any single number that might apply to Saint John at a particular date may well be inappropriate for other years at the same port, and certainly, it is unlikely that it could be applied to the other Maritime ports. The achievement of an exact measure is beyond the scope of the paper. There is, however, an approach which, while not as precise as may be desirable, is practicable: namely the application of upper and lower limits in the estimate of over recording. We can assume, thus, that the greatest amount by which the aggregate tonnage figures for the Maritimes were inflated was 30%, and the least, 20%. The roundness of the numbers indicates their arbitrary selection, and the range, based on the examples we have looked at, is both narrow and, what is more significant, conservative. At the same time, the range allows for variation over time and between ports, as well as for the testing of the results by one limit against the other.

In taking up the problem of replacement tonnage, we immediately confront the topic of the lifespan of British American vessels. Table 12 gives the results of two samples, totalling 879 vessels:

TABLE 12

LONGEVITY OF 'COLONIAL BUILTS'

NO. OF VESSELS		TONNAGE	MEAN AGE
(1)	379	na	13.2
(2)	500	*427300	14.6

*Because of the way the data is arranged in the source, the tonnage for two of the twenty-one builders could not be stated exactly. Hence the total may be slightly out.

Sources: (1) Derived from Craig, 'British', Table 5. (2) Derived from Wright.

The first consists of vessels built in Prince Edward Island between 1820 and 1900; and the second is based on the production of 21 shipbuilders of Saint John, with a more even spread across the same decades. The closeness of the means is suggestive of their accuracy, but it must be observed that temporal, trade and trend variations have been extinguished in these figures. Most of the vessels in the table were export models, and these assuredly had different patterns of longevity than the vessels which remained behind. In contrast to the broad approach in finding means in Table 12, there is a differently-based analysis that I made of the history of all the new vessels first registered at Saint John in 1835 (the 1835 cohort). The results indicate a mean lifespan of 10 years. This figure is perhaps indicative of the lower limit in the range of mean longevity of British American vessels. Without becoming involved in a detailed examination of the subject, we can for our present purpose accept the results of these samples as specifying the range, in round numbers, 10 to 15.

One further step is required in obtaining the values of T_r, in the specification of the relationship between lifespan and replacement. Since we do not have cohort data, a substitute procedure is employed as follows. It is assumed that all the cohorts had the same size and wastage rates. These are dangerous assumptions, particularly in the case of size since, given the cyclical nature of shipbuilding, cohorts obviously varied widely in this respect. But until the stock of shipping of any one of the Maritime ports at particular moments is thoroughly studied, the effect of cohort size on wastage/replacement rates will remain a matter for speculation. It follows from the above assumptions that the replacement values, T_r, lie within the range of 1/15 to 1/10th of the adjusted registered tonnage figures.

Finally, there is the derivation of T_c, the change in stock size. Unlike the production profile, the registered tonnages show a generally smooth upwards progression, at an annual rate of between 4.1 and 4.4%, from 1788 to 1878, and thence downwards at 1.9% per annum (calculated by the method on p. 133). Thus the value for T_c are simply obtained by the employment of these percentages, rounded to four and two respectively, as factors of the adjusted registered tonnages.

The measuring of the British market share of Maritime shipbuilding is now a straight-forward application of the formulae and values. The result is three data series, all in official tonnages: tonnages built; the maximum estimate of the British share; and the minimum estimate of the British share. They are illustrated in Figures 4 & 5.1–5.3.

The three series are plotted in Figure 4. It provides strong visual clues to the importance of the British market, notably during the years of sharply rising production. And the narrowness in the range of the estimated share up until the later 1860's appears to confirm the validity of the methods employed in obtaining the estimates. However, since the tonnage values are arranged after the manner of a logarithmic scale, the apparent correlation between the range of the British market share and the level of British American building is exaggerated.

Far more precise and meaningful representations of the data series are found in Figures 5.1-5.3, where they are broken down into the five stages of the life cycle of British American shipbuilding, and into the trough and peak years within those stages. On the basis of Figure 5.1, my argument about British dominance finds support which is feeble at best, for only in stages 2 and 3 was the British market share dominant; and over

FIGURE 5.1: BRITISH-MARKET SHARE OF MARITIME SHIPBUILDING BY THE 5 STAGES

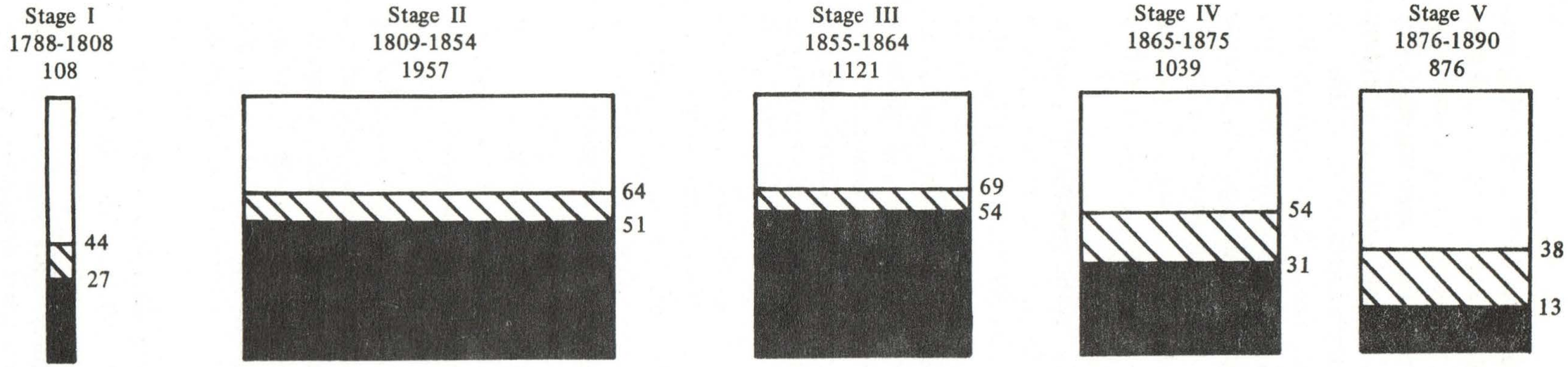


FIGURE 5.2: BRITISH-MARKET SHARE BY 'TROUGH' YEARS IN THE STAGES

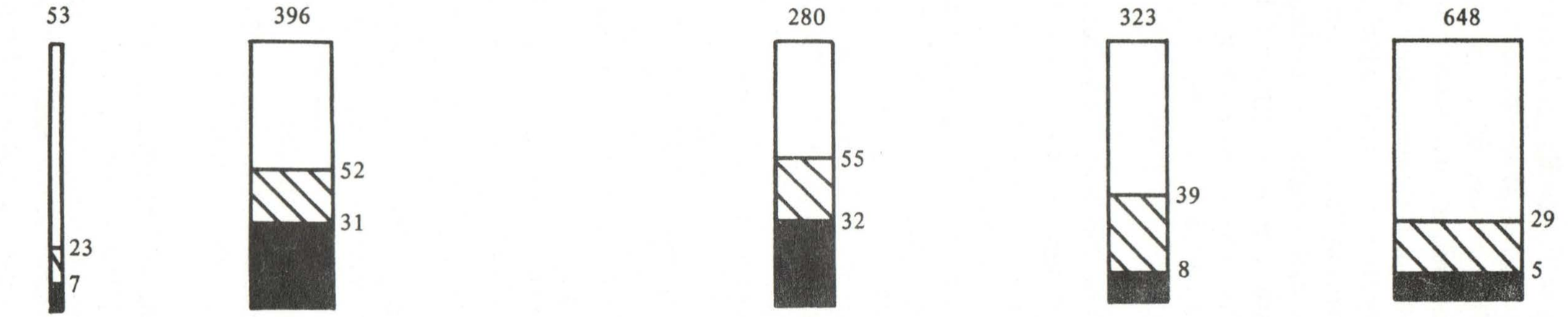
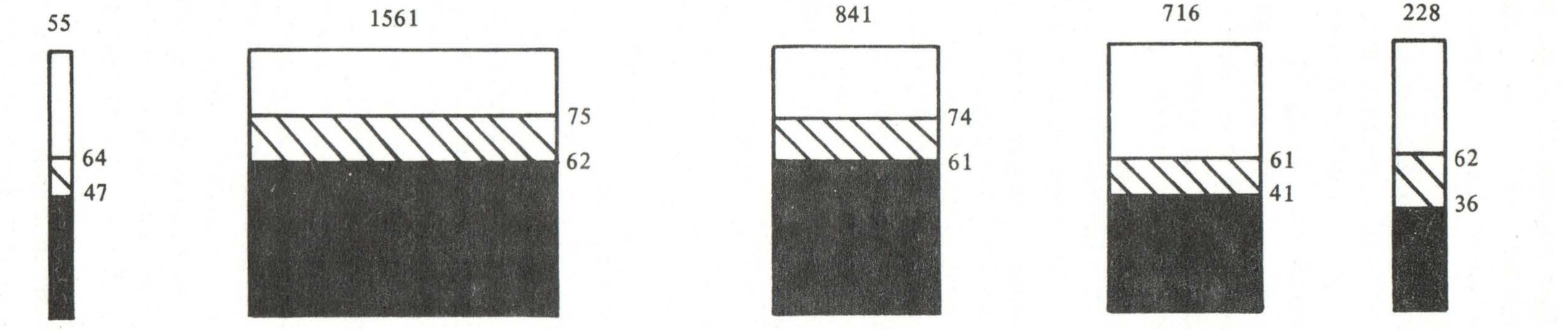


FIGURE 5.3: BRITISH-MARKET SHARE BY 'PEAK' YEARS IN THE STAGES



Source: My worksheets, T4.855

000 Tons, in 000's & official values

Home market share

00 Limits of estimates of British-market share
00

Minimum British-market share

the whole period, the lower limit in the estimate of the British share of the market works out to only 41%, thereby throwing cold water on the thesis of British dominance. On the other hand, the disaggregation within the stages of production by trough and peak years reveals in Figures 5.2 and 5.3 respectively a clear pattern of British dominance, negative and positive. Respecting the first, the British market share ran at a respectable level only during the stages of growth, and otherwise sank, possibly as low as 5%. But during the peak years, illustrated in Figure 5.3, the British market share was unmistakably preponderant, ranging between a minimum of three out of five to a maximum of three out of four tons built over the long period, 1809-1864. Approximately twice as much tonnage was constructed in peak as opposed to trough years, and about the same proportion of the output was made during the stages of growth. The conclusions are clear. In the periods of growth and peak years, the British share of the market was much the largest. And during the periods of decline and of trough years, it was much the smallest. To the extent, then, that the market influence was critical – and I maintain that it was – the British market dominated Maritime shipbuilding in its dynamic and most productive phases. All the more conspicuous are the small and negligible portions of the market ascribed to Britain in the remaining years, whether during the cyclical falls in production or the secular chute after 1875. It seems reasonable to conclude that, according to the definitions established in this paper, British dominance of Maritime shipbuilding has been measured, over both its rise and its fall.

I have tried in this study to bring together a comparatively little known subject – the geographically and chronologically widespread manufacture of ships in British America, a series of sources which I perceive to be of unusual value in their detailed comprehensiveness, and an objective of determining the fundamental factor of influence on the economy of shipbuilding. Whether or not I have persuaded anyone (other than myself) is not for me to say. A lengthy summary would only be repetitive, but a review of what I think are the main characteristics of the essay may be useful in placing its conclusions in perspective.

The main sources on which the study rests are those which were generated in British ship-registry practice: the certificates of registry, 'certificates', Plantation Annual Lists, accounts collected and or published by one or other of the various governments concerned, etc. The particular information taken from them – aggregates of tonnages built and registered – is of the quantitative variety, and this use of ship--registry data is particularly appropriate, if novel in the Canadian context, because of the comprehensive nature of registry. Problems in the interpretation of registry material stem from gaps, changing registry criteria (especially in tonnage measure), systemic shortcomings (particularly regarding the annual accounting of tonnages registered), and the sheer volume of it. On the other hand, these problems are perhaps to be expected with such a long series, and, moreover, are not insuperable barriers to their use. After all, the documentation of registry comprises an archive of rare completeness and antiquity, and not the least of its merits is its duplicated and tiered documentation, which allows the reliability of its evidence to be assessed with considerable confidence. Although I have made major inferences concerning the ownership of British American vessels, I have not in this paper actually utilized the wealth of data which exists in the registry sources on ownership. Similarly have I generally ignored the evidence about ship masters, and the

description of vessels, in terms of rig, dimensions and age. All of these aspects point to the richness of the registry records as an historical record, and to the advisability of the establishment of a machine-based bank of its data in order to make it accessible and to facilitate its analysis. In compiling the statistical series of British American shipbuilding, found in Appendices 1 and 2, I had to come to grips in practical manner with the problems in the interpretation of the registry sources, and on the accuracy of the results rest the conclusions of the paper. On another plane, however, the existence of these series as rare indices of the British American economy are testimony to the value of the evidence to be gained from the documentation of ship registry.

The method of the study, mainly quantitative and analytical, derives on the one hand from a focus on general process, and on the other hand, from the nature of the sources. Since the latter contained information which comprised a full record of production, there was an opportunity to study the general process. Thus a key methodological perspective of this study is the use of tonnage-built figures as basic evidence defining the dimensions of shipbuilding: an obvious and simple point, but none the less important. At the particular level, there is the question of method in terms of the assumptions, conversions, equations, and estimates made in the course of the paper, not least in measuring dominance. Each aspect is in certain respects an exercise in quantification, and upon each there is more or less dependent the validity of the argument and conclusions of the essay. The general feature which they share, to a greater or lesser extent, is explicit formulation and presentation of evidence.

Finally, there are the key premises in the study, and they can for the present purpose be viewed in terms of the idea of the market. First, within the economy of British American shipbuilding, the market is seen as the centre of the system – that the actual activities of construction are secondary in the causal chain. And, therefore, as the second point, the dominant market share (50 plus per cent) indicates the dominant influence on the shipbuilding process as a whole at specific times; and certain moments, especially the periods of growth, are held to be more important than others. These are, I think, respectable ideas, but, in their application to the historic market function in British American shipbuilding, they are undoubtedly simplistic in certain respects. This point might better have been discussed under method, but it has such an important bearing on the general argument of the paper that it is placed last. Under the method and theory of the study, all economic functions other than the market were subordinate to it. Purely as a concept, this can, perhaps, be accepted. But it has been employed here as a working hypothesis, and therefore has reduced, necessarily, the complex and real nature of the market as it worked, over a wide area and for slightly more than a century, to a model of highly simplified, even static, dimensions. In its defence, it should be pointed out that the built in range of the estimated British share of the market is probably at times on the conservative side, and that the range is flexible enough, possibly, to incorporate historical reality. Nonetheless, in choosing to determine the British market share by a method dependent upon a series of estimates of the native stock of shipping and of how much tonnage was required to service it – the remainder being the British share – I sidestepped two major historical difficulties. On the one hand there is the problem of identifying the actual operation of the market, easy in the abstract, but not in the reality of thousands of situations. These can, of course, be reduced to a small number of categories – mainly

building under contract and speculative building – but the difficulties in recognizing these, as already mentioned in the body of the paper, are insurmountable in other than a small number of instances. On the other hand, the model of the market employed here assumes firstly that it would not draw off more tonnage from British America in a given period than was constructed; secondly, that it was confined to new vessels; and thirdly, that tonnage going to market was of the same quality. Nothing further needs to be said on the problem of recognition, but as far as the model of the market is concerned, it is easy to demonstrate that it is out of step with historical reality. On the basis of an analysis I made of all the tonnage 'exported' from Saint John and Quebec before 1856, as revealed in the certificates of registry, it is clear that these British American ports occasionally exported more tonnage to Britain than they built. Similarly, it appears that the British mainly took new ships, but at the same time they registered substantial quantities of second-hand tonnage; and it is obvious that there was a wide variety in the quality of tonnage going to Britain, from East Indiamen and clippers at the top of the scale down to cheap timber droghers at the bottom. It would appear, then, that the market model employed in this paper must be recognized for being a crude one. But that does not necessarily make it inaccurate in specifying the magnitude of the problem.

TABLE 13

A TEST OF THE ESTIMATED RANGE OF THE BRITISH SHARE OF THE MARKET FOR WHICH SHIPS WERE BUILT AT SAINT JOHN & QUEBEC, 1840-1849

	TONS	% OF TONNAGE BUILT
Tonnage built at Saint John & Quebec	447,700	–
Upper limit of estimate of British market share of tonnage built at Saint John & Quebec	317,400	71
Lower limit of estimate of British market share of tonnage built at Saint John & Quebec	252,100	56
Saint John & Quebec-built tonnage first registered in the United Kingdom	388,700	87

Sources: Derived from PRO BT 107, and PAC RG 12

In Table 13 we see that Quebec and Saint John exported a substantially higher proportion of their tonnage in the 1840's than our model would indicate. Even though the two can not be directly equated, since registration in Britain is not a perfect measure of the British market, nor Saint John and Quebec wholly representative of British American shipbuilding, still we can reasonably infer from this test that the model, if it errs in its results, does so in all likelyhood on the conservative side. And certainly, the test more than confirms its conclusions. This should not occasion any surprise, when the very high ratios of tonnage built to tonnage registered of British American ports are recalled. In conclusion, we might note a contemporary and casual usage of language which denoted the British dominance of Maritime shipbuilding: new ships for the British market were sent 'home'.

NOTES

I wish to record my thanks to three people associated with the McGill Economics Department for generous help with quantitative and theoretical problems: Julia Klinesek, Manager of the Statistical Lab; Jake Knoppers, post doctoral fellow; and J.C.R. Rowley, faculty member.

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APPENDIX 1

BRITISH AMERICAN SHIPBUILDING, 1787-1900: ADJUSTED DATA

YEAR	NOVA SCOTIA		NEW BRUNSWICK		P.E.I.		MARITIMES		CANADA		CAN–MA		QUE	
	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons
1787	33	2.0	10	0.9	2	0.2	45	3.1	3	0.3	61	3.9	3	0.3
1788	40	2.7	16	2.4	0	0.0	56	5.1	4	0.2	64	5.7	4	0.2
1789	43	2.8	28	3.7	1	0.1	72	6.6	3	0.2	75	6.7	3	0.2
1790	28	2.1	24	3.8	3	0.2	55	6.1	8	0.6	59	6.6	8	0.6
1791	15	1.1	18	2.6	3	0.1	36	3.8	6	0.3	42	4.3	6	0.3
1792	40	2.1	19	2.3	3	0.2	62	4.6	6	0.6	68	5.1	6	0.6
1793	36	1.8	13	1.8	1	0.2	50	3.8	7	0.4	61	4.3	7	0.4
1794	31	2.0	15	2.2	4	0.1	50	4.3	6	0.8	57	5.1	6	0.8
1795	26	1.6	5	0.4	3	0.1	34	2.1	10	1.0	49	2.8	10	1.0
1796	31	1.3	12	1.5	1	0.1	44	2.9	10	1.1	50	3.2	10	1.1
1797	29	1.6	10	1.7	0	0	39	3.3	10	1.4	42	3.5	10	1.4
1798	35	2.6	5	0.4	5	0.2	45	3.2	8	0.8	55	4.1	8	0.8
1799	52	3.4	17	3.0	4	0.2	73	6.6	14	2.5	86	8.4	14	2.3
1800	40	3.9	23	4.3	11	1.4	74	9.6	16	3.6	91	13.2	16	3.6
1801	34	2.1	17	2.4	4	0.2	55	4.7	22	3.3	76	7.9	22	3.3
1802	64	6.5	27	5.1	6	0.3	97	11.9	19	3.3	117	15.1	19	3.3
1803	56	3.7	27	4.3	11	0.7	94	8.7	21	3.0	117	11.4	26	3.0
1804	46	3.0	5	1.0	8	0.6	59	4.6	22	2.5	81	6.6	22	2.5
1805	60	3.3	9	1.3	1	0.1	70	4.7	10	1.5	82	6.3	10	1.5
1806	50	2.4	8	0.7	4	0.3	62	3.4	14	2.2	78	5.2	14	2.2
1807	40	2.2	18	2.0	7	0.4	65	4.6	12	2.3	77	6.8	12	2.3
1808	26	2.1	4	0.4	8	0.5	38	3.0	15	4.2	52	7.2	15	4.2
1809	24	1.4	15	2.2	1	0.1	40	3.7	21	3.2	61	6.9	21	3.2
1810	52	3.0	32	4.6	3	0.2	87	7.8	36	6.5	123	14.3	36	6.5
1811	107	6.2	66	9.6	7	0.5	180	16.3	54	13.8	234	30.1	54	13.8
1812	94	5.9	23	4.8	15	1.1	131	11.8	34	6.4	165	18.2	34	6.4
1813	48	2.8	12	2.3	7	0.5	67	5.6	18	3.3	85	8.9	18	3.3
1814	26	1.4	13	2.4	16	1.4	55	5.2	15	3.3	70	8.5	15	3.3
1815	62	4.0	41	8.1	2	0.1	105	12.2	22	2.6	127	14.9	22	2.6
1816	152	8.1	74	11.9	17	1.0	243	21.0	25	3.0	268	24.1	25	3.0
1817	70	4.6	50	6.1	29	1.9	149	12.6	27	4.1	176	16.8	27	4.1

1818	80	4.7	31	2.5	18	1.2	129	8.4	33	3.1	162	11.5	33	3.1
1819	100	4.8	39	4.5	16	1.8	155	11.1	25	4.0	178	15.0	25	4.0
1820	72	3.2	30	3.4	17	1.7	119	8.3	14	1.9	133	10.2	14	1.9
1821	86	3.9	24	2.4	16	1.4	126	7.7	18	2.3	144	9.9	18	2.3
1822	50	2.5	30	3.9	14	1.6	94	8.0	18	2.6	112	10.7	18	2.6
1823	63	3.2	44	8.1	23	2.9	130	14.2	31	3.8	161	18.0	31	3.8
1824	87	5.5	81	19.4	31	4.1	199	29.0	29	9.8	228	38.8	29	9.8
1825	101	8.1	169	27.9	37	7.3	307	43.3	83	24.5	390	67.9	83	24.5
1826	158	16.6	125	31.2	48	8.0	331	55.8	78	19.4	409	75.1	78	19.4
1827	142	14.7	114	23.9	46	8.9	302	47.5	60	9.2	362	56.7	60	9.2
1828	160	12.9	67	16.9	54	6.2	281	33.0	61	9.7	342	42.8	61	9.7
1829	145	10.4	60	8.1	47	4.3	252	22.8	30	6.0	282	28.8	30	6.0
1830	123	7.4	46	8.1	34	2.7	203	18.2	25	5.1	228	23.3	25	5.1
1831	108	7.8	56	8.5	48	4.3	212	20.6	27	5.8	239	26.4	27	5.8
1832	113	8.5	69	13.8	43	4.3	225	26.6	26	5.5	251	32.1	26	5.5
1833	126	11.0	89	17.0	46	5.6	261	33.6	38	8.1	299	41.7	38	8.1
1834	128	10.4	88	21.9	34	4.3	250	36.6	49	12.4	299	49.0	49	12.4
1835	120	11.1	95	25.8	43	5.6	258	42.5	33	9.1	291	51.6	33	9.1
1836	137	9.4	103	23.6	36	4.0	276	37.0	37	8.8	313	45.8	37	8.8
1837	160	12.3	99	21.2	45	5.9	304	39.4	39	8.2	343	47.6	39	8.2
1838	209	15.8	116	20.7	46	6.0	371	42.5	33	7.4	404	49.9	33	7.4
1839	223	17.8	151	33.2	69	8.5	443	59.5	45	13.2	488	72.7	45	13.2
1840	239	28.9	162	47.8	77	9.4	478	77.1	61	21.3	539	98.4	61	21.3
1841	190	22.5	118	35.2	63	8.4	371	66.1	66	20.4	437	86.5	66	20.4
1842	159	15.2	82	16.9	65	7.7	306	39.8	59	9.7	363	49.5	59	9.7
1843	149	10.4	60	10.3	53	5.5	262	26.2	44	9.9	306	36.1	44	9.9
1844	164	13.2	80	18.8	74	4.9	318	36.9	40	10.9	354	47.8	40	10.9
1845	209	15.8	79	19.8	92	8.8	380	44.4	40	19.3	420	63.7	40	19.3
1846	248	20.6	114	28.6	80	9.9	442	59.1	38	15.2	480	74.3	38	15.2
1847	256	25.6	102	35.3	82	13.9	440	74.8	65	28.6	505	103.4	65	28.6
1848	195	20.1	81	16.8	67	8.2	343	45.1	42	15.6	385	60.7	42	15.6
1849	199	23.0	114	28.4	75	11.7	388	63.1	43	20.3	431	83.4	43	20.3
1850	134	17.2	71	23.1	83	9.6	288	49.9	75	24.9	363	74.7	75	24.8

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APPENDIX 1 (Cont'd.) BRITISH AMERICAN SHIPBUILDING, 1787-1900: ADJUSTED DATA

YEAR	NOVA SCOTIA		NEW BRUNSWICK		P.E.I.		MARITIMES		CANADA		CAN–MA		QUE	
	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons
1851	147	19.4	88	32.6	83	12.3	318	64.3	69	31.6	387	95.9	69	31.6
1852	186	23.0	118	45.0	76	9.1	380	77.1	58	22.4	438	99.5	58	22.4
1853	227	29.3	121	55.3	62	9.5	410	94.1	92	41.2	502	135.3	92	41.2
1854	250	34.5	125	69.6	94	17.9	469	122.0	72	37.1	541	159.1	72	37.1
1855	236	38.9	95	56.7	85	14.5	410	110.1	121	39.0	531	151.3	121	41.2
1856	208	41.9	129	84.7	51	24.2	388	150.8	148	48.0	536	198.8	126	44.4
1857	189	38.1	148	76.3	104	25.5	441	139.9	126	49.7	567	189.6	98	44.5
1858	151	17.4	75	27.9	69	13.9	295	59.2	102	28.8	397	88.0	83	27.0
1859	190	25.0	93	40.8	61	11.8	344	77.6	69	18.0	413	95.6	50	16.7
1860	233	21.9	100	43.4	66	13.3	399	78.6	74	25.4	473	104.0	57	24.6
1861	216	25.0	80	42.9	67	13.5	363	81.4	96	35.2	459	116.6	65	30.6
1862	201	41.7	90	51.6	80	19.5	371	112.8	120	34.5	491	147.3	92	31.9
1863	207	49.7	137	90.4	100	26.5	444	166.6	158	71.2	602	237.8	116	62.8
1864	304	77.3	163	98.1	119	35.3	586	210.7	193	80.8	779	291.5	142	69.3
1865	294	60.2	148	69.3	126	36.3	568	165.8	167	67.7	735	233.5	139	60.4
1866	300	57.2	133	55.7	127	33.8	560	146.7	211	51.9	771	198.6	140	43.1
1867	192	38.7	104	35.8	84	22.2	378	96.7	199	43.6	577	140.3	139	34.3
1868	139	32.8	84	25.8	75	19.8	298	78.4	132	93.7	430	112.1	76	28.2
1869	105	28.3	88	33.9	53	16.3	246	78.5	142	40.0	388	118.5	92	33.7
1870	141	35.7	88	37.7	53	15.1	282	88.5	90	25.3	370	113.8	55	20.6
1871	146	46.9	108	35.6	52	14.0	306	96.5	135	30.1	441	126.6	80	21.9
1872	188	56.0	93	38.7	60	16.0	341	110.7	133	26.2	474	136.9	74	15.0
1873	176	66.7	104	45.2	75	21.3	355	133.2	100	36.8	455	170.0	72	25.2
1874	181	79.2	96	49.5	67	15.9	344	144.6	142	40.1	486	184.7	63	23.5
1875	193	89.8	83	50.8	91	27.5	367	168.1	122	31.0	489	199.1	80	24.8
1876	232	73.2	71	41.1	90	22.5	393	136.8	185	38.1	578	174.9	141	29.6
1877	234	53.5	64	35.1	67	16.3	365	104.9	143	30.0	508	134.9	103	25.3
1878	198	50.4	50	27.9	57	17.5	305	95.8	77	17.5	382	113.3	47	15.0
1879	133	54.0	67	34.0	28	7.8	228	95.8	75	13.8	303	109.6	41	9.6
1880	136	40.5	48	15.4	19	5.9	203	61.8	94	11.0	297	72.8	38	6.7
1881	135	45.9	62	21.9	18	3.1	215	70.9	99	13.2	314	84.1	49	8.7

1882	122	33.3	56	18.6	14	4.0	192	55.9	119	16.3	311	72.2	48	7.6
1883	200	39.4	76	21.2	13	3.9	289	64.5	87	13.5	376	78.0	33	5.6
1884	195	36.7	67	23.0	22	6.1	284	65.8	74	8.8	358	74.6	31	4.4
1885	133	29.9	47	16.1	21	5.3	201	51.3	86	9.6	287	60.9	17	3.9
1886	90	22.5	28	9.4	8	1.3	126	33.2	82	6.6	208	39.8	28	3.2
1887	77	15.1	32	7.4	14	1.8	123	24.3	74	4.1	197	28.4	14	1.3
1888	106	15.3	22	2.1	4	0.2	132	17.6	99	6.6	231	24.2	13	0.7
1889	124	14.1	42	3.4	16	1.6	182	19.1	76	6.1	258	25.2	15	1.1
1890	114	22.2	45	6.9	10	1.6	169	30.7	97	10.8	266	41.5	20	1.6
1891	138	35.7	69	12.7	11	2.0	218	50.4	94	8.3	312	58.7	8	1.2
1892	111	32.1	44	4.3	5	1.1	160	37.5	118	9.4	278	46.9	35	2.4
1893	108	18.6	60	5.3	8	1.3	176	25.2	137	15.6	313	40.8	50	3.8
1894	82	9.9	113	4.0	4	0.4	199	14.3	121	10.5	320	24.8	49	6.1
1895	107	5.8	22	0.7	1	0.1	130	6.6	134	13.1	264	19.7	59	6.0
1896	70	5.2	24	0.6	2	0.2	96	6.0	94	5.2	190	11.2	24	0.8
1897	52	4.4	30	0.7	4	0.1	86	5.2	105	7.4	191	12.6	29	1.9
1898	60	5.1	24	1.9	1	0.2	85	7.2	134	16.5	219	23.7	25	2.0
1899	69	4.7	35	1.2	8	0.4	112	6.3	138	17.2	250	23.5	46	5.4
1900	112	9.2	18	0.6	1	0.0	131	9.8	99	20.3	230	30.1	20	3.0

