CONTINUITY OF SANDSTONE BEDS IN THE ORDOVICIAN CLORIDORME FORMATION, GASPÉ PENINSULA, QUEBEC

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CONTINUITY OF SANDSTONE BEDS IN THE ORDOVICIAN CLORIDORME FORMATION, GASPÉ PENINSULA, QUEBEC

by

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ABSTRACT

The objectives of this thesis are to re-evaluate the continuity of sandstone beds and to investigate the factors that control sandstone bed continuity in the Cloridorme Formation. The study was carried out in a 5 km-long strike exposure of unit G of the β7 member of Enos (1965) between Grande-Vallée and Petite-Vallée.

Thirteen facies and four facies associations were recognized in the field. The thirteen facies are: (1) coarse- to fine-grained, graded sandstones; (2) "slurry" sandstone beds; (3) sandstones containing abundant shale clasts; (4) sandstones that feed injections; (5) sandstones with shallow erosional bases; (6) cross laminated or/and parallel laminated sandstones or siltstones; (7) thinly bedded, laminated sandstones or siltstones; (8) sandstones containing large laminated slabs; (9) sandstones with bidirectional paleoflow indicators (Megaturbidite); (10) bi-partite sandstones; (11) thinly bedded sandstones; (12) concretions; and (13) laminated, silty mudstones.

The four facies associations are: (1) erosively based sandstone packets; (2) sandstones intercalated with mudstones or siltstone; (3) intercalated sandstones, siltstones and silty mudstones; and (4) silty mudstones intercalated with siltstones or sandstones.

The interpretation of sandstone facies and facies associations described from the β7 member suggests that these turbidites accumulated in the distributary channels,

the outer fan, and the fan fringe of a transverse fan near the margin of the foreland basin, and on the adjacent basin plain. The proximal parts of the marginal fans are believed to have been destroyed by later tectonic uplift and erosion.

The turbidite succession, where bed-by-bed tracing is possible, contains outer fan and fan-fringe deposits of a transverse fan, and basin-plain deposits. The lateral correlation of individual beds proves that the continuity of sandstone beds in this succession is extremely low. Only 27 of the 94 traced beds extend beyond 3 km. The relationship between bed length (L) and percentage of beds longer than L (Y) is defined by the following equation:

$$Y(\%) = -49(\log L) + 200; \quad r^2 = 0.98$$

Extrapolation to Y=0% suggests that all beds are shorter than 12 km along this two-dimensional outcrop, although inclusion of partial beds in the regression analysis means that this is a minimum estimate of maximum bed length.

Nine types of sandstone bed terminations were identified. They are: (1) beds feeding injections; (2) sills; (3) gradual taper; (4) scour-and-fill geometry; (5) erosional truncation; (6) depositional mounds; (7) shale-clast "nests"; (8) faulting; and (9) gradual passage into shale. The percentage of discontinuous beds accounted for by these type of terminations are follows: (a) scour and focussed deposition in scours (Types 4 and 5), 44.6%; (b) depositional thinning on unscoured surfaces as a result of patchy deposition (Types 3 and 6), 24.4%; (c) liquefaction and sand redistribution

(Type 1), 10.8%; (d) masking of bed continuity by extensive "nests" of shale clasts (Type 7), 10.8%; (e) apparent lateral changes in the texture of watery debris flows (Type 9), 8.1%.

The study of bed terminations suggests that the major factors controlling sandstone bed continuity are depositional and fault-controlled sea-bed morphology, and tectonics of the depositional setting. Sandstone bed continuity depends strongly on the rates and magnitudes of sea-bed deformation, the frequencies and magnitudes of the earthquakes that are inferred to have liquefied many of the Cloridorme Formation beds, and proximity to the termini of shifting feeder channels. Knowledge of the tectonic setting alone is not enough to permit a reliable prediction of sandstone bed continuity.

ACKNOWLEDGEMENTS

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CHAPTER 1

INTRODUCTION

1.1 Background and Objectives

In the literature, individual turbidite correlation has been reported from both modern and ancient turbidite systems. Even though the means for correlation may vary, most studies show long-distance turbidite continuity.

The geometry of turbidites is a fundamental property that can be related to basin morphology and turbidity current dynamics. For example, flows carrying a poorly-sorted sand to mud load are very "efficient" (Mutti, 1979) in carrying sand far out into a basin so as to deposit extensive sheet-like deposits, whereas flows with little mud load are "inefficient" sand transporters and lead to lenticular sand turbidite deposition. Turbidity currents passing through hydraulic jumps downslope from channel terminations (Normark and Piper, 1991) are believed to form scour fields and lenticular sand deposits.

Turbidite geometry is also of great interest to petroleum companies in general, and in particular to the sponsor of this thesis, BP Exploration Company, because the continuity of turbidites influences reservoir size and hydrocarbon production from such deposits.

1.1.1 Correlations in modern turbidite systems

Bed-by-bed correlation of modern turbidites is mainly based on cores, seismic profiles and/or side-scan sonar images. Special techniques such as geochemistry and palaeontology may also be applied. Studies of this type are few and are summarized in Table 1.1.

1.1.2 Correlations in ancient turbidite sequences

As early as 1939, bed-by-bed correlation in an ancient turbidite sequence was reported by Vassoevich. He successfully correlated turbidites in two Upper Cretaceous flysch sections that are 12 km apart in the Caucasus region. Later, this correlation was extended in a northwest and southeast direction to more than 200 km (Vassoevich, 1948; Grossheim and Vassoevich, 1966). Several post-1955 correlations in ancient turbidite systems are summarized in Table 1.2.

Because of discontinuous exposures and the highly deformed nature of flysch terranes, few bed-by-bed correlations have been made from unbroken outcrops where beds can actually be walked out throughout the reported distance. Instead, most correlations depend on matching of beds between sections that are several kilometres or tens of kilometres apart. This method of correlation of spaced sections resembles the correlation necessary between marine cores, but without the benefit available to marine geologists of a relatively flat intervening seafloor as a reference datum.

1.1.3 Thesis objectives

Enos (1969a), in his classic paper, claimed that the lateral continuity of sandstone beds in the Ordovician Cloridorme Formation of the Quebec foreland basin

Table 1.1 Bed-by-bed tracing in modern turbidite systems

No.	Reference	Age[1]	Location[2]	No. of Beds Traced	Bed Thickness Range (cm)	Deposi-tional Envir.[3]	Longest Traced Dist.(km)	Methods
1	Elmore et al., 1987	LPl	Hatteras AP, Western NAO	1	0-400	AP	>500	56 cores, color, grain size, relative thickness, similarity of sequence, mineralogy, geochemistry
2	Hesse, 1995	LPl-H	NAMOC, Labrador Sea	14	<0.3-20	levee	300	11 cores, thickness, sequential order, lithology
3	Piper et al., 1988	1929	Sohm AP, Western NAO	1	50-100	AP	>600	20 cores, seismic profiles, side-scan images, seabed photography
4	Payne et al., 19[illegible]2	LTe & Q	Wilkes AP, AO	4	100-500	AP	55	6 cores, diatom zones, sequence of turbidite zones, stratigraphic position
5	Weaver & Rothwell, 1987	LQ	Madeira AP, Eastern NAO	9	50-500	AP	300	50 cores, seismic profile, color, sand layers, sequence, composition

1 Abbreviations for age: L=Late; Pl=Pleistocene; H=Holocene; Te=Tertiary: Q=Quaternary

2 Abbreviations for locations: AP=Abyssal Plain; NAO=North Atlantic Ocean; AO=Antarctic Ocean; NAMOC=Northwest Atlantic Mid-Ocean Channel

3 Abbreviation for depositional Environment: AP=Abyssal Plain

Table 1.2 Bed-by-bed tracing in ancient turbidite sequences

No.	Reference	Age[1]	Location[2]	No. of Beds Traced	Bed Thickness Range (cm)	Deposi-tional Setting	Longest Traced Dist.(km)	Methods
1	Carozzi, 1957	LJu	Nappe de Morcle Basin, France	9	?	flysch basin	30-40	5 sections, facies and texture of clastic beds, distribution of peculiar organic or inorganic components
2	Kingma, 1958	Mi	Hawke's Bay, New Zealand	1	30-50	flysch basin	32	sections, tuff beds and marker sandstone bands
3	Slaczka, 1959	Pa	Carpathians	1	200	flysch basin	60	?
4	Dean & Anderson, 1967	Pen	Haymond Fm., Texas, USA	768	1.5-64.6	foreland basin	10.5	2 sections, pattern of stratification, thick key beds
5	Enos, 1965	MOr	Cloridorme Fm., Canada	139	<10-~100	foreland basin	3	4 sections, literally walking out beds on ground
6	Hesse, 1974	ECr	Gault Fm., Germany	55	<10-400	deep sea trench	>115	44 sections, bed thickness, sequence, mineralogy, geochemistry
7	Hirayama & Nakajima, 1977	Pl	Otadai Fm., Boso Peninsula, Japan	16	<1-1000	suprafan	38	sections, tuff marker beds
8	Tokuhashi, 1979	Mi-Pl	Kiyosumi Fm., Boso Peninsula, Japan	14	0-~900	upper-lower fan(slope basin)	20	24 sections, tuff beds

continued...

Table 1.2 Bed-bybed tracing in ancient turbidite sequences (continued)

No.	Reference	Age[1]	Location[2]	No. of Beds Traced	Bed Thickness Range (cm)	Depositional Setting	Longest Traced Dist.(km)	Methods
9	Ricci Lucchi & Valmori, 1980	Mi	Marnoso arenacea Fm., Italy	112	40->100	basin plain	350-400	18 sections, pattern matching, megaturbidite composition
10	Labaume et al., 1987	Eo	Hecho Group, SW-Pyrenean Foreland Basin, Spain	9	1000-20000	foreland basin	135	14 sections, pattern matching of megaturbidites
11	Mutti, 1992	EMi	Castagnola System, Tertiary Piedmont Basin, Spain	27	<~1000	foreland basin	4-6.5	6 sections, pattern matching
12	Mutti, 1992	EMi	Broto System, Eocene Tremp-Pamplona Basin, Spain	1	40-1000	foreland basin	12.5	8 sections, pattern matching
13	Mutti, 1992	EMi	Torre degli, Amorotti system, Northern Apennines	14	megaturbidites	foredeep basin	7.5	2 sections

1 Abbreviations for Age: L=Late; Ju= Jurassic; Pa=Paleogene; Pen=Pennsylvanian; M=Middle; Or=Ordovician; E=Early; Cr=Cretaceous; Pl=Pleistocene; Mi=Miocene; Eo=Eocene

2 Abbreviation for location: Fm.=Formation

is extremely low. According to Enos (1965, 1969a), only 46 of 139 traced greywacke beds extend through and beyond a 3 km interval; 18 of the beds are locally discontinuous. Subsequent publications based on different geological units (e.g., Ricci Lucchi and Valmori, 1980; Mutti, 1992) judge that foreland-basin turbidites are generally much more continuous than reported by Enos (1969a). However, the Cloridorme Formation is one of the few ancient deposits where beds can be physically walked out for several kilometres, and after having done this Enos (1969a) asserted that "many of the most logical correlations [hypothesized before bed tracing and] based on lithology, bed thickness, sequence, grain size, current directions, sedimentary structures, color, or other characteristics proved incorrect." (p. 685)... and "walking out of beds showed that errors in correlation generally made beds appear more persistent than they actually are" (p. 707). Therefore, correlation proposed by other workers in units where bed tracing along unbroken outcrop is not possible, may also be locally incorrect, calling into question the true nature of bed continuity in foreland basin turbidite successions.

In spite of walking beds out over about 3 km, Enos (1969a) apparently used only 4 measured sections as a framework for his bed-by-bed correlations. Moreover, he did not give an explanation for the low continuity of the Cloridorme turbidites.

Part of the Middle Ordovician Cloridorme Formation is continuously exposed between Grande Vallée and Petite Vallée, along the north coast of the Gaspé Peninsula, Quebec, Canada. The best strike exposure of about 3 km is in unit G of the β7 member of Enos (1969a), called the Gros-Morne member by Slivitzky et al. (1991). Beds on a roughly 60 m-wide wave-cut platform are only locally offset by brittle faults which offer no hinderance to bed tracing. Mean paleoflow (282°) is essentially parallel to the strike direction (280°), although there is considerable dispersion of paleoflow indicators about the mean (Enos, 1969a; this thesis), and single turbidites show variable flow directions with height in the bed (Parkash and Middleton, 1970). The Gros-Morne member is interpreted as channel-levee deposits by Hesse (1982) and as lobe-fringe deposits by Hiscott et al. (1986), although no rigorous paleoenvironmental reconstruction of the Cloridorme Formation has been published. Regional setting and previous work on the Cloridorme Formation are summarized in Chapter 2 and the next section, respectively.

The primary objectives of this thesis are to re-evaluate the continuity of sandstone beds in the Cloridorme Formation and to attempt to explain any discontinuities of the sandstone beds. It is a fundamental tenet of science that experiments should be reproducible. Given the clear disagreement between the data of Enos (1965, 1969a) and other studies of foreland-basin turbidites, it is critical that Enos' results and methods be scrutinized and either verified or rejected. Questions that this thesis aims to answer include the following:

1. Does independent re-examination support the claim of Enos (1969a) that turbidites of the Cloridorme Formation are lenticular and discontinuous?

2. What are the explanations for turbidite discontinuity in the Cloridorme

Formation?

3. Are Cloridorme Formation turbidites unusual in some way, compared with other foreland-basin turbidites that have been studied?

4. Can statistical data on turbidite continuity from the Cloridorme Formation be applied to other, more poorly exposed (or subsurface) turbidite deposits?

1.2 Previous Studies of the Cloridorme Formation

1.2.1 Previous work

Since 1965, several sedimentological studies have been carried out in the Cloridorme Formation. The contributions that are most relevant to this thesis are introduced one by one below.

1. Enos (1965, 1969a, 1969b) studied the stratigraphy, structure and sedimentology of the Cloridorme Formation. He arrived at the following conclusions.

(a) The Cloridorme Formation consists of eastern, central and western structural blocks, separated by faults. The eastern block was later included in the Deslandes Formation by Biron (1972, 1973).

(b) The Cloridorme Formation (as redefined by Biron, 1972, 1973) includes 11 members. Each member contains a characteristic stratigraphic sequence and lithologies. The 11 members are grouped into 2 sequences: β (β1 upward to β7) and γ (γ1 upward to γ4). Each sequence is confined to one structural block.

(c) Ninety-eight percent of the Cloridorme Formation was deposited by turbidity currents, producing argillite (60%); three types of greywackes (15%); calcareous wackes (3%); and two types of calcisiltites (20%). Minor non-turbidite facies are dolostone and limestone concretions, volcanic ash, and silty dolomitic argillite.

(d) Terrigenous detritus was recycled from uplifted Cambrian and Lower Ordovician deep passive-margin deposits. Calcareous detritus was derived from a contemporaneous carbonate shelf. The two source areas were in proximity to one another.

(e) Individual turbidites are very discontinuous: only 46 of 139 beds can be traced for 3 km.

(f) A turbidity current is extremely sensitive to small irregularities in bottom topography, so that small changes in seafloor relief can cause great variations in bed thickness and grain size. Furthermore, the path of a turbidity current is probably sinuous.

(g) Downcurrent changes in sedimentary structures and mean current direction are not significant, except in a few cases where Enos concluded that turbidites change rapidly from sandstone into mudstone.

(h) The orientations of grooves are significantly more variable than those of flutes both downcurrent within individual beds and in vertical sections of many beds.

2. Parkash (1969), based on Enos' bed-by-bed correlations, studied the downcurrent changes in sedimentary structures in eight turbidites from the β7 member of the Cloridorme Formation, each of which is divided into two parts by a bedding joint (i.e. bipartite beds). Parkash (1969) arrived at the following conclusions.

(a) Variance in sole mark directions increases in the downcurrent direction. Deviation of intrabed parting lineation from the sole marks also increases in the downcurrent direction.

(b) On slowing down in the distal region, a turbidity current tends to meander and spread over small slopes. The current, thus, tends to change direction greatly in the distal region.

(c) The depositing currents were relatively low in concentration, but highly turbulent.

(d) A bipartite bed was deposited by at least two distinct phases -- a "quick" bed phase depositing the lower part of the bed, followed by deposition of the upper part of the bed either by settling of individual particles or by another "quick" bed phase. The two depositing phases were separated by a small time interval.

3. Parkash and Middleton (1970) studied downcurrent textural changes in the eight turbidites mentioned above. They arrived at the following conclusions.

(a) Grain fabric is depositional. Grains are imbricate upcurrent.

(b) Grain and graptolite orientations are generally parallel to current direction, but tend to deviate from the sole mark orientation both in the downcurrent direction and upward in the bed.

(c) The path of the depositing current is sinuous.

(d) Grading of beds decreases downcurrent.

(e) The two parts of bipartite beds were probably deposited by two mechanisms.

4. Walker (1970) examined both "ABC index" and sand/shale ratio in one section from the β7 member of the Cloridorme Formation, for the purpose of separating proximal and distal turbidite sequences. A, B and C represent turbidites beginning with Bouma (1962) a, b and c divisions, respectively. The percentage of such beds in a section can be expressed as a point on a triangular diagram. The projected point on the A-C base of the triangle represent a percentage of the distance from A to C, which is defined as the "ABC index" of the section. The ABC index is calculated by

$$\text{ABC index} = A + \frac{1}{2} B$$

A higher ABC index indicates a more proximal facies. Walker (1970) found that mixtures of A and C, without B, are very common in the Cloridorme Formation, unlike other turbidite sequences. Upcurrent locations have a low ABC index. Conclusions about proximity based on ABC index are not consistent with variations in sand/shale ratio in the Cloridorme Formation. Specifically, two sequences with upward decreasing "proximality" were detected based on ABC index, whereas four minor cycles of upward decreasing sand/shale characterized the same interval.