APPENDIX 2 BRITISH AMERICAN SHIPBUILDING, 1787-1900: OFFICIAL DATA

YEAR	NOVA SCOTIA		NEW BRUNS		P.E.I.		MARI-TIMES		CANADA		CAN–MA		QUE	
	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons
787	33	2.0	10	0.9	2	0.2	45	3.1	3	0.3	61	3.9	3	0.3
788	40	2.7	16	2.4	0	0.0	56	5.1	4	0.2	64	5.7	4	0.2
789	43	2.8	28	3.7	1	0.1	72	6.6	3	0.2	75	6.7	3	0.2
790	28	2.1	24	3.8	3	0.2	55	6.1	8	0.6	59	6.6	8	0.6
791	15	1.1	18	2.6	3	0.1	36	3.8	6	0.3	42	4.3	6	0.3
792	40	2.1	19	2.3	3	0.2	62	4.6	6	0.6	68	5.1	6	0.6
793	36	1.8	13	1.8	1	0.2	50	3.8	7	0.4	61	4.3	7	0.4
794	31	2.0	15	2.2	4	0.1	50	4.3	6	0.8	57	5.1	6	0.8
795	26	1.6	5	0.4	3	0.1	34	2.1	10	1.0	49	2.8	10	1.0
796	31	1.3	12	1.5	1	0.1	44	2.9	10	1.1	50	3.2	10	1.1
797	29	1.6	10	1.7	0	0	39	3.3	10	1.4	42	3.5	10	1.4
798	35	2.6	5	0.4	5	0.2	45	3.2	8	0.8	55	4.1	8	0.8
799	52	3.4	17	3.0	4	0.2	73	6.6	14	2.5	86	8.4	14	2.3
800	40	3.9	23	4.3	11	1.4	74	9.6	16	3.6	91	13.2	16	3.6
801	34	2.1	17	2.4	4	0.2	55	4.7	22	3.3	76	7.9	22	3.3
802	64	6.5	27	5.1	6	0.3	97	11.9	19	3.3	117	15.1	19	3.3
803	56	3.7	27	4.3	11	0.7	94	8.7	21	3.0	117	11.4	26	3.0
804	46	3.0	5	1.0	8	0.6	59	4.6	22	2.5	81	6.6	22	2.5
805	60	3.3	9	1.3	1	0.1	70	4.7	10	1.5	82	6.3	10	1.5
806	50	2.4	8	0.7	4	0.3	62	3.4	14	2.2	78	5.2	14	2.2
807	40	2.2	18	2.0	7	0.4	65	4.6	12	2.3	77	6.8	12	2.3
808	26	2.1	4	0.4	8	0.5	38	3.0	15	4.2	52	7.2	15	4.2
809	24	1.4	15	2.2	1	0.1	40	3.7	21	3.2	61	6.9	21	3.2
810	52	3.0	32	4.6	3	0.2	87	7.8	36	6.5	123	14.3	36	6.5
811	107	6.2	66	9.6	7	0.5	180	16.3	54	13.8	234	30.1	54	13.8
812	94	5.9	23	4.8	15	1.1	131	11.8	34	6.4	165	18.2	34	6.4
813	48	2.8	12	2.3	7	0.5	67	5.6	18	3.3	85	8.9	18	3.3
814	26	1.4	13	2.4	16	1.4	55	5.2	15	3.3	70	8.5	15	3.3
815	62	4.0	41	8.1	2	0.1	105	12.2	22	2.6	127	14.9	22	2.6
816	152	8.1	74	11.9	17	1.0	243	21.0	25	3.0	268	24.1	25	3.0
817	70	4.6	50	6.1	29	1.9	149	12.6	27	4.1	176	16.8	27	4.1

818	80	4.7	31	2.5	18	1.2	129	8.4	33	3.1	162	11.5	33	3.1
819	100	4.8	39	4.5	16	1.8	155	11.1	25	4.0	178	15.0	25	4.0
820	72	3.2	30	3.4	17	1.7	119	8.3	14	1.9	133	10.2	14	1.9
821	86	3.9	24	2.4	16	1.4	126	7.7	18	2.3	144	9.9	18	2.3
822	50	2.5	30	3.9	14	1.6	94	8.0	18	2.6	112	10.7	18	2.6
823	63	3.2	44	8.1	23	2.9	130	14.2	31	3.8	161	18.0	31	3.8
824	87	5.5	81	19.4	31	4.1	199	29.0	29	9.8	228	38.8	29	9.8
825	101	8.1	169	27.9	37	7.3	307	43.3	83	24.5	390	67.9	83	24.5
826	158	16.6	125	31.2	48	8.0	331	55.8	78	19.4	409	75.1	78	19.4
827	142	14.7	114	23.9	46	8.9	302	47.5	60	9.2	362	56.7	60	9.2
828	160	12.9	67	16.9	54	6.2	281	33.0	61	9.7	342	42.8	61	9.7
829	145	10.4	60	8.1	47	4.3	252	22.8	30	6.0	282	28.8	30	6.0
830	123	7.4	46	8.1	34	2.7	203	18.2	25	5.1	228	23.3	25	5.1
831	108	7.8	56	8.5	48	4.3	212	20.6	27	5.8	239	26.4	27	5.8
832	113	8.5	69	13.8	43	4.3	225	26.6	26	5.5	251	32.1	26	5.5
833	126	11.0	89	17.0	46	5.6	261	33.6	38	8.1	299	41.7	38	8.1
834	128	10.4	88	21.9	34	4.3	250	36.6	49	12.4	299	49.0	49	12.4
835	120	11.1	95	25.8	43	5.6	258	42.5	33	9.1	291	51.6	33	9.1
836	137	10.9	103	30.6	36	4.7	276	46.2	37	11.4	313	57.6		
837	160	14.3	99	27.5	45	6.9	304	48.7	39	10.6	343	59.3		
838	209	18.4	116	26.9	46	7.1	371	52.4	33	9.6	404	62.0		
839	223	20.7	151	43.1	69	10.0	443	73.8	45	17.2	488	91.0		
840	239	33.6	162	62.1	77	11.1	478	106.8	61	27.6	539	134.4		
841	190	26.2	118	45.7	63	10.8	371	82.7	66	26.5	437	109.3		
842	159	17.7	82	22.0	65	9.0	306	48.7	59	12.6	363	60.7		
843	149	11.8	60	13.4	53	6.5	262	31.7	44	12.8	306	44.5		
844	164	15.4	80	24.4	74	5.6	318	45.6	40	14.2	358	59.8		
845	209	18.4	79	25.7	92	10.3	380	54.4	40	25.0	420	79.4		
846	248	23.9	114	37.1	80	11.7	442	72.7	38	19.8	480	92.5		
847	256	29.6	102	45.9	82	16.4	440	91.9	65	37.1	505	129.0		
848	195	22.8	81	21.8	67	9.7	343	54.3	42	20.2	385	74.5		
849	199	27.3	114	36.9	75	13.7	388	77.9	43	26.3	431	104.2		
850	134	20.9	71	29.9	83	11.3	288	62.1	75	32.2	363	94.3		
851	147	23.1	88	42.4	83	14.5	318	80.0	69	41.1	387	121.1		
852	186	26.8	118	58.4	76	10.7	380	95.9	58	29.1	438	125.0		

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APPENDIX 2 (Cont'd.) BRITISH AMERICAN SHIPBUILDING, 1787-1900: OFFICIAL DATA

YEAR	NOVA SCOTIA		NEW BRUNS		P.E.I.		MARI-TIMES		CANADA		CAN–MA		QUE	
	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons	no.	tons
853	227	34.1	121	71.8	62	11.2	410	117.1	92	51.3	502	168.4		
854	250	39.5	125	90.4	94	21.1	469	151.0	72	48.2	541	199.2		
855	230	36.8	95	53.7	85	13.7	410	104.2	121	39.0	531	143.2		
856	205	39.6	129	80.0	51	22.8	388	142.4	148	45.3	536	187.7		
857	189	36.0	148	72.0	104	24.1	441	132.1	126	46.9	567	179.0		
858	151	16.4	75	26.3	69	13.1	295	55.8	102	27.2	397	83.0		
859	190	23.6	93	38.3	61	11.1	344	73.0	69	17.0	413	90.0		
860	233	20.7	100	41.0	66	12.6	399	74.3	74	24.0	473	98.3		
861	216	23.6	80	40.5	67	12.7	363	76.8	96	33.2	459	110.0		
862	201	39.4	90	48.7	80	18.4	371	106.5	114	30.4	485	136.9		
863	207	46.9	137	85.3	100	25.0	444	157.2	158	67.2	602	224.4		
864	304	73.0	163	92.6	119	33.3	586	198.9	164	60.0	750	258.9		
865	294	56.8	148	65.4	126	34.3	568	156.5	167	63.9	735	220.4		
866	300	54.0	133	52.6	127	31.9	560	138.5	160	38.0	720	176.5		
867	192	36.5	104	33.8	84	21.0	378	91.3	199	41.2	577	132.5		
868	139	31.0	84	24.4	75	18.7	298	74.1	132	31.8	430	105.9		
869	105	26.7	88	32.0	53	15.4	246	74.1	142	37.8	388	111.9		
870	141	33.7	88	35.6	53	14.3	282	83.6	90	23.9	370	107.5		
871	146	44.3	108	33.6	52	13.2	306	91.1	135	28.4	441	119.5		
872	188	52.9	93	36.5	60	15.1	341	104.5	133	24.7	474	129.2		
873	176	63.0	104	42.7	75	20.1	355	125.7	100	34.7	455	160.4		
874	181	74.8	96	46.7	67	15.0	344	136.5	142	37.9	486	174.4		
875	193	84.6	83	48.0	91	26.0	367	158.8	122	29.3	489	188.1		
876	232	69.1	71	38.8	90	21.2	393	129.1	185	36.0	578	165.1		
877	234	50.5	64	33.1	67	15.4	365	99.0	143	28.3	508	127.3		
878	198	47.6	50	26.3	57	16.5	305	90.4	77	16.5	382	106.9		
879	133	51.0	67	32.1	28	7.4	228	90.5	75	13.0	303	103.5		
880	136	38.3	48	14.5	19	5.6	203	58.4	94	10.4	297	68.8		
881	135	43.3	62	20.7	18	2.9	215	66.9	99	12.5	314	79.4		
882	122	31.4	56	17.6	14	3.8	192	52.8	119	15.4	311	68.2		
883	200	37.2	76	20.0	13	3.7	289	60.9	87	12.7	376	73.6		

884	195	34.6	67	21.7	22	5.8	284	62.1	74	8.3	358	70.4
885	133	28.2	47	15.2	21	5.0	201	48.4	86	9.1	287	57.5
886	90	21.2	28	8.9	8	1.2	126	31.3	82	6.2	208	37.5
887	77	14.3	32	7.0	14	1.7	123	23.0	74	3.9	197	26.9
888	106	14.4	22	2.0	4	0.2	132	16.6	99	6.2	231	22.8
889	124	13.3	42	3.2	16	1.5	182	18.0	76	5.8	258	23.8
890	114	21.0	45	6.5	10	1.5	169	29.0	97	10.2	266	39.2
891	138	33.7	69	12.0	11	1.9	218	47.6	94	7.8	312	55.4
892	111	30.3	44	4.1	5	1.0	160	35.4	118	8.9	278	44.3
893	108	17.6	60	5.0	8	1.2	176	23.8	137	14.7	313	38.5
894	82	9.3	113	3.8	4	0.4	199	13.5	121	9.9	320	23.4
895	107	5.5	22	0.7	1	0.1	130	6.3	134	12.4	264	18.7
896	70	4.9	24	0.6	2	0.2	96	5.7	94	4.9	190	10.6
897	52	4.2	30	0.7	4	0.1	86	5.0	105	7.0	191	12.0
898	60	4.8	24	1.8	1	0.2	85	6.8	134	15.6	219	22.4
899	69	4.4	35	1.1	8	0.4	112	5.9	138	16.2	250	22.1
900	112	8.7	18	0.6	1	0.0	131	9.3	99	19.2	230	28.5

8. DISCUSSION FOLLOWING THE PAPER OF R. RICE

RICE, in answer to a question, raised the problem of how one might lay bare the pattern of investment in Canadian shipbuilding. How much of it was Canadian and how much British? Perhaps one means would be by analysing the pattern of transactions by sale or mortgage, at least in those cases where the vessels were fairly rapidly sold by North American owners to British buyers.

CRAIG thought that instead of looking at the date upon which the vessel was transferred one should look at the date of the Bill of Sale. This date was generally recorded either on the Registry Book or endorsed on the back of the ship's copy of the registry by a British court.

He went on to raise a question about the over estimate of tonnage under the New Measurement system. The new measurement was disadvantageous to the ship owners from the aspects of pilotage fees and harbour dues and yet nine out of ten immediately adopted the new system despite the fact that they were not legally obliged to do so.

RICE pointed out that the increase or decrease in registered tonnage which arose from the New Measurement system depended upon the size of the vessel. At 300 tons for example, there was almost no change, but below 200 tons the New Measurement actually lessened the registered tonnage.

KNOPPERS raised the question of whether many of the vessels which took lumber from Canada to the U.K. were not really "timber rafts" built not to trade continuously as merchant vessels but only to take on cargo across the Atlantic. Is it possible to distinguish between the true merchant vessel and the "raft"? In the case of the latter might there not be a co-relation between the price of timber in England and increase in the production of these temporary vessels?

RICE said that he had tested the relationship between the timber trade and shipbuilding but found that it was not high. He suspected that the statistical series which exist on timber trade and freight are not very accurate.

9. ASPECTS OF LATE NINETEENTH CENTURY RURAL SHIPOWNING IN SOUTHWESTERN BRITAIN

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ASPECTS OF LATE NINETEENTH CENTURY RURAL SHIPOWNING IN SOUTHWESTERN BRITAIN

Basil Greenhill

In this paper I shall consider in very broad terms some aspects of rural shipowning as it existed in parts of the counties of Devon and Cornwall – areas with particularly long and close associations with Newfoundland and Atlantic Canada generally – in the late 19th and early 20th centuries. I shall draw attention briefly to aspects of West of England shipowning which were particularly closely linked with Eastern Canada and I shall equally briefly draw attention to contrasts with rural shipowning in an area of the eastern Baltic.

This general paper is intended to do no more than give indications. It is in no sense quantitative. I hope that it will stimulate discussion and draw attention to a particular kind of small scale shipowning, worthy of more serious professional study.

I must first define what I choose to mean by rural shipowning. I mean in general shipowning as a part-time occupation, or as an investment made locally by people whose main sources of income come from other occupations. The people concerned lived in small communities in a rural environment, that is, in a society generally dependent on agriculture and allied occupations supplemented perhaps by small scale mining or manufacturing industries. The ships themselves have to be defined. I have in mind products of the same or similar environments, built often in the community, always of wood, and equipped with almost nothing that could not be made locally, in the blacksmith's shop and foundry, in the ropewalk, in the blockshop, and the sail-loft.

This description may sound like an idyll of rural self-dependence that never was. Self-dependence and economic and technical isolation, yes. Idyllic, no, as we shall see. This kind of rural shipowning led to an interesting contrast, between the very limited horizons, social and cultural, of the inhabitants of small West of England communities, and their involvement at all levels in the long range sailing of merchant ships with the accompanying much wider economic horizons. This contrast was, I think, likely a hangover from a situation common in the 18th and 17th centuries and earlier. This situation, met with in parts of south western Britain and elsewhere in the British Isles until the First World War, was to be seen in a pure form in the Åland Islands in the eastern Baltic, pure in the sense that this kind of shipowning as a major activity of the community was not confused by other industries. It stood alone with agriculture, fishing, and lumbering.

This kind of shipowning was, as I have already said, centred on the management of wooden sailing vessels requiring the minimum capital investment over and above the immediate resources in material and labour of the owning community. The structure of management and ownership may have been a hangover from an earlier period. Certainly the vessels were. Ships were what it was all about and so we had better have a brief look at the ships first of all.

The history of the wooden sailing ship goes back to the earliest years of the ascent of man. It is a very complicated story indeed and many different traditions of building

grew up in different parts of the world as the centuries passed. The archaeology of boats and ships is a new subject of study and it is only in very recent years that it has had the full-time attention of some archaeologists. We are only at the beginning of collecting and collating detailed information about the ways in which wooden shipbuilding traditions developed around the world.

But in the 1400s a technical revolution seems to have taken place in shipping. At the beginning of the 1400s most vessels were built in one or another of the old traditions edge-joined and shell constructed and they were equipped with one mast and one big single squaresail. By the end of of the 1400s big vessels were constructed in the new non-edge-joined, skeleton built style and they were equipped with three masts, each carrying a squaresail and sometimes two or three sails, one set above the other. The seagoing vehicle which resulted was capable of an altogether different performance from its predecessors of only 70 years before and in the short time of 40 years, between about 1480 and 1520, the oceans of the world were all discovered and the world encompassed.

The effective invention of the sailing ship at this period was surely one of the more important events in European history. The wooden sailing ship from now on was to play an increasing part in human affairs.

What came out of the 1400s was a vessel strong enough and seaworthy enough to go almost anywhere, with a sail plan and rigging that enabled her to be sailed there, given sufficient time, with an acceptable rate of casualties. More than that, because she was simply constructed from natural materials she was practically self-supporting. In the following centuries this remarkable vehicle played a very large part in the industrial and commercial developments and the movements of peoples which laid the foundations of present day economies and societies.

So by the 1860s and early 1870s, when we enter the period under review, there were dozens of communities all around the coastlines of the western world the whole lives of which were centred around the building and operation of wooden sailing ships, then perhaps at the height of their numbers. These communities differed from one another in many details of social organization and of the techniques used by their craftsmen, ashore and afloat, but they had perhaps more in common than they differed.

This world of the wooden sailing vessel is, of course, a world we have completely lost. The same applied to many other specilized "worlds" of earlier stages of technical and industrial development and, remembering the hardships, the squalor, the poverty, the overwork and misery often associated with them, in many ways the loss is not regrettable. But perhaps I have drawn together sufficient of the relevant material to point to a factor which distinguished investment in wooden sailing vessel property from other forms of investment. The wooden sailing vessel could be, and very often was, the product entirely of the simplest local industries, and yet she was capable of operating profitably from her home base all over the world. She was really an astonishing vehicle in retrospect, as well as being a very important one.

"A coffee pot and a share in a vessel", were reckoned high among the necessities of life in the Åland archipelago, a community of about 20,000 people living on some of 9,000 islands and islets lying in the mouth of the Gulf of Bothnia and now part of Finland, in the 60 years before the First World War. Åland was then the textbook farming and seafaring community; today, and this is one of the reasons I have chosen it as an

illustration for this symposium, it is still one of the world's great shipping places. The foundations of modern prosperity were laid by hundreds of small wooden sailing ships, owned in partnership groups by farmers, seafarers, housewives, schoolmasters, woodmen, housebuilders, shipbuilders, carpenters, blacksmiths, shopkeepers, but mostly by farmers. Most of their owners stayed at home. But it has been said of the inhabitants of Åland a century ago that there was scarcely anyone who had not a ship to think about.

Because the whole structure of the shipping industry in Britain has changed out of recognition in the last hundred years, it is not widely realised that much the same condition prevailed in a number of places in England and Wales a century ago, and that "a share in a vessel" was as common a form of investment in these places for humble people with a little money to put by in the hope that it would grow as was investment in land or houses or in the local mines, mills, breweries or small factories. To invest in vessel property was part of local tradition and the prospects for growth of capital were on the whole probably as good, or better, than with the other outlets mentioned here – and the possibility of rapid and spectacular growth was always there. Besides which, you could see and comprehend a ship, and the ownership of shares in her was a real thing. You knew who was managing her and who was responsible for her at sea. Before investing you could form your own judgement in a very personal way.

Although as the second half of the 19th century advanced the ordinary deep sea merchant ship became steadily bigger and in due course became a steel vessel, latterly propelled by steam, there remained even then a demand for relatively small ships to carry very small cargoes of every kind, usually between small ports all over the world. Steam ships, as they developed, needed coal. Often the cheapest way of carrying it to bunkering ports was in wooden sailing vessels. In Britain the later 19th century was the great era of the coastal sailing vessels. Until the development of road transport after the First World War the small wooden sailing vessel was still often the cheapest and most efficient means of transport between ports on navigable water, despite the competition of steamers. The growth of the railway system took some of the coasting vessel's work, but the general increase in economic activity which accompanied the development of the railways meant more cargoes to carry and in the end probably gave more work than was taken away – this again is a subject susceptible to much further analysis. Like the steamers, the railways needed endless supplies of coal and often the cheapest way of carrying this was in wooden sailing vessels.

So the wooden sailing vessel and the pattern of ownership and management in rural communities which often lay behind it, persisted. Although it is little more than half a century since the last of these vessels was built in Britain, today it seems almost incredible that they could be built without machinery and sailed under all conditions all over the world without engines or any kind of mechanical labour saving devices beyond blocks and tackles, crude winches for loading and discharging cargo, and an even cruder windlass for anchor work. That all this could be achieved seems already as remarkable as, say the construction of Stonehenge or the early cathedrals.

For all the highly skilled craftsmanship that went into their construction, none of these vessels would be allowed to earn their living at sea today without extensive modification and the incorporation of numerous safety requirements. There has even been some talk recently in the United States, I believe, of banning the commercial use of

wooden hulls altogether – the complex structure of organic materials is far too vulnerable for the modern world. Wooden ships have been called, with some aptness, great wooden baskets. They fixed and groaned like laden baskets both at sea and when they took the ground on the ebb tide in harbour, say in the Minas Basin, and they leaked like baskets all too often, as well.

In Britain and many other countries legislation made easy multiple shareholding in rural communities. The system of dividing the property in every British merchant ship into 64 shares was introduced, I believe, by an Act of 1824 in Britain and confirmed in subsequent Acts of Parliament. The system merely made part of law the long established practice of dividing vessel property into fractions, not always 64ths, sometimes into many more shares, 100 or 200, and always sufficiently small to make it possible for poor people to invest. You did not even have to own a whole share, a part of a share would do, though you were not legally recognised as a part shareholder. Though many vessels were owned by only a few people, often by members of the same family (which led often to efficiency of operation and rapid expansion of capital) many, perhaps the majority of vessels, were widely shared.

The actual managing owner of the vessel, perhaps a master, especially if she traded to remote foreign parts, often an experienced ship manager ashore, did not have to hold more than one share and sometimes held only two or three. The little ship owning groups were often tied in with other local industries.

It is unproductive to take specific examples from the thousands that are available in the shipping registration records which have not yet been subjected to statistical analysis on any scale. Statistical study in depth of the structure of the shipowning industry in south western England as a whole will only be possible when transcriptions of the registration material from all the ports concerned becomes available as a result of the transcription scheme now under way. It will then be possible to analyse the patterns and nature of ownership quantitatively in different ways.

The system of dividing vessel property into shares as small as a 64th had an important effect, particularly relevant to the development of the rural maritime communities in south western Britain, which tended to distinguish them from neighbouring farming and fishing places. With good fortune, endless hard work, competent management and business courage and enterprise, money could be made, in time of prosperity, with small vessels in which relatively little was invested. The master – shareholder of a vessel of a certain size had it in his power to enhance his fortunes to a degree sufficient to break out of the labouring into the small capitalist class – to become an employer. His prerequisites varied, but they were usually complex and not inconsiderable, and with the return on his shares they could enable him to accumulate a little fortune. He carried the other shareholders up in the financial heirarchy with him. A vessel which was a "money spinner" could assist in this process of economic and social enhancement over perhaps two generations.

This open road to prosperity through shares in vessels gave the inhabitants of the small shipowning communities opportunities the rural labourer, craftsmen and the fishermen could never have. Those connected with the building and operation of small wooden sailing ships were not necessarily tied forever to the treadmill of labouring in near poverty. In Britain and Europe farm workers and fishermen had little or no hope of

acquiring reasonable capital, however hard they worked. Seamen, bargemen, their families and fellow villagers could have the means open to them to do so. Thus the seafaring, as opposed to fishing, and the agricultural communities were probably fundamentally different, just how far they were different is another subject worthy of more detailed examination and study than it has yet received.

I shall now move from these general statements to particular examples and I will compare two west of England communities and the Åland Island community already referred to.

In the second half of the 19th century the valley of the River Tamar between Devon and Cornwall, where the river is still tidal though fifteen or sixteen miles from the open sea, was heavily industrialized with copper mines and brickworks, quarries and arsenic works, as well as numerous farms and prosperous market gardens. There was no railway into the valley and the bulk products of the mines and quarries and brickworks and the imports needed to supply the industries, coal, fertiliser, machinery, grain for the watermills and timber for the mines and the builders could not be carried by road. The heavily tidal river was the natural highway, both for ships bringing and taking cargoes to and from distant ports and for the local movement of goods from Plymouth at the mouth of the river to the village up river, and from the local mines and brickworks down stream to Plymouth and the adjacent sea coasts. Some cargoes were moved only from roadside wharf to roadside wharf, or from farm to farm.

An extraordinarily intensive local sailing transport industry grew up on the Tamar in the years of the greatest prosperity in the second half of the last century. It was conducted in sailing barges which rarely, if ever, sailed beyond the Plymouth Breakwater, in coasting smacks and small ketches which could carry the local products to other parts of south Devon and Cornwall, in schooners which sailed far and wide around the British coasts and in many foreign vessels, particularly Scandinavian, which brought timber for the mines. But most of the vessels passed their whole working lives up and down the river, some of them in sailing to and fro for years on end between the same two villages, serving perhaps one small factory or timber yard or mine or mill. The men who sailed them were masters of their craft, not only were they intimately familiar with all the ways of the river, tides and the local winds and weather, they maintained the vessels themselves at the lowest possible cost, doing everything except major repairs. The vessels were owned on the shares system, no less than those of other communities. But the capital investment was smaller and the shareholders tended to be less numerous, often they included with the master and his family, a miller or quarry owner, or a mine captain, who provided the barge with many of her cargoes. The smack *Thomas Edwin* for example was owned initially half by her local builder and half between a local merchant and two farmers of neighbouring parishes. Vessels were often partly owned by farmers who regarded them in the same light as big wagons. Frequently the master was a part-time bargeman, part-time farmer, laying the barge up in the local creek when sowing or harvesting or when the lambing was on, returning to the barge when the work on the land was not so busy. Theirs was by the standards of the times in many ways a good rural existence.

Other types of wooden sailing ships were owned on the banks of the Tamar. In the 1860s locally built vessels more widely owned on the shares system by many different people traded around the north Atlantic.

Something of the flavour of the life of the barges and smacks is conveyed by the account of Jack Martin, one of the sons of a barge master:

> I was born at St. Dominic 80 years ago. My father was William Martin, barge owner and master. My mother's name was Clara. She was village midwife, taught in the school, and knitted guernsies for seamen. She taught sewing at school. We were a family of eight, four boys and four girls.
>
> My father was a broad, very strong man, with a beard like King Edward. He was upright and straight and devout. We used to have to go to Chapel in the morning, Sunday School in the afternoon, and chapel in the evening every Sunday. My father had beautiful copper plate handwriting and it was very neat. If he received a letter with a blot on it he would throw it in the wastepaper basket without reading it. When writing up the big ledger on the working of the barges he used to use a piece of blotting paper the size of the page so that no speck of dirt could get on the page.
>
> My father owned and was Captain of a barge called the *Myrtle* and she was about 50 tons with tanned sails. She was built by Bob May in Ashburton Creek. One of my three elder brothers sailed as mate''.

I said that by the standard of the times the life was in many ways pleasant, but all things are relative. Since there was no railway into the valley, travel was possible only by horse, or on foot, or by boat, and many workers at the local shipyard, for example walked eight or twelve miles daily to and from work which lasted from 6:00 in the morning until 6:00 at night, 4:00 on Saturdays, with only Sunday as a day of rest. The crafts were learned through apprenticeship and since this was usually seven years long and boys who were not going to take to the trade for one reason or another were weeded out at an early stage, there were few poor craftsmen.

The craft, either of barging, seafaring or shipbuilding, was everything and the boy as he grew up heard talk of very little else, at home, in the family, in the pub and at work, nine-tenths of the conversation when men were gathered together was about their trade. There were few distractions and no other strong interests. Time off on Sundays was taken often enough as an opportunity to build boats.

Protective clothing in the modern sense was unknown. There was nothing that really kept out the rain. Drying out was done at home after work, round the fire when everyone went to bed, which was often around 7:30 or 8:00 in the evening in the winter in order to save fuel and candles. To be wet and cold and exhausted from a 12 hour day was the common experience for bargemen, seamen or shipbuilders. The usual clothes were a flannel or twill shirt without a collar, and a belt with braces on a pair of heavy woollen cloth trousers. Shipyard workers' leather boots were constantly wet as the tide lapped the part of the yard in which work was going forward. Woollen scarves were worn for protection both against the wet and cold and the flat cap or a seaman's cap with a top coat often very old. These, with home knitted jumpers as the thermal layer between the top coat and the body were virtually the uniform of the seaman or shipbuilder and it is not surprising that many suffered in middle age from rheumatism.

As home housing was primitive, washing was difficult and grimy hands with callouses were chapped into prominence by black lines, endless heavy work brought short tempers to the home at night and the children were put to bed early so that the father would not be disturbed in the hour or two before bed. Often children saw their fathers only on Sundays. The families lived not far from poverty and often in crowded conditions, so consumption was very common. The women worked in the house caring for the large families and continually stoking stoves that smoked and deposited smuts everywhere, posing an endless cleaning problem. The women were adept at most heavy chores, like the preparation and carting of fuel for the stoves. Every door had a foot scraper but nevertheless the mud from the dirt roads was brought into the house over clean flag stones and into every corner and the continual fight against it preoccupied many women's minds to the point of obsession. Baths were taken in a trough or a tin bath on the kitchen floor in front of the stove and in many families nobody ever bathed properly, only washed down outside in the scullery.

Seamen and bargemen and their families had very few possessions. Many when they died left little more than a pocket watch which was handed down from generation to generation. It was rarely worn with a gold chain but kept wrapped up in a box, stored for a life time possession, a capital asset. One best pair of boots and a black suit completed personal possessions. Few owned their own cottages, they went on working into their 70s because there was no provision for their retirement. These conditions smothered the inate ability and initiative of many men and women, but they stimulated some to break out at almost any cost. Many of these emigrated to towns or overseas, very many of them here to Canada, some worked and took risks to become men of property at home and some succeeded.

In the Tamar valley conditions were a little allievated by the close connections between the shipping and farming communities and by the general possession of gardens, which through the growing of vegetables, effectively increased the head of the family's earnings of about 62 1/2p (say $1.50) a week. By way of contrast Appledore, the other shipping place in south western Britain which I propose to take as an example, was orientated towards longer range trades. Appledore's seafaring history goes back to the fourteenth century, but its modern story begins in 1818 when Thomas Burnard, a great local shipowner, sent a little brigantine to Prince Edward Island, to put a party of local shipwrights ashore to see if they could establish a shipbuilding industry. In this move he

was paralleling similar moves that were taking place at the same time from Plymouth and elsewhere in south western Britain. After many vicissitudes the industry did indeed succeed and prosper, and some of the individuals involved in it did as well. One of these was James Yeo, formerly a country carrier to North Cornwall and before that a labourer, who built up a great international business of shipbuilding, shipowning, importing and exporting. He sent his eldest son William back to Appledore to be his British agent and James and William enclosed Appledore's sheltered bay with the creek running into it, and built a great drydock where it had been. In the drydock vessels built in Prince Edward Island and sailed over the Atlantic were fitted out for selling in the British market. Although there was an extensive coasting and deep sea trade from Appledore it was this connection with Canada and the Prince Edward Island shipbuilding industry which was the dominant factor in the maritime history of this part of the wouth west of England for the greater part of the 19th century.

The employment and trade which came with all this maritime activity generated capital for house building and for investment in new locally owned ships. Appledore became a community of which the very existence was based on wooden shipbuilding and on the ownership and operation of scores of small wooden sailing vessels employed in carrying cargoes around the coasts of Britain and further afield. It became a community dedicated to the sea and almost totally dependent on it, with its back turned to the land. Such a community in the days of wooden sailing ships acquired a very distinctive character of its own, the last traces of which lingered on with the last of the vessels into the mid 20th century. At the height of its prosperity, with timber laden ships arriving from North America and the Baltic, emigrants crowding the quays for berths in the empty American vessels on the return voyages, the drydock and the half dozen shipyards around it, teamed with life and vigour as only a seaport of its kind in the 19th century could do. But the living conditions for the majority of its people were no better than those in the Tamar Valley and the shipyard workers were if anything worse off, for they lived in a markedly harder climate and did not have the tradition of gardening which was a feature of life 50 miles to the south.

The local society was literally in three layers. The merchants and gentry lived high up on the hill above the river and the busy waterfront. Some of their handsome houses still remain and one is in the process now of being turned into a local maritime museum. The prosperous ship masters and the small ship owners and master shipwrights' houses lined the streets leading down towards the strand. At the back of the strand, in the warren of small houses, and back streets, and in the courts above the beach and behind the shipyards on the banks of the Pill, lived the seamen and boatmen, the shipyard labourers and sawyers.

The seafaring activities of Appledore were also clearly differentiated. At the bottom of the social and economic pyramid were the "down homers", the seamen whose little vessels were sailed mostly up the Bristol Channel and who rarely went out into the Atlantic. They were in a world of their own, sailing for the most part on very tight margins in very old vessels in which very little money was invested, making a bare subsistence from endless grinding labour. Often their cargoes were discharged on open beaches with no harbour facilities at all. The vessels were sailed up on to the beach at high tide, moored and discharged into carts which came down across the sands when the tide ebbed. It was a dangerous trade for strangers and it depended on intimate local knowledge of sea

conditions and a very highly specialized and developed knowledge of the local weather. The local insurance societies charged special rates for this kind of trade and limited the months of the year in which it could be carried out.

The next level of the economic scale did better. They were the long range home traders, men with brigs and brigantines and two and three masted schooners and later with big ketches, who latterly earned a much more prosperous living than the "down homers", carrying cargoes between any two ports within the limits of the home trade. To sail further the vessels had to have masters who had passed Board of Trade examinations and who held a master's certificate of competence. Most of the local masters did not, many of them could scarcely read or write, but they were in a position to generate capital, to accumulate enough to buy shares in other vessels and some of the families which did this among themselves became very prosperous indeed, rising in one or two generations in economic status from the level of the agricultural labourer to the level of the small farmer owning his own land.

The shares system of ship owning was one large part in this kind of success. Another absolutely fundamental factor was share holder, and preferably family, command. The master of the vessel as a shareholder himself had the best of all incentives to make the maximum number of voyages with paying cargo possible in each year. The master did all the ship's business, obtaining cargoes and keeping the vessel in good repair. In addition he and the rest of the crew were employed by the voyage, that is at a fixed rate for a given voyage, the agreement terminating when the voyage was over. This system gave every member of the crew besides the master, the maximum personal interest in making the greatest possible number of voyages in each year, since the more voyages they made the more money they earned. Shipowning groups which hired masters and crews by the month did not link earnings directly to passages completed and cargoes carried and they never prospered in the same way as those who sailed by the month. It was this by-the-voyage system of payment which perhaps more than anything else contributed to the continuing prosperity of Appledore sailing ships well into the 20th century.

There was another incentive for the master to do the most work he could with a wooden sailing ship sailing out of Appledore, and many other places in the south west of Britain and elsewhere and this was the third share system on which the vessels were operated. The owning group of shareholders (who so often included the vessel's master) kept one third of all the money earned by the vessel, out of which they paid for the upkeep of the ship and her gear and all insurances. The insurance of Appledore coasters and many other vessels in Europe was carried by local mutual associations the working of which was a complicated business but which, in fact, represented the most economical form of cover possible. The other two thirds of freight earned belonged to the master and from them he had to pay wages, food, and all port expenses. Any balance he kept, and this was an additional wage. Thus the master had three separate sources of income, all directly related to his own efforts and astuteness. To give its most enterprising and energetic citizen such incentives was an excellent way of ensuring the rising prosperity of the whole community, and in one form or another this kind of system was operating in many rural shipowning communities, in Britain generally as well as in the south west, in Europe and in North America.

The third level in the structure of Appledore shipping in the 19th century was that

of the deep sea sailing vessels. These traded all over the North Atlantic basin and further afield and they varied from barques and brigs and full rigged ships carrying emigrants to Canada by the thousand and returning laden with Canadian timber to schooners in the hard trade with salt fish from Newfoundland. The vessels were the aristocrats of the place, crossing the Atlantic regularly four times each summer and autumn, they carried on one of the world's hardest trades.

Well, so much for two communities in south western Britain, the economic prosperity of which was largely based upon rural shipowning in the sense in which I have defined it in this paper. Now I will turn finally to look briefly at a community which is the perfect example, the text book model case of rural shipowning.

The inhabitants of the Åland Islands have been involved in international trade with wooden sailing vessels since at least the 13th century, when they carried timber and fish and farm products to the markets of Stockholm and to Åbo in Finland. The larger farms had vessels of their own, often built on the farm, smaller farms had "a share in a vessel". The vessels were locally built on the farms. A group of farmers would join together to build a wooden sailing ship for themselves to carry their own produce and any necessary imports. They and their sons would do the work and a master shipwright was in charge. Often he was a farmer himself who specialized in shipbuilding as a sideline. When the vessel was finished she was manned by farm workers and the sons of farm workers. In the archipelago of nearly 9,000 islands, where a single farm can have many islands in its acreage almost everyone was a boatman from early childhood.

The old records show the ship masters and mates and crews as farmers and farmers' sons, smallholders and farm hands. As late as 1906 the big three masted schooner *Ingrid* was built by 20 farmers, owned by nearly 50, some of whom bought their shares with labour and materials. She sailed all over northern Europe, to the West Indies and to Montreal and she made those farmers a lot of money.

The local trading across the mouth of the Gulf of Bothnia remained until the last days of wooden sailing ships. The last small schooner for it was built in 1930 and it finally died out about five years later. But international politics reduced the prosperity of the Stockholm trade and the Ålanders began to look further afield. First came trade with Denmark and southern Sweden and Germany. Then in the late 1850s two very important things happened. The tolls all shipping had previously had to pay to pass through the Sound in Elsinore in Denmark and what is now southern Sweden were stopped and in 1859 Czar Alexander II (for Åland was then part of Imperial Russia) agreed to the foundation of a port town in the archipelago with a custom house of its own. This was Mariehamn, the present capital of the Islands. In 1857 the first Åland vessel had sailed out of the Baltic beyond the Kronborg castle at Elsinore. Only 8 years later the wooden barque *Preciosa* crossed the Atlantic to the West Indies in a trade Åland shipowners were to continue with wooden sailing ships until after the First World War, and thus the *Preciosa* began the opening up of the world of Åland shipping.

Strong connections were developed with Britain and in due course the other European countries with an Atlantic coast. There was a tremendous expansion of shipping activity, all with wooden sailing vessels, locally built in the circumstances I have described above. One village on the island Vårdö had 6.8 tons of shipping per head of the population by 1875 and these vessels were owned by the local community, literally by

the farmers by the score and not by joint stock companies or millionaires. The seafaring was directly complementary to the farming. The historian of Åland's shipping, George Kåhre, estimated that even by the mid 19th century Åland had three tons of shipping for every acre of cultivated land. The farmers and their sons, smallholders, and fishermen, went off to the sea, leaving the women at home to keep the farm in order. The Island parish of Lemland in the mid 1870s had only 350 men between the ages of 15 and 50 in its population, yet listed 340 seamen. By the 1860s only a decade after the first Åland ship had sailed out of the Baltic, there were no fewer than 200 vessels regularly employed in trade with Britain.

So prosperous did this carrying trade become that a great generation of capital took place. The farmhouses grew bigger and more comfortable and better furnished, indeed the houses expanded out of all proportion to the little farms around them. This was a reflection of an important element in Åland sailing which gave masters, who were nearly always shareholders, every incentive towards energetic promotion of the ship's business. The master kept five per cent of the freight money on every voyage with cargo, over and above his income as a shareholder, his salary and prerequisites. It was this five per cent, which continued to be paid until after the First World War and which was often very much more than the master's salary and could represent a considerable sum over a few years, which built the big farm houses and encouraged the vigorous pursuit of profitable cargoes by those in charge of vessels in foreign ports.

The Åland community was quite different from the other communities I have described. Accustomed to a climate even more rigorous than that of Canada and with a longer darker winter, less fertile land and smaller resources of timber, the Ålanders were accustomed to hardship and hard work. Their standard of living, depite their circumstances, was higher on the whole than that of their equivalents in the other communities I have described. With some fertile land, a wood lot, a boat for fishing and family transport, work at sea in the summer and in the woods during the winter freeze up when the vessel was laid up awaiting the repairs which were made in the spring, and a share in a vessel, the Ålander was free and independent, neither the slave of his employer nor in debt to a merchant. A deeply democratic community with few social distinctions, and a close pattern of interrelationships, in the days of wooden sailing ships everyone had a fortune from the sea at his behest and in varying degrees quite a few of them seemed to have made it.

How is all this relevant to the problem we have been discussing at this symposium? I suggest highly relevant, because the Åland community has so many parallels with maritime Canada. It is geographically similar. In fact taken there blindfold you might think yourselves for a short time in Nova Scotia. Like Atlantic Canada it has a notable deficiency of resources. Yet today this community, which occupies an area perhaps less than the area of the peninsula between Trinity Bay and Conception Bay, operates and owns more than half of Finland's large modern merchant fleet. Had I realised how very relevant this simple fact is to the discussion which has developed at this symposium I would have armed myself with some statistics, but probably more than half a million thoroughly modern tons are owned by a community the largest town of which is not much bigger than Harbour Grace is today. As you walk through its tree lined streets it is difficult to realise this because much of the tonnage hardly ever visits its home port. But if you go into the modern but small and unpretentious offices of the owning companies

you can see the wall charts of daily positions with their flags – vessels on the coast of Africa, of South America, in Indonesia, Japan, the Southern Ocean. There are ship repair facilities, a splendid navigation school, and incidentally, what is probably the finest regional maritime museum in the world. The history of the industry is very well documented indeed. Working in Mariehamn the Island capital, and at the Swedish University at Åbo, it is possible in this case to form conclusions about vessel profitability, and so on, because the records of at least one company are complete down to the most detailed correspondence in the early years of this century.

At the same time Åland is what Canadian Provincial Governments call a leisure resources area. Over one million tourists from all over Europe pour into this tiny area between June and September each year. Yet its shipping industry is far more important and the place retains its own strong identity.

Now some of you may find this a mouth watering description of what you would like to have happen in Atlantic Canada. Why did it happen in Åland and not in places like Yarmouth? Well it is your job to study the evidence and form your conclusions. I shall make only one suggestion which, I submit, is very relevant to much of what we have heard here. If you are a tough and lively people with no resources at all except inherited capital and expertise which have not been dispersed because there is nowhere for it to go, if you have the attitudes which emerge from half a century of wars, revolutions, near bankruptcy, if you have the Russian presence on your doorstep and there is nowhere else to go, then you may well develop into a major shipping community. You have plenty of incentive, largely because there is nothing else you damn well can do.

10. DISCUSSION FOLLOWING THE PAPER OF B. GREENHILL

ALEXANDER asked about Greenhill's suggestion that the success of the Åland Islanders in making the transition to modern ship owning was perhaps due to their cultural and social isolation, which meant that neither they, nor their capital, could easily migrate. In Newfoundland before 1949 there were more restrictions upon movement from the Dominion than existed in mainland Canada, and Newfoundland faced essentially the same situation that the Ålanders did. However, Newfoundland was not transformed. Why was one successful and the other not?

GREENHILL remarked that there was migration from the Åland Islands, including some to North America, but a considerable number of these people eventually returned home. There was also capital migration to Helsinki, and two of the pioneer shipowning families did transfer to Helsinki during the First World War, but none of these circumstances prevented the development of the Åland shipping industry, but compared to the movement in English speaking North America, the Alanders were certainly much more restricted. However, other factors also played a part in the success of the Åland economy. The population was small, homogenous and had reached a high educational and cultural level. There was a long tradition of seafaring, a readiness to spend long periods away from home and an eagerness to invest in shipping. The farming/seafaring community was skilled in ship building and was able to use very sophisticated ship models as a pattern.

PANTING noted that the Åland Islands were incorporated into the Russian Empire for a period and wondered whether they were in the same sort of colonial relationship to Russia, Finland or Sweden that Newfoundland was to Britain, or later to the continental part of North America.

GREENHILL thought the parallel should not be drawn too sharply since Finland was run "on a pretty loose rein by Imperial Russia". In addition, the Ålanders were Swedish speaking and thus distinct and culturally alienated from the Finnish mainland. The Finnish and Åland characters are very different, and the Ålanders have a strong cultural defensiveness. Today they are not in a dependent relationship to the rest of Finland because they dominate the Finnish shipping industry.

JANNASCH stressed the importance of educational levels in the success of the Ålanders by pointing out that the town of Mariehamm with a population of 5,000 possesses five large bookstores.

CRAIG examined the points raised by Greenhill about the ports on the River Tamar and of Appledore and pointed out that these were not unique but absolutely typical of the coastal communities around the British Isles. The trade patterns of each region were determined by geography in that the shipowner of Yarmouth on the East

Coast focussed on the Baltic and the European continent whilst the West Coast men focussed on Ireland or the Atlantic trades, yet the basic characteristics of the coastal communities were the same.

Turning to the Åland Islands he raised the important question of the role of entrepreneurs in developing an economy. How far was the growth of the Åland Islands due to the fact that one entrepreneur, Gustav Ericson, found it in his best interests to remain there?

In general shipowners are uniquely endowed with the ability to migrate because the essential requirement, besides capital, is know how which goes with the man. Many "British" shipowners were not British at all – Ellerman and the Greeks being good examples. There was an enormous German and Scandinavian influence on the North East Coast of Britain. Thus why did Ericson remain on Åland where the conditions were not really conducive to capital formation? Certainly throughout the period there was a tendency for the larger shipowners to congregate at the bigger sea ports. Was Ericson unique or were there others?

GREENHILL replied that Ericson was merely the most well-known of a group of Åland shipowners and he entered into trade as an heir, and into a long established shipping tradition, although he agreed that some of them did leave the region. The Ericson family, however, is not even the largest shipping interest. Of 10 or 12 major shipowners in the Aland Islands during the 20th century only two have left.

RICE pointed out that Norway, which was successful in making the transition from wooden ships to steamers, was in many cases comparable to Maritime Canada. Both had a timber trade, both were largely engaged in the deep sea carrying trades, but Norway continued to operate sailing vessels well into the 20th century, and from this to develop a modern shipping and shipbuilding sector, whilst Atlantic Canada did not.

GREENHILL agreed that the Baltic lumber trade was an essential ingredient in the development of the Åland shipping industry, and they tended to fall back upon that trade when other shipping trades were depressed.

KNOPPERS agreed that the Alanders had a long tradition of involvement in Baltic trades but thought that the really important question was how they managed to break out into world-wide voyaging.

11. THE DEVELOPMENT OF THE LINER TRADES

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THE DEVELOPMENT OF THE LINER TRADES

P.N. Davies

It is the aim of this paper to examine the changes in technology which transformed the shipping industry during the 19th Century so as to show how they led to the establishment of the "liner" companies. It is also intended to demonstrate how, as a consequence, a similar revolution took place in commercial organisation. It is then proposed to explain how these two events subsequently encouraged the evolution of the "conference" system that was designed to regulate competition. In each instance the changes will be examined in a general way but, where necessary, particular cases will be illustrated by reference to either the West African trades or to the activities of the "Royal Mail" Group. The detailed study will end at 1914 but certain aspects will be continued to the post-war era.

The development of the British shipping industry may best be traced from the reign of Elizabeth I. In 1560 the English owned only about 50,000 tons[1] of merchant shipping and lagged far behind both the Spanish and the Dutch in this respect. Most of these ships were utilised on coastal routes and in the fisheries but a few conducted a small trade with the Continent and with the Baltic.[2] The growth of fishing in the North Sea, off Iceland and on the Newfoundland Banks together with the rapid increase of the coal trade from Newcastle to London provided a major impetus to the industry which also began to establish direct links with Italy and Turkey.[3] A little later, the trades with the Far East and to the West Indian Islands and the American colonies all developed quite significantly and, in spite of Dutch opposition, sailings to the Baltic gradually increased.

By 1702 English merchant shipping amounted to approximately 323,000 tons[4] and France rather than Holland was the main competitor. The rate of growth of trade, hence shipping, then slowed considerably and rapid expansion did not begin again until the middle of the century. This fresh increase was based on the long-distance routes, especially those with America, the West Indies (including the Slave Trade), India and China, so the demand for additional vessels was particularly enhanced. In turn, the need for shipbuilding materials led to a further extension of trade with both the Baltic and North America and by 1788, in spite of the difficulties caused by the War of Independence, capacity had risen to 1,055,000 tons.[5]

The emergence of Britain as the world's first industrial state during the late 18th Century[6] dramatically increased her range of exports. Her competitive position was further improved by the Revolutionary and Napoleonic Wars which effectively prevented France and other potential rivals from taking an active part in overseas trade. The Americans and Swedes took full advantage of their neutrality to secure a share in these new developments but, as the following table indicates, Britain was able to make very satisfactory progress with her foreign trade:

By 1816, therefore, there were 2,417,000 tons of shipping on the Register of Great Britain[7] and in addition to the direct services shown above many vessels found employment in the "cross-trades" – those between the West Indies and British North America, and between Newfoundland and Spain and Portugal were of considerable

importance – and in the coasting trade which provided London with coal from the North East.[8] Britain's favourable position at sea was quickly challenged by America and her merchant fleet rose from only half that of her rival to near parity in 1861.[9]

TABLE 1

BRITISH SHIPS ENTERED AND CLEARED IN THE FOREIGN TRADE OF GREAT BRITAIN: 1792 AND 1816

1792				1816		
NUMBER OF SHIPS		Average		NUMBER OF SHIPS		Average
Entered	Cleared	Tonnage		Entered	Cleared	Tonnage
2,746	1,367	186	Russia, Scandinavia, Baltic, and Germany	1,824	1,721	148
1,603	1,734	117	Holland and Flanders	1,148	1,070	99
1,413	1,317	73	France	1,522	1,442	70
975	615	126	Spain, Portugal, Atlantic, Is., Gibraltar and Malta	806	545	120
138	215	143	Italy and Austria	175	230	143
38	48	224	Turkey, Levant, and Egypt	26	18	180
77	250	202	Africa (excluding Egypt)[1]	42	68	188
28	36	707	Asia[2]	116	164	657
219	383	147	British North America	783	772	220
202	223	221	United States	175	277	260
705	603	233	West Indies (British and Foreign)[3]	963	936	258
160	135	270	Whale Fisheries	175	164	320
8,304	6,926	151	Total, excluding "Foreign Coasting"	7,755	7,407	165
532	611	47	Channel Isles and Man	1,424	1,115	45
4,195	6,354	75	Ireland	7,575	8,861	82
13,030	13,891	117	Grand Total	16,754	17,383	116

Source: See C. Ernest Fayle, *A Short History of the World's Shipping Industry,* George Allen and Unwin, London, 1933, p. 223.

Notes:
1. Ships cleared to Africa in 1792 include slavers ultimately bound to West Indies.
2. Includes one or two ships for Australia. The great increase in 1816 shows the effect of the opening of Indian trade to private merchants in 1814.
3. In 1816 includes some ships trading with South America.

This American success was based on ships built of home produced softwoods that were not only cheaper than contemporary British vessels but which were also very much larger and able to take advantage of many economies of scale.[10] The British ships were constructed of hardwood which, though expensive, could be relied upon to give long service. This was, perhaps, the more economical material in the long term,[11] but any marginal gain in this direction was more than offset by the superiority of American design

and size. It was not until the advent of the steam engine that the American challenge could be successfully defeated, for British engineering led the world at this time.[12]

II

A great deal of pioneering work on the application of steam to propel small river craft was undertaken in the second half of the 18th Century[13] but it was not until 1807 that it was used commercially. In that year the *Clermont,* built by Robert Fulton, began a regular service between New York and Albany, and five years later, in 1812, Henry Bell's *Comet* began to operate from Glasgow to Greenock and Helensburgh. Clearly the Americans were the first in this field but any claim to pre-eminence is usually contested on two grounds: Fulton is alleged to have been the son of an Ayrshire emigrant[14] (so was really British!) and, of more importance, the engine which he used to power the *Clermont* had been made by Boulton and Watt in Birmingham, England![15]

America, in fact, quickly took a lead in the ownership of steamships and by 1820 she possessed over a hundred compared with Britain's forty three. In 1840, for example, the steam tonnage belonging to the United Kingdom amounted to 95,807 tons while the United States owned approximately 200,000 tons. The explanation is that whereas most of the British vessels were suitable for the open sea, all but 4,000 tons of the American ships were intended for river work.[16] At this stage in their development steam vessels required enormous quantities of fuel and were still relatively unreliable so they were unsuitable for long voyages. At the same time their independence of wind and current made them ideal as tugs and ferries and for providing cross-channel services.

The first steam crossing of the Straits of Dover was made in 1816 by the *Majestic* but this was only a single voyage.[17] In 1819, the *Rob Roy* commenced what was probably the world's first regular sea service by steaming between Greenock and Belfast,[18] and in the same year the *Waterloo* began to operate in a similar way between Belfast and Liverpool.[19] Two years later the *Rob Roy* was moved to the Dover-Calais route where she operated with great regularity – her 30 h.p. engine giving a speed of 7 knots and an average crossing time of about 2 hours and 45 minutes.[20]

The success of steamships on the shorter routes led to attempts to extend services to more distant places and by 1826 the General Steam Navigation Company employed two steamers between London and Portugal.[21] In 1828 the City of Dublin Steam Packet Company began to operate between Dublin and Bordeaux but longer voyages were still regarded as non-viable propositions. More typical of the era was the activity on the Thames where some 35 steam boats were placed into service between 1814 and 1828. These were mainly to provide passenger services and covered the river from Richmond to Margate.[22] A few experimental voyages were completed over lengthy distances. These included *Savannah,* New York to St. Petersburg in 1819; *Rising Star,* England to Chile in 1821 and *Enterprise,* Falmouth to Calcutta in 1825.[23] All of these journeys were made partly or mainly with the aid of sail – many technical advances were necessary before steam could be utilised as the sole means of propulsion over long distances.

The application of technology to ocean going vessels was applied on a number of fronts simultaneously so that improvements in engine performance and transmission were complemented by advances in the design and construction of the hull. The development of steam engines is very closely allied to progress with boilers and in the 1820s the safe pressure that could be achieved was rarely more than 5 lbs. per square inch. This meant, in effect, that the consumption of coal could be as much as 10 lb. per horsepower per hour.[24] By the 1840s boiler pressure had risen to 10 lbs. and by the 1850s it was frequently used at 20 lbs. per square inch.[25] With pressure at this level a simple expansion engine, fitted with jet condensers, would require about 4 lbs. of coal per indicated horsepower per hour.[26]

The introduction of the compound engine in which the steam is expanded in two stages, allied to even higher boiler pressures, led to coal consumption being halved in many cases. They also reduced the weight of the machinery and the space it occupied and opened the way for faster speeds to be achieved. Randolf and Elder fitted the first effective engine of this type to the *Brandon* in 1853[27] but, perhaps, the most impressive example of early compounding was that of Alfred Holt's *Agamemnon, Ajax* and *Achilles.* These vessels, constructed in 1864 operated with a boiler pressure of 60 lbs. per square inch and at their service speed of 10 knots required only 2¼ lbs. of coal per indicated horsepower.[28] The consequence of this economical performance was that these ships could make the run of 8,500 miles from England to Mauritius without refueling and thus just about all routes were now open to steam navigation.

The advances in boilers and machinery were aided by the almost universal, if gradual, adoption of screw propulsion after 1845. In that year the Royal Navy arranged a test between two vessels of similar power – the screw steamer *Rattler* and the paddle sloop *Alecto.* The ships were lashed stern to stern and the *Alecto* went at full speed ahead. She towed her rival until the *Rattler* produced her full power and eventually the screw driven craft towed the *Alecto* astern at about 2 knots.[29] In course of time paddle wheels were only fitted to vessels where manoeuvrability was crucial such as in ferries and tugs and even more conservative owners like Cunard adopted the propellor. Cunard's last paddle-driven ship was, in fact, the *Scotia,* built in 1861.[30]

Other improvements in technology, such as the surface condenser, and developments in hull design that enabled a free flow of water to the propellor also made substantial gains to efficiency. Of even greater significance, however, was the adoption of iron for the construction of the hull. The first iron steam ship was the *Aaron Manby,* built in 1822, and she was to prove the forerunner of many such vessels designed for river and canal work. Thus the Birkenhead Iron Works (now Cammell Laird and Company) produced *Lady Lansdowne* in 1833 for use on the River Shannon. Her active life came to an end in 1867 and she was scuttled at Killaloe where she was excavated by a team of divers under the direction of the author in 1967. Unfortunately, *Lady Lansdowne's* engines and paddle wheels had long since disappeared, but her frame and part of her plating were still in remarkably good condition.[31]

Many experts thought that an iron vessel was an affront to nature and although they gradually gained acceptance for river work it took a long time for them to be used

for ocean voyages. The first sea-going vessel to be constructed of iron was the *Alburkah* of only 35 tons which had been specially built in 1832 to carry MacGregor Laird and his party up the River Niger. She had to make her own way out to West Africa and some commentators thought that this would prove to be impossible:

> It was gravely asserted that the working in a sea-way would shake the rivets out of the iron of which she was composed: the heat of a tropical sun would bake alive her unhappy crew as if they were in an oven; and the first tornado she might encounter would hurl its lightnings upon a conductor evidently sent forth to brave its power.[32]

In practice, *Alburkah* proved to be particularly successful. Her iron hull caused no problems on the way out to the Niger and was a source of great strength when she grounded. She did not attract lightning and was no warmer than a comparable wooden ship, and her 16 horse power engine did all that was asked of it in spite of the lack of qualified engineers and suitable oil.

Evidence such as this slowly convinced shipowners and engineers that iron was a suitable medium for hulls and Lloyd's Register classified its first iron steamer, the *Sirius,* of 180 tons in 1837. A second vessel, the sailing ship *Ironsides* of 270 tons was classified in 1838, but no rules were laid down for constructors until 1855.[33] This is not to suggest that problems did not exist for the rapid fouling of iron hulls by marine growths and the deviation of the compass needle by the iron in the ship obviously led to difficulties and expense. In the case of the *Tayleur,* bound from Liverpool to Melbourne on her maiden voyage, the compass deflection was so marked that instead of proceeding down St. George's Channel she was wrecked during a fog on Lambay Island, near Dublin, with the loss of over three hundred lives.[34] This disaster occurred as late as 1854 so it will be realised that the characteristics of the new construction were not always fully understood.[35]

Nevertheless iron came rapidly into favour for the building of both steamers and sailing vessels during the 1860s[36] for in spite of its various defects it possessed two important advantages over wood. In the first place although iron is heavier than wood its greater tensile strength permits so large a reduction in thickness that an iron ship weighed about a quarter less than a wooden vessel of the same dimensions so that she could carry considerably more cargo without diminishing her buoyancy. Secondly, whereas the structural limit of the length of a wooden ship was about 300 feet, there was practically no restriction on the size of an iron ship other than the ability of her owners to fill her and of ports to handle her.[37] These two aspects of iron construction were of such value that they easily outweighed its disadvantages, but it should not be forgotten that in the 'fifties and 'sixties the P. and O. Company had to spend some £70,000 a year to keep the bottoms of their vessels clear of fouling.[38]

The acceptance of iron for hull construction was not, of course, confined to steamships and many sailing vessels benefitted from its use. At first iron was substituted for wood in the framing only and wood continued to be used for all other purposes. Gradually sailing ships built entirely of iron became common and, with its aid, sail was able to restrict the advance of steam. Other factors which increased the efficiency of sail during this period included the alterations in the Tonnage Laws in 1836 and in 1854. These allowed changes in hull design for owners were no longer constrained by penalties

on breadth[39] and under pressure of the competition of steam many labour saving devices were installed.[40] The work of Maury in combining the experience of hundreds of voyages into sailing directions for all parts of the world meant that significant savings in time could be achieved by taking advantage of favourable winds and currents.[41] Taken together, these measures meant that it was not until the 1880's that Britain's steam tonnage equalled her sailing tonnage.[42]

It was the certainty of performance that finally ensured the victory of steam over sail. Many clipper ships could log 15 knots under certain circumstances whereas the average steamer in the 'eighties would seldom have a service speed of over 10 knots. But while the clipper might be becalmed for days on end the steamer was not subject to delay of this kind, and being less dependent on climatic conditions the power driven vessel could take a direct course from port to port whereas the sailing ship might have to sail many hundreds of extra miles in order to take advantage of the prevailing winds and ocean currents. The consequences of these factors were that the steamship could perform far more round voyages in the year than the sailing vessel and her annual carrying-power was likely to be at least four times greater. The opening of the Suez Canal in 1869 was a further blow, for sailing ships could not pass through the Red Sea and had to continue to use the Cape route, while steamers saved between 3,000 and 4,000 nautical miles on the trading routes from Europe to Asia.[43] The subsequent replacement of iron by steel and the development of very high boiler pressures and triple-expansion engines then completed the ascendancy of steam,[44] and sail began to decline quite rapidly.[45]

IV

In spite of the fact that it was the steamship that was capable of ignoring the vagaries of natural forces it was the sailing vessel that was originally used to operate a regular, deep sea, schedule. Sailings of this type are usually referred to as "liner" services, but this is a term which had better be defined,

> . . .for it is not always understood – partly because many owners both of steamers and of sailing vessels have called their vessels the "Such or such Line" as a mere badge of common ownership, without reference to the kind of trade in which the ships were employed. Strictly speaking, a liner service implies today a fleet of ships, under common ownership or management, which provide a fixed service, at regular intervals, between named ports, and offer themselves as common carriers of any goods or passengers requiring shipment between those ports and ready for transit by their sailing dates. A fixed itinerary, inclusion in a regular service, and the obligation to accept cargo from all comers and to sail, whether filled or not, on the date fixed by a published schedule; these, and not the size and speed of the ships nor the number of vessels in the fleet, are what distinguished the "liner" from the "tramp", "seeker", or "general trader" – the ship which can be hired as a whole, by the voyage or the month, to load such cargo and to carry it between such ports as the charterer may require.[46]

At the end of the Napoleonic Wars most merchant ships operated on a casual basis

sailing from port to port as cargo was offered. In addition to these "tramp" or "transient" vessels a substantial number of "regular traders" confined their activities to particular routes, usually carrying a high proportion of their cargoes on owners' account, but filling any spare capacity with freight for other merchants. This was a pattern on many routes throughout the world but it was especially evident in the busy North Atlantic trades which connected Europe with America. Sailings on these fixed routes were constant and regular but as they were not coordinated and as they tended to depart when full rather than on an advertised date, they cannot be regarded as true "liners".[47]

By 1817 a strict timetable was being followed by steamboats on the Hudson River and American coastal vessels were providing a regular service by sailing in succession at advertised times. These examples may well have influenced Jeremiah Thompson to investigate the possibility of a similar service across the Atlantic but it is certain that he and his partners considered the economic and practical aspects very carefully before they made a final decision.

The undertaking to sail on scheduled dates whether full or not involved the risk of considerable loss. It was hoped, however, that this would be more than offset by attracting the better paying cargoes for items such as mail, specie, "fine freight" and cabin passengers could be expected to pay a premium for the convenience of regularity and speed. The concept of a monthly service also involved sailings throughout the winter. This meant that each ship would complete three round voyages per year instead of the two which had previously been made by "regular traders". Thus the owners would be able to raise the utilisation of their vessels by 50% and they calculated that this would be sufficient to compensate for the heavy damage that could be anticipated during the winter crossings.[48]

Accordingly, on 27th October, 1817, an announcement was made in the New York *Evening Post* as follows:

LINE OF AMERICAN PACKETS BETWEEN
NEW YORK AND LIVERPOOL

In order to furnish frequent and regular conveyances for GOODS and PASSENGERS, the subscribers have undertaken to establish a line of vessels between NEW YORK and LIVERPOOL, to sail from each place on a certain day in every month throughout the year.

The following vessels, each about four hundred tons burthen, have been fitted out for this purpose:

Ship AMITY, John Stanton, master.
COURIER, Wm. Bowne,
PACIFIC, Jno. Williams,
JAMES MONROE, –

And it is the intention of the owners that one of these vessels shall sail from New York on the 5th and one from Liverpool on the 1st of each month. . . .