5. Beeden (1983) mainly worked on the sedimentology of the γ4 member in the Cloridorme Formation. His main conclusions are that the γ4 member is dominated by argillite and type 1 greywacke of Enos (1965). Thickening upward sequences are more common than thinning upward sequences. Therefore, he hypothesized that the turbidites accumulated on depositional lobes and lobe fringes of a prograding, relatively high-efficient submarine fan. Moreover, submarine fans that deposited this part of the Cloridorme Formation were asymmetric, longitudinal and grew along the axis of the foreland basin.

6. Hiscott et al. (1986) studied foreland-basin evolution in the eastern part of the Quebec Re-entrant. Concerning the Cloridorme Formation, they reached the following conclusions.

(a) The Cloridorme Formation developed on top of a foundered carbonate platform. It contains a 4000 m-thick sequence. From the base to top, the depositional setting changed from a flat basin floor (1500-2000 m of deposits), to repeated development of coarse sandy lobes (2000 m of deposits), to a muddy fan-fringe or lobe-fringe setting (500 m of deposits, γ4).

(b) The deposition of alternating sand-rich and mud-rich sequences may be partly controlled by sea-level variation.

(c) The Cloridorme Formation can probably be classified as the deposit of a high-efficiency fan.

1.2.2 Critical constraints from previous work

The short length scales of facies and paleocurrent changes in the Cloridorme Formation prompt questions such as (i) why do facies characteristics change so rapidly in these deposits, (ii) were the controlling factors local, (iii) was the Cloridorme Formation formed by stacking of small turbidite systems, (iv) was there more than one source supplying the Cloridorme Formation?

These questions will be considered later in this thesis.

CHAPTER 2

GEOLOGICAL SETTING AND STUDY METHODS

2.1 Geological Setting

2.1.1 The Cloridorme Formation

The Cloridorme Formation is exposed along the north shore of the Gaspé Peninsula, from Marsoui in the west (49°13'N, 66° W) to Pointe-Jaune in the east (49°04'N, 64°31'W). The formation is confined to the external domain of the Humber Zone of the Canadian Appalachians. The southern boundary of the unit is defined by a number of thrust faults, including Logan's Line in the west, the Mont-Louis fault and the Méchins-Carey fault in the central area, and an unnamed fault in the east (Brisebois et al., 1991; Slivitzky et al., 1991). The Cloridorme Formation is overthrust by the older Deslandes Formation (Fig. 2.1) (St-Julien and Hubert, 1975; Williams, 1979; Brisebois et al., 1991).

The Cloridorme Formation is a Middle Ordovician turbidite succession that is at least 4000 m thick (Hiscott et al., 1986). Both shales and sandstone turbidites contain graptolites of the *Diplograptus multidens* to *Climacograptus spiniferus* zones (Riva, 1968). The turbidites were deposited in a foreland basin which extended from Newfoundland in the northeast to Georgia in the southern U.S. Appalachians (St-Julien and Hubert, 1975; Williams, 1979).

The Iapetus Ocean was contracting during the Ordovician Period, as the

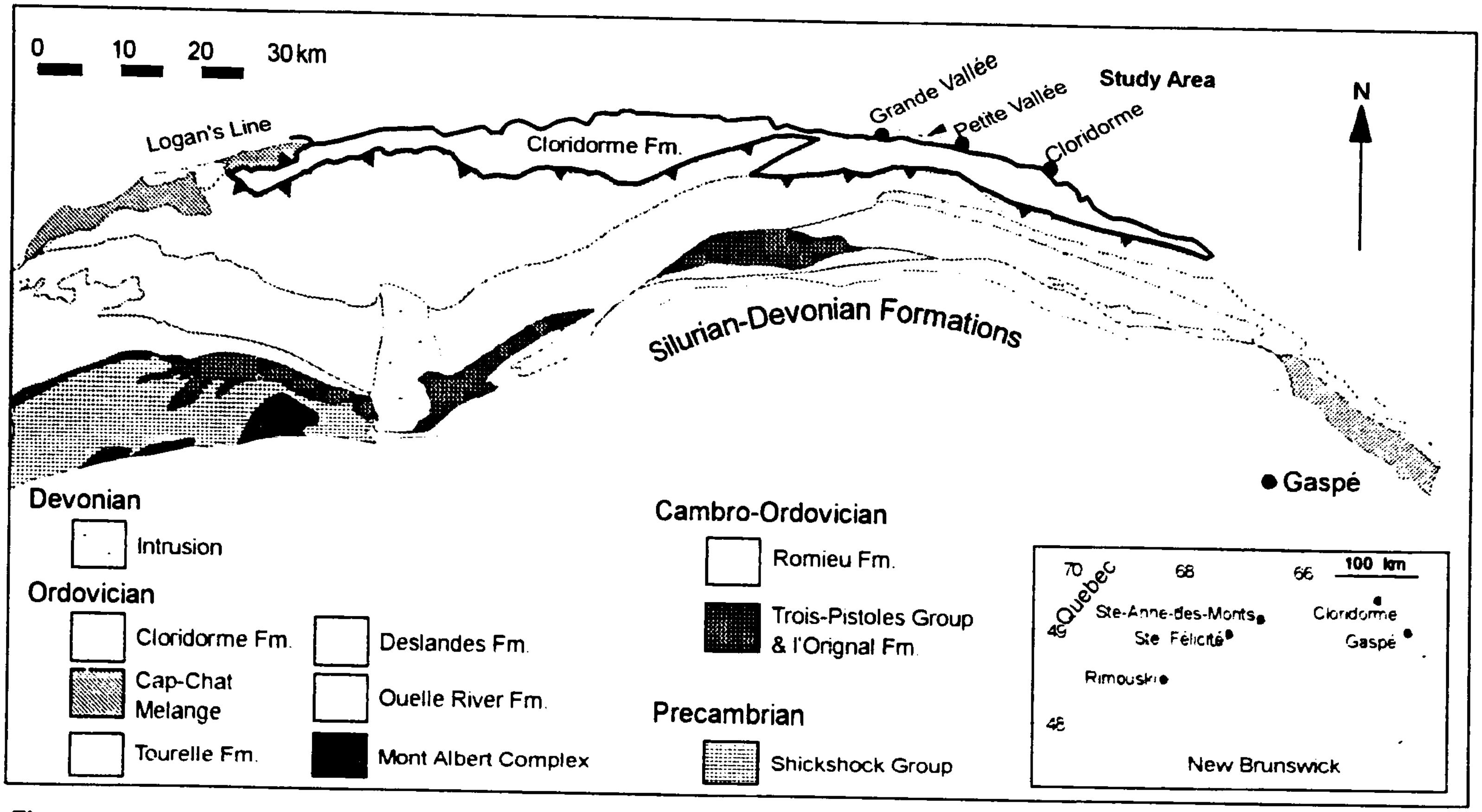


Figure 2.1 Tectono-stratigraphic setting of the Cloridorme Formation (simplified from Brisebois et al.,1991 and Slivitzky et al., 1991)

continental margin of Laurentia (i.e., ancient North America) was subducted beneath a micro-continent and/or volcanic arc to the southeast (relative to modern geographic coordinates). Collision with the offshore land mass and the inevitable "locking up" of the subduction zone produced the Taconic Orogeny (Williams, 1979). Subsequent isostatic rebound resulted in uplift of the forearc accretionary prism, which consisted in part of allochthons formed of Cambrian and Lower Ordovician sediments of the former continental rise of Laurentia. The erosion of these uplifted allochthons provided detritus to the foreland basin during the Middle Ordovician, depositing the Cloridorme Formation. This deposition was coeval with the advance of the thrust sheets (i.e., the Cloridorme Formation is a syn-orogenic flysch; Enos, 1969b). Later continued advance of thrust sheets tectonically buried the syn-orogenic flysch (Fig. 2.2) (Williams, 1979; Hiscott et al., 1986; St-Julien and Hubert, 1975; Rowley et al., 1981). Illite crystallinity and pyrobitumen reflectance suggest maximum tectonic burial of about 5 km just to the west of the Cloridorme Formation in the Lower Ordovician Tourelle Formation (Islam and Hesse, 1982).

2.1.2 Field area

The thesis study area is a 5 km-long strike exposure of unit G of the β7 member of Enos (1965) between Grande-Vallée and Petite-Vallée (Fig. 2.1). These are the youngest rocks in Enos' (1965) central block of the Cloridorme Formation. Sand/shale ratio is about 1:2 (calculation based on logging of section PV3). Exposure

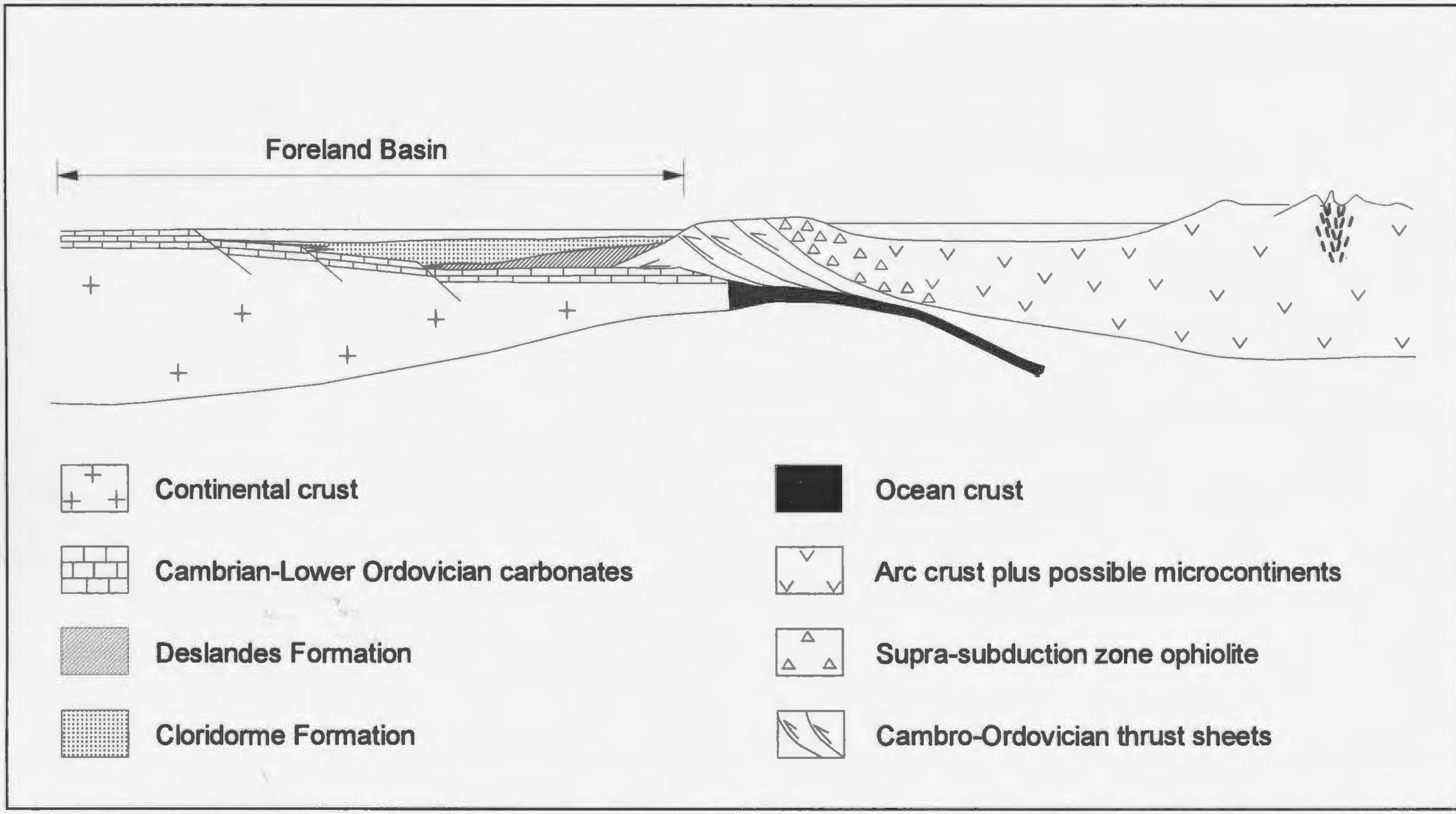


Figure 2.2 Hypothetical tectonic profile across the Quebec Appalachians during the Ordovician (modified from Rowley and Kidd, 1981)

is on a broad wave-cut platform (Fig. 2.3). There are at least two generations of faults that affect stratal continuity. Late stage (post-folding) faults, at a high angle to bedding, strike NW to NE and offset beds up to 60 m on the outcrop surface. These faults also offset an earlier generation of faults which are at a low angle to bedding (Fig. 2.4, back pocket). The early faults are interpreted as thrust faults that formed at the beginning of folding of the Cloridorme Formation. Where these earlier faults cut bedding, they generally do so by ramping up section over a short distance. Farther west, in the western structural block of the Cloridorme Formation, E. Beutner of Franklin and Marshall College (pers. comm. to R. Hiscott, 1993) interprets that some thrust faults breached the Ordovician sea floor.

Most of the small shoreline structural blocks, separated by the late-stage high-angle faults, belong to the south limb of a syncline, in which beds are overturned and dip south at 69°-75°. The Longue Pointe block in the east (at section PV12) belongs to the north limb of the same syncline; here beds are upright and dip about 30° to the south.

Structure in the lower part of section PV7 is quite complicated (Fig. 2.5). Faulting and folding cause bedding dip to vary along strike and in the vertical section. Some beds dip as low as 57°. Two non-planar faults account for about 20 m of local apparent offset. About 28 m of section is apparently missing wherever these faults are crossed west of section PV7. Above this level, deformation is much less strong, and subsequent field work was concentrated in this less deformed succession.

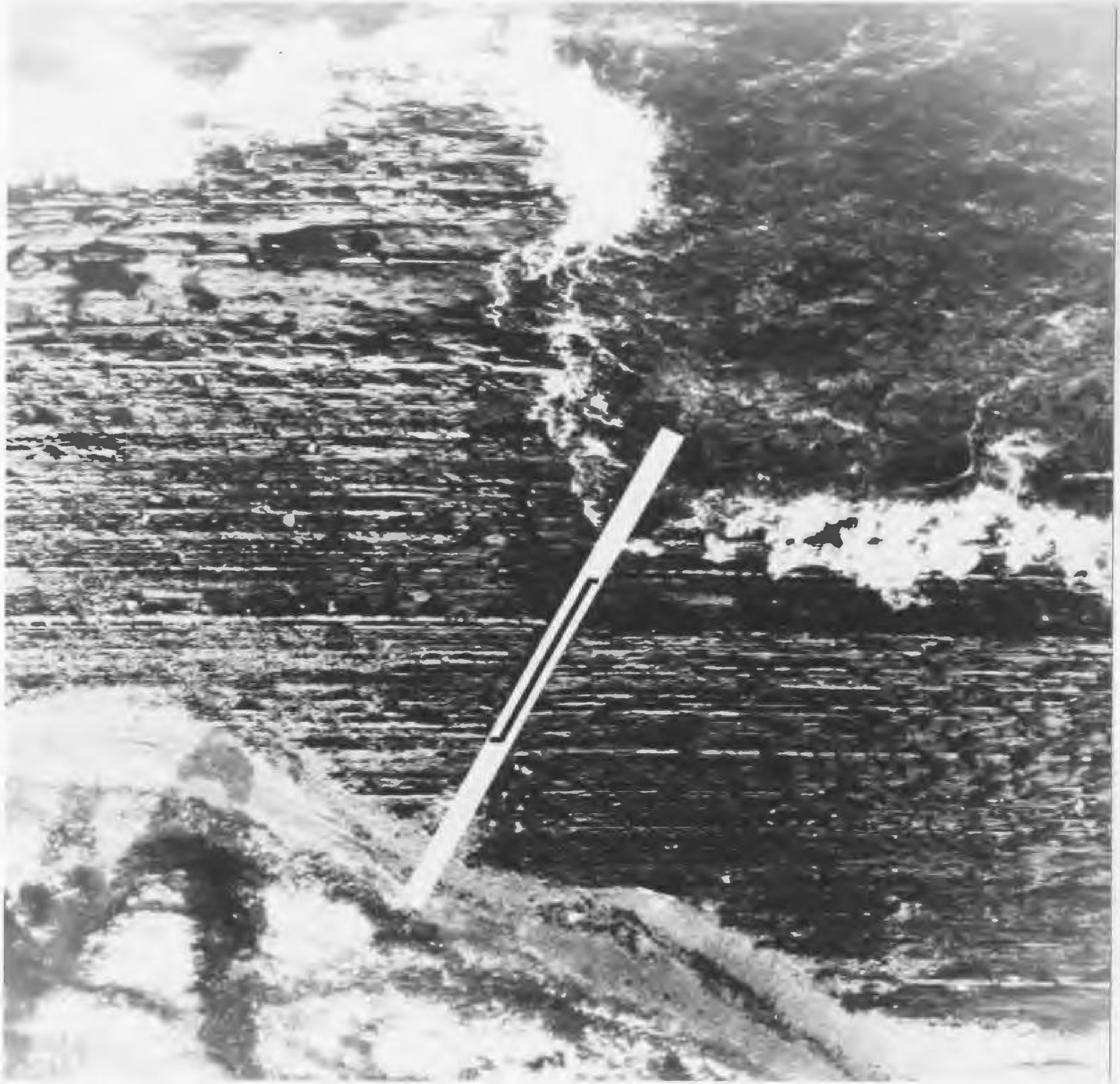


Figure 2.3 Wave-cut platform in the vicinity of section PV2. Beds are overturned with top towards the sea and a dip of 69°. Offset of a marker bed by a post-folding brittle fault is indicated. Photography courtesy of EXXON Corporation.