ISAAC WRIGHT AND SON
FRANCIS THOMPSON
BENJAMIN MARSHALL
JEREMIAH THOMPSON

Contrary to public expectation the *James Monroe* sailed as planned at 10 a.m. on 5th January, 1818. On the previous day the *Courier* had left Liverpool – three days later than arranged – and thus the service was underway in both directions.[50] A distinctive black ball at the top of the main mast and a large black circle on the foretopsail identified what became known as the "Black Ball Line" and, such was its success, that is soon attracted a number of rivals. These included the "Red Star Line" and the "Swallowtail Line" which both, in 1822, established additional services on the Liverpool route. In the same year a new group began a line from New York to Le Havre and this was joined by a competitor in 1823. A further service was introduced in 1824. This was to London and although organised by several sets of partners was usually known as the "Black X Line".[51]

During the 'twenties and 'thirties the lines mentioned above appear to have made satisfatory profits. In 1835, for example, it was estimated that gross earnings for a packet completing three round trips would amount to $20,000 from freight, plus a further $10,000 from passengers, specie and mail. Outgoings would amount to about $4,000 for wages, $2,500 for insurance and an unspecified amount for food, repairs and dock charges. As the average packet cost between $40,000 and $50,000 when new, and could be expected to give eight or ten years of service, it would seem that returns on capital could be quite high.[52] This was certainly the understanding of the promoters of the "Dramatic Line" which entered the Liverpool trade in 1837. The service received its name by calling all its vessels after theatrical characters, Shakespeare, Garrick, Siddens and Sheridan and under the management of E.K. Collins it made steady progress.[53] With the addition of this line the regular packet service on the Atlantic rose to employ 48 vessels by 1840 and 52 by 1845. This meant that each week there were three sailings to and from New York.[54]

The scheduled services operated for a sixty year period. Until 1838 they monopolised the best part of the trade but during the ensuing twenty years had to share the more lucrative items with the ever increasing competition of the steamship. Thus the packets lost mail and specie almost immediately and the better classes of freight and passengers gradually followed. To some extent this loss could be balanced by the carriage of immigrants, but after 1858 these, too, tended to be conveyed by steam. The packets were then left with little more than high bulk, low value cargoes which barely paid and sailings to Liverpool came to an end in 1878.[55]

V

Although the Atlantic liners relied entirely on sail they were increasingly assisted by steam at the beginning and end of their journeys. In New York the first instance of steam towing took place during 1818[56] and the following year a hired steamboat towed the *Hastings,* (a ship of the line) down the Thames against a rising tide to a point two miles beyond Gravesend.[57] The Admiralty then ordered a small steamer to act as a harbour tug and vessels of this type quickly became common at all the major ports.[58]

The practical application of steam in this way together with the increasing use of steamships on the cross-channel routes then encouraged shipowners to think of the

advantages of utilising powered craft on longer and longer voyages. This aim was obviously limited by the technology available but as reliability improved and coal consumption fell the constraints on the wider employment of steamers were financial rather than mechanical.

By 1837 the firm of Willcox and Anderson was advertising a fortnightly service from London via Falmouth to Oporto, Lisbon, Gibraltar and Malaga. At this time the mail, carried by "Falmouth" sailing packets, took three weeks to reach Lisbon. Many items were therefore carried illegally by the new steamers and their owners argued that it would be cheaper for the Exchequer if the Admiralty packets were abolished and all mail carried by them in return for a suitable subvention. After considerable debate this was agreed and it was arranged that Willcox and Anderson would receive £29,600 per annum for providing a regular mail service to Gibraltar. This came into effect in August, 1837, just in time to prevent bankruptcy for the steamers had been operated at great loss. The subsequent improvement in speed and reliability then led to demands for an extension of the facility to Alexandria and when this was approved in 1840, with a subsidy of £34,200 a year, it led directly to the formation of the Peninsular and Oriental Steam Navigation Company.[59] Two years later the P. & O. undertook to carry the mails on from Suez to India and soon afterwards the contract was further extended so that the Company was responsible for delivery to Penang, Singapore and Hong Kong.[60]

The commercial importance of the postal subvention to the P. & O. was immense for in 1838 the Admiralty publically invited tenders for an Atlantic mail contract and, thereafter, were willing to consider financial support for a wide variety of routes. One consequence of this changed situation was the formation of the Pacific Steam Navigation Company by William Wheelwright in September, 1838. This provided for the establishment of a steamship route along the coal-less Western coast of South America so as to connect Bolivia, Chile and Peru.[61] Another even more ambitious project was the creation of the Royal Mail Steam Packet Company in 1839. This company was largely the work of James MacQueen who was basically a financier and had little experience of maritime affairs. Nevertheless he was able to persuade the Government to incorporate the Royal Mail as a "Chartered" company[62] and, in return for a "service twice monthly to Havannah via the West Indies, the staggering subsidy of £240,000 per annum was paid".[63]

On the North Atlantic the experimental voyage of the *Savannah* was followed by other crossings under sail and steam but it was not until 1838 that steam navigation really began in earnest. In that year the *Sirius* and the *Great Western* departed within three days of one another and were followed by the *Royal William* and the *Liverpool.*[64] The owners of the *Sirius* and the *Great Western* then tendered for the contract, and subvention, to carry the mails from England to Halifax and on to Boston. Neither satisfied the exact conditions so were refused and Samuel Cunard, an astute merchant with experience of shipowning, was able to secure the acceptance of his bid.[65] The original contract, signed in 1839, provided for a subsidy of £55,000 per annum for seven years but it was later raised to £80,000.[66] Armed with this agreement Cunard joined with George Burns and David MacIver and established the British and North American Royal Mail Steam Packet Company – this was subsequently known as the Cunard Steam Ship Company.[67]

The new Company began its service in 1840 with four specially constructed vessels: *Acadia, Caledonia, Columbia* and *Britannia* – the latter taking the first sailing on the 4th

July and reaching Halifax on the 17th. During the remainder of that year the four steamers each made eight voyages and completed a further twenty-one in 1841. On average the outward journey took 13 days and the return trip just over 11 days and all were completed on time and without incident.[68] The success of this service immediately affected the prospects of the original sailing lines and was to lead, in the course of time, to their extinction. That this was inevitable, at least for the carriage of the better paying cargoes and passengers, can be seen by reference to the performance of the sailing packets. Over the ten year period from 1829 to 1839 they averaged thirty-six days from Liverpool to New York and twenty-four days on the return voyage.[69]

After eight years of steady progress using Boston as his American terminus, Cunard decided to establish a direct service from Liverpool to New York. A fresh contract was made with the Admiralty and, in return for a subsidy of £145,000 a year, four new ships were constructed and the new link was inaugurated. By then the first American attempt to compete with Cunard had failed, for the Ocean Steam Navigation Company's vessels were slower and less reliable than their British counterparts.[70] It was then left to E.K. Collins to oppose Cunard and with the aid of massive Government support he built a number of fast and luxurious steamships which were specially designed "to drive the Cunarders off the sea".

The vessels of the Collin's Line soon proved that they were quicker than their rivals and were able to cut, on average, a day off their sailing times.[71] But this speed was expensive both in fuel and repairs so while Cunard made money, Collins lost heavily. The American Government then raised its assistance from $385,000 to $853,000 a year but it soon became clear that speed cost lives as well as money.[72] In 1854 the *Arctic* was lost after a collision in fog and 318 people were drowned including Collins' wife, son and daughter. Two years later the *Pacific* sailed from Liverpool and was never heard of again and it was presumed that she had been sunk by ice. These two disasters discredited Collins and in 1858 the subsidy was withdrawn.[73] This meant an end to the line and to its competition with the Cunard line, who throughout this period had continued to maintain its regular service. As will be seen later, however, recent research has shown that although the rivalry between the two Companies was real enough they had made a secret agreement to fix rates and pool a proportion of their earnings.[74]

VI

By the middle of the 19th century liner services operated by steamships were quite common and by the 1870's were covering most of the world's busier routes. An example of the establishment of a smaller line is that of the African Steam Ship Company which came into being as a result of the work of Macgregor Laird. Laird, born in 1809, was a member of the Birkenhead family of shipbuilders that is now well known as Cammell Laird and Company. In 1832 he joined with Richard Lander to form an expedition to explore the River Niger by steamship[75] but this proved to be a costly failure and he turned his attention to other, more lucrative, affairs.[76] These included the secretaryship of the British and American Steam Navigation Company which sent the *Sirius* and, later, the *British Queen,* to compete on the North Atlantic.[77] He then rejoined the family

shipbuilding business but in 1849 moved to London where he became a merchant in the West African trade.[78]

MacGregor Laird was then in a unique position for he had personal experience of West African conditions as well as recent experience in the operating of steam shipping. He was also in a good position to judge the potential of the trade between Britain and the Coast which by 1850 was employing over 40,000 tons of registered sailing vessels.[79] He therefore approached the British Government and after protracted negotiations was able to obtain a ten-year mail contract with a subsidy which amounted to an average of over £21,000 per annum. With the aid of this contract Laird attracted the interest and capital of a number of businessmen and in 1852, the African Steam Ship Company was incorporated by Royal Charter. Investment in the new firm was undoubtedly encouraged by the limited liability status conferred by this form of organisation for until the Limited Liability Acts of 1855 and 1856 this protection was not readily available. Shares were consequently taken up very quickly and by June, 1853, the capital account stood as follows:

Deposit on 11,008 shares @ £5:	£55,040
First Call of £5 on 11,008 shares:	55,040
Amount paid in anticipation of calls:	19,712
	£129,792[80]

A number of small ships were ordered from Laird's of Birkenhead – no doubt by Macgregor's suggestion – and the *Forerunner* sailed on 24th September, 1852. The log of the *Faith*, which departed on her maiden voyage at the end of January, 1853, has survived and shows a coal consumption of 352 tons on the outward run and 533 tons on the homeward run and she averaged 9½ knots during actual sailing time to Fernando Po and return. The extent to which she used her sails for propulsion, as distinct from steadying, is not clear. The log occasionally refers to the setting of sails and the disconnecting of the screw, but whether the wind was merely used to supplement or replace steam when it happened to be blowing in the right direction or whether the vessel was to be navigated as a sailing ship using power only when essential is not certain.[81]

At the end of the first half year, when five voyages had been completed, the Directors reported a net profit of £1,929-8s.-3d. Thereafter the African Steam Ship Company made steady, if unspectacular progress paying 5% dividends in its early years and 8% throughout most of the 'sixties.[82] In spite of the loss of *Forerunner* at Maderia in 1854 and the sinking of the *Niger* at Teneriffe in 1857 a regular and reliable service was maintained. This created much closer links with Britain than had previously been possible and went a long way towards opening up the West African trade to the smaller merchants.[83]

With few exceptions the liner services that covered the world's shipping routes in 1875 were British owned and utilised British built steamships. The Hamburg-America Line, the North German Lloyd of Bremen and the Netherland Steamship Company of Amsterdam had all been founded in 1856 or 1857, but their activities were still relatively small and they continued to employ the products of the British shipyards.[84] The Americans possessed the Pacific Mail Steamship Company which successfully used American built ships on the San Francisco to Yokohama route and the Guion Line

operated on the North Atlantic with British vessels. The only other rival at this time was the Austrian Lloyd which provided a number of services with steamers built at Trieste.[85]

This position was virtually unchanged in 1880 but ten years later the German challenge was becoming more obvious. In that period German steamships had increased from 215,758 tons to 723,656 tons – a significant development that pointed the way to the near two and a half million tons owned by 1910.[86] Compared with Britain, Germany lagged far behind, with only 9% of world tonnage as against nearly 42%. But the effect of German competition cannot be adequately quantified in this way for while many British vessels were concerned with the bulk trades, the Hamburg-America and the North German Lloyd concentrated almost exclusively on the liner trades.[87]

In the West African trade the monopoly of the African Steam Ship Company had been broken in 1869 when a new line, the British and African Steam Navigation Company had been established by Alexander Elder and John Dempster.[88] After a single year of competition the two firms had decided that co-operation would be more profitable and, thereafter, they had gradually worked closer and closer together.[89] In 1878, Carl Woermann, a West African merchant based at Hamburg commissioned his first steamship and in 1882 his son, Adolph Woermann, established Woermann's German Steam Navigation Company with three vessels.[90] Originally these steamers merely carried cargoes in connection with Woermann's own merchanting activities but in 1885 a separate organisation was created and the line, now owning five steamships, became common carriers. By this time the African Steam Ship Company (which possessed twelve ships) and the British and African (which owned twenty-three vessels) were virtually working as a single unit under the guidance of (Sir) Alfred Jones, the Senior Partner of Elder Dempster and Company. Jones disliked the opposition provided by Woermann which tended to make all of their services unprofitable so, in 1888, the first of many agreements restricting competition was signed.[91]

VII

The introduction of liner services was largely dependent upon the advances in technology which enabled a regular timetable to be maintained. With the single exception of the Atlantic sailing packets organised in New York, the liner companies operated steam driven iron or steel vessels and economies of scale dictated that these would inevitably increase in size.

This development can best be illustrated by examining the cargo and passenger capacity of three vessels of the Cunard line. In 1840, *Britannia,* built of wood, with a simple side lever engine, had a gross tonnage of 1,139 and could carry only 225 tons of cargo and ninety passengers. The *Persia,* an iron paddle steamer of 3,300 tons gross, constructed in 1855, had a capacity for 1,100 tons of cargo and for 180 passengers, and *Bothnia,* an iron screw vessel fitted with compound engines, which went into service in 1874, had a gross tonnage of 4,556 could carry 3,000 tons of cargo together with 340 cabin and 800 third class passengers. In addition, the increase in speed from the 8.3 knots of *Britannia* to the 13 knots of *Bothnia* meant that annual capacity was much greater because of the larger number of voyages that could be completed in a year.[92]

From a commercial point of view the provision of such vast quantities of cargo, and the arrangements that had to be made to deal with such enormous numbers of passengers meant that an entirely different form of organisation had to be evolved.

In the 17th and 18th centuries a ship spent a very low proportion of its time at sea.[93] This was partly because of the need to repair and re-equip after just about every lengthy voyage and because of the difficulty in getting substantial quantities of cargo together. The advent of steam did little, at first, to reduce time spent on repairs but by the 1870's a very high degree of reliability had been achieved and arrangements for planned maintenance could be fully utilised to ensure a rapid turnround during normal operations. The corollary of this was an effective management structure which could undertake the organisation of the business so that the provision of the service and the demands of the shippers or passenger could be efficiently matched. In the course of time this meant that big shore staffs were necessary, for the work done in the office and at the docks became as important to the achievement of profit as the efficiency of the ships themselves.[94]

An example of the way in which it was essential to organise a liner service can be seen by reference to the returns which had to be completed by the officers of the early vessels of the African Steam Ship Company:

TABLE 2[95]

DOCUMENTATION OF THE AFRICAN STEAM SHIP COMPANY

Three Manifest of Cargo	Wine Account — Captain, Officers and Engineers
Three Epitomes of Cargo	Abstract Wine Account
Three Passenger Lists	Abstract Intercolonial Freight out and home
Three Specie Lists	Vouchers for Stores purchased on the Coast
Three Parcel Lists	Passenger Lists, with amounts extended
Bills of Lading — cargo	Cash Book
Bills of Lading — specie	Wine Book
Report on Conduct of Servants	Towage Account
Surplus Stores List	List of Stores supplied to other vessels
Manifest Book	Government Passengers' Wine Accounts
Report on Conduct of Officers	Account of Wines, etc.
Admiralty Log	Visitors, Cooking, Medicine, Breakage
Ship's Log Book	Agents' Accounts
Bills of Lading for Outward Cargo	Kroomen's Wages Accounts
Cargo Receipt Book	Kroomen's Victualling Account
Parcel Receipt Book	List of Draughts, and what taken for Ship's Disbursement Account and Vouchers
Admiralty Returns, *viz:* Journal	Account Current
Abstract of Journal	Government Requisitions and Dinner Certificates
Average Speed	To be handed in within three days of Arrival
List of Mails	Indent for next voyage
List of Vessels Spoken	Inventory and Expenditure Book
List of Admiralty Packages	
Cash Keeper's Department	
Victualling Account of Passengers	
Victualling Account of Captain, Officers and Crew	
Postage Bill	

A typical sailing ship of the early 19th century would probably only carry a log and a manifest, and her Captain would provide a report – either verbal or written – to the owners when he returned to his home port. From that situation to the complex demands of the African Steam Ship Company was a tremendous step – with the exception of taxation returns they were almost equal to the requirements of a modern cargo liner.

Another consequence of the increase in the size of ships was on their cost. When Samuel Cunard negotiated with Robert Napier in 1839 for the construction of vessels for his proposed Atlantic service the price quoted for a vessel of 960 tons with a motive power of 375 horse power was £32,000.[96] Less than thirty years later Cunard purchased the *Oregon,* of 7375 tons, for the sum of £220,000.[97] In these circumstances, demurrage, which had been of little account with smaller and cheaper sailing vessels, assumed great significance and speed of turnround was a critical factor in determining profitability. Furthermore, the high capital cost of large steamships meant that in many cases it was beyond the resources of a single man, or even a partnership, to finance the purchase of sufficient vessels to establish or maintain a viable line. Consequently the principal mail and passenger lines were created as chartered companies and were substantial organisations from their very inception.[98] The general public was prepared to invest in these, and in other shipping firms, because of the protection afforded by "limited liability" status, so growth was seldom hindered by lack of capital.[99]

VIII

In the period from 1855 to 1912 the import and export trade of the United Kingdom grew from just over £260 million to nearly £1,230 million.[100] During the same period the total tonnage which entered and cleared the ports of the United Kingdom rose from less than 19 million tons to 139 million tons.[101] Nevertheless at certain times there was found to be an excess of shipping capacity. This was especially true after the opening of the Suez Canal in 1869 for it not only ended the competition of sail on the Far Eastern routes but also made many existing steamers obsolete.[102] The saving of many thousands of miles on voyage patterns[103] meant that existing trades could be accommodated with far fewer ships, yet the fear that competitors might utilise more advanced designs ensured that the existing lines built many additional vessels.

In these circumstances a surplus of shipping developed and technical obsolescence continued to be a major feature of shipping throughout this period. Improvements in performance in the 1880's engendered by the evolution of triple expansion and quadruple expansion engines, together with boiler pressures of up to 250 lbs per square inch[104] caused vessels fitted with compound engines to become uneconomic. In turn, the introduction of the steam turbine after 1901[105] and of the diesel engine after 1910[106] made many ships that were powered by reciprocating machinery virtually redundant for certain purposes. The replacement of iron by steel for the construction of the hull, the adoption of water tube boilers, the increasing use of twin screws and the change from general to specialised ships all assisted efficiency in various ways.[107] In practice these innovations then forced many owners to sell or scrap vessels which still had years of useful life left in them and thus created further complications in what was already a difficult and uncertain business.

Shipowners, like other entrepreneurs, are not only anxious to optimise their returns but wish to protect their investments. Thus from a very early stage rebates were utilised to encourage additional cargoes for the Black Ball Line[108] and when rivalry between Cunard and Collins became acute (and potentially dangerous to both) they came to an agreement which effectively ameliorated the sharpness of competition.[109] Minimum rates were then fixed for the carriage of both cargo and all classes of passenger. In addition, it was arranged that a part of all earnings would be "pooled" and then divided in accordance with certain fixed rules which took account of the number of vessels which each line had on the berth.[110] These were commonly used arrangements when shipping conferences were introduced later in the century.

A shipping conference is a combination of shipping lines that has been formed to regulate and restrict competition in the carrying trade of a particular route. It has two main aims. The first is to regulate rivalry between the regular companies themselves so as to obtain and maintain what they regard as reasonable rates of freight. This can be achieved by charging unified rates, and the trade may then be divided by fixing the number of sailings for each line during a specific period, or by allotting certain ports to each company, or by pooling an agreed proportion of the freight receipts. The second aim is to restrict the entry of other shipping lines, or individual vessels, and this is normally undertaken by the use of a deferred rebate system.[111]

It is probable that the system was first developed by Swire on the River Yangtse in the early 1870's[112] but the first deep-sea conference did not begin until 1875.[113] This was established to regulate the Calcutta trade and with the introduction of a deferred rebate system in September, 1877, it proved to be an effective device. Many other shipping lines then decided to follow this example and the China conference was formed in 1879,[114] the Australian in 1884, the South African in 1886 and the North Brazilian in 1895. Various attempts at conference agreements were made in the North Atlantic trade[115] during the 1880's and 1890's and later arrangements dealt with the River Plate and the West Coast of South America, in fact, by 1904 they had achieved (and still maintain) an almost world wide coverage.

The West African shipping trade adopted a degree of regulation in 1895. This was largely the work of Alfred Jones who by that date dominated Elder Dempster and Company which, in turn, controlled both the African Steam Ship Company and the British and African Steam Navigation Company.[116] Jones had already eliminated the opposition of several British firms which had attempted to gain a footing in the trade but after an early, mutually unprofitable skirmish, had decided it was better to co-operate with his German rival – the Woermann Line – rather than fight it! Jones was a realist and appreciated that Woermann had the advantage of a steady trade with the German colonies in West Africa and many of the trade goods, especially spirits, used by British merchants were obtained from German sources via Hamburg. Apart from this, West African produce found a ready sale in Germany and three-quarters of the palm kernels exported from British West Africa were crushed in Hamburg.[117] The crushed residue could not be sold in England, but German farmers welcomed it for cattle food and this gave their importers a competitive edge. Thus even if Alfred Jones had been prepared to have fought the Woermann Line it would have been difficult to have won a final victory. The economic advantages of a German-based firm were such that if Woermann had been defeated a new

competitor would soon have arisen.[118]

Once Jones and Woermann had come to terms and decided to introduce a conference structure into the West African trade, action quickly followed. According to Mr. George Miller, a prominent merchant, his first knowledge of the event was when he received a circular through the post.[119] He then had only a month in which to agree to give all of his cargoes to the conference lines and in the absence of a convenient alternative he decided to consent. If he had wished he could have provided his own ships but this would have been more expensive and troublesome than accepting the Conference terms.

Miller was typical of the West African merchants. Few wished to join the scheme, yet all did so, and once having shipped with the Conference the deferred rebate system ensured their continued support. In practice the Conference operated as the original circular had laid down.[120] All freights were increased by 10% and this increase became known as primage. Freight was then only accepted from merchants who signed a declaration to the effect that all of their shipments would be made via the Conference Lines for the succeeding six months.

Once this six month period had elapsed the rebate due could be claimed by the shipper for all outward cargo and for palm oil and kernels for the homeward journey. This claim would not, however, be paid until a further six months' exclusive shipment had taken place. Thus Elder Dempster and Company always had in their possession a sum equal to 10% of nine months' freight receipts. This gave the firm an interest-free loan which was a valuable addition to their working capital and although it was continually being repaid it was simultaneously being replaced by fresh payments of primage.[121]

The West African shipping conference was extremely successful. From 1895 until Jones' death at the end of 1909 only one British firm – the Sun Line – had attempted to enter the trade and that had been easily defeated. Another ship, the *Prestonian,* managed by Henry Tyrer and Company had undertaken two voyages to West Africa in 1903 and in 1904 but they were not repeated. This was partly due to certain actions taken by Alfred Jones but also because Tyrer's nephew, who had been acting as supercargo, was killed by an alligator when swimming at Capetown near Benin.[122] The only other rival which emerged during this period was the Hamburg-Bremen Africa Line which began sailing to the Coast in 1907. A brief struggle using "fighting ships" then took place and rates were reduced by 40%. A compromise was then reached and the German side of the Conference was completely re-organised, but the newcomer was apparently charged a very high price for admission.[123]

Many shippers were, of course, discontented with the monopoly powers possessed by the shipping conferences for they alleged that these were frequently abused. This belief led, in time, to a number of investigations of which the first was, perhaps, the most important. This was the Royal Commission on Shipping Rings which sat from 1906 to 1909. The Commission heard evidence in respect of many shipping "rings" but that relating to West Africa was particularly extensive. The main witnesses who were questioned included representatives of the larger and smaller merchants, the Manchester Chamber of Commerce, the Bank of British West Africa (which was owned by Elder Dempster) and the Bank of Nigeria, together with a former High Commissioner of Southern Nigeria. Both Alfred Jones (who appeared to represent the shipping companies)

and John Holt (an important merchant) were allowed to give their testimony in private, and Jones' was never published.[124]

After due consideration the majority of the Commission recommended that an association be formed in each trade so that the merchants could present a solid front to the shipowners and thus make bargaining a more realistic feature of the system. They also suggested a compulsory publication of tariff rates that would include every item. A minority of members wanted the Board of Trade to establish a system of limited supervision over the individual conferences.[125] They also recommended that a comprehensive tariff should be published and circulated regularly to the shippers, but neither the majority nor minority reports made any proposal for ending the deferred rebate system and were apparently quite content to see the conference structure remain intact.[126]

A similar enquiry was made by the Alexander Committee in the United States. This issued its findings in 1914 and largely agreed with its British predecessor:

> The consensus of these reports was that shipping conferences were necessary to assure stability of rates, regularity of service and improved facilities; but that these organisations contained the inherent vice of monopoly power. There was considerable divergence of opinion between the majority and the minority reports of the Royal Commission regarding the relative weights to be attached to the alleged advantages and abuses; and there were substantial differences in the remedial procedures favoured by the British and those proposed by the Congressional Committee.[127]

In 1921, at the request of the Commonwealth Governments a further investigation was undertaken by the Imperial Shipping Committee.[128] This, too, upheld the value of the Conference system but recommended that an alternative to the deferred rebate should be offered – suggesting that the contract system, as used in the South African trade, be employed for this purpose.[129] This was adopted in the Far Eastern Conference in 1931 and it has since spread to most, if not all, of the 360 shipping conferences that exist today.[130] An immediate rebate contract was introduced in the West African trade in 1968[131] which, by then, like most other trades, had long possessed a satisfactory shippers' association.[132]

IX

The increase in the size and complexity of the ocean steamer led, as previously noted,[133] to a tremendous rise in the level of investment that was necessary to operate a shipping line. Thus the capital and debentures of most firms engaged in the industry also rose substantially during the later years of the 19th century[134] and this encouraged owners to pursue various methods of protecting their resources. One such method was the adoption of the conference system on most of the world's shipping routes: another was the movement towards larger units either by growth or amalgamation.

In the 1880's the British India Steam Navigation Company and the P. and O. were the largest single companies but, although they continued to grow, by 1914 they had been easily overtaken by a number of combinations or "groups". Prior to the outbreak of

the First World War one of the biggest was undoubtedly the Hamburg-Amerikan Line with a fleet of 408 vessels totalling nearly a million and a quarter tons.[135] Another very large combine was that formed by J. Pierpont Morgan, the American merchant banker, under the title of the International Mercantile Marine Company. This included the American Line, the British Inman Line and the Belgian "Red Star" Line and it took over two more British lines, the "Leyland" and the "National" in 1900. Morgan then purchased the White Star Line, albeit with many restrictions on his control, and made a ten year agreement with the Hamburg-Amerika Line. He then sought to complete his hold on the North Atlantic by acquiring both the Holland-America Line and the Cunard Line.[136] British shipowners viewed this possibility with dismay and Sir Alfred Jones suggested that Cunard might join with Elder Dempster and the Allen Line to provide a rival combination to that of the International Mercantile Marine Company.[137] A meeting was held in June, 1902, between Lord Inverclyde of Cunard, Sir Ernest Cassel for the Government, Sir Christopher Furness and Sir Alfred Jones, and a memorandum was prepared which set out the details of the proposal. It later became clear that the Government were not favourably disposed towards the scheme and it came to nothing.[138] There is, in any case, much doubt whether the sale of Cunard to Morgan was ever a serious possibility but the Company were able to use the threat to some purpose and obtained considerable additional assistance from the British Government.[139]

While these events were reaching their conclusion another significant development took place. On the 25th of March, 1903, on his fortieth birthday, Owen Crosby Philipps became Chairman of the Royal Mail Steam Packet Company.[140] Phillipps, better known as Lord Kylsant, quickly adopted a policy of expansion and after establishing close links with the Pacific Steam Navigation Company, acquired a major interest in the Shire Line and took over the Forewood Line. His first important acquisition was, however, that of Elder Dempster on the death of Alfred Jones in 1909. Thereafter he extended his "group" quite dramatically, taking over the Glen Line (1911), Union Castle (1912), Nelson Line (1913) and establishing Coast Lines in 1917. He continued with this policy throughout his career but amongst many other purchases that of White Star (from the International Mercantile Marine) in 1927 was the most expensive and least rewarding.[141]

Kylsant's method of acquisition was based on utilising a system of high gearing so that his companies issued few ordinary shares, in which he retained control, and many preference shares and debentures. This he concealed by the ingenious and massive use of cross-shareholdings so that,

> in 1930, just before the collapse of his "Royal Mail" Group its capital comprised £45 million in ordinary shares and £26 million in preference shares while debentures worth £20 million had also been issued. The relationship of 'voting' capital (£45m.) to 'non-voting' capital and debentures (£26m. + £20m. = £46m.) does not appear to be exceptional until it is remembered that because of the use of extensive cross-shareholdings many of the ordinary shares were just 'paper'. Any attempt to evaluate the equity of the total ordinary shareholding necessarily involves a great number of arbitrary decisions but Kylsant himself stated that of the whole of the preference and ordinary share capital (£26m. + £45m. = £71m.) the Group itself "owned" no less than £50m.[142]

It was suggested, later, after Kylsant had gone to prison for fraud that the *net* deficiency of the Royal Mail Group amounted to £50 million – at 1931 prices this represented the largest amount ever lost by a British commercial undertaking.[143]

X

In June, 1914, British tonnage (including ships registered in the Dominions and the Colonies) accounted for 45.2% of the world's steam powered vessels.[144] It was later estimated that 54% of the tonnage trading to and from the United Kingdom was operated by the liner companies who also provided some 25% of the British vessels which sailed between foreign ports.[145] About 20% of all the tonnage under the British flag was owned by the twenty four biggest liner firms, of which the Royal Mail Group then controlled approximately one and a half million tons.[146]

By this time sail was playing only a very small part in the work of British shipping and it was steadily declining.[147] At the end of 1913 there were still over 8,000 sailing vessels on the Register but nearly 75% were fishing craft or used on inland waters, while most of the others were employed as Coasters or in the "Home" trades. Only 300 of these ships had been over 500 net tons in 1911 and by 1913 this number had been reduced to 238.[148]

From the foregoing it is clear that by 1914 the liner services, using power driven (mainly steam) vessels, were providing a vital element of continuity and stability without which it would have been impossible for a high level of world commerce to have developed. Over half of Britain's trade was then being carried by liner companies and most, if not all, were organised in shipping conferences in an attempt to maintain their profitability and protect their investments and they were increasingly joining together to form powerful amalgamations.

To some extent all of these trends had been accentuated by what was regarded in some quarters as "unfair" competition as Germany fought to establish a share in the world's carrying trades. The German Government used combined rail and sea rates;[149] offered visible subsidies and secret bounties;[150] and diverted all emigrants who wished to cross its territory to Hamburg[151] in a sustained effort to help its growing shipbuilding and ship operating companies. This aid was conditional upon firms agreeing to combine into ever larger and more efficient units so that German lines did not compete with one another – only with foreign services. So far as Britain was concerned this was, in effect, an attack on her for the United Kingdom was the main operator of liner shipping and 80% of German tonnage fell into this category. The success of the policy of the German Government will be seen by the fact that two companies, the Hamburg-Amerika and the North German Lloyd, included no less than 40% of the entire German mercantile marine, and that prior to the outbreak of war, the first of these operated 68 lines which covered the whole world.[152]

By 1960 the fighting of two world wars, interspersed by a terrible depression, and followed by a "cold war" and a period of economic recovery had further strengthened the trends existing in 1914 but had not changed the basic situation. Thus the liner trades were even more important as they operated 8,764,000 tons, while tramps had weakened

and were utilising only 3,304,000 tons. A new dimension to the division was contributed by the tankers which then employed 5,457,000 tons of the total British merchant fleet.[153] The conference structure remained as strong as ever but was restricting competition in different ways:

TABLE 3

TERMS OFFERED OUTWARD BY FORTY EIGHT U.K. CONFERENCES[154]

Deferred Rebate (net rates, usually less 10%, for six months deferred)	11
Contract (typical terms are net rates less 9½% immediate)	10
Contract and Deferred Rebate (terms as for contract and deferred rebate alone)	21
No Ties (net rates)	6

The move towards amalgamation had also remained strong and by 1960 a number of very substantial groups had evolved. The largest was that formed by the Peninsular and Oriental Steam Navigation Company;[155] the second was the group owned by Furness Withy; the third consisted of the Blue Funnel/Elder Dempster Companies. These are now formally united under the title of Ocean Transport and Trading Limited. Cunard, the British and Commonwealth, Ellerman, Vestey and Inverforth then made up a total of eight amalgamations that owned approximately 80% of all British liner tonnage.[156]

At that time only three of these groups operated other classes of vessel besides their liners, but tramps, oil tankers and bulk carriers are now commonly owned as well. In more recent years, following the "container revolution" the liner concept has had to be considerably modified but its essential principles remain as strong as they were in 1818. The cost of providing container ships, the containers themselves and the special installations at the ports of call is now so great that it is beyond the capabilities of even the biggest of our groups. Accordingly national and international consortia have had to be established to share the expense and the new technology can only justify the vast investment that it requires if it fully utilises the virtues that have characterised the liner services, and seeks to avoid any abuses of its power.

NOTES

1. R. Davis, *The Rise of the English Shipping Industry,* David and Charles, (Newton Abbot, Second Impression 1972), p. 1, F/N 2.
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3. *Ibid.,* p. 4.
4. *Ibid.,* p. 25.
5. *Ibid.,* p. 27.
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7. *Ibid.,* pp. 196-7.
8. *Ibid.,* pp. 222-4.
9. A.W. Kirkaldy, *British Shipping,* (David and Charles Reprints, Newton Abbot, 1970), pp. 25-6.

10. R.H. Thornton, *British Shipping,* (Second Edition, University Press, Cambridge, 1959), pp. 5-6.

11. C. Ernest Fayle, *A Short History of the World's Shipping Industry,* p. 236.

12. R.H. Thornton, *op. cit.,* p. 7-8.

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20. K.T. Rowland, *op. cit.,* p. 55.

21. R.H. Thornton, *op. cit.,* p. 16.

22. K.T. Rowland, *op. cit.,* p. 58.

23. E.C. Smith, *op. cit.,* pp. 23-26.

24. R.H. Thornton, *op. cit.,* p. 14.

25. E.C. Smith, *op. cit.,* p. 133.

26. *Ibid.,* p. 174.

27. *Ibid.,* p. 179.

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29. E.C. Smith, *op. cit.,* p. 73.

30. K.T. Rowland, *op. cit.,* p. 36 and p. 120.

31. P.N. Davies, "An Expedition to Identify and Survey the Wreck of the Paddle Steamer 'Lady Lansdown' ". *Transactions of the Liverpool Society for Nautical Research,* X, 1973, pp. 22-27.

32. Macgregor Laird and R.A.K. Oldfield, *Narrative of an Expedition into the Interior of Africa. . .,* Richard Bentley, (London, 1837), I, p. 7.

33. E.C. Smith, *op. cit.,* p. 97.

34. A.W. Kirkaldy, *op. cit.,* p. 35.

35. This wreck has been extensively excavated in recent years, and the author has in his possession some of the pottery that she carried as part of her cargo.

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37. A.W. Kirkaldy, *op. cit.,* pp. 36-7.

38. G.S. Graham, *op. cit.,* p. 76, F/N 3.

39. *Ibid.,* p. 79. See also, P.N. Davies, "The Management of Ships," *Sea Breezes,* December 1968.

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52. *Ibid.,* pp. 42-3.

53. *Ibid.,* p. 44.

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56. R.G. Albion, *Square-Riggers,* p. 29.

57. K.T. Rowland, *op. cit.,* p. 63.

58. R.H. Thornton, *op. cit.,* p. 11.

59. R.H. Thornton, *op. cit.,* pp. 17-20. See also Boyd Cable, A Hundred Year History of the P. and O.

60. A.W. Kirkady, *op. cit.,* p. 77.

61. R.H. Thornton, *op. cit.,* pp. 24-5. See also Roland E. Duncan, *William Wheelwright. Entrepreneur Extraordinary. The Promoter of Pacific Steam Navigation.*

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72. *Ibid.,* p. 328.

73. *Ibid.,* p. 330.

74. See below, p. 189

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97. *Ibid.,* p. 124.

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99. See Appendix 2.

100. See Appendix 3.

101. A.W. Kirkaldy, *op. cit.,* p. 337.

102. *Ibid.,* p. 318.

103. See Appendix 4.

104. E.C. Smith, *op. cit.,* p. 240.

105. *Ibid.,* p. 279.

106. *Ibid.,* p. 330.

107. C.E. Fayle, *op. cit.,* p. 247.

108. R.G. Albion, *Square-Riggers,* p. 47.

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116. P.N. Davies, *Sir Alfred Jones, Entrepreneur Par Excellence,* (Europa Publications Ltd., Library of Business Biography, London), Chapter 3, "The Achievement of Power". To be published in September, 1977.

117. *Report of the Committee on Edible and Oil Producing Nuts and Seeds,* (H.M.S.O., 1916), CD.8248, Table 1, p. 5.

118. P.N. Davies, *The Trade Makers,* pp. 157-8.

119. *Royal Commission on Shipping Rings,* (H.M.S.O., Cd. 4668-70 and 4685, 1909), Evidence of George Miller, Q.4311-4.

120. See Appendix 5. Copy of Conference Rebate Circular.

121. P.N. Davies, *The Trade Makers,* pp. 108-9.

122. The author of this present work is hoping to publish a history of Henry Tyrer and Company in 1978.

123. P.N. Davies, *The Trade Makers,* pp. 131-3.

124. *Ibid.,* p. 140.

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137. F.E. Hyde, *Cunard and the North Atlantic,* p. 143.

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140. P.N. Davies and A.M. Bourn, "Lord Kylsant and the Royal Mail," *Business History*, XIV, 2, July 1972.

141. Details of the growth of the Royal Mail Group are given in Appendix 6.

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151. *Ibid.*, p. 137.

152. *Ibid.*, pp. 128-9.

153. S.G. Sturmey, *British Shipping and World Competition*, (University of London, The Athlone Press, 1962), p. 361.

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156. *Ibid.*, pp. 365-375.

APPENDIX 1

Net Tonnage of the Leading Mercantile Fleets of the World from 1850 to 1910, showing :—

(*a*) Sailing ship and Steamship Tonnage.
(*b*) World's Totals.
(*c*) The British, United Kingdom, United States of America, and German Percentage of the World's Total.
(*d*) These Percentages also shown in terms of Steamship Tonnage, reckoning 1 ton of steam = 4 tons sailing.

(The tonnage figures in this Table are taken from *Progress of Merchant Shipping in the United Kingdom and Principal Maritime Countries*, Cd. 6180, 1912.)

Countries		1850	1860	1870	1880	1890	1900	1905	1907	1910
United Kingdom	Sailing	3,396,659	4,204,360	4,577,855	3,851,045	2,936,021	2,096,498	1,670,766	1,461,376	1,113,944
	Steam	168,474	454,327	1,112,934	2,723,468	5,042,517	7,207,610	9,064,816	10,023,723	10,442,719
British Possessions	Sailing	648,672	1,096,464	1,369,145	1,646,844	1,338,361	915,096	906,372	883,448	879,926
	Steam	19,157	45,817	89,200	225,814	371,189	532,188	696,430	814,808	926,399
British Empire	Sailing	4,045,331	5,300,824	5,947,000	5,497,889	4,274,382	3,011,594	2,577,138	2,344,824	1,993,870
	Steam	187,631	500,144	1,202,134	2,949,282	5,413,706	7,739,798	9,761,266	10,838,531	11,369,118
Russia (including Finland)	Sailing	..	..	..	655,771	560,267	556,614	511,518	564,721	581,316
	Steam	..	..	..	100,421	234,418	417,922	440,643	501,638	535,040
Norway	Sailing	298,315	558,927	1,009,200	1,460,596	1,502,584	1,002,675	813,864	750,862	628,287
	Steam	..	..	13,715	58,062	203,115	505,443	668,230	819,282	897,440
Sweden	Sailing	..	..	..	421,693	369,680	288,687	263,425	238,742	175,916
	Steam	..	..	..	81,049	141,267	325,105	459,664	532,515	596,763
Denmark	Sailing	..	..	168,193	197,509	189,406	158,303	149,310	141,035	131,342
	Steam	..	..	10,453	51,957	112,788	250,137	334,124	404,946	415,496
German Empire	Sailing	..	..	900,361	965,767	709,761	593,770	553,817	533,652	506,837
	Steam	..	..	81,994	215,758	723,652	1,347,875	1,915,475	2,256,783	2,396,733
Netherlands	Sailing	289,870	423,790	370,159	263,887	127,200	78,493	54,417	49,640	45,936
	Steam	2,706	10,132	19,455	64,394	128,511	268,430	356,890	398,026	488,339
Belgium	Sailing	33,315	28,857	20,648	10,442	4,393	741	2,844	964	3,402
	Steam	1,604	4,254	9,501	65,224	71,553	112,518	96,889	119,223	187,730
France	Sailing	674,228	928,099	917,633	641,539	444,092	501,175	676,193	662,828	636,081
	Steam	13,925	68,025	154,415	277,759	499,921	527,551	711,027	739,819	815,567
Portugal	Sailing	..	..	..	..	..	57,925	43,126	38,363	43,844
	Steam	..	..	..	..	..	51,506	58,077	62,675	70,193
Spain	Sailing	..	..	..	326,438	210,247	95,187	58,201	45,185	44,940
	Steam	..	..	..	233,695	407,935	679,392	685,680	676,926	744,517
Italy	Sailing	..	..	980,064	922,126	634,149	571,164	541,171	468,674	432,695
	Steam	..	..	32,100	77,050	106,567	376,844	484,432	526,586	674,497
Austria Hungary	Sailing	..	..	279,400	258,642	138,796	52,736	39,565	37,658	32,235
	Steam	..	..	49,977	63,970	97,852	246,989	366,070	418,838	477,616
Greece	Sailing	..	263,075	398,703	..	226,702	175,867	145,312	145,283	145,284
	Steam	..	..	5,360	..	44,684	143,436	225,512	257,900	301,785
United States of America—										
(*a*) Registered for Foreign Trade	Sailing	1,540,769	2,448,941	1,324,256	1,206,206	749,065	485,352	353,333	269,021	234,848
	Steam	44,942	97,296	192,544	146,604	197,630	341,342	601,180	602,125	556,977
(*b*) Enrolled for River and Lakes	Sailing	1,418,550	1,982,297	1,795,389	1,650,270	1,816,344	2,021,690	2,361,716	2,450,405	2,372,873
	Steam	481,005	770,641	882,551	1,064,954	1,661,458	2,316,455	3,140,314	3,677,243	4,343,384
China	Sailing	..	..	..	21,694	11,801	20,541	19,560	18,243	14,314
	Steam	..	..	..	..	29,766	18,215	45,617	57,604	88,888
Japan	Sailing	..	..	..	41,215	48,094	320,571	334,684	366,013	412,859
	Steam	..	..	..	..	93,812	543,365	938,783	1,116,193	1,233,785
Total		9,032,191	13,295,302	16,765,205	19,991,863	22,265,598	26,205,398	30,849,067	33,132,066	34,629,742
World's Total	Sailing	8,300,378	11,844,810	14,111,006	14,541,684	12,016,963	9,993,075	9,559,194	9,126,113	8,435,874
	Steam	731,813	1,450,492	2,654,199	5,450,179	10,248,635	16,212,323	21,289,873	24,005,953	26,193,868
British percentage of world's total		46·86	43·33	42·64	42·25	43·51	41·02	39·99	39·79	38·58
United Kingdom do.		39·47	34·80	33·94	32·88	35·83	35·50	34·80	34·66	33·37
United States of America do.		38·58	39·51	25·02	20·38	19·87	19·70	20·92	21·12	21·68
German do.		..	..	5·85	5·91	6·43	7·40	8·00	8·42	8·38
British percentage of world's total in terms of steamship tonnage, reckoning 1 ton steam = 4 tons sailing		42·7	40·86	43·49	47·56	48·91	45·39	43·98	43·46	41·93
United Kingdom do.		36·25	33·95	36·51	40·57	43·58	41·32	40·00	39·48	37·88
United States of America including (*a*) and (*b*) do.		45·09	44·55	30·00	21·19	19·46	17·55	24·24	18·86	19·61
German do.		..	..	5·85	5·03	6·79	7·99	8·67	9·09	8·91

Source: A.W. Kirkaldy, *British Shipping. Its History, Organization and Importance,* Kegan Paul, Trench, Trubner and Co., Ltd., (London, 1914), Appendix XVII.

Working of Some Representative Passenger Steamship Lines in the Year 1912.

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Name of Company	Paid up Capital	Debentures	Sundry Creditors & Loans	Book Value of Fleet	Sundry Debtors, Investments, Cash, etc.	Fleet		Dividend Paid	Per cent-age
						No. of Ves-sels	Tons Gross		
African Steamship Co.	£675,000	£153,910	£165,322	£1,034,832	£138,548	23	64,791	£50,625	7½
Anchor Line (Hender-son Bros.)	575,000	465,000	634,096	1,595,958	375,319	19	112,214	35,582	6·18
Australasian United Steam Navigation Co.	343,620	246,845	250,510	640,612	215,658	23	57,077	27,489	8
Booth Steamship Co ..	550,000	400,000	397,125	1,374,249	294,026	37	105,086	41,500	7·54
British & African Steam Navigation Co. ..	650,000	372,200	142,594	918,055	291,725	40	107,784	32,500	5
British India Steam Navigation Co. ..	1,657,200	543,420	1,127,218	3,384,299	900,131	108	458,619	106,790	6·44
Bucknall Steamship Co.	102,250	290,462	419,420	648,071	171,332	27	117,476	*nil*	—
China Mutual Steam Navigation Co. ..	508,235	*nil*	184,570	832,410	113,317	19	118,895	50,208	9·87
Clan Line	500,000	750,000	243,290	1,996,187	27,141	53	223,019	30,000	6
Cunard Steamship Co.	1,600,020	3,600,000	476,544	5,571,280	1,176,347	26	267,017	96,001	6
Elder Line	500,000	233,810	95,099	689,299	163,909	30	91,083	25,000	5
Ellerman Lines ..	1,400,000	*nil*	887,586	2,162,558	243,000	87	355,791	98,000	7
Houlder Line	474,245	200,000	278,430	348,532	381,043	8	36,062	*nil*	—
Imperial Direct West India Mail Service Co.	250,000	105,550	125,474	248,730	15,777	6	28,124	*nil*	—
Indo-China Steam Navi-gation Co.	495,890	277,050	26,910	764,208	132,313	38	90,428	14,877	3
F. Leyland and Co. ..	2,614,350	335,600	191,663	2,167,087	798,439	41	251,155	*nil*	—
National Steamship Co.	225,000	34,825	3,758	102,071	13,578	2	16,005	*nil*	—
New Zealand Shipping Co.	696,384	385,100	722,960	1,423,893	829,905	24	164,149	69,638	10
Oceanic Steam Naviga-tion Co.	750,000	1,250,000	3,554,083	8,136,685	1,161,137	43	425,579	450,000	60
Orient Steam Naviga-tion Co.	319,310	712,500	640,506	1,948,128	152,642	9	97,390	73,875	23·13
Pacific Steam Naviga-tion	1,477,125	*nil*	285,222	1,486,170	738,413	35	167,826	88,627	6
P. and O. Company ..	3,500,000	1,800,000	1,027,541	3,296,592	4,793,444	89	447,391	291,000	8·31
Prince Line	601,495	*nil*	314,927	1,094,403	42,556	38	142,275	60,149	10
Royal Mail Steam Pac-ket Co.	1,700,000	2,250,000	1,196,516	4,875,183	817,454	59	237,502	85,000	5
	£22,165,124	£14,406,272	£13,391,364	£46,739,492	13,987,154	884	4,182,828	£1,726,861	7·79
International Mercantile Marine Co. of New Jersey	20,332,541	15,549,832	3,087,329	37,897,974	3,062,029	120	1,067,425	*nil*	—

Source: A.W. Kirkaldy, *British Shipping. Its History, Organization and Importance,* Kegan Paul, Trench, Trubner and Co., Ltd.; (London, 1914), Appendix XXIII.

APPENDIX 3

TOTAL VALUES OF IMPORTS AND EXPORTS IN THE TRADE BETWEEN GREAT BRITAIN AND THE UNDERMENTIONED COUNTRIES FROM 1855 – 1912.

The black figures show the order of importance of the trade with each country. (Compiled from the Statistical Abstracts for the United States).

IMPORTS AND EXPORTS—	1855	1880	1912
	£	£	£
France	**4** 19,568,299	**3** 69,961,257	**4** 91,905,234
Germany (Prussia, Hanse Towns Hanover. till 1870) . .	**2** 30,740,883	**4** 53,411,263	**3** 102,468,044
Russia (1856)	**5** 14,932,778	**7** 26,996,212	**9** 60,484,369
Holland	**6** 13,630,909	**6** 41,563,737	**7** 68,331,672
Belgium	**13** 6,480,939	**8** 24,241,094	**8** 63,399,027
China, including Hong Kong .	**8** 10,050,586	**9** 22,571,090	**16** 19,811,449
Japan	..	**18** 4,345,018	**18** 16,409,087
British India, including Strait Settlements and Ceylon . .	**3** 26,129,392	**2** 72,726,587	**2** 142,228,981
Australia (and Australasia till 1900)	**7** 11,721,825	**5** 44,411,426	**6** 74,400,312
New Zealand	..	..	**12** 31,489,404
Canada and Newfoundland .	**11** 7,782,235	**10** 21,905,007	**10** 56,643,668
United States of America . .	**1** 43,804,355	**1** 145,035,452	**1** 201,312,770
British West Indies and Guiana .	**12** 7,452,813	**15** 9,821,167	**21** 5.941,685
South America, West Coast, Chili and Peru	**10** 8,142,070	**16** 8,654,500	**17** 17,838,800
South America, East Coast, Brazil, Uruguay, Argentina . .	**9** 8,268,775	**11** 17,713,881	**5** 90,024,073
Central America and Mexico .	**18** 1,358,247	**19** 3,931,415	**20** 6,965,614
South Africa. (Cape of Good Hope and Natal . . .	**17** 1,786,390	**14** 12,844,522	**11** 33,533,119
Denmark	**16** 4,107,261	**17** 7,633,340	**13** 29,155,379
			15 20,900,249
Sweden and Norway (together till 1890)	**15** 5,339,663	**12** 16,121,208	**19** 12,953,537
Spain	**14** 6,093,720	**13** 14,778,533	**14** 22,081,623

Source: A.W. Kirkaldy, *British Shipping. Its History, Organization and Importance,* Kegan Paul, Trench Trubner and Co., Ltd., (London, 1914), Appendix XIX.

APPENDIX 4

Table of Distances (specially calculated for this book) from the Chief European Port, London, and the Chief American Port, New York, to Ports affected by the Panama Canal.

	Via Cape of Good Hope	Via Cape Horn	Via Suez Canal	Via Panama Canal	Saving via Suez over Panama	Saving via Panama over Suez
London to Fremantle	10,900	..	9,340	14,550	5,210	..
New York to Fremantle	[1]11,571	..	11,317	11,910	593	..
London to Adelaide	11,910	..	10,748	12,996	2,248	..
New York to Adelaide	[1]12,580	..	12,650	[2]10,356	..	2,294
London to Melbourne	12,220	..	11,057	12,860	1,803	..
New York to Melbourne	[1]12,850	..	12,920	[2]10,226	..	2,694
London to Sydney	12,530	..	11,542	11,579	28	..
New York to Sydney	[1]13,120	..	13,390	[2]9,930	..	3,460
London to Brisbane	13,030	..	12,043	11,750	..	293
New York to Brisbane	[1]13,660	..	13,890	[2]9,110	..	4,780
London to Auckland	13,760	..	12,600	11,580	..	1,020
New York to Auckland	[1]14,390	..	13,480	[3]8,940	..	4,540
London to Wellington	13,280	..	12,447	11,370	..	1,077
New York to Wellington	[1]13,910	..	13,327	[3]8,730	..	4,597
London to Dunedin	12,940	..	12,107	11,610	..	497
New York to Dunedin	[1]13,570	..	13,987	[3]8,970	..	5,017
London to Calcutta	11,730	..	7,900	17,210	9,310	..
New York to Calcutta	[1]12,360	..	9,780	14,570	4,790	..
London to Singapore	11,417	..	8,241	15,580	7,339	..
New York to Singapore	[1]11,040	..	10,121	12,940	2,819	..
London to Manila	12,980	..	9,560	14,260	4,700	..
New York to Manila	[1]13,610	..	11,440	11,620	180	..
London to Hong Kong	13,030	..	9,681	14,410	4,729	..
New York to Hong Kong	[1]13,660	..	11,561	11,770	219	..
London to Shanghai	13,790	..	10,441	15,430	4,989	..
New York to Shangai	[1]13,420	..	12,321	11,240	..	1,081
London to Yokohama	14,287	..	11,112	12,860	1,748	..
New York to Yokohama	[1]14,917	..	12,992	10,220	..	2,772
London to Coronel	..	8,557	..	7,720	..	837
New York to Coronel	..	8,217	..	5,080	..	3,138
London to Valparaiso	..	8,777	..	7,360	..	1,417
New York to Valparaiso	..	8,452	..	4,720	..	3,732
London to Iquiqui	..	9,555	..	6,840	..	2,715
New York to Iquiqui	..	9,233	..	4,200	..	5,033
London to Callao	..	10,013	..	6,190	..	3,823
New York to Callao	..	9,688	..	3,550	..	6,138
London to San Francisco	..	13,548	..	8,010	..	5,538
New York to San Francisco	..	13,223	..	5,370	..	7,853
London to Portland Or.	..	14,163	..	8,625	..	5,538
New York to Portland Or.	..	13,838	..	5,985	..	7,853
London to Vancouver City	..	14,348	..	8,810	..	5,538
New York to Vancouver City	..	14,023	..	6,170	..	7,853
London to Pernambuco	4,124					
New York to Pernambuco	3,760					
London to Rio de Janeiro	5,197					
New York to Rio de Janeiro	4,760	Not affected by either Suez or Panama.				
London to Buenos Ayres	6,291					
New York to Buenos Ayres	5,888					

[1] Via St Vincent. [2] Via Rapa and Wellington. [3] Via Rapa.

Source: A.W. Kirkaldy, *British Shipping. Its History, Organization and Importance,* Kegan Paul, Trench, Trubner and Co., Ltd., (London, 1914), Appendix X.

APPENDIX 5

WEST AFRICAN COAST STEAM LINES

Form for Statement of Primage Claimed in Respect of Shipments

To be signed by the Merchant owning the Goods and/or Palm Oil and/or Palm Kernels.

190

Messrs.

Gentlemen:

I/we beg to hand you the annexed list of my/our shipments by the steamers despatched by your Line during the six months ended upon which shipments I/we claim the rebate referred to in the Circular of the West African Coast Steam Lines dated October, 1905, and such claim I/we make in accordance with, and on the terms and conditions of the said notice, which I/we have received, and with which I/we have complied in every particular.

The following are the particulars of the above-mentioned shipments, and they are in accord with the bills of lading and freight notes paid.

I/we remain,

GENTLEMEN,

Yours truly,

Signature to be that of the firm.

Name and Address in full.

Note:- if B/L was taken out in any other name than your own, please state.

REBATE CIRCULAR IN WEST AFRICAN TRADE ISSUED BY MESSRS. ELDER DEMPSTER & COMPANY

Liverpool, 1st October, 1905.

Shippers (who are Principals) to and from ports of the above Coast, as far South as and including Tiger Bay, are hereby informed that on all shipments outwards and palm oil and palm kernels inwards made on and after the above date, and until further notice, and subject to the conditions and terms set out herein, each of the undernamed Companies and Lines of Steamers will allow a rebate of the -10 per cent primage received by such Companies and Lines from such shippers on all shipments at tariff rates outwards and/or on palm oil and/or palm kernels inwards from or to Liverpool, Hamburg, Rotterdam, Havre, Antwerp and Bremen, or other ports or places in the United Kingdom or on the Continent.

The said primage to be computed every six months up to the 30th June and the 31st December in each year, and to be payable six months after such respective dates to those Principals only who until the date at which the primage shall become payable, shall have shipped exclusively by the steamers despatched by the undernamed Companies and Lines of Steamers respectively, from or to Liverpool, Hamburg, Rotterdam, Havre, Antwerp and Bremen, or other ports or places in the United Kingdom or on the Continent, to or from aforesaid ports of the above Coast, provided that such shippers have not, directly or indirectly, made or been interested in any shipments to or from such ports by vessels other than those despatched by the undernamed and also provided that the statement of claim for such primage shall be made in the annexed form within twelve months of the date of shipment to the Company or Line of Steamers which shall have carried the outward goods, or the palm oil and palm kernels, in respect of which the primage is claimed.

BRITISH & AFRICAN STEAM NAVIGATION CO. (1900) LTD.

AFRICAN STEAM SHIP CO.

WOERMANN-LINE M.B.H.

APPENDIX 6

Growth of the Royal Mail Group[1]

Year	*Company Acquired*	*Main Areas Served*
1907	50 per cent of shares of the Shire Line.	Far East
1908	Goodwill of the Forwood Line, together with two vessels from the Mersey S.S.Co.	
1910	Elder Dempster & Co., Ltd. formed to take over the assets of Elder Dempster & Co. These included the African Steam Ship Co., the British & African S.N.Co., the Elder Line and the Imperial Direct W.I.M.S.Co.	West Coast of Africa, West Indies, Gulf and Canada.
1910	Pacific Steam Navigation Co.	West Coast of South America.
1911	Other 50 per cent of shares of the Shire Line.	Far East
1911	Glen Line	Far East
1911	Lamport & Holt Ltd.—including the Liverpool, Brazil & River Plate S.N.Co. Ltd.	East Coast of South America.
1912	Union Castle Line	South and East Africa
1913	Nelson Line (Nelson S.N.Co.) and H. & W. Nelson	South America
1914	Formation of R.M.S.P. (Meat Transports) Ltd.	South America
1916	Moss S.S.Co., including James Moss & Co.	Mediterranean
1916	Robert MacAndrew & Co. Ltd.	Gulf
1917	Coast Lines Ltd. formed—including the Belfast S.S.Co., British & Irish S.P.Co., Burns and Laird Lines and the City of Cork S.P.Co.	Irish and Coastal
1917	McGregor, Gow & Holland Ltd. (previously operated as McGregor, Gow, Norris and Joyner)	
1917	Argentine Navigation Company (Nicholas Mihanovich) Ltd.	South America
1917	John Hall Jr. and Co. (acquired by Robert MacAndrew & Co. Ltd.)	
1919	J. and P. Hutchison	Mediterranean
1919	Bullard, King and Co. (Natal Direct Line)	East Africa
1919	David MacIver & Co. Ltd.	
1919	Scottish Steamship Co. Ltd.	
1925	British Motorship Co.	
1926	Dundalk & Newry S.P. Co.	Ireland
1926	Michael Murphy Ltd.	Ireland
1927	Oceanic S.N. Co. purchased from the International Mercantile Marine Co. and re-formed under title of the White Star Line, Ltd. This purchase gave a 40 per cent holding in Shaw, Savill & Albion to the Royal Mail which then acquired a further 50 per cent on deferred terms from Sir John Ellerman. Oceanic (together with Shaw, Savill & Albion) also controlled George Thompson & Co. Ltd.—the Aberdeen Line—so this, too, became part of the Royal Mail Group.	North America New Zealand, Pacific and Australia
1928	David MacBrayne Ltd.	Scottish Islands
1928	Australian Commonwealth Line.	Australia.

[1] Compiled from the R.M.S.P. Minutes, relevant years, and from *Fairplay's* Annual Summaries of British Shipping Finance.

Source: P.N. Davies and A.M. Bourn, "Lord Kylsant and the Royal Mail", *Business History,* v.XIV, July, 1972, p. 108.

12. ASPECTS OF TRAMP SHIPPING AND OWNERSHIP

ROBIN S. CRAIG

University College London

ASPECTS OF TRAMP SHIPPING AND OWNERSHIP

R.S. Craig

A very substantial proportion of the accumulation of crew agreements and official logs now happily housed at Memorial University relate to the voyages of tramp steamers. This paper seeks to rescue from obscurity what might otherwise be a rather neglected part of the archive, since the tramp steamer cannot match the sentimental appeal of the sailing ship in her hey-day, any more than it can compete with the glamour of the ocean liner.

If we may accept that the term "tramp" was associated exclusively by contemporary writers with the iron or steel-hulled screw steamship as she achieved something approaching technological maturity in the 1880's, we may trace the origins of such cargo carriers to the demands of expanding and diversifying trade early in the nineteenth century. Three trades exemplify the growing impetus towards the adopting and perfection of the bulk carrying steamship and we shall briefly examine them in turn. Each kind of freight – ore, cattle, and coal – made distinctive contributions to the evolution of the merchant marine, and each trade nurtured its visionary figure who believed he perceived the potentialities of a new kind of ship. Each trade manifested also its due proportion of those who miscalculated or saw their hopes deferred or destroyed. If we pay some attention to the failures it is no more than the study of maritime history as a discipline should compel. Few industries were more subject to rapid and disconcerting change, and most kinds of history (particularly economic) could benefit from a less single-minded concentration on success as if it were some kind of norm. We ought perhaps to recognize the successful as the deviants in any society.

I

As early as 1824, Richard Cort, (son of that Henry Cort of Gosport who had been justly celebrated, although inadequately rewarded, for his invention of the pudding process in the manufacture of iron), himself interested in copper as well as iron smelting,[5] addressed a report to John Taylor, the eminent mining entrepreneur. This published report[6] related to the potentialities of a copper works and colliery estate located on the River Burry, near Swansea in Wales. Cort asserted: "The merits of steam navigation are now so well known that little need be said to induce its adoption, wherever the trade presents a sufficient capability to bear the expense of its application." Cort was proposing that steamships be used by this Welsh copper smelting and coal producing concern to transport copper ore from the mines of Cornwall to Wales, returning thence with coal. This must represent an early example of the recognition of the possibility of utilising steam for the sea carriage of bulky, relatively inexpensive, homogeneous freight. Cort's visionary scheme was thought by its author capable of reducing the freight costs to be incurred by as much as 30% compared with the existing mode of transport in small sailing vessels.

In supposing that the steamship of 1824 could economically freight copper ore or coal, Cort proved himself less technically adept than his famous father. Clearly, the

carriage of such cargo in quantities such as to render operations profitable must needs depend upon the metal hulled vessel propelled by screw propellor, inventions which still lay some way ahead. Nevertheless, Cort was to see his faith in steamers justified in precisely that trade in which he had advocated their employment. The great mining and smelting entrepreneur Henry William Schneider was to become owner of that same copperworks and it is not too fanciful to suppose that he read Cort's twenty year old report. From 1849 Schneider began to experiment with bulk-carrying steamers which he employed extensively in both the carriage of copper and iron ore. It was these two ores, by this time carried extensively round the coast of Britain which were to be a potent force in the development of the steamship. Schneider's first iron screw steamer *Augusta,* built in 1849,[7] appears to have been the most successful of the series of vessels which he acquired. *Augusta* was built in a small shipyard which was to gain most of its orders from copper smelters[8] and her engines were built by a nearby firm whose main commercial interests were also in copper.[9] The other Schneider vessels were built by J.W. Hoby of Renfrew (who for a brief period specialised in small freighters) and T.D. Marshall of South Shields. None of Schneider's vessels enjoyed a long life as a steamship, suggesting that they did not altogether satisfy the expectations of their designers or owners, except the screw steamer *Briton Ferry,* built by Hoby for a rival copper company, Frederick Bankart and Company, and acquired by Schneider in 1854.[10] She had the unusual distinction of being converted from steam to sail in the year Schneider acquired her, was then lengthened and reconverted to steam a year later, passing subsequently to yet another copper smelter H.H. Vivian in 1856.

Metallic ores feature again in the development of the steamship with the growth of the Cumberland and Furness iron ore fields – the latter development being particularly associated with Schneider. But Schneider was not alone in his use of steamers for iron ore. Thomas Ainsworth of Cleator, Cumberland ordered a curious wood and iron steamer named *Alpha* from a Workington shipyard in 1851 designed expressly for the iron ore trade and propelled by what appears to have been a novel but short-lived prime mover.[11] The new form of engine was, we may infer, less than a total success, since the vessel was converted to conventional screw propulsion in 1852. It was this vessel which first brought Alfred Holt to prominence, since it was he who advised Ainsworth as to how the vessel might be made to pay her way.[12] Holt and his associates then ordered the iron screw steamer *Cleator* which was to be employed in the iron ore trade between Cumberland and South Wales until the advent of the Crimean War.[13] *Cleator* was lengthened in 1856 and was ultimately fitted with the compound engines which were to effect a reduction in coal consumption by as much as 40% giving Holt his first experience of an innovation which was to have a profound impact on the commercial pre-eminence of Blue Funnel Line.