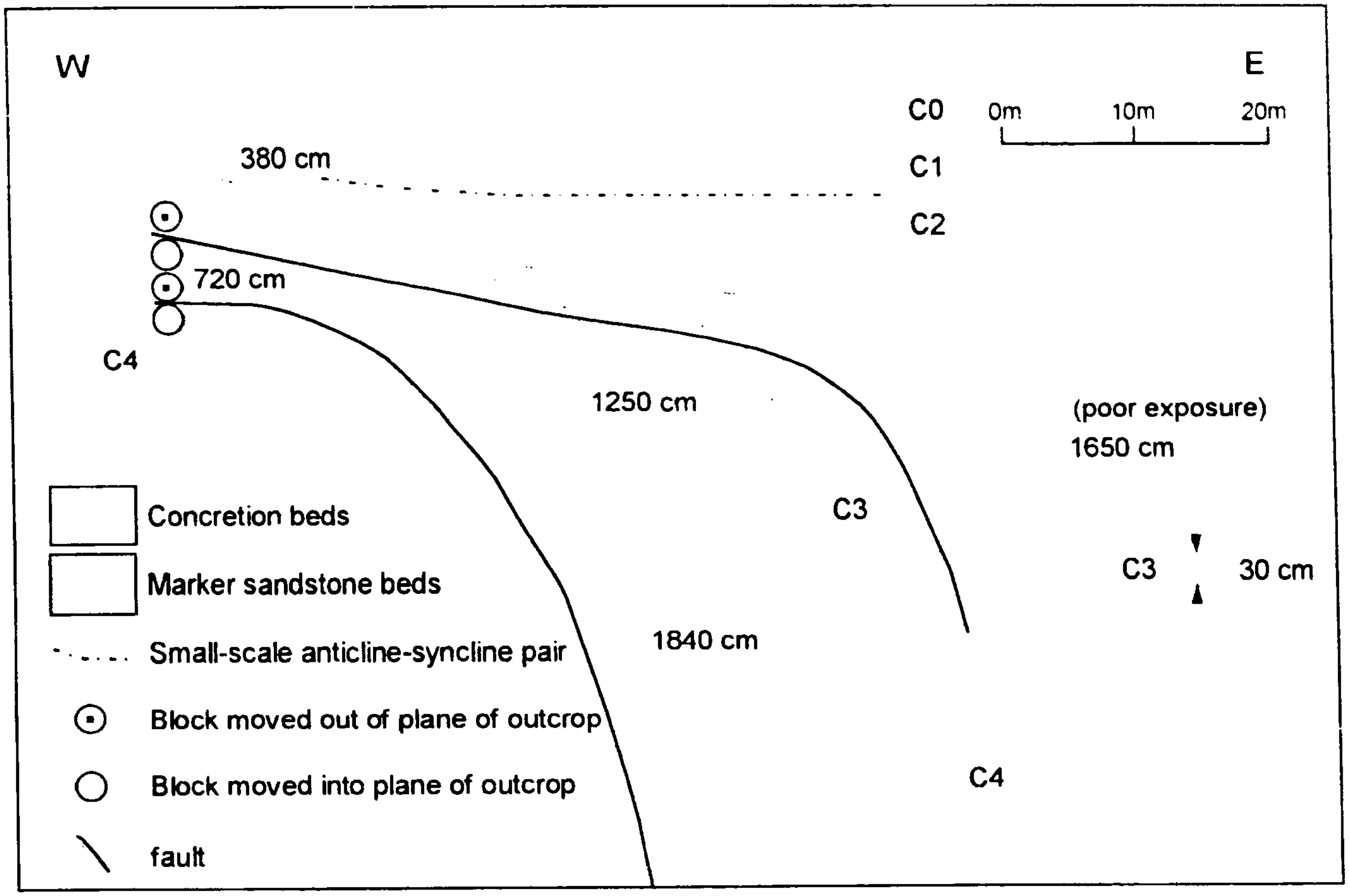


Figure 2.5 Sketch of two-dimentional fault geometry in the lower part of section PV 7. The 720 cm of section preserved in fault slivers at the western end of the sketched outcrop is much less than a reconstructed thickness (1840 cm + 1650 cm + 30 cm) of about 35 m between the same marker beds measured where the section is unbroken by faults. Sense of true movement of separate fault blocks was determined using (i) offsets of marker beds, (ii) slickenside orientations and (iii) geometry of the same faults in the cliff face south of the outcrop.

2.2 Field Methods

This project started in the summer of 1991, when thesis supervisor R.N. Hiscott took oblique aerial photographs of the outcrops between Grande-Vallee and Petite-Vallée, shot approximately down the dip of the beds. Then a photomosaic of the coastal outcrop was produced by Dr. Hiscott and research assistant Dr. D. Pitman (Fig. 2.6, back pocket). This photomosaic, together with high quality, commercial, low-level aerial photographs subsequently provided by EXXON Exploration Company of Houston, Texas, provided excellent guidance in the field, especially for a structural reconnaissance of the field area.

In the summers of 1992 and 1993, the author of this thesis spent approximately 13 weeks in the field. Dr. Hiscott spent about 10 days in the field to provide guidance on field techniques. Ms. Jane Mills provided field assistance in 1992.

The first phase of field work involved checking of correlations between fault-bounded blocks inferred from the photomosaic, and recording of all megascopic faults and folds on the mosaic. Inferred thrust faults at low angles to bedding were also noted. Major faults and folds are marked in Figure 2.4.

Fifteen bed-by-bed sections were measured (locations in Fig. 2.4). Each section was designated by prefix PV (for Petite-Vallée) followed by a number, beginning with 1 in the west and increasing eastward. These 15 sections cover almost all of the small shoreline fault blocks between Grande-Vallée and Petite-Vallée. The cumulative thickness of all the measured sections is 1375 m. Most sections overlap stratigraphically, and the stratigraphic thickness represented by the entire data set is only 298 m. All beds thicker than about 5 cm were described separately in detail, noting bed thickness, maximum grain size, grading style, internal structures, clasts, and sole markings. Moreover, special features of individual beds were noted, such as the relationship to injections and lateral changes in thickness. Thickness, grain size and facies for all beds, section by section, are tabulated in Appendix 1. Other characteristics are shown graphically on drafted field sections. These were plotted while in the field as graphic columns at a vertical scale of 2 meters to one inch, so that data could be subsequently checked on the outcrop. The sections were redrawn in St. John's using a computer graphics package. The full sections are reproduced in Appendix 2.A through 2.O (back pocket).

The total thickness of each section was checked by measurement with a long tape and correction for dip of bedding. Duplication caused by low-angle faulting was removed. The difference between dip-corrected tape measurements and the sum of individual bed-by-bed measurements is generally small (Table 2.1).

Correlation of units was completed by examination of the graphic columns, based on marker concretion beds, dolostone beds and tuff beds, all checked later in the field. The general correlation of all 15 sections is summarized in Figure 2.7. This initial general correlation provided guidance for later bed-by-bed correlation.

Bed tracing was carried out in 1992 by literally walking along the strike of individual beds in a down-current direction. This work was then checked in 1993.

Table 2.1 Estimates of measurement error for each section

Section	Section thickness by bed-by-bed measurement (cm)	Section thickness measured by tape and corrected for dip (cm)	Error (%)
PV1	10440	10407	0.32
PV2	7290	7321	-0.42
PV3W	9663	9650	0.13
PV3	12160	11958	1.7
PV4	8550	8400	1.8
PV5	5170	5237	-1.3
PV6	6660	6476	2.8
PV7	1951	1969	-0.91
PV8	6380	6264	1.85
PV9	5883	5953	-1.2
PV10	4090	4242	-3.6
PV11	7050	7145	-1.3
PV12			
PV13	14320	14571	-1.7
PV13N	1630	1649	-1.15

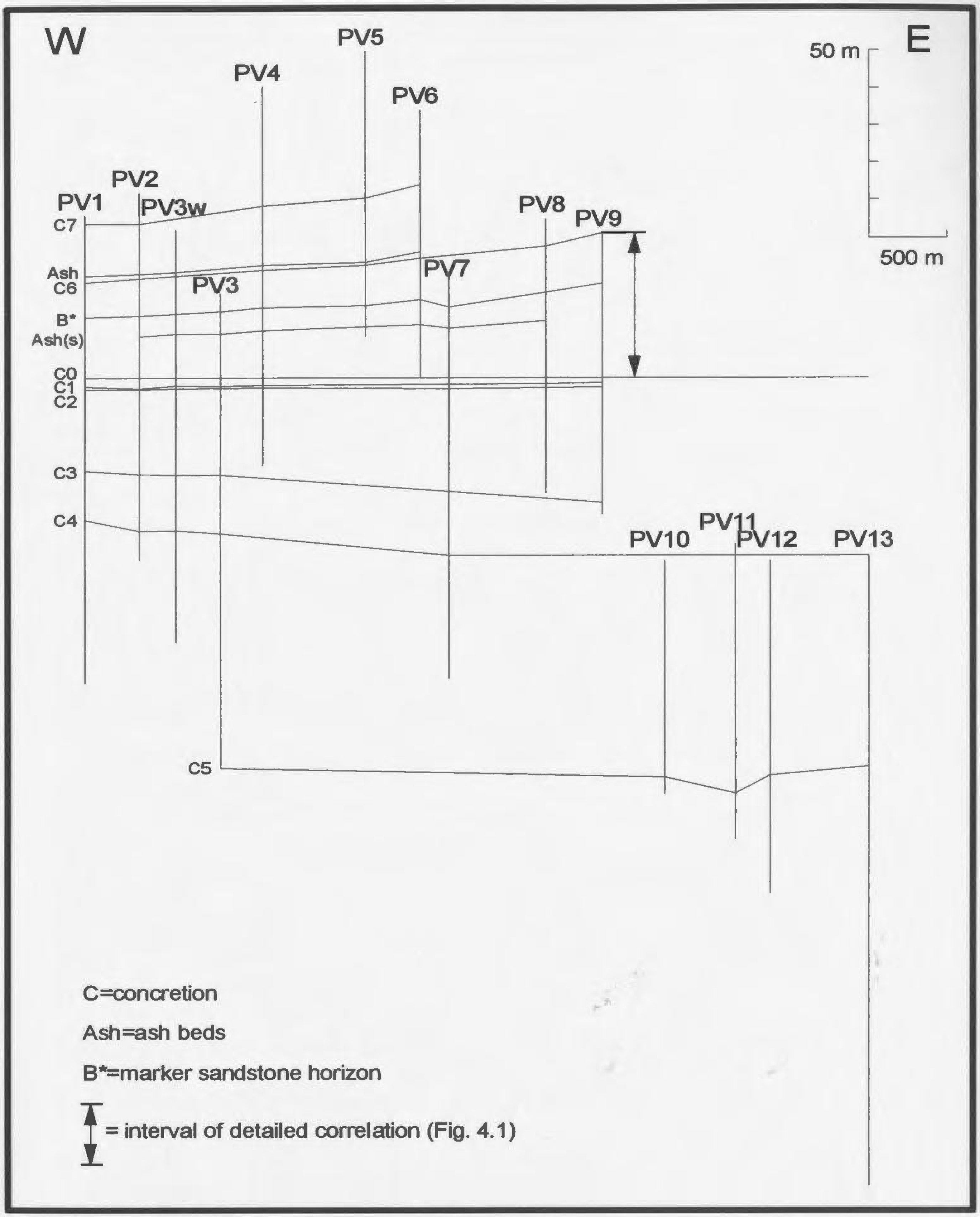


Figure 2.7 General correlation of the sections

Sections PV10 through PV13 and 13N belong to a lower part of the sequence (Fig. 2.7). Therefore, bed-by-bed tracing was only possible between sections PV1 and PV9, for about 3 km.

During bed tracing, bed terminations were described and photographed, or sketched in order to understand the nature of bed discontinuity in the Cloridorme Formation. The length of each traced bed is recorded in Appendix 3. Meanwhile, paleocurrent directions of each traced bed were measured where sole markings are available (Appendix 4).

During field description in 1993, all the studied deposits were classified into 13 facies, based mainly on their primary and liquefaction structures, grain size and bed thickness. Photographs were taken to illustrate typical features of each facies. The description and interpretation of each facies will be discussed in detail in Chapter 3.

As requested by thesis sponsor BP Exploration, an attempt was made to estimate the probability of injection features being sampled by coring of this formation. Five of the measured sections, where liquefaction features are relatively common, were selected for this core simulation experiment. At each section, a 15-20 m-long tape was stretched across the section, perpendicular to the strike, with no regard for the location of small-scale features. Distinctive evidence for injection was subsequently sought within a 10 cm-wide band centred on the tape. This experiment showed that the chance of capturing injection features in conventional cores is very low. In all five "cores", only one small, low angle injection was intersected.

However, even this injection might have been mistaken for a thin turbidite if it were not possible to examine the surrounding outcrop.

CHAPTER 3

FACIES DESCRIPTIONS AND ENVIRONMENTAL INTERPRETATION

Based on texture, bed thickness, internal structures, abundance of clasts and post-depositional structures, 13 facies are recognized in the study area. The thickness percentage of each facies in each section is listed in Table 3.1. Because it is nearly impossible to separate a mud turbidite from Bouma division *e* of an underlying sand-mud or silt-mud couplet, all mudstones are classified as facies 13: the laminated mud turbidite facies. For other facies, only the thickness of the sandy (or silty) divisions are tabulated.

Where appropriate, facies are correlated with the deep-water scheme of Ghibaudo (1992) so that the reader can obtain an overview of similar deposits in a range of settings.

3.1 Facies Descriptions and Process Interpretations

3.1.1 Facies 1 description: Coarse- to fine-grained, graded sandstones

This facies comprises beds with a basal, graded, but otherwise structureless division of coarse- to fine-grained sand (Fig. 3.1). Bed thickness is 10-60 cm. A cross-laminated and/or rarely parallel laminated top composed of very fine sand to silt may also be present. However, such laminated upper divisions are absent more commonly than present, and form less than 50% of the total thickness of the bed. In a

A

B

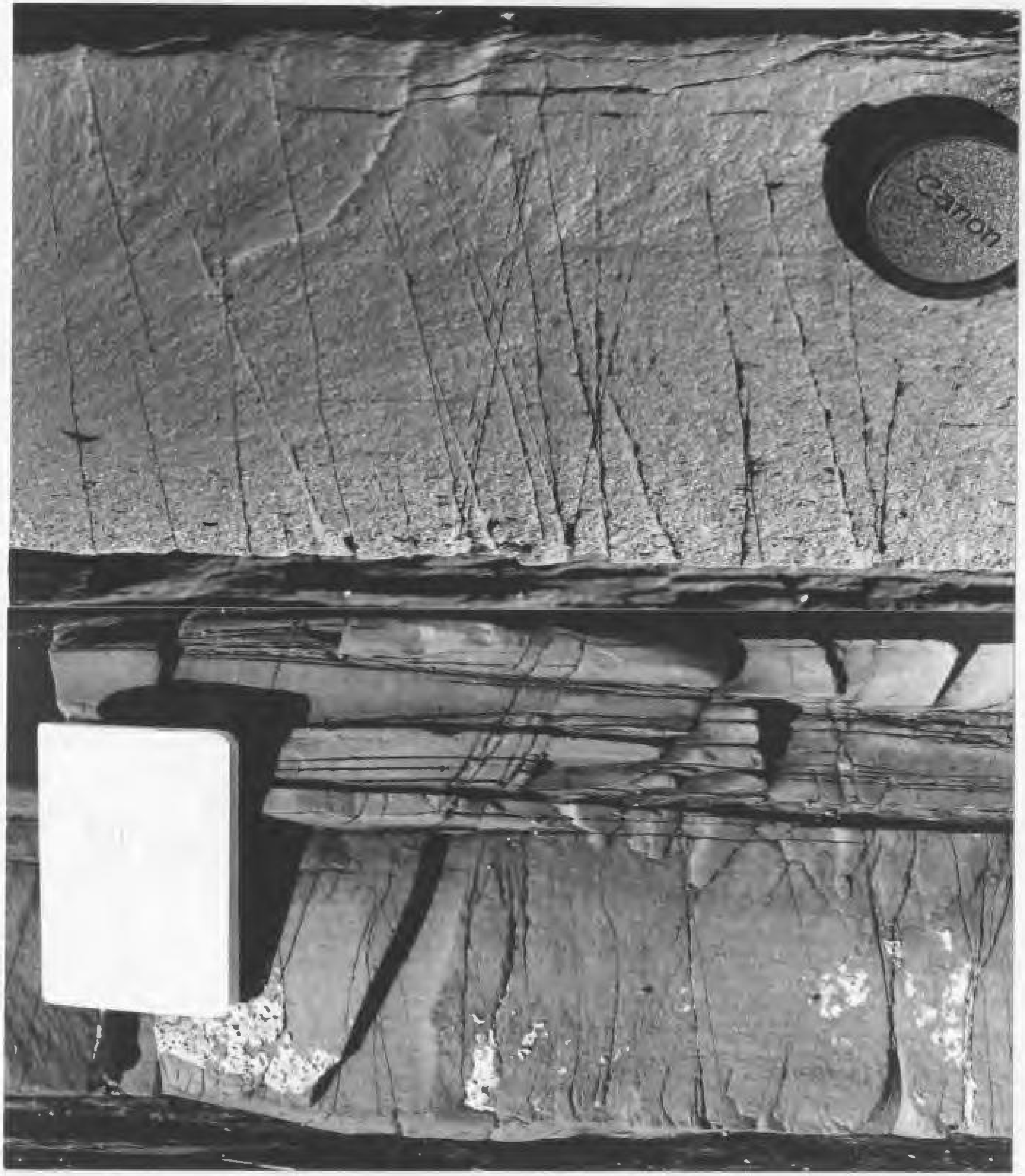


Figure 3.1 **Facies 1: Coarse- to fine-grained graded sandstone. A, Facies 1 sandstone bed without laminated upper division. Picture was taken in Section PV3, bed 292 (111.37 - 111.56 m). Camera lens cap is 5 cm in diameter; B, Facies 1 sandstone bed with cross laminated upper division. Picture was taken in Section PV4, bed 79 (33.70 - 34.07 m). Notebook size 11.5×17.7 cm**

few cases, the laminated portion appears to decrease in thickness downcurrent. These sandstones are moderately sorted to moderately well sorted (Folk, 1974). Some contain small shale clasts a few millimeters to several centimeters in length. Flutes and grooves are common sole markings. Bed tops are quite planar. Fluid-escape pillars may be present in some beds of this facies. This facies accounts for 12.0% of the thickness of the sections (Table 3.1).

3.1.2 Facies 1 process interpretation

The lack of lamination in the lower graded division (Bouma division *a*, cf. Fig. 3.2) indicates rapid fall-out of grains from suspension (Arnott and Hand, 1989), or development of a quick bed condition (Sanders, 1965; Middleton, 1967), both without traction along the bed. The upper laminated divisions formed by traction, mainly in the lower flow regime, as a turbidity current decelerated (Harmes & Fahnestock, 1965; Walker, 1965). The fluid- escape structures formed where escaping pore water caused local fluidization (Nichols, 1995). This facies corresponds to the basal part of the sand-mud couplets or mud-sand couplets of Ghibaudo (1992).

3.1.3 Facies 2 description: "slurry" sandstone beds

This facies typically has high mud content and, thus, very poor sorting. It is mainly composed of matrix-rich sand, in all grades from coarse through fine (Fig. 3.3). Coarser grains tend to be widely scattered throughout the entire bed thickness. However, the abundance of coarse grains decreases slightly towards the top to form a

Table 3.1 Percentage of each facies in the measured sections

Sections	total thck (cm)	Facies 1		Facies 2		Facies 3		Facies 4		Facies 5		Facies 6		Facies 7		Facies 8		Facies 9		Facies 10		Facies 11		Facies 12		Facies 13	
		thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%	thck (cm)	%
1	12343	1576	12.8	150	1.2	168	1.5	575	4.7	450	3.6	774	6.3	296	2.4	53	0.4	46	0.4	146	1.2	54	0.4	349	2.8	7686	62.3
2	9740	1221	12.5	35	0.4	74	0.8	308	3.2	175	1.8	483	5.0	227	2.3	67	0.7	50	0.5	132	1.4	19	0.2	270	2.8	6679	68.6
3	12564	1196	9.5	266	2.1	86	0.7	457	3.6	833	6.6	469	3.7	386	3.1	62	0.5	36	0.3	184	1.5	8	0.1	336	2.7	8239	65.6
3W	10933	938	8.6	65	0.6	144	1.3	434	4.0	894	8.2	666	6.1	294	2.7	60	0.5	39	0.4	134	1.2	14	0.1	273	2.5	6958	63.6
4	10105	983	9.7	315	3.1	156	1.5	624	6.1	146	1.4	372	3.7	144	1.4	26	0.3	27	0.3	69	0.7	9	0.1	140	1.4	7094	70.2
5	7641	891	11.7	72	0.9	223	2.9	320	4.2	369	4.8	280	3.7	184	2.4	157	2.1	22	0.3	54	0.7	9	0.1	124	1.6	4936	64.6
6	7373	690	9.4	86	1.2	175	2.4	384	5.2	196	2.7	484	6.6	189	2.6	12	0.2	7	0.1	100	1.4	0	0.0	67	0.9	4983	67.6
7	10657	1452	13.6	195	1.8	106	1.0	419	3.9	211	2.0	376	3.5	606	5.7	183	1.7	29	0.3	8	0.1	0	0.0	275	2.6	6787	63.8
8	7261	607	8.4	33	0.5	156	2.1	373	5.1	555	7.6	457	6.3	308	4.2	45	0.6	15	0.2	80	1.1	0	0.0	168	2.3	4464	61.5
9	7481	1014	13.6	145	1.9	29	0.4	370	4.9	402	5.4	449	6.0	231	3.1	37	0.5	24	0.3	11	0.1	0	0.0	212	2.8	4557	60.9
10	6161	900	14.6	128	2.1	19	0.3	212	3.4	734	11.9	413	6.7	433	7.0	28	0.5	7	0.1	50	0.8	0	0.0	45	0.7	3212	50.7
11	7913	1193	15.1	97	1.2	25	0.3	84	1.1	705	8.9	727	9.2	440	5.6	29	0.4	0	0.0	16	0.2	20	0.3	147	1.9	4430	56.0
12	8792	1311	14.9	23	0.3	0	0.0	243	2.8	868	9.9	731	8.3	328	3.7	25	0.3	0	0.0	0	0.0	0	0.0	50	0.6	5213	59.3
13	16584	2291	13.8	593	3.6	71	0.4	554	3.3	2235	13.5	936	5.7	841	5.1	87	0.5	10	0.1	99	0.6	94	0.6	163	1.0	8608	51.9
13N	1686	227	13.5	9	0.5	0	0.0	36	2.1	125	7.4	29	1.7	239	14.2	0	0.0	12	0.7	23	1.4	18	1.1	34	2.0	934	55.4
Average	137254	16466	12.0	2232	1.6	1454	1.1	5393	3.9	8896	6.5	7650	5.6	5148	3.6	871	0.6	326	0.2	1106	0.8	245	0.2	2653	1.9	84790	61.6

Note: thck -- thickness of each facies

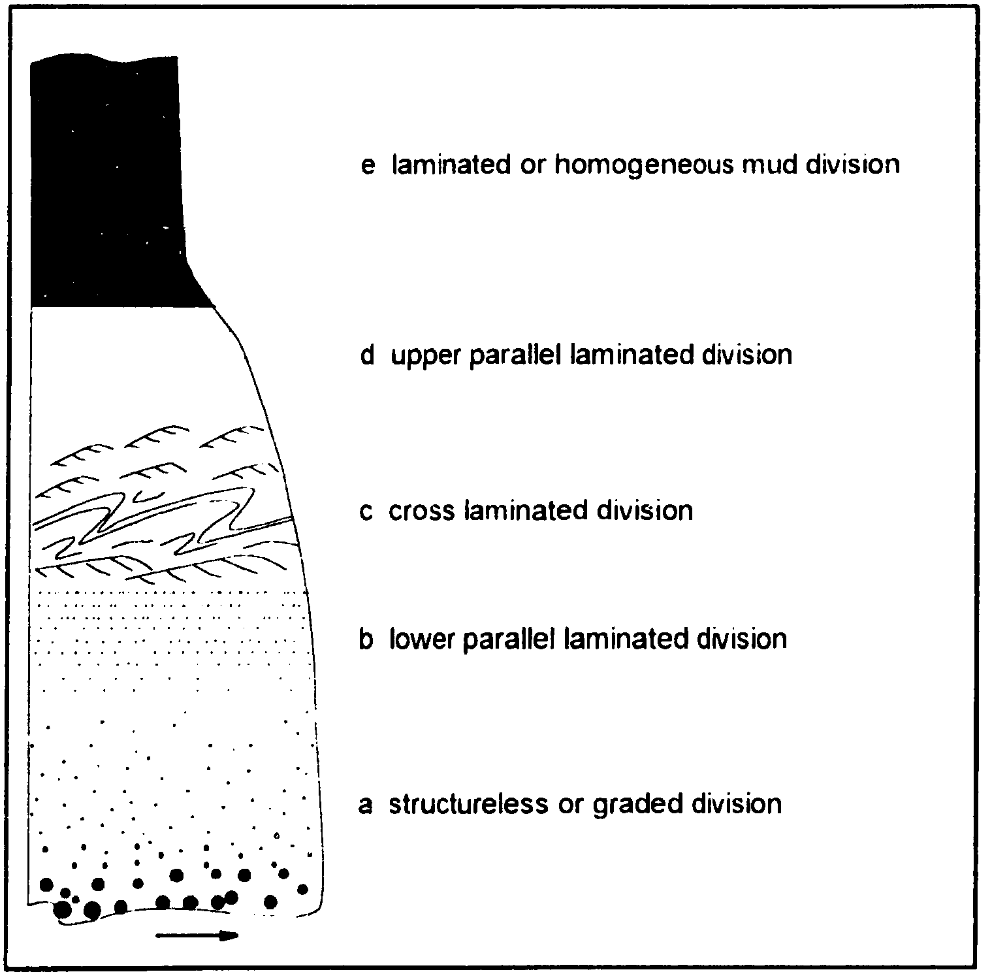


Figure 3.2 The Bouma (1962) turbidite model (after Bouma, 1962)

Figure 3.3 Facies 2: "Slurry" sandstone bed. Picture was taken in Section PV4, bed 34 (12.75 - 13.02 m). Camera lens cap is 5 cm in diameter. Note round intraclast at lower left.

"content graded bed" (McBride, 1962, p.50). Shale clasts, dolomitic clasts, or folded siltstone clasts are common. These beds have flat bases, with rare sole marks, and planar and sharp tops. This facies accounts for only 1.6% of the thickness of the sections (Table 3.1).

3.1.4 Facies 2 process interpretation

The high mud content, extremely poor sorting, relatively coarse maximum grain size, poor grading, abundant sedimentary clasts, sharp top, and rare sole markings, all suggest deposition from cohesive debris flows (Walker, 1978; Myrow and Hiscott, 1991; Mutti, 1992). This facies is equivalent to the muddy sand facies of Ghibaudo (1992).

3.1.5 Facies 3 description: sandstones containing abundant shale clasts

Bed of this facies are usually fine- to very fine-grained sandstones, mostly less than 15 cm thick. Sorting is poor and the content of mud matrix is high; hence, the colour of these beds is relatively dark. However, mud content is less than in facies 2. This facies characteristically contains abundant shale clasts a few millimeters up to tens of centimeters in length (Fig. 3.4). Shale clasts are very similar to the surrounding mud turbidite deposits, and may locally form the entire thickness of the bed. Some Facies 3 beds are slightly graded. Bed bases are flat with local grooves. Some tops are both flat and gradational. This facies accounts for only 1.1% of the sections (Table 3.1).

Figure 3.4 Facies 3: sandstone containing abundant shale clasts. Picture was taken in Section PV8, bed 109 (36.40 - 36.50 m). Camera lens cap is 5 cm in diameter.

3.1.6 Facies 3 process interpretation

The abundance of both shale clasts and interstitial mud suggests rapid deposition from a highly concentrated density current (Mutti, 1992). Slight normal grading may signified that the flows were turbulent. The similarity of shale clasts to surrounding mud turbidite deposits suggests that these shale clasts are intrabasinal, perhaps derived nearby. As the turbidity current gradually lost its momentum, shale clasts settled to the bed. This facies corresponds to the basal part of some sand-mud couplets of Ghibaudo (1992).

3.1.7 Facies 4 description: sandstones that feed injections

The sedimentary characteristics of this facies are quite similar to those of facies 1, except for the general lack of upper laminated divisions and the presence of sandstone injections that issue from the bed tops. In most cases, small dykes less than two centimetres wide inject overlying shale. Some beds are capped by numerous small injections which subdivide the immediately overlying shale into masses resembling large clasts; in these cases, the location of the top of the bed cannot be easily defined and changes elevation along the outcrop. A few Facies 4 sandstones feed large, irregular dykes and lenticular sills which locally inflate by several times the apparent bed thickness (Fig. 3.5). Because of sand extraction and redistribution during liquefaction and injection, bed thicknesses locally vary from several tens of centimeters to less than 1 mm (compare Hiscott, 1979). Where sand injection and

Figure 3.5 Facies 4: sandstones that feed injections. Picture was taken in Section PV13, bed 108 (31.09 - 31.36 m). Camera lens cap is 5 cm in diameter. Highly irregular bed top marked by arrows.

redistribution are common, the sandstone beds look discontinuous in the two-dimensional outcrop. In one extreme case, injection formed two lenticular sills several beds above the source bed. These two sills change stratigraphic position several times. However, the level containing the sills persists a long distance along strike (Fig. 3.6) Some dykes and sills contain shale clasts. Others appear to have disrupted the sandstone beds immediately above the source bed. This facies accounts for only 3.9% of the measured sections (Table 3.1).

3.1.8 Facies 4 process interpretation

The injection is superimposed on sands like those that characterize Facies 1. Liquefaction of source beds might have been triggered by seismic activity along the contracting foreland basin. The injection complexity and abundance are probably related to the original thickness of the turbidite, its water content and strength of the trigger (Nichols, 1995). The beds that experienced liquefaction probably had high pre liquefaction porosities (i.e., open packing), consistent with the interpretation that the "*a*" division of turbidites like those of Facies 1 was deposited rapidly from suspension.

3.1.9 Facies 5 description: sandstones with shallow erosional bases

This facies is characterized by beds formed of granules, and very coarse to fine-grained sand (Fig. 3.7). The beds have irregular or tabular erosional bases,

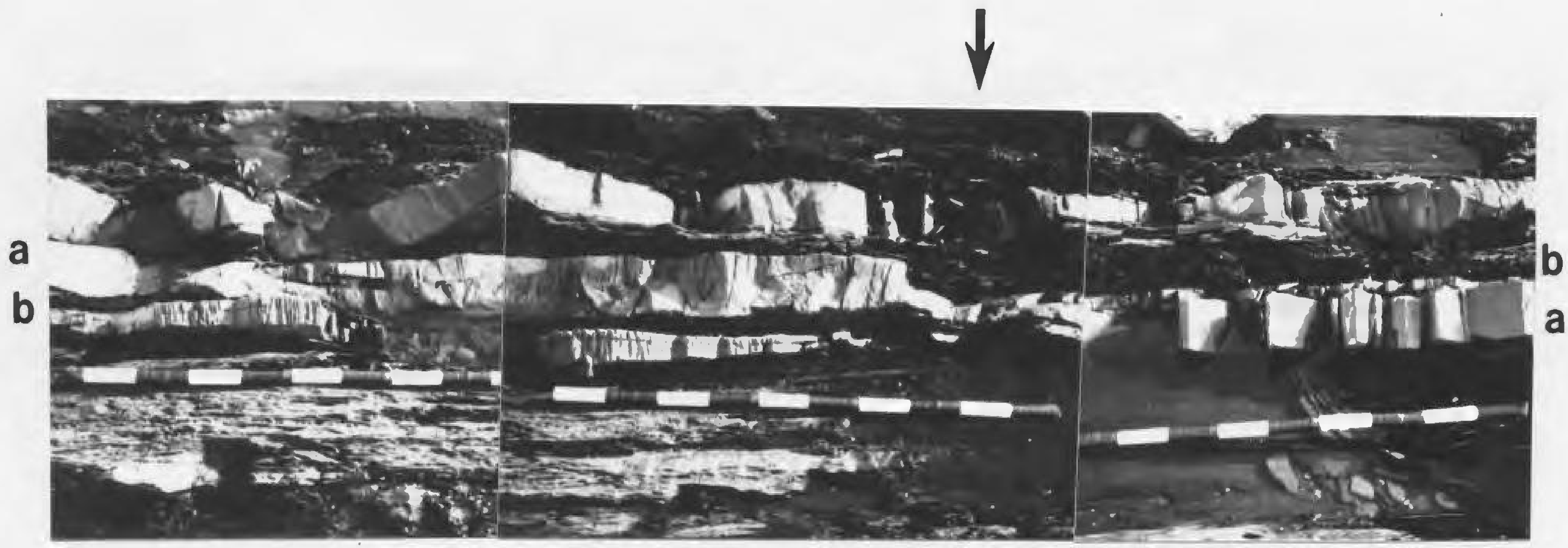


Figure 3.6 **Two sills (a and b) change stratigraphic position. The point of stratigraphic cross over is marked above the photos with an arrow. Scale divisions are 10 cm. Picture was taken in Section PV2, bed 148-149 (60.48 - 60.74).**

A

B

Figure 3.7 Sandstones with shallow erosional bases (arrow). A, picture was taken in Section PV3W, bed 90 - 93 (24.96 - 26.06 m). Scale divisions are 10 cm; B, picture was taken in Section PV5, bed 4 (2.11 - 2.22 m). Notebook size is 11.5×17.7 cm.

carving tens of centimeters into shale, sandstone or siltstone below. Beds of Facies 5 tend to occur together to form amalgamated beds in which each individual bed is lenticular due to erosion; mainly, such beds are ungraded or poorly graded. In groups of coarser beds, abundant shale clasts are commonly concentrated along the amalgamation surfaces. In contrast, amalgamation surfaces are extremely difficult to recognize in finer grained examples of this facies. Fluid-escape pillars are present in some beds, while sole markings are rare. This facies accounts for 6.5% of the total thickness of the measured sections (Table 3.1).