By the mid-1850's ore carrying steamers were a familiar sight in the Irish Sea, trading between Cumberland, the Mersey and the South Wales ports. Braithwaite Poole refers in 1854 to two screw steamers plying between Cardiff and Liverpool with iron, which then proceed to Whitehaven, where they take on board full cargoes or iron ore before, as Poole somewhat inelegantly puts it ". . .they screw away back again to Cardiff".[14] The capabilities of such vessels were illustrated by the *Annie Vernon* launched by T. Vernon and Son, Liverpool in 1856 for John Bacon and Company. She measured 519 tons gross, with engines of 70 horsepower. Chartered to Fothergill of the

Aberdare Iron Company on commission in February 1856, she secured a freight rate of 6/- per ton per month for four months' trading. A typical round trip was that beginning 26 April 1856 when she completed discharge of her cargo at Whitehaven and loaded 652 tons of iron ore. She sailed at midnight 26 April, and arrived at Cardiff 37 hours later to commence her discharge on Monday, 28 April. Having unloaded her cargo by Friday, 2 May she then loaded 748 tons of coal, sailing from Cardiff 3 May, arriving at Liverpool 5 May. Having completed discharge 6 May, she sailed to Whitehaven in ballast (she was fitted for water ballast), arriving at the Cumberland port on the following day. Another cargo of iron ore was loaded 8 May when she sailed on her next voyage to Neath.[15] This intensity of utilisation suggests the extent to which the ports of the West Coast had adapted themselves to the demands of the steamship by the mid 1850's.

Of the two mineral ores, copper was to prove of less long-term commercial importance in the evolution of the steamship than was iron. Much of the impetus to develop steamers adapted to the carriage of copper ore slackened with the dimunition in the supply and quality of the produce of British mines, and the consequential flow of copper ore from relatively remote parts of the world where the steamship was at a disadvantage. Iron ore was of much greater significance to the tramp shipowner, however, and played a strategic role in the period between 1870 and 1890, as we shall see.

II

Another, perhaps even less familiar, trade was important in the evolution of the bulk-carrying steamer even though it affected the attitudes of shipping entrepreneurs more effectively than it influenced the design and deployment of shipping. This was the traffic in cattle, particularly from the near Continent, which began with the repeal in 1844 of the duty on imported cattle. To be sure, there had already developed a cattle trade between Ireland and England and between Scotland and London, but the individuals and firms associated with these trades had, with the exception of Burns, less influence on the future direction of development of oceanic steam transport than those exploiting the new opportunities of opening the British market to Continental meat in the era of "high farming". But it has to be said at the outset that the vision of such entrepreneurs was not fully matched by commercial and technical competence.

Among the firms and individuals prosecuting the trade in Continental cattle were the General Steam Navigation Company and Ralph Ward Jackson of the West Hartlepool Steam Navigation Company, in addition to other shipping firms at Hull and Grimsby. Two London entrepreneurs, James Laming and William Margetson quickly established the London, Rotterdam and Harlingen Steam Schooner Shipping Company with a capital of £40,000 divided into £100 shares, one of a considerable number of shipping companies floated under the provisions of the new Companies Act of 1844. The object of the Company was to "establish a line of fast sailing iron schooners with steam power and the screw propellor", to carry cattle from Holland to London.[16] The firm ordered four steamers from the London shipbuilders Ditchburn and Mare in 1845/6, each being schooner rigged with three masts. The units in the fleet were:

City of Rotterdam (built 1845) 190 tons gross, 157 tons net

City of London (built 1846) 191 tons gross, 158 tons net
Lord John Russell (built 1846) 254 tons gross, 207 tons net
Sir Robert Peel (built 1846) 248 tons gross, 201 tons net

The two larger vessels were capable of conveying 400 tons of measurement or 300 tons of deadweight cargo in addition to 35 tons of bunkers which was regarded as ample to meet the maximum round journey of six days. In fact, in the trade to Holland, these vessels "never occupied more than 36 hours and have accomplished the passage in 22 hours".[18] Under steam power only, the vessels could achieve an average speed of 8¼ knots in calm water, whereas under steam and sail, four points from the wind, they could average 10½ knots, each vessel achieving as much work in the year as could be accomplished by four sailing vessels. The proprietors of the enterprise reckoned that the expense of the vessels was about 16/- per ton, compared with 25/- for comparable sailing vessels, thus freight was reduced on large cattle from 30/- to 20/- per head from Holland to England.

At about the same time as the London, Rotterdam and Harlingen Company was active, another firm entered the trade, the Continental Cattle Steam Ship Conveyance Company, who ordered two steamers from R. & H. Green of Blackwell in 1847. These were larger vessels than their rivals, measuring 342 tons gross and 278 tons net, but they proved less than wholly successful competitors in a cut-throat business.[19]

A not infrequent phenomenon among nineteenth century entrepreneurs was then made manifest. Not satisfied with a modicum of success, the proprietors of the London, Rotterdam and Harlingen Company quickly raised their sights and sought to embrace more visionary schemes. Persuading themselves that the supremacy of iron screw steamers was fully established, they now sought to form a company to exploit what they saw as the almost limitless potentiality of steam. In a petition for a charter of incorporation of the General Screw Shipping Company to the Board of Trade in 1847, the London & Rotterdam directors stated that their experience had taught them "that there yet remains to be accomplished. . . an equally economical as speedy conveyance for the large bulks of general merchandise (which) remain as yet unassisted to their various destinations by the power of steam and that because, except on very short voyages, they can be conveyed by the paddle steamer with a profitable return to none." As proof of their faith in the screw they pointed to the unhappy case of *H.M.S. Dragon* employed to carry emergency supplies to the distressed population of Ireland during the potato famine. Although *Dragon* was of 1,270 tons burthen, this fine ship "was enabled to embark only 187 tons of meal, biscuit and pease" in addition to the 375 tons of bunkers necessary for the voyage and "with this amount she was yet immersed so much below her intended loadline as materially to affect the power of her wheels and machinery." The actual cost of conveying the stores to Ireland was 46/0½d per ton – a higher freight rate than that charged for a voyage to the East Indies.[20]

Intoxicated with heady visions of the triumph of the steamship, the proprietors of the newly floated General Screw Shipping Company in 1847 initiated a massive investment programme. Between 1848 and 1854 at least eighteen steamers were built, ranging from 296 to 2,768 in gross tonnage, the latter, named *Golden Fleece* being the largest unit in the fleet.[21] All were built on the Thames by C.J. Mare. The Company mobilised a capital of £200,000 in 1847, increased it to £300,000 in 1850, and in the same year augmented its capital yet again to £600,000. In 1852, the ambitious

proprietors again advanced the Company's capital to £700,000 having secured a mail contract to Calcutta.[22]

The carriage of cattle from Rotterdam to London proved to have been an inadequate preparation for the more burdensome task of deploying steamers of ten times the size in deep-sea trades around the world. A company vessel, *Queen of the South,*[23] 1,826 tons gross, consumed 4,684 tons of coal on her first voyage to the East, reducing this formidable appetite to 3,314 tons on her second voyage when it was reported that her machinery was by then in "more perfect order".[24] Some shorter routes were then tested, as the firm announced that five vessels were to be withdrawn from the Indian trade to inaugurate the first service from Southampton to New York, with calls at Havre and Bremen.[25] The attempt to conquer the North Atlantic was as unsuccessful as the brave foray in the Indian Ocean, but the Crimean War proved to be of inestimable though impermanent benefit to the Company. Many charters were obtained at remunerative rates, and, by August 1855 the half-yearly accounts revealed net profits of £118,898.[26] This respite did nothing to sustain any rational hope, however, that the very considerable capital expenditure on large vessels deployed on long sea routes could be made to yield a satisfactory dividend. The formation of a French company, Societé Général des Clippers Française in Paris, whose original intention had been to operate sailing vessels, was the means by which the directors of the General Screw Company sought to escape from their difficulties. The French firm, in the throes of an euphoria induced by wartime freight rates, suddenly decided that steamships were now the thing, and they were persuaded to contract for the purchase of eight large steamships from the General Screw Company. The scheme did not go through, however, once peace and more normal employment for steam vessels, prevailed. The General Screw Company soon succumbed.

The Continental cattle trade itself never expanded sufficiently to sustain the hopes of all those who ventured capital into new ships in the 1840's. However, later in the century, the transatlantic cattle trade was to prove a profitable chapter in the history of the tramp and an important factor in the advance of such entrepreneurs as Christopher Furness, perhaps the most successful tramp shipowner.

III

If the vision of entrepreneurs such as Laming and Margetson in recognizing the potential of the bulk-carrying steamship was not matched by technical and business competence, at least their experience was a warning to some others, although it did not deter a whole succession of shipowners, notably W.S. Lindsay, Member of Parliament and historian of the shipping industry, and the ill-fated joint stock companies promoted to secure steam communication with Australia. Two factors were necessary for success: first, economy of fuel consumption in marine engines was of the utmost importance; second, the trade upon which reliance was to be placed had to manifest both stability and growth. The first factor, technical progress, was soon to be achieved, and, in the meantime the coal trade furnished the reliable fulfilment of the second. Coal was the inescapable concomitant of Britain's industrial and commercial progress, and Britain's unique endowment of high quality steam coal was to become the most potent agent of Britain's

supremacy in tramp steamships.

That remarkable precursor of the "roll-on roll-off" steamer, *Bedlington,* built by T.D. Marshall and Woodhouse at South Shields in 1842 at a cost of £4,925 represented a bold attempt by a colliery company to conjoin steam, iron, railroads and the screw in the seaborne carriage of coal.[27] Of 277 tons gross, *Bedlington* could manage a speed of between 6½ and 7 knots on a coal consumption of eight hundredweights per hour. She was followed in 1844 by *Q.E.D.,* built by John Coutts of Walker, Northumberland, a vessel of 288 tons gross with a small engine of 16 horsepower built by R. and W. Hawthorne.[28] Her average speed was no more than 3½ knots, but her coal consumption was only 160 pounds of coal an hour. Her owners, M.C. Bingham and John Coutts were probably disappointed with her performance, since within two years of her launch she was converted to sail. It has been suggested that her owners were frustrated in their efforts to obtain preferential facilities for loading and discharge, and there could well be some truth in this.[29] Swift turn-round was even more critical for the steam than for the sailing collier, and it is evident that soon after the advent of the commercially successful steamship it became the custom at most coal-loading ports for steam vessels to be given priority of stem over sailing vessels, presumably in recognition of the greater capital embarked in the former, and no doubt a shrewd calculation by dock and harbour authorities that revenue would be increased by showing favour to steamships capable of rapid repeated voyages.

If *Bedlington* and *Q.E.D.* were experimental and tentative in their exploitation of steam, the next two steam colliers were fully powered vessels relying more completely upon machinery. Both were to enjoy, for vessels of their kind, an extreme old age, suggesting that they embodied sound engineering principles no less than superlative craftsmanship. The iron screw steamer *Collier* was built by John Reid at Port Glasgow in 1848, with engines constructed by Caird of Greenock of 40 horsepower, giving her an average speed of seven knots on coal consumption of four hundredweights an hour.[30] *Collier* was still afloat in 1914, having run out to Australia and back in 1854/5. *John Bowes,* built by C.M. Palmer of Jarrow in 1852 at a cost of £10,000 was at once the first iron vessel built on the river Wear and the precursor of a huge fleet of collier tramps which pioneered the short-sea trades.[31] Although *John Bowes* was intended for, and successfully employed in, the East Coast coal trade, she, like so many of her contemporaries, found active employment as a transport in the Crimean War.

The mid-1850's saw the emergence of a growing fleet of screw colliers which steadily widened their sphere of operations both geographically and in diversity of freights. John Scott Russell designed the collier *New Pelton* in 1855,[32] while Palmer at Jarrow furnished Hugh Taylor and William Cory with a number of vessels beginning with the *Samuel Laing* of 1854,[33] the *Earsdon,*[34] Sardinian[35] and *General Codrington*[36] of 1855, while T. & W. Smith of North Shields built *Zouave*[37] for the same ownership the same year. The shipbuilding industry of the Tyne and Wear specialized in this kind of tonnage in the 1850's helped by orders from shipowners such as the Earl of Durham and Nicholas Wood. At first most of these steamships were deployed in the coal trade from the North East coast to London, but soon the South Wales coalfield began to absorb tonnage. Russell's *New Pelton* went missing on a voyage from Llanelly to Havre in 1860, and *Thomas Powell,* built by Stothert and Tripp in 1856 at Bristol, with engines built by

G.K. Stothert and Company, gave long service to the Welsh coal industry before being disposed of to Australian owners who still employed her in the 1890's.[38] While West Coast of England shipbuilders were less active in the construction of bulk carrying steamers in the 1840's and 1850's than their East Coast contemporaries, at least one iron screw steamer was to become celebrated, although not expressly designed for the coal trade. This was *Sarah Sands,* built by James Hodgson at Liverpool in 1846, with engines built by Bury, Curtis and Kennedy of 100 horsepower, giving her an average speed of 6½ knots.[39] She gained the distinction of being the first iron screw steamer to reach the Pacific via South America, in 1849, and was the first screw vessel to cross the Pacific, her itineraries and cargoes suggest that she deserves to be regarded as one of the first deep-sea tramp steamers.

The coal trade gave no guarantee of commercial success to investors who ventured into steam. The General Iron Screw Collier Company began with a bang but expired with a whimper. The firm created something of a stir when it ordered a succession of nine steamers from Palmer of Jarrow in 1853/4, following these orders by contracts with shipbuilders in Liverpool and Chester in 1854, and further contracts in Jarrow in 1854 and Low Walker in 1856. This bold enterprise was not rewarded. By March 1958, the Company was "in rather a bad way".[40] Six months work by the steamers produced a gross surplus of £5,576 this modest return was subject to bad debts, a disputed claim, a collision case in hand, and the loss of two vessels. By September of the same year, the Company was seeking to dispose of its fleet.[41] It was experiences such as this that led a perceptive commentator to note in 1858:

> Screw colliers have hardly realised the expectations formed of them as a commercial scheme. . .[the] cause less due to steam power than to lack of suitability of the vessels for the trade, which demands a combination of qualities not easily obtainable in one vessel.[42]

But the necessary combination of shrewd commercial enterprise and vision was better manifested by the case of the Union Steam Collier Company which was formed originally as the Southamptom Steam Shipping Company in 1853.[43] Launched by the famous Arthur Anderson, the firm sought to exploit the need at Southamptom of regular supplies of coal to bunker the mail steamers that took their departure from that port. To this end the Company issued a capital of 3,000 shares of £20 each, to build five screw steamers to be employed in the conveyance of coal from South Wales to Southampton. It was confidently predicted by the directors that each vessel would be able to perform twenty-four voyages each year. The first vessel in the fleet was the composite (wood and iron) *Union,* built by C. Lungley at Rotherhite in 1854.[44] Of only 137 tons gross she was the smallest unit of a fleet of six vessels built by Lungley or Samuda in 1854 and 1855, the largest being *Celt* which measured 551 tons gross.[45] As did so many other steamship companies, the Union Steam Collier Company enjoyed buoyant receipts during the Crimean War. With vessels chartered to either the British or French Governments, the firm was able to show a profit of over £15,000 in the year ending August 1856. Wartime experiences in deploying tonnage to the Mediterranean and Black Seas no doubt encouraged Anderson to formulate ambitious plans, just as the London and Harlingen directors had done. Anderson, however, proved a more shrewd and capable manager and built effectively on the experience gained with the first generation of screw steamers. He

registered a new Company in 1856, the Union Steam Shipping Company, with plans to enter the South American trade. But one of his fellow directors was C.E. Mangles, who was also a director of Royal Mail Steam Packet Company, one of the chief beneficiaries of the Union's provision of cheap bunker coal at Southampton. Mangles bitterly resented the prospect of competition with R.M.S.P. Company tonnage deployed in the same trades, and he resigned from Anderson's board of directors. The first year's trading by the reconstituted Union S.S. Company was unhappy: South America proved no El Dorado, but Anderson flexibly responded to the situation by successfully negotiating a mail contract to South Africa in September 1857. Thus the "Union Castle" organization was fathered by the coastwise coal trade.

It is difficult to generalize as to the reasons for the high level of failure among these early steam collier enterprises, but it seems likely that entrepreneurs with financial interests in colliers and/or outlets in the coal market, owning individual vessels on the "1/64th" principle, were more successful than joint stock enterprises managed by businessmen without any very close links with the coal trade. That many joint stock enterprises were financially unsound and commercially inadequate is a commonplace of nineteenth century economic history. Many of those who had been tempted into investment in steamships would have echoed the words of Goschen, who wrote in 1868:

> Capital is on strike, out of employ! In England it has struck against limited liability. . .against joint-stock companies of every description.[46]

One reason for the disillusion of investors in steam shipping enterprises was the difficulty of perfecting an economical steamship which could trade profitably when times were good, and which could at least earn enough to cover her depreciation in times of depression. The technical problems to be surmounted were indeed formidable. Some shipyards were more successful than others in solving these. It would seem from the evidence so far collected that Thames-built vessels were the least likely to earn reasonable profits, whereas the steamships built on the North East coast were the most successful. High shipbuilding costs and an excessive degree of finish and sophistication in the engine room were inimical to prosperous shipowning. The omens were becoming clear for Thames shipbuilders, whereas builders in North East England were laying the essential basis for consolidation and expansion.

By the 1860's the coal trade was beginning to expand rapidly, both in tonnage exported and, significantly, in geographical distribution. It was thought noteworthy in a technical journal in 1862 that nine screw steamers carried 10,470 tons of coal from Sunderland to ports other than the Thames.[47] In June of that year cargoes of 700 tons to Shanghai and 900 tons to Alexandria betokened the gradual but persistent extension of the boundaries within which the screw steamer could successfully operate. This extended dominion of steam depended critically upon an improvement in the efficiency of the marine engines and boilers, and perhaps no less on the facilities available for rapid loading and discharge.

By the 1870's it was Cardiff, rather than the North East Coast ports, which was becoming headquarters for the deep-sea export coal trade. In 1874, Cardiff alone despatched 328 steamers in what may be termed distant trades, as may be seen from the following summary table:

TABLE 1

PORT OF CARDIFF

Steamship freights to distant ports in 1874*

PORT TO WHICH CONSIGNED	NUMBER OF STEAMSHIP VOYAGES
Malta	123
Trieste	3
Corfu	4
Piraeus	2
Syra	3
Constantinople	33
Galatz	2
Sulina	4
Odessa	22
Alexandria	11
Port Said	73
Suez	4
Aden	21
Zanzibar	1
Bombay	2
Point de Galle	1
Calcutta	1
Rangoon	1
Singapore	3
Shanghai	2
Havana	1
St. Thomas	1
Para	1
Rio Janeiro	3
Buenos Aires	1
Montevideo	1
Fray Bentos	1
Callao	3

*Source: Tellefsen, Holst & Willis, *South Wales Coal, Iron & Freight Statistics for 1874* (Cardiff, 1874). For the purpose of this table "distant" trades have been defined as Eastern Mediterranean or beyond to the eastward, and transatlantic voyages to the westward.

These data suggest the growing importance of Welsh coal in the stocking and replenishing of bunkering stations for both ships and railways. The link (which was to become of vital importance) between the coal trade of Wales and the Black Sea grain trade is already made explicit in the figures. No complementarity played a more durable role in the rise of the tramp ship than did this. It was in this happy conjunction of trades, eliminating long ballast intermediate voyages, which was to play such a remarkable part in the fortunes of tramp shipowners.

IV

Another trade was particularly associated with the coal trade in permitting almost

optimal utilization of steamships with minimal ballast passages. This was the rapidly developing trade not, as in earlier decades, in domestically mined iron ore, but, from the 1870's, iron ore mined in Spain. The great stimulus to the trade was the advent of Bessemer steelmaking and the need to exploit new sources of non-phosphoric iron ore. Low ore costs and high iron content were the essential prerequisites of cheaply smelted iron and steel, the latter at first produced in Bessemer converters, subsequently increasingly smelted in acid open-hearth furnaces. But low transport costs were no less vital to the growth of the steel industry. Britain was fortunate in having access to the mines of Spain's Biscay coast, and Britain's coast-located steelworks were able to benefit from ore particularly suitable for smelting which could be offered at low freight costs by extremely competitive tramp shipping. It became increasingly difficult for the splendid Cumberland ores to compete in South Wales because of the low cost of freight from Spain, and lack, on the Duddon Estuary, of a deep water loading terminal.[48]

Although investment in Spanish mines has been seen as the predominant factor in the British emphasis on acid steelmaking, and the success of the more efficient steelmakers, less stress has been placed in recent writing on the cost of freighting the ore[49] – a matter fully recognized by nineteenth century entrepreneurs.[50]

A number of firms, promoted by or acting for, British iron and steel producers, were established in the Bilbao region in the 1860's and early 1870's, their function being to win, and transport by railway or aerial ropeway to the river at Bilbao, the rich ores of Northern Spain. None of these enterprises was more important than the Orconera Iron Ore Company, formed in 1873 as the result of an agreement to share costs and output, between the Consett Iron Company, the Dowlais Iron Company, Krupps of Germany, and Ybarra and Company of Spain. By the 1890's Orconera alone was exporting more than one-quarter of all the ore sent down to Bilbao River.[51] Shipments of Bilbao ore to Britain grew rapidly once the Spanish Government had lifted the export duty on ore in 1862, and export was further encouraged when the Bilbao port authorities on advice from the British Consul there, waived the imposition of dock dues on inward-bound vessels in ballast. The growth of the trade may be summarized as follows:

TABLE 2

EXPORTS OF IRON ORE FROM BILBAO ('000 METRIC TONS)

YEAR	METRIC TONS ('000)
1866	26
1880	2,391
1885	3,296
1890	4,373
1895	4,037
1900	4,653

This remarkable expansion of bulk freight was both the source of wealth to many British shipowners and to the Bilbao region of Spain. It played no small part in the evolution of the tramp steamer.

Facilities at Bilbao before the mid-1870's were primitive and discouraging to shipowners. Only vessels drawing less than thirteen feet of water could reach Bilbao from the sea, since the town was situated five miles up the river Nervion. The river, moreover, faced westwards into the Bay of Biscay and the prevailing westerly winds made the approaches to the river very hazardous. These problems were compounded by a most dangerous sand bar at the entrance to the river. The action of wind and tide conspired to render the channel both restricted and variable. Not unexpectedly, therefore, nearly all the iron ore shipped in the 1860's and early 1870's was despatched in small wooden sailing vessels.

It was largely British enterprise and capital that transformed the port, despite the fact that the great scheme for Bilbao's improvement, drawn up by Charles Vignoles, was turned down by the Spaniards. The Bilbao Iron Ore Company spent over £400,000 between 1872 and 1877 on harbour works and railways to the rapidly developing mines.[52] Despite such improvements, as the tonnage of ore shipped increased, so did the evil reputation of the port. Many vessels were wrecked, and, as a consequence, insurance rates and freight rates alike were high. With the average depth of water on spring tides only slowly increasing, and there being inadequate water on neaps to float all but the smallest vessels, the preponderance of tonnage was sail rather than steam, not least because the danger of becoming beneaped could mean very large demurrage payments for steamers. The Carlist Rebellion interrupted the trade, and exports were not resumed until 1876 when a remarkable transformation was observed: steam had almost entirely ousted sail in the trade, despite the slow rate of progress in deepening the loading berths. Congestion grew as demand for Spanish ore increased. By March 1880, nearly 200 steamers were crowded into the narrowly confined waters between Portugalete and San Nicholas. In that month alone two British vessels were wrecked, and no fewer than forty vessels noted protest before the British Consul at Bilbao because of damage sustained in the river.[53] Efforts to deepen the channel did little to transform the port from "the marine Golgotha" Bilbao was described as still being in 1886.[54] By 1890 conditions in the port had materially improved and it was not unusual to see 150 or 180 large steamers in the river below Bilbao awaiting their turn to load. Up to 1893 nearly £1m had been spent on the bar and channel and vessels of 21 feet draft could then enter on spring tides. The size of vessel using the port consequently increased. In 1881 the Consul reported that "a very large number of steamers from 1,100 to 1,700 tons gross register are specially dedicated to this trade",[35] but between 1889 and 1894 the average net register tonnage of ships loading iron ore increased from 1103 to 1331 tons.[56]

The attempts to attain economies of scale were often self-defeating however. The pressure of competition by the 1890's had become severe, as is reflected in the levels of freight rate prevailing for spot ships.

Charters sought to obtain larger ships despite the growing delays in loading them. Steamers could wait seven to twelve days to load, and problems were increasingly experienced at such discharging ports as Cardiff, which by this time was importing as much as three-quarters of a million tons annually. Shipowners were discovering to their cost that the employment of bigger vessels could prove disadvantageous if port facilities did not keep pace with the size of the vessel chartered. This was a matter which exercised the mind of the Manager of the Shipping Office at Cardiff of the Dowlais Iron Company, who investigated the problems of delays in 1895:

TABLE 3

FREIGHT RATES BILBAO/SOUTH WALES

YEAR	RATE (SPOT VESSELS) PER TON
1871	11/3d
1873	15/9d
1876	11/3d to 12/-
1877	9/- to 12/-
1879	7/- to 7/6d
1880	8/- to 10/-
1882	7/6d to 10/-
1883	5/6d to 5/9d
1884	5/- to 6/-
1885	4/3d to 4/9d
1887	5/- (average)
1893	4/4d to 5/4d
1894	3/10½d to 4/1½d

TABLE 4

DOWLAIS IRON COMPANY ANALYSIS OF TIME OCCUPIED BY VESSELS ON BERTH AT CARDIFF DISCHARGING IRON ORE IN AUGUST-SEPTEMBER 1895

SIZE OF CARGO (TONS)	NO. OF VESSELS	TOTAL TONNAGE DISCHARGED	TOTAL HOURS ON BERTH	TONS DISCHARGED PER HOUR ON BERTH
Up to 1,000	5	2,391	182	13
From 1,001 to 1,500	2	2,595	211	12
From 1,501 to 2,000	17	30,519	1,672	18
From 2,001 to 2,500	14	30,593	1,619	18
From 2,501 to 3,000	2	5,269	367	14
Above 3,000	3	11,259	714	15

Source: Glamorgan R.O., Dowlais MSS, D/DG, Fifoot Letterbook. A letter accompanying this return states that the average rate of discharge was 420 tons per day.

The remarkable, but almost totally neglected, trade in ores from the Iberian Peninsular survived the decline in supplies of Bilbao ore despite the gradual exhaustion of mines there in the decade before 1914. New mines were discovered and exploited elsewhere in Spain, notably at Castro Urdiales, Carthagena, Santander and Almeria. To such freight must be added the very substantial volume of bulk cargo which emanated from other kinds of mining enterprise. The trade in pyrites and copper ore similarly employed large fleets of steamships from the 1870's up to the outbreak of the first World War.

Nearly all the vessels in this trade coupled their homeward ore freights with exports of coal from British coalfields to French ports or even Gibraltar or Madeira. Thus ballasting was often limited to an inconsiderable voyage of a few hundred miles. Furthermore, as Bilbao developed its own very substantial iron and steel industry, the port was kept busy with inward freight from Britain of mounting quantities of coal and especially coke. Paradoxically, the growth of a rival Spanish steel industry could actually benefit British steel producers by further reducing the freight costs incurred in importing Spanish ore, since many shipowners now found that the intermediate ballast voyage was eliminated altogether.

V

The technical development of the steamship in the nineteenth century is well-known. The substitution of iron for wood and steel for iron and the massive improvements in marine engines and boilers are commonplaces of maritime history. However, the emphasis is often on the largest, the fastest, the most expensive, or sometimes, the most bizarre. Less attention is paid to those who pursued other and perhaps less amenable technological imperatives. The perfection of the bulk cargo-carrying tramp demanded, and obtained, at least as much ingenuity and skill as was associated with the oft-considered passenger liner.

The world of the tramp steamer was the most internationally competitive sector of the shipping industry, critically affected by violent cyclical fluctuations, national and international regulation, and the chance hazards of war, crop failure or surplus. Few friendly governments before the First World War tempered the chill winds of fierce international competition to this sector of the shipping industry, and the freight market approached the economist's conception of a perfect market. Moreover the tramp steamer was herself the instrument in perfecting a number of commodity markets as technological improvements lowered freight costs.

This long secular decline in freight rates was the tangible evidence of the economies effected in the coal consumption of marine engines. The technological progress in both engines and boilers is now so well appreciated that it is not proposed to do much more than re-emphasize the matter here.[57] It is sufficient to give two examples of steamship economy as achieved by William Gray of West Hartlepool and his associated Central Marine Engineering Works. A writer in 1894 pointed out that the ocean tramp "had been somewhat looked down upon as scarcely examples of the highest kind of marine engineering" yet they had realised some "wonderful" performances.[58] The 3,500 ton deadweight *Weston,* built in 1890, used only 0.64 ounces of coal per ton per knot, at a cost of 1/500th of a penny. *Oscar II,* which carried 4,600 tons deadweight at a consumption of 14 tons of coal per day consumed just half an ounce of coal per ton per knot. Both vessels maintained the optimal tramp speed of 9 knots, and this measure of economy is graphically illustrated by the observation that the heat generated from burning a sheet of writing paper was sufficient to transport one ton of cargo per knot in the best practice steam tramp of the early 1890's. This economy was the consequence of a long succession of incremental innovations, in the course of which the development of

the compound, then the triple, expansion engine marked crucial steps on a long and continuous progression. The demands of economy, suitability and flexibility exercised the ingenuity of naval architects and shipbuilders in a number of other ways, however, and it is to some of these we briefly turn.

The need to sustain rapid turn-round for steamers growing ever larger has already been referred to in respect to the coal and ore trades. One of the essential conditions of quick turn-round was the introduction of water-ballast. *John Bowes* was originally fitted with moveable tanks to permit her to utilize water-ballast, and Palmer's yard was prominent in extending the use of more permanent water-ballast arrangements which served to allow the proper trim of screw vessels. *Samuel Laing,* built for John Fenwick by Palmer in 1854 embodied this innovation, and *Rouen* (1857) and *Lyon* (1857) were similarly fitted. These vessels embodied the "John McIntyre tank", a double bottom built on the cellular principle suggested by the construction of the Britannia Bridge at Holyhead. Such developments could have significant effects on costs. Benjamin Martell reckoned that for a Mediterranean trade vessel (coal out, grain home) costing £20,000, the adoption of water-ballast tanks might effect a saving of 5% on annual costs. Were a similarly fitted vessel employed in the Baltic trade, he supposed a saving of nearer 7½% by virtue of the greater number of voyages achieved on the shorter sea route.[59] The value of water-ballast in the trimming and stability of steamers carrying measurement cargoes, such as cotton, timber or esparto, hardly needs emphasis.

Quick turn-round was also affected by the size of hatches, and yet longitudinal strength could not be sacrificed. Large hatches were increasingly specified in builder's contracts in the 1880's and 1890's reflecting the increased pressure to accelerate loading and discharge.

The concentration of bulk commodity-using industries at major ports, with the consequent relocation of manufacturing processes adjacent to deep water berths facilitated the cheapening of costs to shipowner and manufacturer alike. But it presaged declining trade at many small ports. This is exemplified by the relocation of flour milling at relatively few major ports.[60] The location of new oilcake mills, steelworks and oil refineries similarly reflected the growing impact of such considerations. But nevertheless there was a persistant lag between the growth of many bulk trades and the provision of adequate discharging facilities in Britain. It is a curiosity of the pre-1914 era that progress was much more marked in effecting the rapid loading of coal than was to be achieved in the admittedly more complex technical problem of discharging bulk cargo, although grain was a notable exception. The astonishing performances in loading and discharging cargo in the American Great Lakes trades were slow of emulation in Britain.[61]

The development of the easy- and self-trimming steamer was of enormous benefit in the reduction of costs and turn-round time. Small hatches combined with large holds exacerbated the problems of stowage and necessitated the employment of gangs of trimmers at the coal-loading ports particularly – a kind of labour notorious for its recalcitrance, not to be wondered at by those who can imagine the nature and conditions of work for these men. Thus the advent of the self-trimming collier,[61] and the provision of topside wing tanks for ore carriers were valuable developments in the late nineteenth century. Not to be neglected either was the increased provision of devices on board ship that permitted loading and discharge by ship's gear. Derrick systems and the provision of

abundant cargo winches helped solve some of the problems to be encountered at ill-equipped ports.