3.1.10 Facies 5 process interpretation

Each scoured base was probably produced beneath or just behind the head of a highly turbulent turbidity current. The poorly graded character and fluid-escape structures suggest that beds of this facies were probably deposited very rapidly or as quick beds (Middleton, 1967; Arnott and Hand, 1989), without traction transport. This facies is equivalent to the sand facies of Ghibaudo (1992).

3.1.11 Facies 6 description: cross laminated or/and parallel laminated sandstones or siltstones

Characteristically, beds assigned to Facies 6 contain a thick cross-laminated division, mainly climbing ripple lamination, which passes upward in many cases into parallel laminated very fine sand to silt (Fig. 3.8). Thin basal divisions of graded or parallel laminated sand are present in some beds, but always comprise less than 50%

Figure 3.8 Facies 6: cross-laminated or/and parallel laminated sandstones or siltstones. Picture was taken in Section PV3W, bed 293 - 294 (93.37 - 94.18 m). Notebook size is 11.5×17.7 cm. Paleoflow is towards the left.

of the total thickness of the bed. The cross-laminated and higher divisions are mainly composed of silt and very fine sand, while any lower divisions usually consist of sand which is finer than the sand in most beds of Facies 1. A few beds with climbing ripples appear to thin rapidly downcurrent. Cross lamination may also change to parallel lamination in this same direction (e.g., Bed 296 in PV 3W, Fig. 3.9). Generally, cross lamination is more common than parallel lamination. Sole markings are poorly developed, especially in beds without basal graded or parallel-laminated sand divisions (i.e. Bouma *a* or *b* divisions). This facies accounts for 5.6% of the total measured thickness (Table 3.1).

3.1.12 Facies 6 process interpretation

Facies 6 cross-laminated and parallel-laminated beds were deposited by low density turbidity currents with fall-out then traction transport . The climbing ripples indicate traction during deposition and a high fall-out rate (Walker, 1965). Beds with a thick division of climbing ripples thinning rapidly in the downcurrent direction (Fig. 3.9) were probably formed by a scour-and-fill process, whereby a vigorous turbidity current eroded the basin floor and then later, as the tail passed, filled the depression. The two-dimensional nature of the outcrop does not allow exclusion of the possibility that the apparent downcurrent thinning and change in character might be the result of a highly oblique cut through the margin of a shallow scour. In this case, paleoflow would be slightly in or out of the plane of the outcrop. An alternate possible

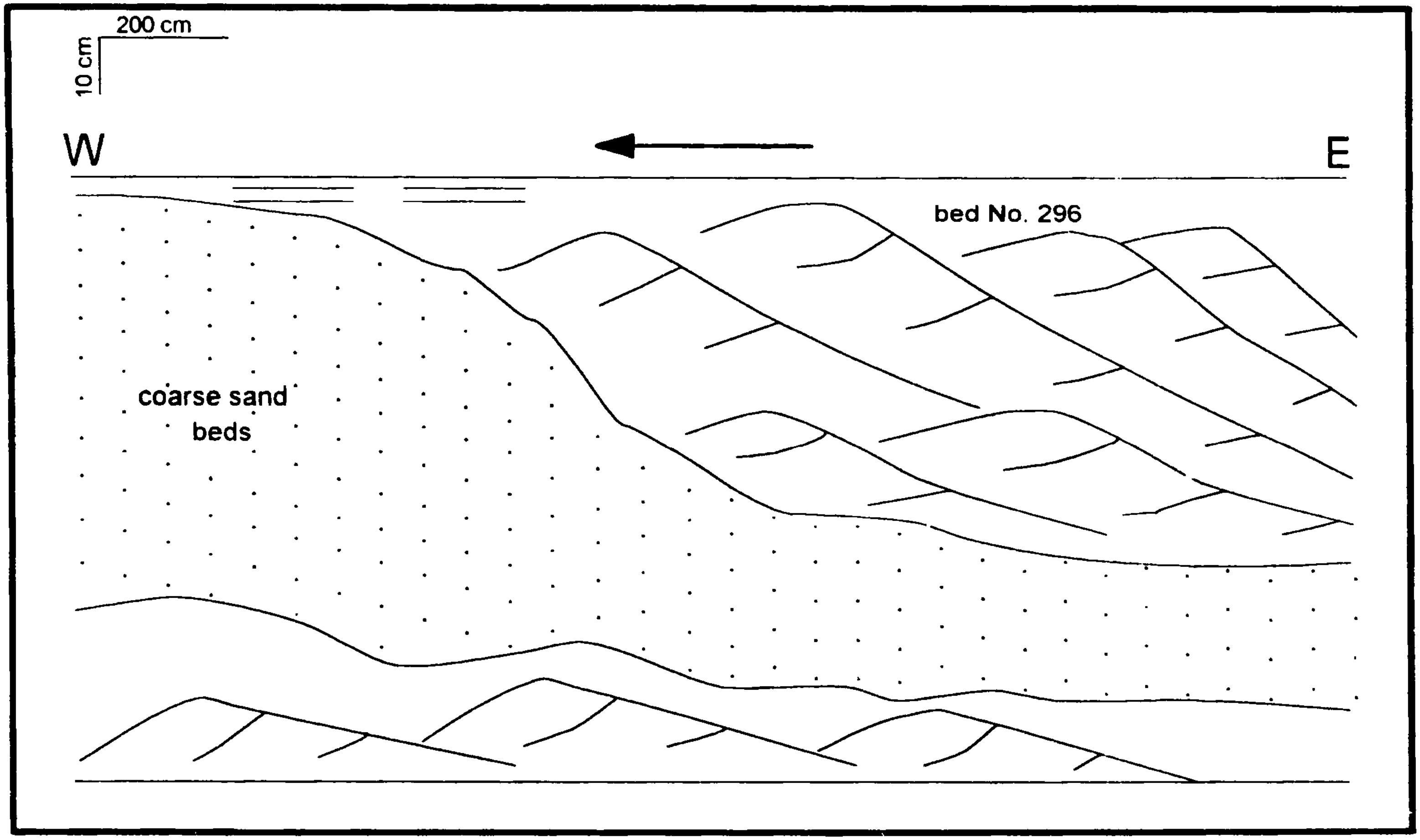


Figure 3.9 Sketch of bed 296 in PV 3W. Bed thickness changes from 60 cm to 9 cm over 20 m in the mean downcurrent direction. Also the depositional structure changes from climbing ripple lamination to parallel lamination.

explanation for downcurrent changes in sedimentary structures might be that slight changes in the morphology of the basin floor caused a readjustment in the rate of deceleration and deposition of the turbidity current (Kneller and Branney, 1995). This facies is equivalent to the basal part of some silt-mud couplets or sand-mud couplets of Ghibaudo (1992).

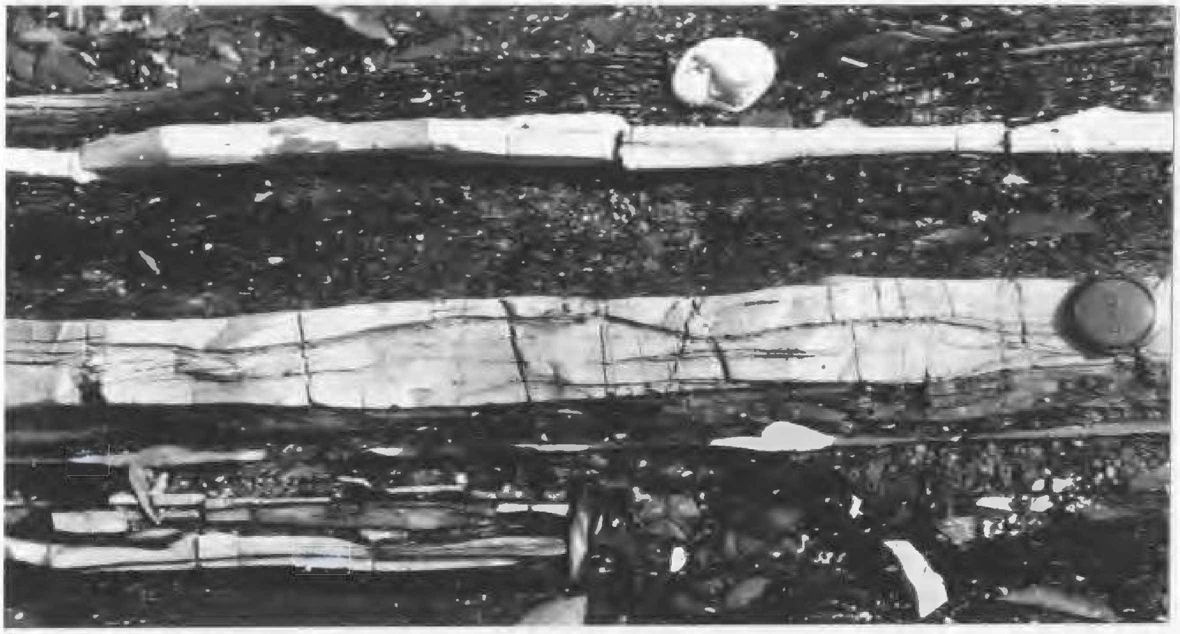
3.1.13 Facies 7 description: thinly bedded, laminated sandstones or siltstones

Beds assigned to Facies 7 are similar to beds of Facies 6, but are thinner and finer: less than 10 cm thick and mainly composed of silt and very fine-grained sand (Fig. 3.10). Sedimentary structures are mainly wavy, parallel and convolute lamination, with only rare ripple lamination and no climbing ripple lamination. The beds are laterally persistent, and very tabular in shape, except for those beds containing ripple lamination which may be lenticular. Sole markings are rare. Round to elliptical sections of burrows are present on the soles of a few beds. Burrow diameters are less than 0.5 cm, while elliptical, oblique sections through similar burrows are less than 3 cm in length. This facies accounts for 3.8% of the total measured thickness (Table 3.1).

3.1.14 Facies 7 process interpretation

The deposition of this facies was similar to that of Facies 6. This facies probably indicates more distal deposition in the sense of evolving flow velocity and

A



B

Figure 3.10 **Facies 7: thinly beded, laminated sandstones or siltstones. A, picture was taken in Section PV8, bed 110 (37.37 - 37.47 m). Camera lens cap is 5 cm in diameter; B, picture was taken in Section PV8, bed 98 (32.00 - 32.5 m). Notebook size is 11.5×17.7 cm.**

thickness of a low-density turbidity current. This facies corresponds to the basal part of the silt-mud couplets or mud-silt couplets of Ghibaudo (1992).

3.1.15 Facies 8 description: sandstones containing large laminated slabs

This facies is characterized by laminated slabs of very fine-grained sand-to-silt size material (Fig. 3.11), which are so numerous that one might imagine them once fitting together to form a continuous layer along the outcrop. The similar appearance of all the slabs is consistent with their origin from a single layer. In some cases, irregular masses of coarse sand are scattered within the bed. Other characteristics of Facies 8 are quite similar to those of Facies 1. The beds show normal grading. This facies accounts for only about 0.6% of the total measured thickness (Table 3.1).

3.1.16 Facies 8 process interpretation

Original sediment deposition is believed to have been like that for Facies 1. Therefore, original beds resembled the sand-mud couplets of Ghibaudo (1992). The laminated slabs, because of their similar appearance and sheer abundance, are believed to not be true clasts. Instead, it is hypothesized that two successive turbidity currents deposited "quick" beds, separated by a laminated top belonging to the lower bed. Subsequently, another passing turbidity current exerted such a strong shear stress on the sea bed that the laminated layer was distorted and rolled to form folded masses of very fine sand to silt. Because the lower sand had a high water content, it probably partly liquefied so that the distorted fine-grained masses gradually sank to form large

A

B

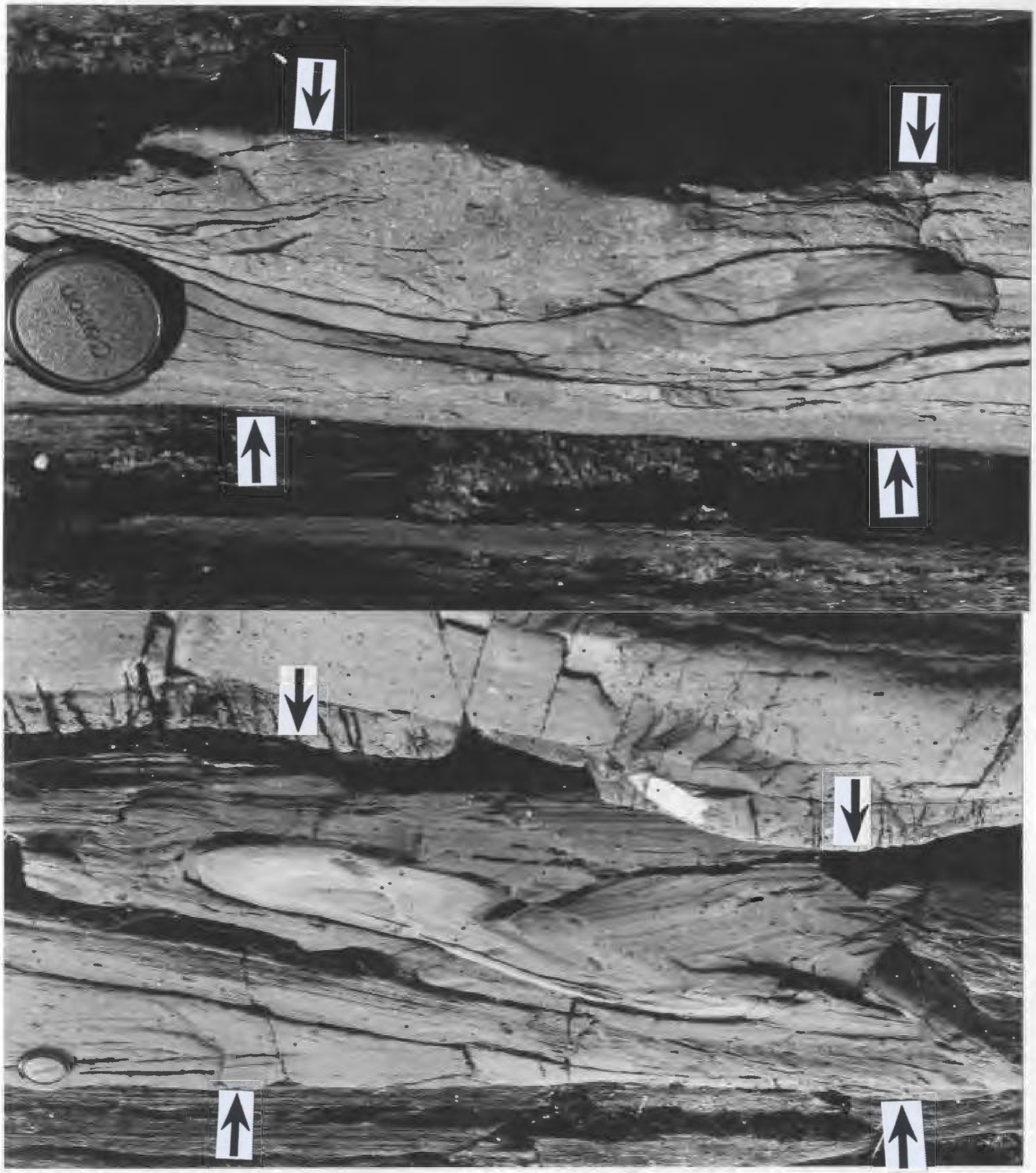


Figure 3.11 Facies 8: sandstones containing large laminated slabs. Bed bases and tops are marked with arrows. Camera lens cap is 5 cm in diameter. A, picture was taken in Section PV5, bed 108 (34.50 - 34.75 m); B, picture was taken in Section PV13, bed 420 (107.11 - 107.65 m).

pseudo-clasts. The currents that triggered deformation and sand liquefaction in this facies apparently by-passed the area, leaving only local lenses of very coarse sand which also gradually sank into the partly liquefied sandy substrate.

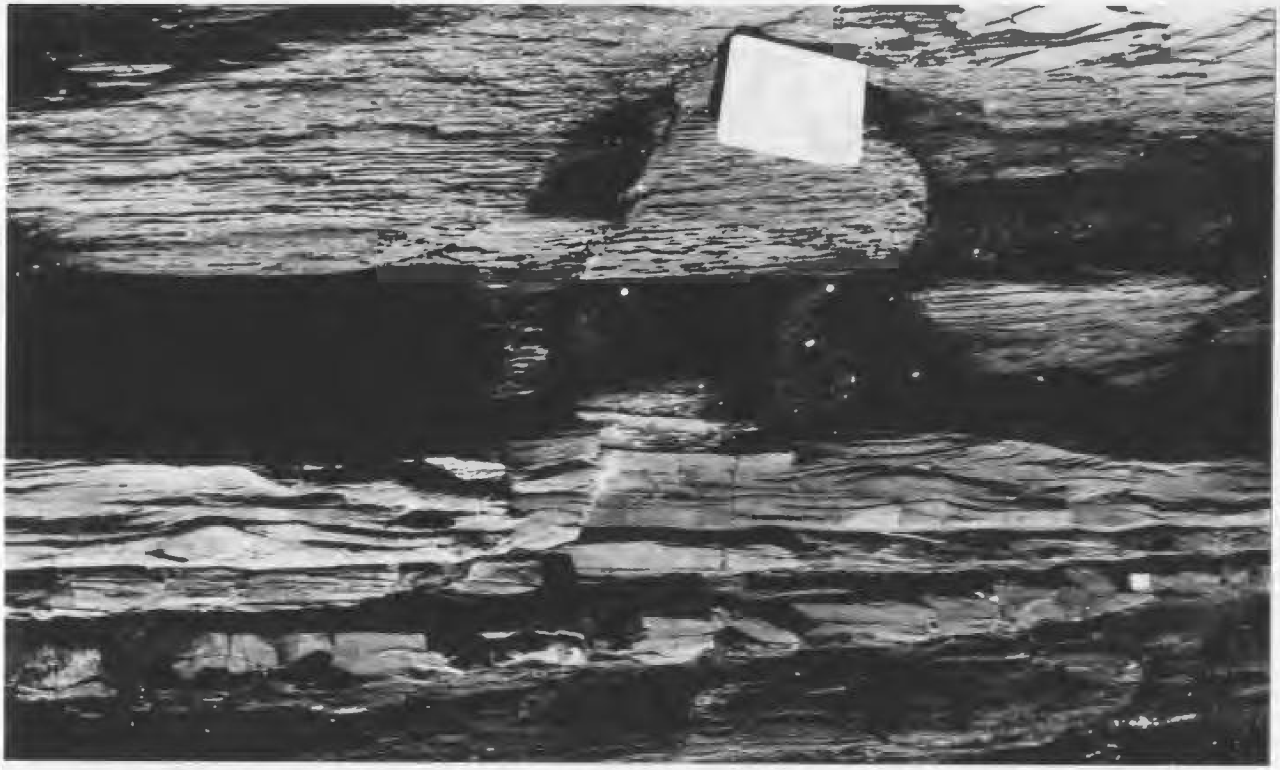
3.1.17 Facies 9 description: sandstones with bidirectional paleoflow indicators (Megaturbidite)

Beds assigned to Facies 9 are identical to beds described by Pickering and Hiscott (1985) from the St-Hélier member of the Cloridorme Formation. The most important feature of this facies is that sedimentary structures at different levels in the same bed indicate different paleoflow directions (Fig. 3.12). Usually, the flutes at the base point eastward, whereas the first set of ripples or climbing ripples above the base point westward. In one case, the ripples or overturning of convolute laminations above the climbing ripples indicate renewed eastward flow. Facies 9 sandstones are very rare in the studied sequence, accounting for only 0.24% of the total measured thickness (Table 3.1). The sandy divisions of each bed are together less than 12 cm thick and are overlain by a thick mud cap that is featureless except for dolomitic concretions that preferentially occur at this level in the bed. Sharp grain size breaks from medium to fine sand size occur at some paleoflow breaks. Clasts are rare. These beds are very persistent laterally. Figure 3.11 gives an example of this facies.

3.1.18 Facies 9 process interpretation

As Pickering and Hiscott (1985) proposed, this type of sandstone bed was

A



B

Figure 3.12 Facies 9: sandstones with bidirectional paleoflow indicators (Megaturbidite). Left = west; right = east. Pictures were taken in Section PV2, bed 120 (47.82 - 47.94 m). Notebook resting on the mud cap has a size of 11.5×17.7 cm. A, ripples indicate flow from first west to east and then east to west; B, flutes on the base of the same bed indicate flow from west to east.

probably emplaced by a very large, powerful turbidity current which had been deflected or reflected one or more times from the margins of a laterally constricted basin. Unlike the sandstone beds studied by Pickering and Hiscott (1985), Facies 9 sole marks support an initial eastward current direction, up the inferred local paleoslope (i.e. opposite to the predominant paleoflow in the Petite-Vallée member; see Pickering et al., 1986, for probable paleography).

3.1.19 Facies 10 description: bi-partite sandstones

This facies comprises sandstone beds with two parts separated by a bedding joint, across which an abrupt upward grain-size drop occurs (Fig. 3.13). Some beds show grading in both parts. The joint between the two parts is very even, and there may be some shale clasts along the bedding joint. The lower part has characteristics similar to Facies 1, Facies 11 or even Facies 2, whereas the upper part is very similar to Facies 4 or Facies 3. Shale clasts are more common in the upper part than in the lower part, so that the upper part is darker in colour. The two parts together usually have a thickness 20-30 cm. They are very persistent laterally. This facies accounts for about 0.8% of the total measured thickness (Table 3.1).

3.1.20 Facies 10 process interpretation

Parkash and Middleton (1970) interpreted this type of bed to have been deposited by a low concentration, highly turbulent current during two distinct phases -- (1) a quick bed phase and (2) another quick bed phase or a phase of deposition from

A B

C

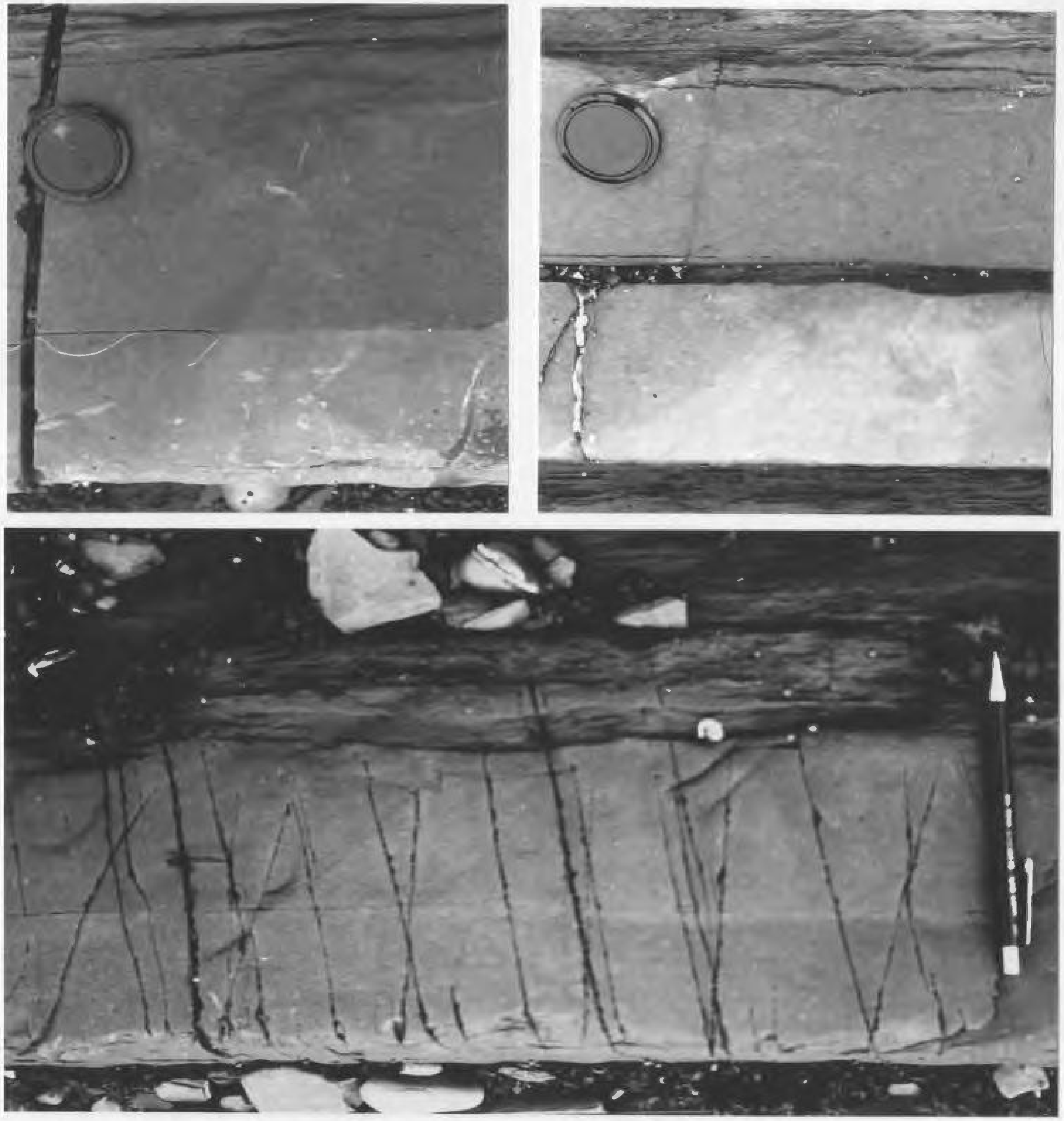


Figure 3.13 Facies 10: bipartite sandstones. A, picture was taken in Section Pv1, bed 174 (6-.15 - 60.39 m). Camera lens cap is 5 cm in diameter; B, picture was taken 5 m eastward from the same bed as A. Note a thin layer of shale separates the two parts; C, picture was taken in Section PV3, bed 230 (89.10 - 89.30 m). Pencil is 14 cm in length.

suspension. Their interpretation is mainly based on a conclusion that there is no compelling support for deposition from two successive currents. They state the following (Parkash, 1969, p.587): "If the two parts were deposited from two separate currents, the following features should be observed: (1) argillite should be present between the two parts of the bed; (2) if the argillite was deposited by the first current and later eroded along with a small portion of the lower bed by the second current, one should observe an erosional surface which is likely to be irregular at places; (3) the second current may have carried material coarser than that carried by the first current. Thus the grain size of the upper part of the bed may be coarser than that of the lower part."

However, if the upper part contains coarser material than the lower part, the two parts might have never been recognized as belonging to a bipartite bed, but rather as two separate turbidites. Further, the erosion of the argillaceous portion of a lower bed need not leave an irregular surface; many solitary turbidites have been observed here and in other formations to have flat bases. The shale clasts present along the contact in some bipartite beds might be the product of erosion. Therefore, the two parts of Facies 10 bipartite beds are interpreted in this thesis as the deposits of two successive currents with little time break in between, perhaps sharing a common trigger. The flow which deposited the upper part was always more mud rich. Some of these second flows may have been low-viscosity debris flows (cf. Facies 3).

3.1.21 Facies 11 description: thinly bedded sandstone

Thin bedding (< 10 cm) and relatively coarse grain size (medium to coarse sand) are the two most important characters of this facies (Fig. 3.14). Clasts are rare Beds are typically structureless. The tops of the beds are sharp and irregular. Some of them show wedge shape, while others have a wavy top. This facies is equivalent to Facies B1.2 of Pickering et al. (1989) -- thin bedded, coarse grained sand. This facies accounts for only 0.2% of the total measured thickness (Table 3.1).

3.1.22 Facies 11 process interpretation

The lack of internal structures, the relatively coarse grain size and the thin bedded nature suggest that these beds may have been formed by dropping of some small part of the coarse grained sediment load of vigorous density currents. Hydraulic readjustments of a turbidity current due to irregularities on the basin floor might explain such a thin sand veneer, abandoned as the main current by-passed the area and transported its load farther out into the basin (Mutti, 1977, his Facies E).

3.1.23. Facies 12 description: concretions

Concretion beds or lenses range from 5 cm to 1 m in thickness (Fig. 3.15). The levels of concretions are laterally persistent in the outcrop, and provide useful marker beds for detailed correlations. Growth of concretion lenses, especially between closely spaced sandstone beds, resulted in accentuated compaction and flexure in adjacent shale and sandstone beds. This facies is rare, and accounts for 1.9% of the

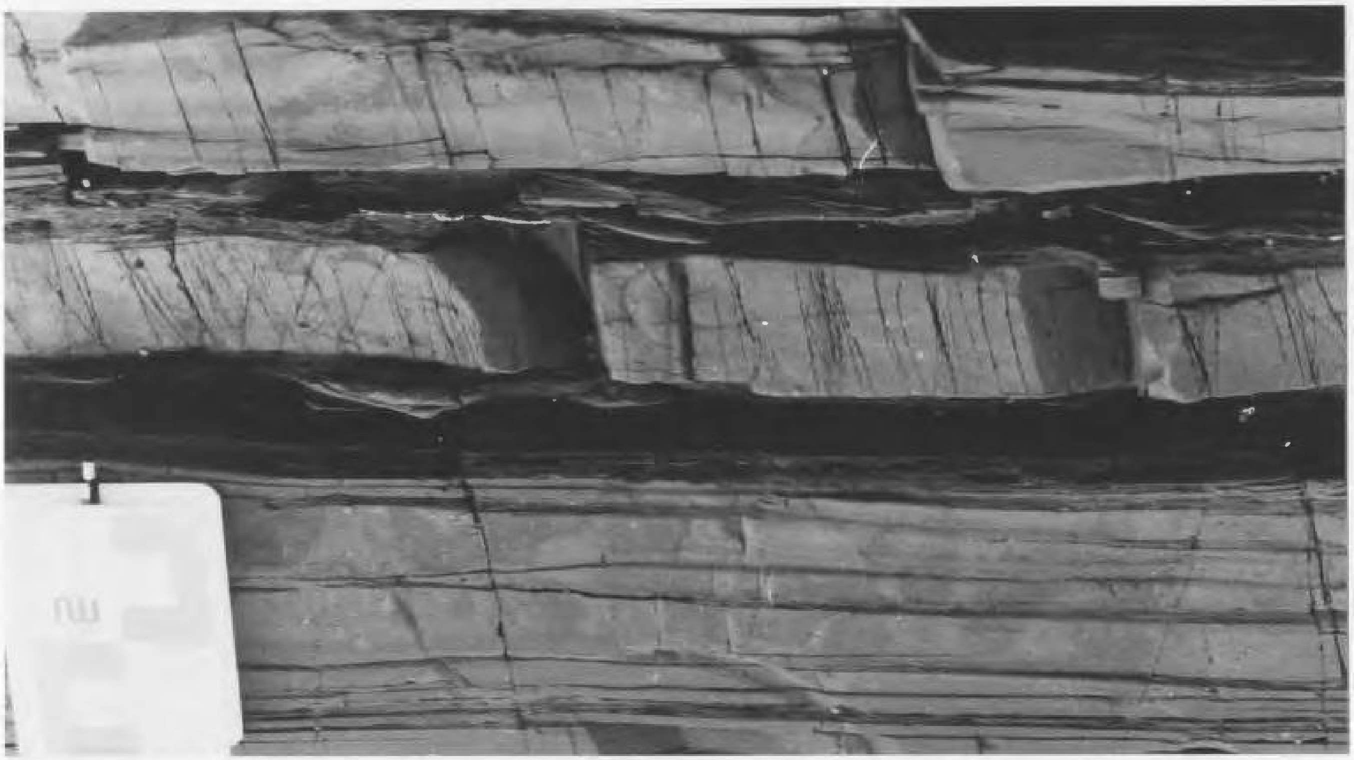
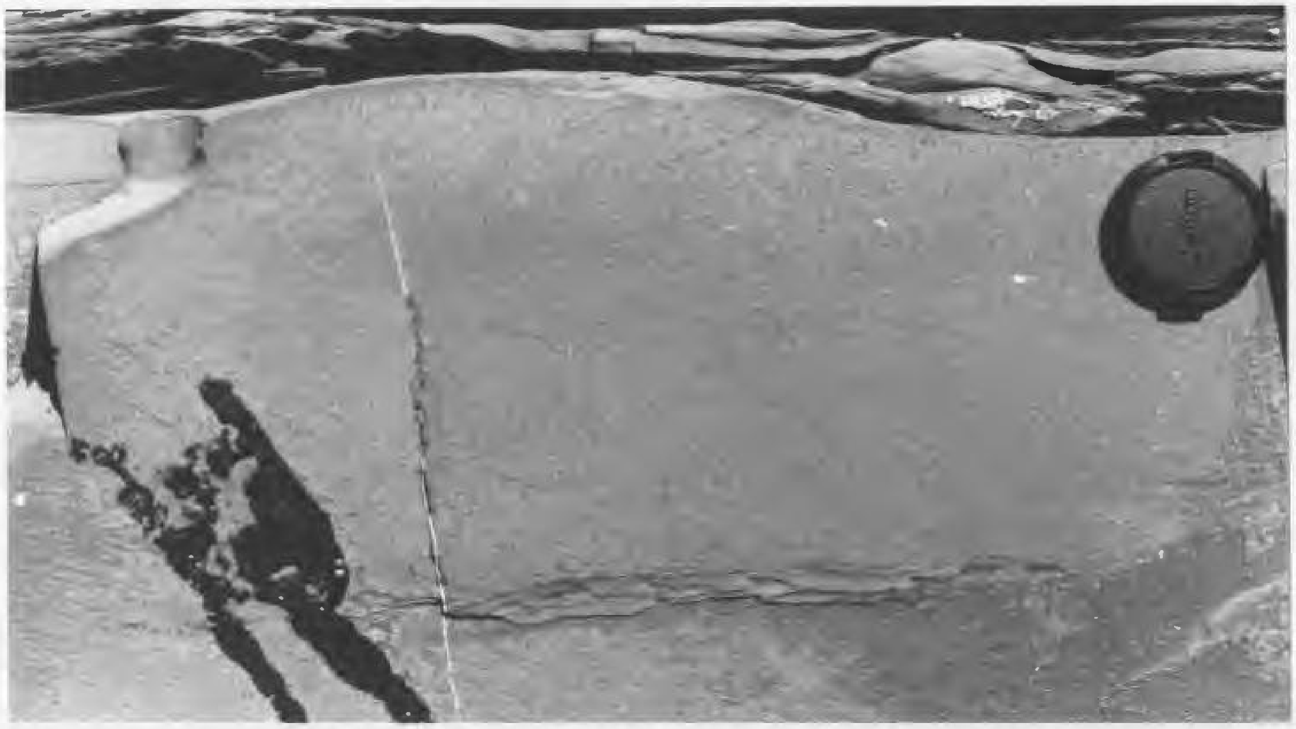


Figure 3.14 Facies 11: thinly beded sandstones. The bed in question is marked by arrows. Picture was taken in Section PV5, bed 88 - 97 (31.97 - 33.05 m). Notebook size is 11.5×17.7 cm.