Space will not permit an examination of the many other technical problems which shipbuilders and shipowners had to overcome in perfecting the tramp steamer. Very often the problem was to reconcile irreconcilables. For example, it was desirable at one and the same time to achieve fuel economy accompanied by maximum carrying capacity, so that increases in the block coefficient had to be traded against increased deadweight. Carrying capacity had also to be reconciled with the need to minimize both draught and breadth, since pre-existing dock systems and undeveloped ports could not always accommodate vessels however optimal their economic proportions. So far as engines and boilers were concerned, there was the problem of instituting beneficial technical change but at the same time compelling utter and total reliability and simplicity of operation so that demands upon engine room staff were kept to a minimum. There was also the desirability of reducing the overall weight of engines and boilers without sacrificing solidity and strength. There was even the nice technical adjustment so that the rated nominal horsepower could be kept low, while indicated horsepower was increased, thus limiting the impact of Board of Trade regulations respecting engine room manning.

Regulations of this kind also posed other problems. Owners sought maximum carrying capacity coupled with minimum net tonnage, so that there arose a constant and bitter warfare between dock and harbour authorities, the Board of Trade, and the shipping interest, on the determination of measured tonnage. Much diversity of design was engendered by ingenious attempts to modify the impact of dues on tonnage, and diversity was inimical to the production of cheap, standardized vessels which was the ideal formula for running a successful shipyard.[62] But we must finally turn to mention very briefly just one consideration which exercised the minds of tramp shipowners in the decade before 1914: the problem of the increased size of ships.

Each new shipping boom in the nineteenth century was the occasion for shipowners venturing more capital in larger ships.[63] The overoptimism generated by high freight-rates was partially responsible for this, but other factors included the ease with which finance could be obtained thanks to the advent of limited liability and the emergence of the single-ship company, and the fact that there were clearly significant economies of scale in both prime and running costs.

By the end of the nineteenth century, however, it was clear that problems were beginning to arise, and these became extremely troubling to shipowners in the collapse of freight rates which followed the end of the Boer War. The owners of the larger vessels found it very difficult to earn profits on such steamers because their size acted as a constraint on their employment in many active trades. Such vessels could strain the resources of both dock and harbour authorities (as we have seen in the case of iron ore), and perhaps more especially imposed stress on the whole existing merchanting system in assembling, storing and financing these large cargoes, not least in those less developed parts of the world where the accumulation of stock subjected the commodity to the danger of deterioration (*e.g.* wheat in Argentina). The problems of the big tramp were to be solved in the long run, but in the early 1900's those foreign shipowners who purchased what were termed "handy" secondhand, British-built tramps were enabled effectively to compete with the larger British ships deployed by many British shipowners.[64]

To become a tramp shipowner was to accept quite exceptional risks. But, despite this, there were always plenty of newcomers to the profession, suggesting that, although the hazards were considerable, the rewards could compensate the steadfast ship manager. Tramp freight rates, and consequential earnings, were exceptionally volatile, and investors were very vulnerable to unfavourable trends in the market. But when a shortage of tonnage propelled freight rates upwards, the profits that could be earned proved extremely attractive, often appearing to exceed those which could be obtained from other forms of investment. The tramp shipowner could not protect himself effectively in times of adversity, despite his frequent attempts to form protective associations. Few such arrangements survived more than a few months and nearly all proved ineffective in stimulating an improvement in rates. It was shown repeatedly that it was impossible to make enforceable a coherent policy for bolstering up rates in an industry notable for its cosmopolitanism, individuality and heterodoxy.

The tramp presented a marked contrast with the liner, the latter increasingly extended under the protective umbrella of an aggressive and widespread conference system. The liner trade could generally adjust to a downturn in freight rates, and depression, although it often had severe effects, could generally be outstayed. But when the economic pendulum swung from depression to prosperity, liner conferences could not always take full advantage of the advance in rates. Many tramp shipping enterprises sought to stabilise and consolidate their activities by entering the liner trades (by no means always successfully as we have suggested), but it was a very rare occurrence for a liner company to enter tramp trades, although this has become a striking feature of the present-day shipping industry.

It would be illuminating, were it possible, to determine whether liner or tramp trade was the most profitable before 1914, but it is unlikely that any such study, however ingeniously organized, would elicit meaningful conclusions. Such was the diversity of organization and experience of each sector of the shipping industry that it would be almost impossible to select enterprises both representative and comparable. Furthermore, while the financial statements of typical tramp steamship enterprises, many of them nominally single ship companies or organized as "sixty-fourth" concerns, are reasonably clear and unambiguous documents, the balance sheets and published accounts of the principal liner companies seemed designed to conceal more than they reveal. It can be no more than an impression, but it could be argued, that the return on the capital invested in tramps before 1914 was often higher than that derived from investment in the more prestigious liner companies, who often bestowed as little by way of dividend upon their ordinary shareholders as they presented useful information on their financial arrangements. Comparisons of the financial performance of the principal liner companies with the more important tramp shipping enterprises were almost always rendered nugatory by the fact that few tramp shipping firms consolidated their fleets into joint stock companies until the few years before 1914.

It is impossible not to be struck by the quite extraordinary success of some of the well known tramp shipping firms. The careers of such men as Christopher Furness, George and William Burrell, Robert Ropner, Walter Runciman, Maclay and MacIntyre,

and Edward Hain, to cite some of the most notable, are by any standards remarkable. Most achieved wealth without having at the outset of their careers any very significant advantages in birth, education or inherited wealth, and yet, without subsidy or subvention of any kind they accumulated fortunes with astonishing rapidity, often appearing to contrive their most vigorous periods of expansion in otherwise unpropitious years when depression seemed at its deepest. Indeed, qualities of boldness and imagination were often demonstrated most convincingly at such times as they purchased tonnage when it was at its cheapest, to deploy it with decisive effect as freight rates recovered.

Familiarity with the statutory registers of merchant ships – the complementary archive to Memorial University's collection of crew agreements and official logs – will serve as ample corrective to any notion that tramp shipowners always, or indeed often, commanded success. Nevertheless we may conclude by referring briefly to the abilities of just one or two owners who became acknowledged masters of the difficult art of tramp ship management.

Pride of place ought perhaps to go to Christopher Furness, who was born in 1852 and who had accumulated assets conservatively valued at £855,019 when, in 1891, at the age of forty, he promoted the formation of Furness, Withy and Company Limited. Of this sum, steamers and shares in steamers amounted to £354,368, with an additional £222,400 committed to four vessels ordered from shipbuilders. Of the new firm's assets, Edward Withy's shipyard, and the work in progress there represented £66,054, although other Withy assets may be included in other items in the incorporation proposal documents. The predominant part of this fortune was accumulated in the operation of tramp steamers, although Furness was by the 1890's the recipient of Canadian postal subventions.

The Cornishman, Captain Edward Hain, son of a St. Ives master mariner, purchased his first steamer in 1878 for £18,000, built by John Readhead and Sons of South Shields – a shipbuilder to whom Hain remained faithful throughout his life. By 1890, just twelve years after his first venture into steam, the market value of the fleet then managed, constituting nineteen steamers, had a total insured value of £364,000. Two years after Edward Hain's death in 1901, the Hain fleet of 22 vessels was worth £500,000, and by the time the entire fleet was finally sold in 1917, 74 steamers of a capital cost of £2,620,000 had passed through the firm's hands.[65]

Finally there is the case of Edward Nicholl, like Hain a Cornishman, born in 1862 and apprenticed as a youth to the Great Western Railway workshops at Swindon. Turning to marine engineering, he became a journeyman with the marine engine builders Thomas Richardson at West Hartlepool, before becoming an engineer in Cardiff and Newport-owned vessels in the Bilbao trade. By 1894 he was marine superintendent to the Cardiff tramp owners W. and C.T. Jones. Nicholl began his own shipowning career in 1904 with the purchase of two tramps – an unpropritious time to become a shipowner. Despite the unfavourable economic climate he traded his ships with great flair, earning dividends of between 21 and 79 per cent in the difficult years 1904-1909. By 1914 Nicholl had accumulated a fleet representing 95,000 tons which had cost £560,000 – a remarkable achievement after only ten years' trading. Nicholl sold part of his fleet to Furness Withy during the first World War to bring him a clear profit of no less than £300,000.[66]

This essay has perhaps served to draw some attention to the importance of the tramp shipping sector and the crucial role it played in the rise to pre-eminence of Britain as a maritime power. It is to be hoped that research at Memorial University and elsewhere will serve to celebrate the achievements of this vital element in maritime history.

NOTES

1. On the estimated size of the tramp fleet in 1914, see C.E. Fayle, *The War and the Shipping Industry* (London, 1927). One recent study of the tramp is that by Captain A.G. Course, *The Deep Sea Tramp* (London, 1960). One of the best studies so far of an individual firm is A. and R. Long, *A Shipping Venture: Turnbull, Scott and Company, 1872-1972* (London, 1974).

2. *Shipping World* I, 1 (1883).

3. "It is a general complaint among merchants, that they are losers upon capital vested in the shipping which they find necessary to employ, but I am inclined to think this loss in a great measure arises from an error in system, and that whenever the ship holder shall become a distinct body, unconnected with the Importer or Exporter, the grounds of complaint will be removed. Masters of vessels who have retired from the service or others who have made this Branch their particular study are the most proper persons to become shipholders and indeed the trade has taken very much this turn of late." Thomas Irving to William Pitt, P.R.O. Customs 17/10 (1788).

4. Shipowners were describing themselves as such in the 1760's at Hull: see G. Jackson, *Hull in the Eighteenth Century* (O.U.P. for Hull University, 1972), pp. 140-4.

5. R. Cort had connexions with the British Iron Company.

6. R. Cort, *Letter to John Taylor [etc.]* (London, 1824).

7. London Registry, 348/1849; 280/1855; Swansea Registry 1/1858; 19/1872.

8. Alfred Sturge of Swansea.

9. R. Nevill of Llanelly.

10. London Registry 420/1852; 349/1854; 216/1855; Swansea Registry 8/1858.

11. Whitehaven Registry 19/1851; 10/1852; 12/1853; Workington Registry 2/1855.

12. F.E. Hyde & J.R. Harris, *Blue Funnel* (Liverpool, 1957), pp. 16-17.

13. *Cleator,* Liverpool Registry 81/1855; 25/1856; 249/1869. For Government charters in the Crimean War, see *British Parl. Papers* 1854-5, XXXIV and 1856, XLI.

14. B. Poole, *The Commerce of Liverpool* (Liverpool, 1854).

15. Cumb. R.O., Diary of Charles Fisher of Whitehaven.

16. P.R.O. BT/1/466/1477/47.

17. Registry respectively London 99/1846; 263/1846; 286/1846 and 335/1846.

18. P.R.O. BT1/466/1477/47.

19. On the trade in cattle see Fisher Ormandy, *The Cattle Trade of Great Britain and Ireland* (London, 1857), being a collection of reports addressed to Captain Mark Huish.

20. P.R.O. BT/1/466/1477/47.

21. London Registry 118/1854; 162/1869.

22. *The Economist,* 19 June, 1852.

23. London Registry 157/1852.

24. *The Economist,* 8 October, 1853.

25. *The Economist,* 12 August 1854; see also N.R.P. Bonsor, *North Atlantic Seaway,* (Prescot, 1955) Ch. 38, pp. 81-2.

26. *The Economist,* 18 August, 1855.

27. Newcastle Registry 148/1842. National Maritime Museum, Lloyd's Survey Report dated South Sheilds 22 September 1842. See also S.B. Martin & N. McCord, "The Steamship *Bedlington,* 1841-54", *Maritime History* I, 1 (1971), pp. 46-64.

28. Newcastle Registry 138/1844; 4/1846. National Maritime Museum, Lloyd's Survey Report dated Newcastle 7 September 1844.

29. See *Smith's Dock Journal* XII (October, 1931), pp. 179-182.

30. Greenock Registry 1/1849; London Registry 128/1850; 82/1852; 74/1854; Glasgow Registry 17/1857, *etc.*

31. Newcastle Registry 55/1852; 59/1853; 52/1869.

32. London Registry 44/1855.

33. London Registry 5/1855; 121/1859.

34. London Registry 386/1855.

35. London Registry 432/1855.

36. London Registry 5/1856; 152/1859.

37. London Registry 124/1855.

38. Newport Registry 7/1856.

39. Liverpool Registry 261/1846; 292/1852; 251/1860; 344/1864.

40. *The Engineer,* 12 March, 1858, p. 201.

41. *The Engineer,* 2 April, 1858, p. 257.

42. R. Murray, *Rudimentary Treatise on the Marine Engine [etc.]* (London, 1858), p. 179.

43. H. Murray, *Union-Castle Chronicle 1853-1953* (London, 1953).

44. Southampton Registry 23/1854; London Registry 287/1858; 305/1858.

45. Southampton Registry 23/1855; 4/1862.

46. Quoted in B.C. Hunt, *The Development of the Business Corporation in England, 1800-1867* (Cambridge, Mass., 1936), p. 158.

47. *The Engineer,* 18 July 1862, p. 46.

48. Cumb. R.O., *Hodbarrow Mss.* Cedric Vaughan Hodbarrow Mines Manager wrote, 25 February 1881: "Spanish Ore is competing with us in South Wales to such an extent that I find it very difficult to keep our connexion there."

49. M.W. Flinn, "British Steel and Spanish Ore, 1871-1914", *Economic History Reviews* (2nd ser.) VII, 1 (August 1955), pp. 84-90; H.W. Richardson & J.M. Bass, "The Profitability of Consett Iron Company before 1914," *Business History* VII, 2, pp. 71-93.

50. See especially "Depression Trade & Industry," *British Parliamentary Papers* 1886, XXI, Q. 1931 ff. Evidence of Lowthian Bell to the Royal Commission.

51. Report of the Consul, Bilbao for 1901, *British Parliamentary Papers* 1903, LXXVII, p. 851.

52. F.C. Barron, "The Works of the Bilbao Iron Ore Company in the Province of Biscay, Spain", *Proceedings of the Institute of Civil Engineers* LI, 1 (1877-8), pp. 237-60.

53. Report of the Consul Bilbao, *British Parliamentary Papers* 1880, LXXIV, p. 160.

54. Report of the Consul, Bilbao, *British Parliamentary Papers* 1887, LXXXVI, p. 207.

55. Report of the Consul, Bilbao, *British Parliamentary Papers* 1883, LXXIII, p. 802.

56. Report of the Consul, Bilbao, *British Parliamentary Papers* 1895, C, p. 616.

57. See particularly C.K. Harley, "The shift from sailing ships to steam ships, 1850-1890: a study in technological change and its diffusion," in D.N. McCloskey *Ed., Essays on a Mature Economy: Britain after 1840* (London, 1971), pp. 215-237.

58. See T. Hudson Beare, "Abstract of results of experiments on six steamers", *Proceedings of the Institute Mechanical Engineers* (February, 1894), pp. 33 ff. & discussion. The comments quoted are from a discussant, Jeremiah Head.

59. W.B. Martell, "On Water-Ballast", *Transactions of the Institute of Naval Architecture* XVIII (1877) pp. 336-342.

60. A good example of relocation and the borrowing of American technology in cargo handling was the installation of a grain elevator at Fleetwood under the supervision of Joseph Davis who had visited the United States to gain knowledge and experience. See *Proc. Inst. Mech. Engineers* (August, 1893), pp. 492-3 and *ibid.,* (July, 1901), pp. 777-8.

61. The "Great Laker" *Augustus B. Wolvin* in August 1904 loaded 10,345 tons of iron ore in one hour 29 minutes, and discharged 9,945 tons in four hours six minutes. See *Syren & Shipping,* 3 May 1905, p. 234. Henry Burrell of Glasgow was one of the few British shipowners who sought to learn from American experience. He designed a "straight back" steamer in the 1900's which anticipated to a remarkable degree a modern bulk carrier. Burrell thought that a fleet of such vessels employed in the 74m ton British coal and ore trades would save £5m annually in costs.

62. "Principal profits have been made from simple cargo vessels and from repetitions of them". *Memoirs of John Wigham Richardson* (Glasgow, 1911), p. 144.

63. See, for example, W. Theo. Doxford's presidential address to the North East Institute of Engineers and Shipbuilders, printed in their *Transactions,* III (Sess. 1886-7) pp. 9 ff.

64. On this see the perceptive article in *Maritime Review* 1 (6 April 1904), p. 159, and *Glasgow Herald* 30 December 1905.

65. Some details of Hain's remarkable career are given in Sir George P. Christopher, *Roots and Branches* (Liverpool, no date).

66. On Nicholl, see T.C. Wignall, *The Life of Commander Sir Edward Nicholl* (London, 1921).

13. DISCUSSION FOLLOWING THE PAPERS OF R. CRAIG AND P. DAVIES

ALEXANDER noted that both papers stressed the importance of speed, particularly of turn around time in port. The current studies of Yarmouth, Nova Scotia, indicated that turn around time was a great problem to the sailing ship owner quite largely because of the signing off or desertion of the crews immediately they came within sight of land. Did the liner vessels draw their labour from the same general pool of seamen or were they a different class? Did the liners pay a premium to their employees?

CRAIG pointed out that conditions of employment were much better on the liners and that wages were higher than on the tramp vessels. There was also a certain *ésprit de corps* with considerable pomp and ceremony, especially in such companies as Cunard or the Peninsular and Orient lines. There was desertion from liners but it was not nearly as endemic as with the sailing ships.

He mentioned that in the mid-century much of the recruitment of seamen was really a disguised form of imigration with people signing on to work their passage to some other part of the world, but because sailing vessels had a relatively slow turn-around time in port, the crews were almost invariably discharged the moment the vessel arrived. Basically the liner companies provided men with some degree of security and a career structure whereas the sailing vessel owners recruited men from a vast unorganised pool who were in many cases not professional seamen at all.

DAVIES argued that one of the great advantages which the liner companies had over the tramp owners in the recruitment and retention of crew lay in the fact that they traded constantly from one home port to fixed destinations and home.

ALEXANDER stated that the rate of deserting from sailing vessels seems to have been much lower where at some particular point in its history a vessel obtained a crew which for some reason or other was nationally or culturally homogeneous. However, this group always broke up in the end and the desertion rate would climb once more. Thus there are important social patterns to be considered.

KNOPPERS asked whether one can talk of a tramp shipping industry in the era before steam.

CRAIG stated that although the term was unknown until applied to steamers, "tramp shipping" had existed for generations, and except for certain "constant traders" all vessels of the pre-steam era were tramps in a sense, even the Newcastle colliers.

JANNASCH disagreed and argued the earlier sailing vessels were all on more or less fixed runs whereas a true tramp was one which picked up cargoes more or less promiscuously and did not trade between fixed points.

DAVIES and CRAIG pointed out that liners sailed on scheduled dates and carried general cargoes, whereas the most early 19th century vessels did not, and furthermore that many of them were out on charter and thus there was no continuous employment.

It was concluded that whatever she might have been, the sailing vessel was not a liner, and thus must have been in some way a tramp.

RICE was interested in the argument that for the history of shipping it was much more important to study the bankrupt entrepreneur rather than the successful one. Charges of entreprenurial failure have been levelled at the British as well as Canadian businessmen, yet both Craig and Davies had essentially described general success stories since the British promoted and dominated both the liner and tramp shipping industries. How does this fit in with a widespread impression that in the last years of the 19th and first part of the 20th century British entrepreneurs were falling behind?

CRAIG argued that shipping and shipbuilding was a uniquely successful industry in terms of the British economy in the late 19th century, and that it went against all the trends in the overall economy. However, much was due to the volume of trade and especially Britain's deposits of coal and steel which were freely available for export as outward cargoes of British vessels. The repeal of the Navigation Acts, creating as close an approximation to free trade as has ever existed also stimulated efficiency whilst the iron, steel and coal industries placed the British shipping industry in a uniquely effective competitive situation.

DAVIES, whilst agreeing with this, pointed out that this situation was inevitably only for the short run since "No one ever suggested that Britain had any God given right to produce 70% of the world's tonnage", and indeed her status was beginning to decline even before World War I. The dominance of the British shipping industry for so long was indeed only due to tremendous entrepreneurial skill.

RICE pointed out the advantage which British shipowners had in access to cheap capital. But CRAIG argued that this capital was available to many non-British shipowners as well. RICE pointed out that there was capital available in Canada both locally generated and British, yet this was not placed in the shipping industry after the decline of sailing vessels. PALMER stated that the British shipping industry differed in important respects from the Canadian in terms of trade patterns, legal structure, and tax organisation. CRAIG summarising the discussion, thought that one of the critical objectives for the Maritime History Group's current study was to examine the diversity in trades and trade routes. The development of the deep-sea Canadian industry was related to the phenomenal expansion of world trade, and especially to Canada's intimate relationship to Britain which was at the centre of world trade.

14. EXPERIENCE, EXPERIMENT AND ECONOMICS: FACTORS IN THE CONSTRUCTION OF EARLY MERCHANT STEAMSHIPS

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EXPERIENCE, EXPERIMENT AND ECONOMICS: FACTORS IN THE CONSTRUCTION OF EARLY MERCHANT STEAMSHIPS

Sarah Palmer

I

Neither the growth of steam shipping as a form of transport nor the development of the mercantile steamship itself in the years between the launching of Bell's *Comet* (1812) and the adoption of screw propulsion and iron hulls has received much attention from historians. The more obviously experimental phases of steamship construction have been of most interest to historians of technology, and concern with the part played by steam in the development of Britain's oceanic trades has led economic and maritime historians to concentrate their attention on the second half of the nineteenth century. In a historical perspective which included not only the later achievements in steamship construction but also the finest examples of sail, the wooden paddle steamer appears primitive. Between 1820 and 1850 the British mercantile steam navy grew from 34 to 1,187 vessels, from c. 3,000 to 168,000 registered tons. However if these figures are set against sailing tonnage of 3,397,000 tons in 1850 it is clear that the progress of steam was not impressive.[1] The first crossing of the Atlantic under continuous steam power was made in 1838 and the Cunard ocean service began two years later, but until that time the employment of steamships was confined to the river, coast and narrow seas and to passenger and specialized trades.

These aspects of the early years of steam navigation may explain neglect by historians but do not justify it. Both its lack of progress in relation to sail and the business of steam shipping at a time when it was still experimental and novel deserve study but, although this paper touches on both these issues, its aim is to consider some questions relating to the early steamship itself. The contributor to the 7th edition of the *Encyclopaedia Britannica* (1842) who wrote under the heading 'Steam Navigation' referred to its "present state of high perfection", and traced with satisfaction its progress within the quarter of a century from Bell's 3 horse power boat to the 500 – 600 horse power vessels recently built for the Atlantic trade.[2] However, despite the increase in size and power achieved, it is the relative lack of progress in steam technology which seems striking. For almost thirty years Britain's steam fleet consisted of vessels using a technology the general features of which had been established early in the century. Of 1,218 vessels on the British register in 1852 only 189 were iron paddle, 53 iron screw and 5 wood screw.[3] What determined steamship construction, how and why did it change, and did it indeed reach 'high perfection' by the 1840's or, as observations by contemporaries and the early history of fleets such as the Royal Mail or the Peninsular and Oriental suggest, was it in some instances deficient?

II

The immediate responsibility for the physical characteristics of a steamship lay with her builders, but the specifications to which they worked and the standard by which

success was judged were determined by the needs of the shipowner. Once it was established that steam navigation was practicable, all further development was determined by the context in which steam vessels operated, whether naval, mercantile, or private. In consequence, the proper starting point for an investigation of mercantile steamship construction is not the shipbuilding yard, nor the engineering workshop, but the steamship company's office.

For probably the majority of companies and individuals concerned with the business of steam shipping in its earliest days the most significant characteristics of such enterprise were the risks attached and the severe financial consequences of failure. Both were a result of the high capital costs involved. In addition to the expenditure on the hull, frequently greater than for a sailing vessel of the same size because of the additional timber required to give a strong base for the engines, there was the cost of the engines, boilers and paddle wheels.[4] In the late 1820's a 100 ton steam packet, 50 horsepower, cost approximately £5,800 complete.[5] Twenty-five years later a 1000 ton vessel of 350 horsepower was £45,000.[6] That the cost per ton fell over this period did not lessen the capital burden, or narrow the differential between steam and sail in terms of cost of construction, because the size of vessel required also increased. Building costs varied both according to geographical location (the outports were cheaper than London), engineer or shipbuilder selected, and according to the quality of materials and workmanship. In 1839 Robert Napier told Cunard that he had built for £35 per ton but good steam vessels cost £40 – £42 per ton.[7] However, even where quality was sacrificed to economy, there was never any possibility that the sums involved in having a steamship built would be other than large.

The effect of this was not only to put steamship ownership in most instances beyond the financial range of the individual or small partnership, so that the joint stock company became the dominant form of organisation, but also to make steam shipping a more marginal venture in economic terms than its supremacy over the sailing ship in terms of speed might suggest. In order to cover these initial costs alone revenue had to be correspondingly high; hence steamships relied on the availability of sufficient traffic to permit frequent voyages to be made. "If a vessel make but one voyage in a week we consider she is not likely to pay", the Principal Director of the City of Dublin Steam Packet Company told a parliamentary inquiry in 1830.[8] Since cost considerations also meant that steamships could not compete with sailing vessels in terms of freight rates, where speed and regularity of service did not bring any particular advantage there was no incentive to choose the steamship in preference to the sailing vessel. As a result at first steam ship companies achieved a clear lead only in the passenger and livestock trades.[9] Where the volume of freight was limited and competition from sail continued steam vessels found it hard to survive. Thus, in 1839 the General Steam Navigation Company was forced to abandon its station at Berwick after just two years of operation; competition from the smacks had forced the company to reduce rates and when the Berwick Company's steamship *Manchester* was put into service against the *Tourist,* it became clear that neither the value nor volume of traffic could support two companies or justify a contest to eliminate the competitor. A similar fate met the G.S.N.C.'s station at Sunderland which ceased in 1844 after six years of unprofitable operation, due to insufficiency of demand. The history of the same company's continental services provides

similar instances of withdrawal for lack of traffic. Even on the Calais/Boulogne station the company tried to extend operations in 1837 by getting the Mate and Steward of the vessels concerned to "go round to the different inns and hotels to solicit passengers". The following year an arrangement was made with the Calais sailing vessels for their withdrawal so that another cargo carrying steamship could be employed effectively.[10]

In part such difficulties resulted from competition between steam ship companies operating in a limited market for their services. Where the volume of traffic was sufficient to support several companies, competition on the basis of fares or service rarely persisted for long. On both the London – Edinburgh passage and on the River Thames a number of companies became firmly established, apparently in competition with each other but in fact in collusion and united in their determination to resist new entrants on these routes.[11] In these circumstances companies preferred to be content with their share of the market rather than risk the consequences of fierce rivalry in fare levels and ultimately revenue. However if two companies were competing for a quantity of traffic sufficient only to support the operations of one, a situation not unusual in the coastal and near foreign trades during the 1820's, an 'all or nothing' situation existed where the economic survival of one was dependent on the annihilation of the other. Given the amount of capital concerned, the penalties of being the loser were severe; therefore companies in such a situation sacrificed all other considerations to the pursuit of the one objective of forcing the competitor to withdraw. Fare and freight reductions might achieve this but in the long term tended to prove mutually ruinous because of the effect on revenue, hence companies looked above all to the speed and appearance of their vessels to attract business. "The steam packet owner", explained a witness to the 1839 investigation, "looks only to the splendour of the saloon and velocity of the vessel; it is upon these alone that he depends for success."[12]

The effect of these aspects of steamship enterprise on construction and operation was considerable. Its speculative character encouraged shipowners to economise on construction, even where this affected durability. Thus copper boilers, although more lasting, more efficient as conductors of heat and in the long term cheaper because of the second hand value of the metal, were less popular with shipowners than the cheaper wrought iron boiler, ". . .the man who is shortened in means but hopes to be rich enough by the time the boiler is due to get a new one; or who does not know whether he will be solvent so long as to see the boiler out, or who at any rate cannot spare so much money at once, procures at once the cheapest boiler he can. . . .All this applies more peculiarly to steam vessels".[13] Poor materials were sometimes used in an attempt to cut costs although this was not visually apparent, "defects of timber are concealed by planking; defects of planking by certain fittings; and defects of all by painting and decoration."[14]

Passengers were attracted by luxury accommodation hence shipping companies attached more importance to this, sometimes neglecting safety in consequence. The Leith and Aberdeen vessels employed on the passage to London in the 1830's for example, had an unusually spacious deck achieved by its extension over the paddle beam. As a result although, in the words of a critic, "satisfactory to avarice" they were less than safe.[15] The greatest attraction of the steamship for the public, however, was the speed and regularity of service which it offered; therefore the prime objective of shipowners in building a new vessel was that it should be capable of higher speeds than hitherto

achieved. "Competition in speed is often so great as to supersede every consideration of safety, economy and prudence," Maudsley, Sons and Field commented in the evidence to the 1839 inquiry, referring both to the practice of sacrificing strength to lightness in construction in order to increase velocity, and to the tendency of ship engineers to push steam pressures beyond that for which engines and boilers were designed.[16] Although high power was not always associated with greater speeds, in the opinion of one engineer large engines came to acquire a symbolic value for the public and were found "indispensible for ensuring the confidence of travellers".[17]

In our discussion so far of the influence of costs on profitability, and the relationship between this and the qualities shipping companies looked for in their vessels we have ignored the whole question of running costs. This is unrealistic in respect of profitability since obviously such items as repairs and fuel costs were yet another expense which had to be covered by revenue. However repair costs did not at first concern shipowners as much as might be expected, for reasons explained in the 29th Report of the G.S.N.C.;

> "For several years after the general introduction and application of steam navigation, large and indeed extravagant expectations were formed of the profit to be acquired. The cost of the management of steam ships was judged from the results of the first five years, from the returns obtained while the ships were in perfect condition and before reparations to any serious extent had been required. . .The expenses required to maintain steam ships in a proper state of efficiency and repair have been found to reach so large an annual amount that, of the numerous steam companies which have been formed, scarcely one has been found, upon a review of their operations for ten years, able to maintain for the average of that period, a dividend of five per cent; consistently of a proper sum to the maintenance of their capital, while, in many instances, the operations have terminated in the sacrifice of almost the whole of the property embarked. Steam boats have been found to require in a very great degree the exertion of the most indefatigable activity and rigid economy in every particular of their employment and conduct in order to obtain from them any returns. . .Steam navigation has (consequently) now assumed the character of a regular shipping business, subject only to the ordinary chances of competition, which is however rendered more difficult by the large capital required to be at once laid down for the purchase of steam ships and the subsequent magnitude of the cost of keeping them in constant and regular service, whereby the loss in case of failure is rendered very considerable.[18]

Experienced and established companies like the G.S.N.C. and the City of Dublin came to see the long term value of good construction and regular maintenance and to give it a high priority.[19] But others had more pressing problems. As a witness to the 1839 inquiry explained,

> Where competition on certain lines is carried to such an extent in the reduction of freight and passage money, as to entail a serious loss upon the proprietors, [they] are naturally tempted, under such circumstances, to defer

> to the very last extremity the outlay of further capital in effecting the needfull repairs.[20]

Economy in fuel consumption did not become a factor of importance for steam ships until the development of the long distance oceanic routes.[21] In the coastal and continental trades the supply of coal was not a problem and, with the concentration of steamship enterprise on passenger conveyance, increased cargo capacity was not a consideration of significance. Robert Murray, writing in 1852, explained the economic issues involved;

> a great economy would seem to result from the low proportion of power to tonnage; still, if time be calculated as an element (and, in reality, a very important one) in the economy of mercantile conveyance, it will generally be found that a high speed at any expense of fuel will compensate for the additional expense.[22]

This discussion of steam ship technology from the point of view of the shipowner has stressed not only the primacy of the demand for speed but also the risky character of steam navigation as a field of enterprise. The way in which engineers and shipbuilders responded to the need for speed is discussed below but the point must be made that introduction of any technological novelty depended on the willingness of the customer to accept it. Given the degree of risk already attached to the business, shipping companies were not disposed to add to this by adopting hitherto untried systems of construction without good reason to believe that they would succeed. While eager to derive the benefits from improvements, in most instances shipowners were not keen to be the first to try them out. Thus James Napier complained of the initial reception given his tubular boiler; "his firm had to contend with ignorant and interested prejudices, and to give guarantees of security, and to submit to penalties and responsibilities in their contracts for these boilers which no other engineer in the regular course of business would ever submit to".[23] It may be surmised that such natural conservatism on the part of companies was one factor predisposing those who built steamships to look first for the solution to the problem of providing greater speeds in modifications of the known technology rather than in major departures from it.