A



B

Figure 3.15 Facies 12: concretions. A, picture was taken in Section PV3W, bed 206 (66.95 - 67.19 m). Camera lens cap is 5 cm in diameter; B, resistant concretion bed at Section PV4, bed 220 (73.17 - 73.33 m). Notebook size is 11.5×17.7 cm.

total measured thickness (Table 3.1).

3.1.24 Facies 12 genesis

The bending of primary beds around the concretion lenses suggests that the formation of the concretions is probably a product of early diagenesis (Raiswell, 1971). They indicate a relatively high concentration of calcium in the pore water and perhaps a reduced sedimentation rate.

3.1.25 Facies 13 description: laminated, silty mudstones

Facies 13 consists of dark grey, laminated, silty mudstones (Fig. 3.16). Very rarely, irregular very coarse to coarse sand masses are found sitting in such mudstones. The maximum dimension of the sand masses is about 2-3 cm. This is the most common facies in the outcrop between Petite-Vallée and Grande-Vallée. It represents about 62% of the succession (Table 3.1).

3.1.26. Facies 13 process interpretation

These mudstones are all interpreted as turbidites or turbidite divisions. They were probably deposited from very low density turbidity currents, which contained only fine grained material, mostly clay. These may have been the tails of sand-load currents, or flows that carried only mud (cf. Normark and Piper, 1991). The sand masses were probably dropped by by-passing turbidity currents, after which they sank into the underlying soft mud deposits. No hemipelagic mudstones have been

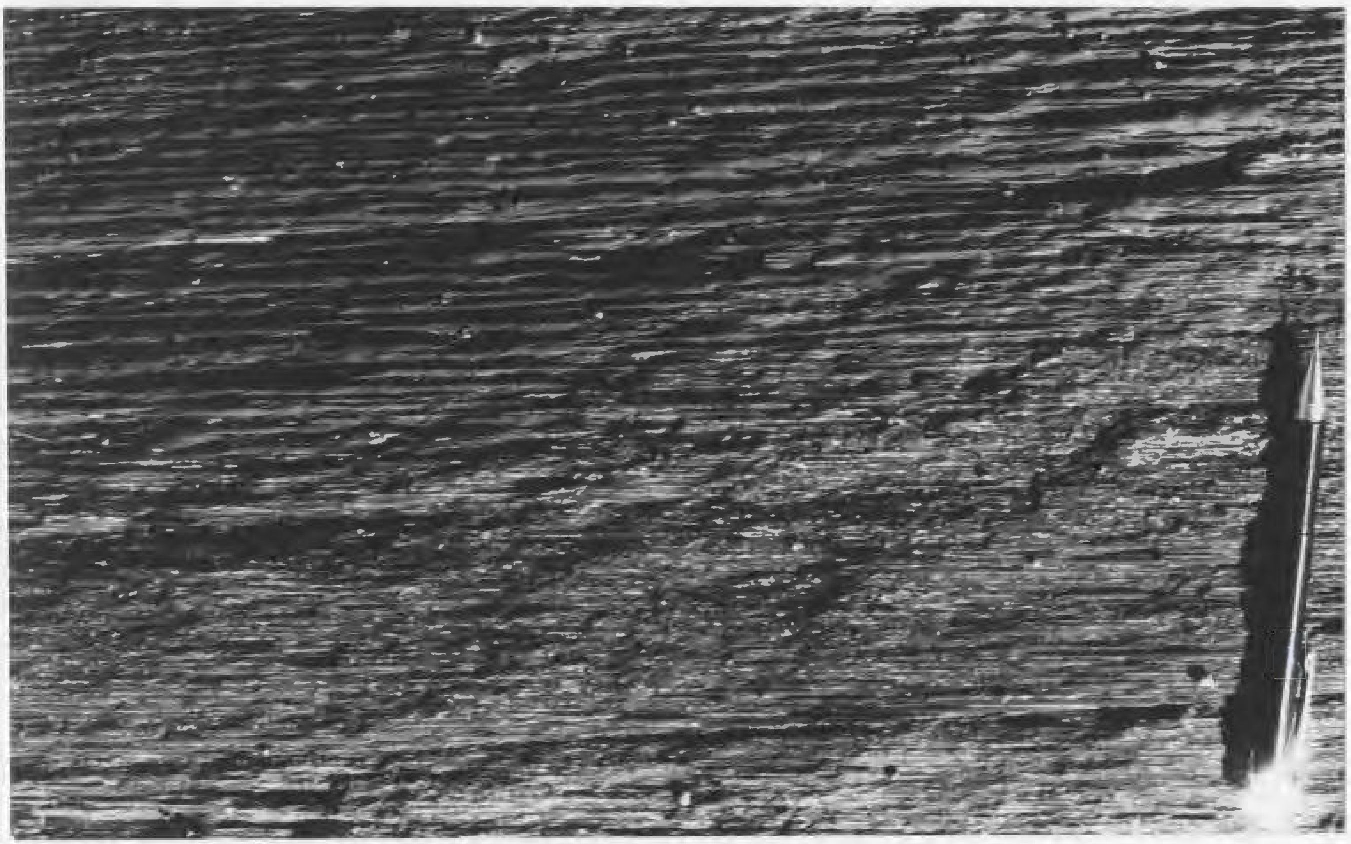


Figure 3.16 Facies 13: laminated, silty mudstone. Picture was taken in Section PV4, bed 376 (11.61 - 20.37 m). Pencil is 14 cm in length.

recognized.

3.2 Facies Associations and Environmental Interpretations

The two most well known submarine fan models were developed by Mutti and Ricci Lucchi (1972), and Normark (1970) for ancient and modern submarine fans, respectively.

Mutti and Ricci Lucchi (1972) proposed that a submarine fan is composed of (a) a channelized inner fan, (b) a middle fan with minor thinning- and fining-upward turbidite sequences, and (c) a relatively smooth outer fan with sheet-like turbidites showing thickening- and coarsening-upward sequences (Fig. 3.17).

Normark (1970) divided modern California borderland fans into three parts: (a) an upper fan with a single deep channel flanked by levees, (b) a middle fan showing a convex-upward morphology, which contains a channelled inner portion and an unchannelled outer portion, and (c) a smooth lower fan (Fig 3.18).

These two models both have radial profiles, and are complementary to one another. The major difference is that the middle fan and outer fan of the Mutti and Ricci Lucchi (1972) model correspond to the middle fan of the Normark model. Consequently, the lower fan of the Normark (1970) model is included in the basin plain of the Mutti and Ricci Lucchi model.

These two fan models provide excellent guidance in the study of the depositional environment of turbidites. However, the formation of turbidite sequences

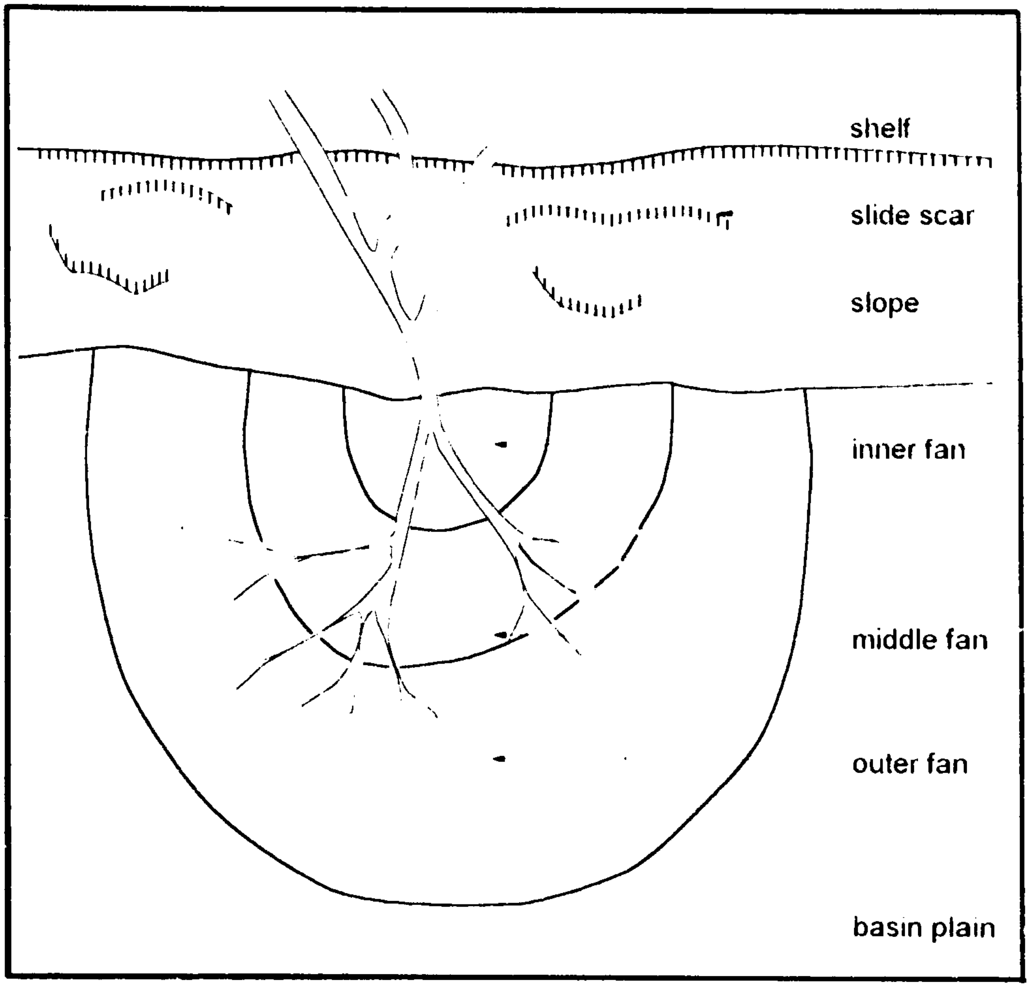


Figure 3.17 Submarine fan model of Mutti and Ricci Lucchi (1972)

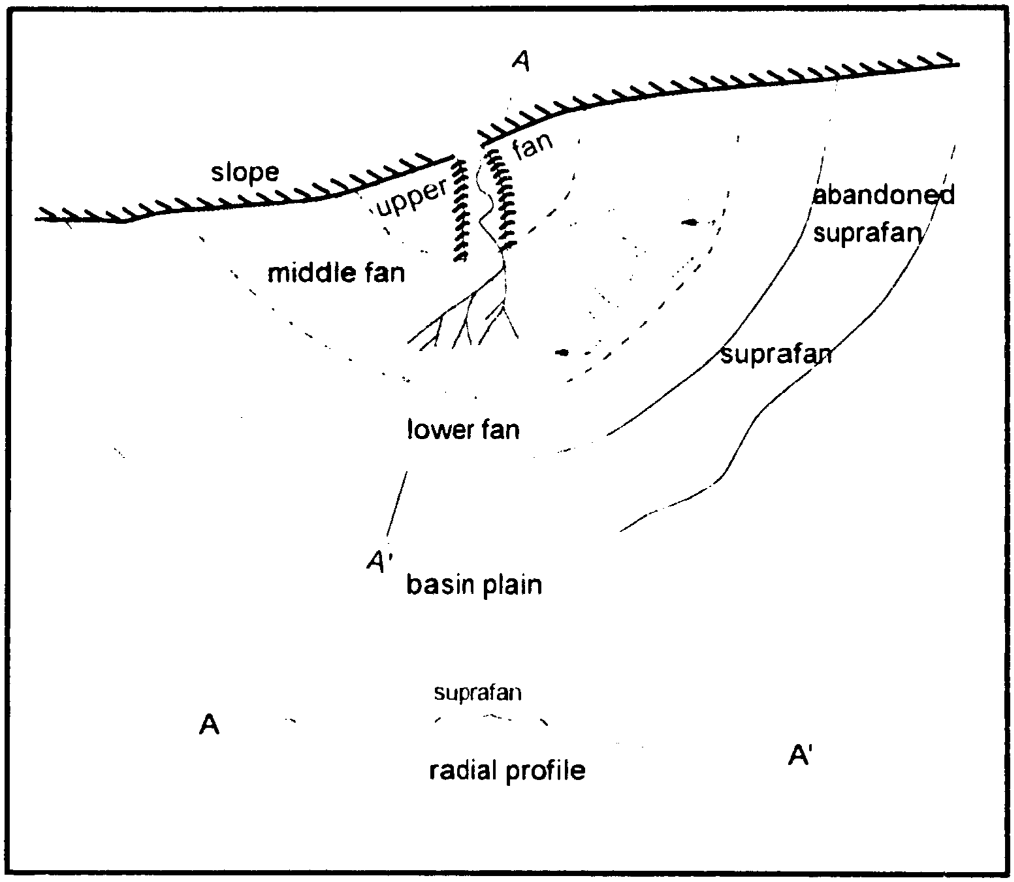


Figure 3.18 Submarine fan model of Normark (1970, 1978)

is controlled by the interaction of a number of factors, such as tectonic regime, rate of sediment supply, sea-level variation, etc. These fan models may not be appropriate for all sedimentary basins, especially elongate troughs. In many cases, elongate basins were filled both longitudinally and laterally (e.g. Nilsen and Zuffa, 1982; Hepworth et al., 1982; Nelson, 1985; Nilsen, 1985; Ricci Lucchi, 1985; Thornburg and Kulm, 1986).

The Cloridorme Formation accumulated in an elongate, narrow foreland basin. Its deposits do not appear to show consistent proximal to distal changes in the downcurrent direction (Walker, 1984). Also, well-developed vertical cycles, especially thickening- and coarsening-upward cycles, are not prominent (Appendix 1, back pocket).

During deposition of the Cloridorme Formation, turbidity currents flowed downslope toward the foreland basin from a southerly source. Some of these might have constructed fans at the basin margin, from which detritus might have been remobolized following tectonic uplift to feed turbidity currents to the axis of the elongate basin in a more distal environment (cf. Thornburg and Kulm, 1987). Other flows might have bypassed the slope, to be deflected and turned by the outer basin margin so as to travel parallel to the trough axis. Longitudinal flow was towards the west down the axial gradient. A series of transverse fans is inferred to have provided sediment for the axial sediment accumulation. Consequently, consistent downcurrent facies changes did not develop. These transverse fans were probably destroyed by subsequent tectonic activity (Walker, 1984).

Underwood and Bachman (1982) developed a facies model for trenches (Fig. 3.19). In this model, the system is composed of four major types of sediment body: (a) a trench fan, which conforms with the Mutti and Ricci Lucchi (1972) model; (b) an axial channel; (c) a non-channelized trench, in which sediments are deposited by sheet flows, the depositional setting is similar to an outer fan or basin plain, and vertical cycles are not well developed; and (d) a starved trench, with facies development like that of either a slope or basin plain. In trench fans, paleocurrents range from radial to longitudinal, whereas longitudinal currents are predominant in the other areas.

Both foreland basins and trenches are formed in convergent settings, and are elongate in shape. Therefore, the model developed by Underwood and Bachman (1982) is more appropriate for interpreting the depositional environment of turbidites in the Cloridorme Formation than simple radial models (e.g. Fig. 3.17 and 3.18).

3.2.1 Association 1: erosively based sandstone packets

This facies association is characterized mainly (>95%) by Facies 5 -- erosive sandstone. The sandstone beds are either closely spaced or amalgamated. Locally, they may intercalate with "slurry" sandstone beds. Each packet shows a lenticular shape laterally. The packets are usually less than 10 m thick. Some show an upward fining and thinning trend (e.g., the 8.12 m packet in section 3, 50.51-58.63 m;

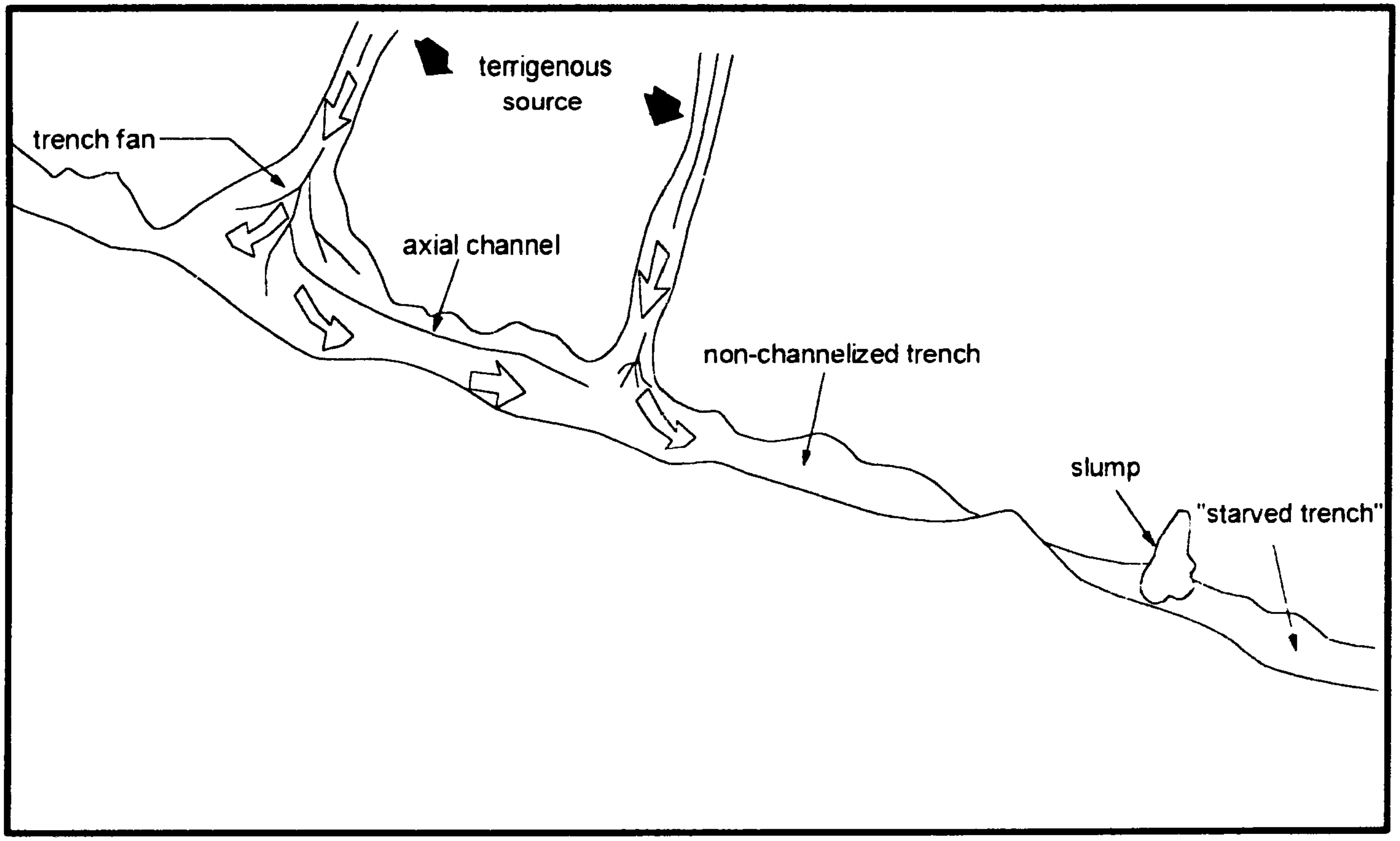


Figure 3.19 Conceptual depositional system in a trench (simplified from Underwood and Bachman. 1982)

Appendix 2, back pocket). This facies association is interpreted as the infillings of distributary channels, probably fed from a transverse fan, in the channelized part of the trough (Mutti and Ricci Lucchi, 1972; Underwood and Bachman, 1982) (Fig. 3.20).