III

To examine the economic needs of steamship companies and to describe the qualities they consequently looked for in their vessels only takes us part of the way, however, to understanding the factors influencing the construction of the first steamships. Whatever the ideal steamship might be for the shipowner, the vessel finally launched depended equally on those who actually built it. The steamship brought together the separate skills of the engineer and the shipbuilder. It was not a natural or inevitably harmonious match. To combine together hull, engines, boilers and paddles to produce a satisfactory result was in itself no easy task; Murray, writing in 1861 with years of experience behind him, described this combination of technologies as "one of the most difficult problems of modern engineering demanding at once the theoretical attainments

of the natural philosopher and the laboriously acquired knowledge and shrew[d] sagacity of the practical mechanician".[24] But the fact that early nineteenth century shipbuilding practice was firmly established on the basis of centuries of experience made the task even harder. Hull form was determined in large measure by custom and tradition, and regard for Murray's "theoretical attainments" was slight. There was no scientific basis to naval architecture on which shipbuilders could draw for the solution of such problems as keel shape and the appropriate siting of engines for stability, nor was there any early recognition among builders of steamships that science had anything to offer. Significantly when the Institution of Naval Architects was at last formed in 1860 its facilities were largely ignored by mercantile shipbuilders, and as late as 1887 it was still regarded as necessary to argue the case for a scientific training for shipwrights.[25] Despite the relative infancy of their industry, the intrusion of engineers into ship construction did little to reduce this suspicion of the theoretical. That exaltation of the engineer as a practical man which led Brunel to say that he would never employ a man who could read, was reflected by Joshua Field, the London engineer, when in answer to a question by a member of the Naval Estimates Select Committee of 1847 as to whether John Scott Russell was a shipbuilder or a practical engineer, he dismissed the inventor of the "wave" form as "a literary man".[26] The discrediting of self-styled experts like Lardner over the question of trans atlantic steam navigation, a source of much glee to contributors to the *Mechanics Magazine* in 1839, provided a satisfying confirmation of such prejudices.

In contending, as he did in 1841, that the popular belief in an opposition between theory and practice had "never been more disastrous than in steam navigation and naval architecture in general" John Scott Russell may have been guilty of exaggeration but the absence of an identifiable science of steam navigation even by mid century is symptomatic of the attitudes of those concerned.[27] In consequence shipbuilders and engineers were dependent on an individual and frequently wasteful process of trial and error for the development of the steamship. It is true that in contrast with naval obsession with experiment the construction of mercantile steamships seemed a fairly settled question by the 1840's, but Gordon's statement to the Select Committee on Naval Estimates that:

> The British and North American line have not thought it necessary to make any experiments, nor have the Dundee and London vessels or the Aberdeen and London vessels. The G.S.N.C. is an old company; they have not thought it necessary to resort to these experiments

is only correct if taken to refer to *formal* trials.[28] As the Report of the 1839 Inquiry into Steamboat Accidents expressed it, "every deviation from already established dimensions, proportion of parts and powers, or methods of constructing the hull and machinery is an experiment. . .".[29]

The absence of a scientific basis to steamship construction did not prevent the emergence of a general body of practical knowledge, based on experience, on which those involved could draw, but its development was slow. It is possible to trace the genealogy of some vessels to a common origin; the *James Watt,* built in 1821, provided the model for many small steamboats launched subsequently, as did Napier's *Leviathan* class for Cunard's Halifax steamers, and the *Great Western* (1838) for the Royal Mail's first eight vessels.[30] But the characteristics of steamships were influenced more by where they were

built and who built them than by any general agreement as to what constituted the ideal. Even where there was a wide acceptance of a general system, for example in the case of the tubular boiler, this did not result in any standardised application; "Most engineers", William Pitcher told the Select Committee on the Steam Navy in 1849, "have a different construction of boilers; some prefer having them very lofty and short, others have them long and low".[31] Although competition was probably more significant within shipbuilding centres than between them – most steamships were built and engined in the port from which they were to operate – considerable geographical rivalry existed which encouraged exaggerated loyalty to local practice. This, together with an attitude which, as late as 1852, led some shipbuilders to destroy their models rather than to allow them to be used by others, not only resulted in a remarkable degree of variation between vessels constructed at the same time but certainly retarded the development of efficient vessels by preventing sharing of experience.[32] This problem diminished to some degree as far as engineering was concerned with the creation of professional bodies like the Institution of Civil Engineers in 1837 which provided a forum for discussion at a time when the introduction of the screw propellor and the increased use of iron raised new issues in steam shipbuilding. But it was not until twenty years later that the Institution of Naval Architects, which concerned itself also with mercantile questions, was able to perform the same function for a more specialised engineering group.[33]

The practical consequence of such reliance on experiment through enterprise was the production of unsatisfactory vessels, involving their owners in much additional cost. "I can cite several mercantile steamers" a witness told the Naval Estimates Committee (1847):

> which have required alterations previously to their being considered satisfactory; I could name the "Great Liverpool" which was built ten years ago. I am aware that the General Steam Navigation Company have cut several of their vessels in two, and lengthened them, which they would not have done if they had been satisfactory previously.[34]

Both the Peninsular and Oriental and the Royal Mail Companies encountered problems with vessels built in the 1840's and early 1850's, partly as a result of using inexperienced engineers, but also through making innovations which did not bring the anticipated result in terms of performance.[35] It was with some justification that an irate Royal Mail shareholder complained at a General Meeting in 1854, "Every new ship we build and launch has to undergo alterations before she can put to sea". But he was less justified in identifying the cause as error committed by the Company's engineer in "defiance of the opinion of men of judgement and practical engineers", because such impracticable features as exceptionally large paddle wheels resulted from the advice of just such experts.[36] Although John Scott Russell was of the opinion in 1847 that shipbuilding standards had improved sufficiently to allow shipbuilders to rely on vessels built by "a house of first-class reputation", where the state of the art of steamship building was such that even its most experienced practitioners were capable of making grave errors, the standard of construction achieved by less reputable shipbuilders and engineers must have fallen far short of the 'high perfection' required by shipowners.[37] In an age which much admired private enterprise, the Admiralty's development of the Steam

Navy came under some censure and was contrasted unfavourably with the mercantile branch. But the view of mercantile steamship development as more advanced because "in the private yards the men are not fettered with any kind of instruction, or model, or principle, it is open to competition, and it is every man's desire to produce the best quality of the article for the money", owes more to political economy than to reality.[38] Reliance on private initiative was not an efficient means for the development of a complex technology.

IV

Given the needs of shipowners and such hindrances to the development of marine steam technology, how were the first steamships constructed? Looking first at the contribution of the shipbuilder, it became clear even before steamships were employed on the open seas that the addition of engines affected stability and that this, together with the demand of companies for greater size and speed, might call for alterations in traditional hull form.[39] By the late 1830's the principle that the steamship required a greater proportion of length to breadth than was typical of sailing vessels was sufficiently well established for Tredgold's *Steam Engineering* to state with confidence that 1:6 was the minimum ratio suitable.[40] Experience alone had led to this conclusion which proved expensive for owners forced to alter existing vessels.[40] Since greater length reduced stability only vessels built for the river trades reached the extreme of 1:10.[41] No consensus comparable to that on proportion emerged on the related question of hull shape, indeed as late as 1854 one member of the Institution of Civil Engineers claimed that this was irrelevant to speed.[42] If this was an eccentric view, the variety of shapes, (ranging, one expert noted, from rectangle to triangle), suggests little understanding of the principles involved and is consistent with a technology relying on trial and error rather than science.[43] Writing in 1841, John Scott Russell identified three prevailing types of steamship hull: the traditional sharp bottomed, wide beamed; the flat bottomed, straight sided; and the hollow wave line type.[44] This last was exceptional in being the outcome of formal experiments, which were conducted by Scott Russell himself in 1832, and influenced the lines of vessels subsequently constructed by the Thames shipbuilders, Fletcher and Fearnall and Ditchburn.[45]

Although the use of iron for steamboat construction dates from 1822 when the *Aaron Manby* was launched, it was not employed on a wide scale until the 1840's, and the majority of steam vessels continued to be built of wood throughout the period under consideration.[46] As has been said, the quantity of timber used in steamships tended to be greater than for sailing vessels because of the need to provide extra strength to take the weight and vibration of the engines. Speed demanded lightness, however, hence pine was commonly used in steamships not only for decks but also for hull. In 1852 William Pitcher, the Northfleet shipbuilder, considered the *Great Western* to have been exceptional in the quantity used, but combinations of pine with other harder woods to be normal practice.[47] Combining strength with lightness, a problem necessarily solved with difficulty in the case of wood, became more pressing as tonnage increased and proved for Robert Napier one of the best arguments for the use of iron because it was "practically

impossible to construct wooden vessels that would keep their shape when driven by engines of large power".[48] However given the preference of shipowners for speed rather than durability, strength was a relatively neglected feature with long term consequences such as those described by the author of a letter to the *Mechanics Magazine,* "in some old boats on their arrival from a voyage after a somewhat boisterous passage, the butts and seams of the wales and upper works will be found opened to a considerable extent".[49] Evidence to the 1839 Inquiry shows how poor construction could threaten safety and companies such as the City of Dublin which introduced bulkheads into their vessels at least a decade before this was made compulsory were probably exceptional.[50]

The most striking feature of marine engineering until mid century was the continued attachment to forms of engines and principles of practice established by 1820. This does not mean that there was no technological advance. Both engine size and power increased, but until the 1840's greater velocity was achieved by "augmenting the power of steam and enlarging the areas of paddles", that is through marginal improvements in the basic technology.[51]

After the explosion of the *Norwich* in 1817, there was a prejudice against high pressure engines even for river use on the grounds of what Sir John Rennie described as "strong, practical caution" with the result that all operated under low pressure.[52] The rectangular flue boilers constructed in the 1820's were not designed to produce pressure above about 5 lb, although in practice ships' engineers resorted to a number of devices (including sitting on them) to prevent the operation of safety valves and so force pressures higher at considerable risk of explosion.[53] With the development of the tubular boiler and its widespread adoption in the 1830's, together with a move away from the rectangular shape by some engineers, higher pressures became feasible so that pressures of up to 20lb were obtained.[54]

As late as 1850 the most popular form of engine continued to be the side lever type, one of the earliest developed and unchanged in essence since its introduction by James Watt, "the principal difference being", it was explained by Robert Napier's agent in 1847:

> that much larger and more powerful engines are made now, having metallic pistons, having much more wrought iron and steel parts, and more gun metal, and that improvement which our improved machinery enables us to throw into the workmanship.[55]

Such improvements which helped to make the engine reliable and economical in use, together with its very familiarity, no doubt assisted in its long survival. Both Cunard's Halifax vessels and all but one of the Royal Mail's initial fleet were fitted with side lever engines.[56] But the tenacity with which Napier in particular clung to the beam engine in the 1840's when companies like Maudsley and Field were promoting direct action engines may also be explained by the rivalry between engineers at London and the outports to which we have already referred.

However, both growth in the importance of cargo capacity as a result of the movement of steam into the oceanic trades and the continued demand for greater speed, particularly in the river trades, gave an impetus to the development of alternative types of engine. Field made the first oscillating engine in 1827. Twenty years later there were six

or seven types of oscillating engine in existence in addition to a variety of direct action engines relying on parallel motion.[57] Repair costs for such engines were higher than for beam types, possibly because of the higher pressures applied to them, but their ability to take these pressures together with their reduced weight and size, made them attractive to shipowners, more interested in beating their competitors than in minimising costs.[58] Concern for speed rather than economy meant also that although methods of using speed expansively had been successfully applied in the 1830's this facility was little used even though the fuel saving was considerable. Cunard's vessels only used this equipment in heavy seas.[59]

In emphasizing the fundamentally stable character of much of marine steam technology reference must also be made to the methods employed for condensing steam. Until the 1830's there was no alternative to jet condensation using sea water. Since this necessitated frequent changes of water on voyage with consequent delays and led to rapid deterioration of boilers, there was a clear case for some better mode of operation.[60] Samuel Hall's system of surface condensation seemed to offer this and was excitedly received by engineers; in 1838 thirty-eight companies had taken licences for its use. Enthusiasm was short lived. The "weight, bulk, complexity and expense" of Hall's invention meant that it was little used, and the majority of shipowners preferred to look to good boiler management and improved construction to minimise the deleterious effects of salt with the result that jet condensation methods continued to predominate.[61]

Until 1837, when the experiments of Ericsson and Smith brought the screw into public view, the paddle wheel was the only form of steam propulsion in use. The resistance the fixed float wheel offered to the water reduced its efficiency so several alternative types were developed to overcome this. The first vertically acting wheel was patented in 1829 but Seaward's development of the same principle was more sophisticated. Alexander Galloway's cycloidal wheels were fitted to the *Great Western.*[62] Paddle wheels were most effective on vessels of small draught, such as those used in river passenger trades. On longer voyages, the varying degree of immersion as the steamship consumed its fuel affected speed, putting it at a disadvantage in comparison with the screw propellor and ensuring its eventual demise in the oceanic trades.[63]

Most of these technological developments were only feasible because of the advance in engineering skill over the period.[64] Indeed better standards of manufacture alone improved steamship efficiency considerably. Boiler making appears to have presented the greatest challenge to engineering, and the quality of their construction was often deficient. The 1839 Inquiry found that explosion, reflecting poor management, was a less common cause of accident than boilers failing through leaks.[65] Nevertheless, whereas in 1822 the average life of a boiler was said to be two years, by the late 1840's boilers could be made to last as long as ten years.[66]

V

We have considered the economic priorities of the shipowner, the role of experience and experiment in the development of steamship technology, and the main features of that technology before 1850, but we have touched only indirectly on another influence on steamship construction – the way in which this was organised.

Many of the earliest steamships were hermaphrodites rather than hybrids. That is, they were the product of two separate technologies rather than an adaptive fusion of these, and as such reflected the initial division of steamship construction into two processes; the building of the hull and fittings in the shipyard and the provision of engines, boilers and paddles by the engineering firm. With the development of the iron ship this geographical distinction became increasingly blurred but for the first two or three decades of steam navigation the successful coordination of the efforts of the engineer and shipbuilder to produce a steamship which satisfied the requirements of the shipowner was an organisational problem of considerable technological significance. Before experience suggested otherwise, there was a tendency for shipowners to treat the building and powering of vessels as independent questions. When for example, the G.S.N.C. asked in 1824 for tenders for the construction of ships no attempt was made, either when approaching the seven engineering companies and fifteen shipbuilders or in awarding contracts, to coordinate these partners in construction.[67] By the 1840's although this continued to be established practice in naval contracts, the advantage of treating the construction of a vessel as a single problem in determining such questions as the appropriate power/tonnage ratio and the best siting of engines was recognised by shipowners.[68] Sometimes contracts were awarded for whole ships or to associations of engineers and builders; on the Clyde the link between Napier and Wood was well established and in London in the 1840's Fields used Wigram or Pitcher when entrusted with a whole contract.[69] Robert Napier was exceptional however in his insistence on handling all aspects of construction.[70]

Some of the larger companies like the City of Dublin, the P & O, the Royal Mail and the G.S.N.C. attempted to solve the problem by using their own facilities for some aspects of construction. Indeed the G.S.N.C., whose early experience with the Butterley Company's engines was bad, engined most of their vessels at their Deptford works.[71]

However, probably the majority of contracts were awarded separately for the simple reason that contracting for a whole vessel did not necessarily guarantee a better product. As the engineer Field pointed out, "you are very likely to meet with a shipbuilder who knows nothing about the adaptation of machinery and who might go from one engineer to another to get cheap machinery and so defeat the object".[72] Not unnaturally owners of steamships preferred any such savings to accrue directly to them, trusting to themselves for the integration of the two aspects of construction. If those laying down specifications and supervising construction were knowledgeable this could be satisfactory (although Scott Russell's record in supervision of the construction of the Royal Mail's vessels was not exemplary) but, where they were not, there might be additional expense arising from basic alterations or even more serious results.[73] It is possible, for example, that the loss of the *President* on her first return voyage from the United States was due to inadequate power in relation to size, the consequence of the decision, taken on grounds of economy, to engine her in Glasgow rather than London where she was built.[74]

VI

Until about 1840 steam navigation, restricted to the coastal and narrow seas for economic as much as technological reasons, had not assumed the character of a "regular

business" either from the point of view of the shipowner or from that of the shipbuilder and engineer. Business survival dictated emphasis on speed over every other consideration hence it was to this that shipbuilders and engineers directed their attention, handicapped both by the division of responsibility between them and by their inexperience. Given the marginal nature of steamship enterprise and the fact that demand was not yet sufficient to justify specialisation in marine engineering, both shipowners and those involved in construction looked to modifications in established technology for improvements in performance, no doubt encouraged by observing that such an approach did bring results in some instances. Steamship construction was characterised by general commitment to wood, the paddle and the beam engine, considerable variation in detailed practice, and a rate of failure which made alteration of quite new vessels not uncommon.

The 1840's saw a marked quickening of the pace of innovation with the introduction of the screw, increased use of iron and acceptance of new types of engine. The power of the "steamship as an idea" on the Atlantic passage resulted in two vessels with a number of experimental features, the *Great Western* and the *Great Britain*, and set new standards in size. But the more settled circumstances of the older steam trades had as much influence. As steam navigation became less of a speculation and as owners gained in experience, quality of construction and working efficiency became more central concerns. Speed continued to exert an influence but as the limits of the traditional wooden paddle steamer in terms of strength and higher pressure engines were approached, engineers and shipowners looked for alternatives. Marine engineering benefited from the development of machine tools, specialisation, and more public discussion of technological questions.

The 1840's then may be seen as the period of "take-off" in steam construction when the wooden paddle steamer began to give way to a more sophisticated technology. That this occured so long after the beginning of steam navigation was due to a variety of economic, attitudinal and institutional factors. Among these, however, one stands out as of central importance: the initially limited scope for steamship operation offered by trade conditions, which made specialisation in this type of shipping an uncertain business, and restricted the size of the mercantile steam navy. The lessons learnt with difficulty through experiment and experience from the design and operation of the wooden paddle steamer provided the basis for later developments, but economics exerted the most powerful influence on the pace and direction of technological change.

NOTES

1. B.R. Mitchell, *Abstract of British Historical Statistics,* 1962, pp. 217-8.
2. *Encyclopaedia Britannica,* 7th edition, 1842, p. 692.
3. "Return of the Whole of the Registered Steam Navy", *British Parliamentary Papers,* 1852, XLVIX.
4. "Report from the Select Committee on Steam Navigation", *B.P.P.,* 1831, XVIII, Q. 1357-8.
5. J. Seaward and Co., *Observations,* (London, 1829), p. 21.
6. "Report from the Select Committee on Navy, Army and Ordnance Estimates" (Naval Estimates), *B.P.P.* 1847-8, XXI, Q.7007-8 (J.S. Russell).

7. James Napier, *Robert Napier of West Shanden,* p. 128.

8. "Report from the Select Committee appointed to take into consideration the state of the poorer classes in Ireland", *B.P.P.* 1830, VII, Q.3120 (C.W. Williams).

9. See Philip Bagwell, *The Transport Revolution from 1770,* (London, 1974), pp. 63-69.

10. General Steam Navigation Company, Letter dated June 17th, 1836; *28th Half Yearly Report,* 1839; *40th Half Yearly Report,* 1845.

11. See G.S.N.C., *12th Half Yearly Report,* 1831; *15th Half Yearly Report,* 1832, *Managing Committee Minute Book,* 24th June 1833, p. 78; *41st Half Yearly Report,* 1844.

12. "Accidents", *B.P.P.,* 1839, XLVII p. 110.

13. *Enc. Brit., op. cit.,* p. 676. See also "Report from the Select Committee appointed to inquire into the means of promoting communication with India by steam," *B.P.P.,* 1834, XIV, Q. 434.

14. "Accidents", *B.P.P.,* 1839, XLVII, Appendix, p. 120 (Curling, Young and Co.)

15. *Ibid.,* p. 89.

16. *Ibid.,* p. 117.

17. *Proceedings of the Institution of Civil Engineers,* 1848. Discussion on the paper by Samuel Seaward by Mills.

18. G.S.N.C., *29th Half Yearly Report,* 1839.

19. "Accidents", *B.P.P.,* 1839, XLVII, Appendix p. 49.

20. *Ibid.,* p. 115.

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22. Robert Murray, *Rudimentary Treatise on Maritime Engines and Steam Vessels,* (1852), p. 163.

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15. DISCUSSION FOLLOWING THE PAPER OF S. PALMER

ALEXANDER thought the retardation in the development of steam is usually discussed in terms of its relative capital cost *vis à vis* the sailing vessel, but was there, over time, a movement to relevant labour capital ratios which gradually make steam more advantageous even though its initial capital costs were high?

PALMER agreed that this was probably the case but it was very difficult to obtain detailed and reliable information on the point. However, she doubted that this factor was really significant. Basically the development of steam shipping was not a function of its relative capital cost, but of the expansion of certain trade routes in which steam could operate.

ALEXANDER noted that discussion about the development of steam ships was generally concentrated upon events in Britain or the United States, and wondered whether they were so dominant, or whether there was an aspect of parochialism.

PALMER felt that much of this was simply parochialism on the part of English speaking historians, and certainly contemporaries in Britain were very interested in the progress of steam abroad, although they were mainly interested in warship construction.

CRAIG whilst agreeing that Continental Europe was engaged early in the development of steam shipping, argued that most of their vessels, even in the Mediterranean states were engined, hulled or both in Britain and few of the successful European steamers did not depend heavily upon British influence in their design and construction, whilst other nations were importing British engineers as early as the 1830's.

PALMER added that many of the European river steamship developments were undertaken in conjunction with British companies – citing the Rhine and Cologne Company's relationship with the General Steam Navigation Company as an example.

DAVIES considered that even in the 1850's, ocean going steamers were not economically viable in their own right and only the existance of postal subsidies enabled them to operate at all.

PALMER added the comment that some of the U.K.-Continental services such as to Rotterdam and Hamburg were also recipients of postal subsidies and that these were an essential element in allowing steam to compete with sail.

ALEXANDER raised the question of the relative operating costs of steamers and sailing vessels especially in respect to crew-tonnage ratios. Over time, did not increasing difficulty in obtaining labour cause the sailing vessel to lose its advantage over steam?

PALMER thought that in the context of all costs, labour was a marginal aspect for a steamship owner.

ALEXANDER asked whether the early steam ship companies had a firm grasp on the problem of capital replacement. Did they know how to depreciate their assets into

retained earnings, and if not did this contribute to the retardation of steamship development?

PALMER agreed that this was a significant problem and cited the early years of the General Steam Navigation Company as an example.

16. SUMMARY OF THE CONFERENCE

R A L P H D A V I S

University of Leicester

SUMMARY OF THE CONFERENCE

Ralph Davis

Davis summed up the conference as placing the maritime history of Eastern Canada into the history of the world shipping industry. He dealt first with the matter of 'liners' and 'tramps'. He saw a central difficulty in the papers dealing with these kinds of shipping because neither of these words are applied to sailing ships. Noting that fixed sailing dates and regular service were hard to ensure economically with sail, Davis asserted that the history of liner traffic is a history of steam traffic. In Davis' opinion, Davies dealt with the first powerful force driving long distance carriage from sail to steam, *i.e.* the advantage of speed and certainty in carrying the mails. Of course, there were limited kinds of cargo that could bear the costs of speed or could gain an advantage from regular delivery.

Davis went on to develop the thesis that there were 'quasi-liners' and 'quasi-tramps'. There were sailing vessels having some of the characteristics of the liners because they operated on more or less regular routes. Although they carried bulk cargoes, they were not 'tramps'. Davis asserted that during the 1820's and the 1830's, a substantial majority of long distance carriers were closer to being 'quasi-liners' than to being 'quasi-tramps'. These were the first sailing vessels to suffer from the competition of steam ships. He cited the point made by Davies that by 1870, the establishment of steam liner routes to most parts of the world tended to eliminate the 'regular route' sailing ships.

However, before the steam ship could attack the sailing ship industry, Davis pointed out, certain problems connected with steam propulsion had to be overcome. The difficulty of high fuel costs was being worked out during the second quarter of the nineteenth century. After the development of screw propulsion and the high pressure boiler during the 1860's, the steam liner was able to replace the sailing 'quasi-liner' within twenty-five years. However, he cited Palmer's paper to demonstrate that the steamship did not develop in an orderly fashion because people stuck to their own technological trade mark.

Next, Davis took up the marked growth of the tramping or seeker function from its minor role in the early nineteenth century. He saw Craig's paper as an exposition of how the steamship, admirably suited to the liner trades, was turned to the bulk trades as well. During the latter part of the nineteenth century, sailing ships reached their greatest total tonnage in world shipping. This is also the period when sailing ships carried on the tramping function.

Relating the growth of tramping to the maritime history of Eastern Canada, Davis argued that the tremendous increase in the bulk trades brought the tramping function to pre-eminence among British shippers. This increase was notably true of grain and coal but it applied to such cargoes as copper, guano, jute and wool. Therefore, while the steamers were taking the liner trades away from sailing ships, the more rapidly growing trades not suited to 'liners', were dominated for a generation by sailing ships. This is the central point about the early performance of the tramping function.

A second point is that sailing ships were attracted by the growing opportunities on the 'quasi-tramping' side, according to Davis. Alexander showed that during the third quarter of the nineteenth century, the Yarmouth shipping business as a whole expanded as a result of the long distance trades. While some ships were shifted into tramping, there were also new people getting into the business. Davis believed that part of this development of tramping probably including Eastern Canadian shipping consisted of carrying bunker coal to ports all over the world in order to service the liner trades.

For Davis, a third key to the exercise of the tramping function was the development of world-wide telegraph systems during the 1850's and 1860's. While the telegraph gave particular advantages to the steam ships once they had entered the tramping function, it was important for sailing ships too, it left some scope for vessels arriving at harbours seeking out cargoes on speculation.

Davis argued that ships falling within the definitions used by Craig and Davies hardly existed in 1840. By 1900, perhaps 20% to 25% of ships still fell outside these categories. The entry of the Maritimes into the long distance world carrying trades between the 1840's and the 1880's was entirely a matter of wooden sailing ships, which would not fit the strict definitions of Craig and Davies. In the early stages of the Maritimes' participation, the 1840's and the 1850's, it seems likely that a great part of the operation was some form of functional liner traffic. But, in the later phase, the 1860's and the 1870's, the greater part of the operation was some kind of functional tramping. Davis then argued that because Eastern Canadian wooden shipbuilding was dependent upon cheap wood and upon trades that were vulnerable to the competition of early steam 'quasi-tramps' or 'tramps', it lost out to steam earlier than occurred in other parts of the world.

A failing that Davis noted in Alexander's paper was that there was no mention of where Yarmouth ships went or what they carried. The entry of these ships into the oceanic trades during the 1850's resulted from the appearance of opportunities in the large-scale trades for which Yarmouth ships were well fitted. Davis believed that Greenhill's paper enabled us to see why people were concerned with owning ships and going to sea and what this was like. However, we still do not know how this shipping was organized to serve the oceanic trades. After a generation of sail 'quasi-tramping', the Maritimes were hit by the steam ship. Therefore, we should know how steam took over the tramp trades stage by stage and what specific advantages of steamships enabled it to happen. Davis called for a thorough study of Alexander's "Maritime disaster" on a world scale. Because of the close connection between the coal trade of the United Kingdom and British tramp shipping, this is a subject that should be studied as well.

By the mid-1840's or the 1850's, Eastern Canada was specializing in the very largest type of wooden sailing ships and became one of the most important suppliers of the British market between the 1850's and the 1880's. A sampling of Lloyd's Register for 1863 revealed that Eastern Canada supplied to Great Britain 76 out of the first 107 vessels over 1000 tons weight on the register. During the 1860's and 1870's, there was an interesting correlation between Prince Edward Island shipbuilding and the total new registration of all ships on the British register. Davis posed some questions about this phenomenon of large ship production. How representative of the Maritimes' total tonnage was the very large ship in the export of ships? Were most of the very large ships sold to

Britain and were most of the smaller ships kept in the Maritimes? In this period, was the building of large ships really the dominant element in the shipbuilding industry of the Maritimes and Eastern Quebec?

Considering the theme of large ships, Davis wondered why the people in Eastern Canadian shipping and shipbuilding did not finance and operate the very largest ships in the Atlantic Ocean traffic themselves. Why did they sell the large ships to the British? He believed that Fischer's paper on Prince Edward Island touches on this substantially. Greenhill's book shows how particular people settled down in Prince Edward Island with West of England craftsmen and technology, and began to build ships. Davis queried whether this was peculiar to Prince Edward Island or was carried on more widely. He also stated his impression that the greater part of the large ships were built in the Miramichi Bay/Chaleur Bay area. He asked whether or not this fell within the area being studied by the project. Indeed, Davis said that he would be much happier if the project was going to cover Chaleur Bay.

Davis pointed out that there are a number of incidental questions about the location of ancillary industries, *e.g.* sail making, cordage and iron work. He suspected that such matters as capital organization and operations spread across provincial boundaries as well as the boundary between the Maritimes and Quebec. Davis also stated that he would like to have it determined whether Montreal capital was involved in the region during the heyday of the trade.

The Eastern Canadian shipping and shipbuilding experience must be put into the context of both the similar European experience and the whole economy and society of Eastern Canada. Davis felt also that it would be worthwhile to relate the Eastern Canadian, small town, inlet and creek experience of shipbuilding and shipping to that of the northern small ports of the United States, expecially Maine and New Hampshire. He suggested that the relations of these small ports and of the Maritimes shipping areas with Boston and Montreal should be considered.

Davis noted that the study was looking into an important element in the economy and society of Eastern Canada which existed for a generation or more. But it was also an important part of the maritime history of the world. He commended those engaged on the project for their pragmatic and inductive approach to the subject.

17. DISCUSSION FOLLOWING THE SUMMARY OF R. DAVIS

DAVIES referred to Ralph Davis' comments on the distinction between liners and tramp ships, and accepted that both his and Craig's descriptions were extreme. They would accept that many liners could operate as "quasi liners". However, the main point to be reiterated was the influence of extraneous forces upon the rise and fall of the Eastern Canadian shipping industry. "These forces acted on the side of the big battalions" and against peripheral areas such as Atlantic Canada. Although shipping is, primarily, dependent upon economic criteria, it has always been greatly influenced by factors of national interest. Thus the present day Russian fleet may well operate below real cost but they do earn vital hard currency and train large numbers of seamen. These decisions were made independently of the general state of the world shipping industry, but have had enormous consequences. He stressed again the point that Altantic Canadian shipping, although it operated on an international basis, was owned in a peripheral region of the world.

ALEXANDER said that he accepted Davies' point that it is necessary to keep a proper perspective on the relative importance of the Atlantic Canadian shipping industry in terms of the British, and indeed the world economy. But the issue is more than an academic one for us, and even more than a strictly historical one. This region of Canada suffers from enormous levels of unemployment, and in Newfoundland at least, our earned per capita income is less than half the Ontario level. Recent work by the Economic Council of Canada indicates that this is not because we suffer from the classical sources of underdevelopment – a shortage of capital, relative to labour, a poor industrial mix, or an unusually inferior quality of labour relative to the rest of the country. Rather the explanation appears to be buried in the residual – the great unknown "other causes". For us in Atlantic Canada there is no great mystery about these "unknown causes". We have trouble obtaining finance for economic activity, we are burdened with inefficient and costly transportation, our export industries have since the last war been depressed by continentalist trade policies, and these are not due to the inhabitants of Eastern Canada.

It was not to the credit of Eastern Canada perhaps that their shipping industry developed in the first place, but it is equally not to their discredit that it disappeared. However, one of the things that has been put to us, not in an unfriendly way, by those at this conference who come from beyond Canada, is that the collapse of the maritime industry was not really our fault. So we should not take it too hard. Yet today in Eastern Canada, we are entering a political and economic situation in which we are going to have to go to work, and it is unlikely that we can continue to depend upon the income guarantees we have had in the past. The only relatively unexploited sector in the Eastern Canadian economy is that based upon the sea.

Certainly the fishing industry is the most promising, and in a world context this is not a good time for Canada to try to get back into shipping. However from my point of view, if what happened in Eastern Canada was an inevitable result of technological change, the present and future prospects for the region look dismal. Norway has managed to flourish on the basis of a traditional reliance on the sea. Why have they succeeded where we failed?

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