3.2.2 Association 2: sandstones intercalated with mudstones or siltstone

This facies association is mainly composed of coarse- to fine-grained, graded sandstones -- typically Facies 1 and Facies 4; sometimes Facies 6; rarely Facies 7, Facies 8 and Facies 11. All of the sandstones are either closely spaced or intercalated with silty mudstones or siltstones. The intercalated mudstones are usually each less than 10 cm thick. Sand/mud ratio is high, about 8:2. This facies association is interpreted as non-channelized deposits of the trough (Underwood and Bachman, 1982) (Fig. 3.20). It is similar to the deposits in the outer fan or fan fringe (Mutti and Ricci Lucchi, 1972).

3.2.3 Association 3: intercalated sandstones, siltstones and silty mudstones

This facies association may contain any facies except Facies 5. However, the abundance of Facies 1 and Facies 4 sandstones is less than for facies association 2, whereas the abundance of Facies 6, Facies 11, Facies 3 and Facies 7 is greater. Sand/mud ratio is approximately 1:1. This facies association is also interpreted as non-channelized deposits of the trough (Fig. 3.20), more distal in character than Facies association 2.

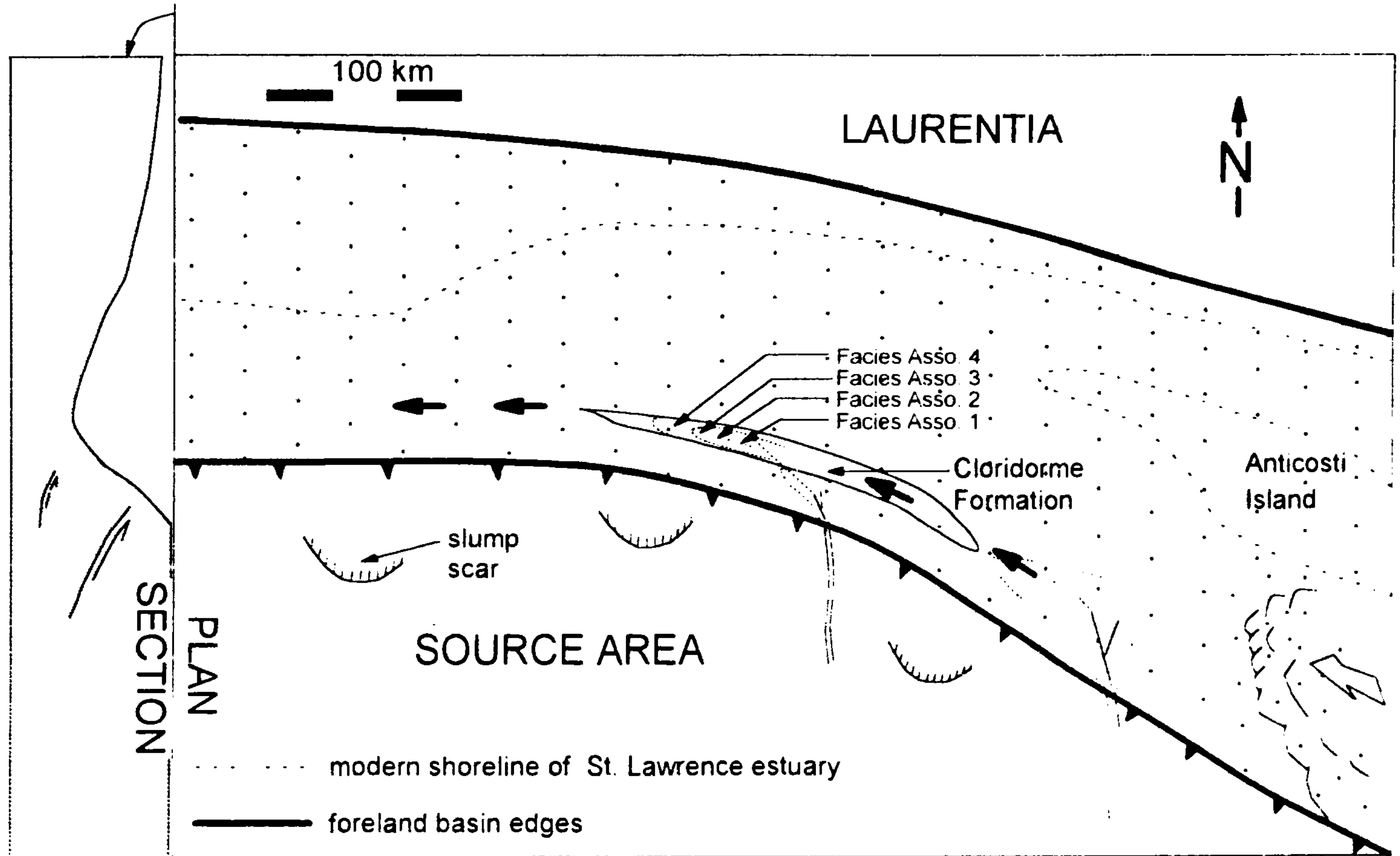


Figure 3.20 Sedimentary environment of the turbidite sequences in the field area. Longitudinal flows were derived from unpreserved transverse fan systems. The outline of the foreland basin in the Ordovician was inferred by Hiscott et al. (1986). Both margins of the foreland basin have subsequently been eroded. The Cloridorme Formation accumulated along the deepest side of the asymmetric basin, and represents only a small part of the original basin width.

3.2.4 Association 4: silty mudstones intercalated with siltstones or sandstones

This facies association is characterized mainly by laminated silty mudstones, which may intercalate with siltstones or more thinly bedded sandstones. Sand/mud ratio is very low, about 2:8. This facies association probably represents a period when the part of the trough was starved of coarse clastic material (Underwood and Bachman, 1982) (Fig. 3.20). The setting is similar to the basin plain environment of Mutti and Ricci Lucchi (1972).

Because foreland basins form in convergent margins, the deposition of facies is probably controlled more by tectonics than by other factors. The lack of coarse material in this facies association might indicate that tectonic uplift in the source was reduced. However, intrabasinal processes like distributary channel switching or diversion of sand-load turbidity currents around tectonically-generated obstacles in the basin cannot be ruled out (cf. Thornburg and Kulm, 1987).

There is no evidence for or against sea level changes as a control on sand delivery to the foreland basin. Moreover, the high inferred accumulation rate of 400 m/m.y. (Hiscott et al., 1986) require very rapid changes to produce the observed contrasts between facies associations, and for this a tectonic engine seems most probable in the Middle Ordovician foreland basin.

CHAPTER 4

SANDSTONE CONTINUITY AND ITS CONTROLLING FACTORS

A single sequence of correlated turbidites extends continuously for 3 km between sections PV1 and PV9. The base of this sequence is a megaturbidite that shows reversed current directions and is capped by a very thick and laterally persistent concretion bed. The top of this sequence is a packet of sandstone beds (including B' bed of Fig. 2.7) that are amalgamated at most of the localities. Concretion nodules are found in the uppermost of these sandstone beds. The maximum thickness of the entire correlated sequence is 26.28 m in the east (PV9), and the minimum thickness is 17.76 m in the west (PV1). The sequence thins downcurrent at a rate of 2.84 m/km, confirmed by tape measurement (Table 2.1).

Using marker beds such as concretion beds, thin dolostone layers, and tuff beds, the correlated sequence can be subdivided into five parts for the convenience of bed-by-bed tracing (Fig. 4.1, back pocket). The turbidites of Unit A are Facies Association 4 deposits, while Units B, C, D, and E consist of Facies Association 2 deposits. Units thin rather uniformly in the downcurrent direction, except for Unit E at section PV7, where faulting has removed about 1.5 m of the unit. Individual bed correlation was carried out by literally walking the beds out along the strike in the downcurrent direction. Some beds taper very uniformly in the downcurrent direction. Many beds terminate abruptly.

4.1 Statistics of Bed Continuity and Bed Length

In total, 94 beds were traced. No sills were included. Only 27 of the 94 beds (28.7% of the total) can be traced for 3 km (the bases of which are numbered 1 - 27 in Fig. 4.1, back pocket); the other 67 beds have at least one termination in the 3 km-long outcrop window. Nine of the 27 beds are locally discontinuous. This result is similar to the results presented by Enos (1969a), confirming that the continuity of sandstone beds in this sequence is very low.

The distribution of bed length is shown in Figure 4.2. The data on which this figure is based are presented in Appendix 3. Because the outcrop is truncated at its upcurrent and downcurrent ends, the lengths of beds that extend beyond section PV1 and/or section PV9 are undetermined. These are unlimited/partial lengths of Cossey (1994). Partial lengths are included in Figure 4.2 for $L \leq 3.3$ km. In reality, such beds must be longer than their partial exposed length, so that the "field data" line in Figure 4.2 B should really shift somewhat to the right as X increases.

When the logarithm of bed length, L, is plotted against the percentage of beds longer than L, the field data fall close to a straight line defined by the linear regression equation:

$$Y(\%) = -49(\log L) + 200 \qquad (4.1)$$

where L is bed length in meters, and Y is the percentages of beds longer than L. The standard error of Y is 2.8, while the standard error of L is 21.4. The regression

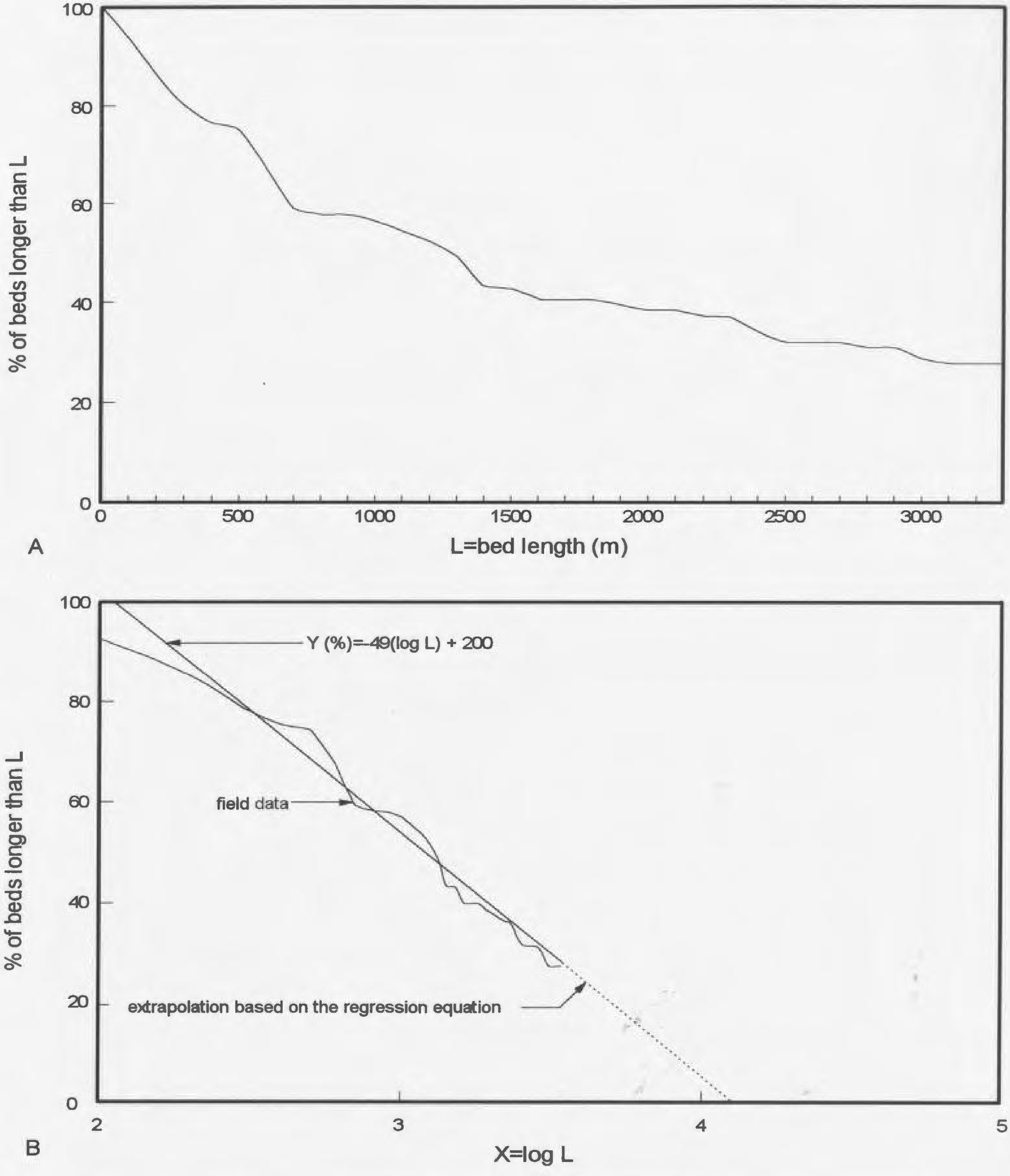


Figure 4.2 Sandstone bed length distribution. A percentage of beds longer than L vs L.
B percentage of beds longer than L vs log L.

coefficient r^2 is 0.98, very close to the value of 1.0 that would characterize a perfectly linear data set. Using equation 4.1, the percentages of beds longer than 1000 m, 3000 m, 5000 m, and 10,000 m are estimated to be 53.0%, 29.6%, 18.8%, and 4% respectively. The longest bed (Y=0) is estimated at 12 km. Note that because some beds are partial, these percentages and the longest bed length are underestimated. One method to refine these estimates would be to use the Figure 4.3 B distribution as input into probability estimates (Geehan and Underwood, 1993) -- iterative modifications to the distribution curve could be designed so as to converge on estimates of the percentages of partial and unlimited beds similar to the observed field values.

In addition to plotting Y vs log L, plots of log Y vs L and log Y vs log L were investigated for linearity. Regression coefficients were lower for these two other formats (r^2=0.96 and 0.92, respectively). Note that a plot of log Y vs log L is conceptually like plots of power-law distributions of bed thickness and bed volume (Hiscott et al., 1992; Rothman et al., 1994). One might expect bed length to have a similar power-law distribution function under the assumptions that L $\propto$ bed volume, V, and Y $\propto$ percentage of beds with volume greater than V. Because this study aims to predict with a minimum of uncertainty the percentages of beds longer than 3 km, I only present Equation 4.1, which gives the best straight-line fit to the data.

In addition to uncertainties resulting from the presence of partial and unlimited beds, one must be careful in interpreting Figure 4.2 and Equation 4.1 for other reasons. For example, unchannelized sand beds are probably crudely elliptical in planview shape. A two-dimensional vertical section through such an elliptical deposit having a major axis of α km, say, can vary in apparent length from essentially zero to α km. Hence, bed lengths measured in outcrop are likely all underestimates of the maximum bed dimension. Also, the observation that beds vary in length from only a few meters to an upper estimate of 12 km may give a false impression that bed dimensions have wide variation. A more restricted range of true bed dimensions could give the same apparently wide range of bed lengths simply as a result of the outcrop cutting each bed at a different distance from its major axis.

4.2 Bed Termination Types

Nine types of sandstone-bed termination were recognized in the field (Fig. 4.3). Description of each termination type follows:

4.2.1 Type 1 termination: beds feeding injections

This type of termination occurs in Facies 4 sandstone beds where loss of sand to feed injections caused the bed thickness to vary dramatically. Mounded tops characterize some parts of these beds, whereas at other localities the same bed rapidly thins to < 1 mm (Fig. 4.4). Where such a rapid bed-thickness change occurs, the bed appears to terminate. Even though this kind of bed termination is only "apparent", the very thin bed remnant could not always be traced with certainty along the outcrops, particularly across faults. In such cases, the bed was declared to have terminated, even though it might re-thicken farther downcurrent. If this were to happen, the rapidly-

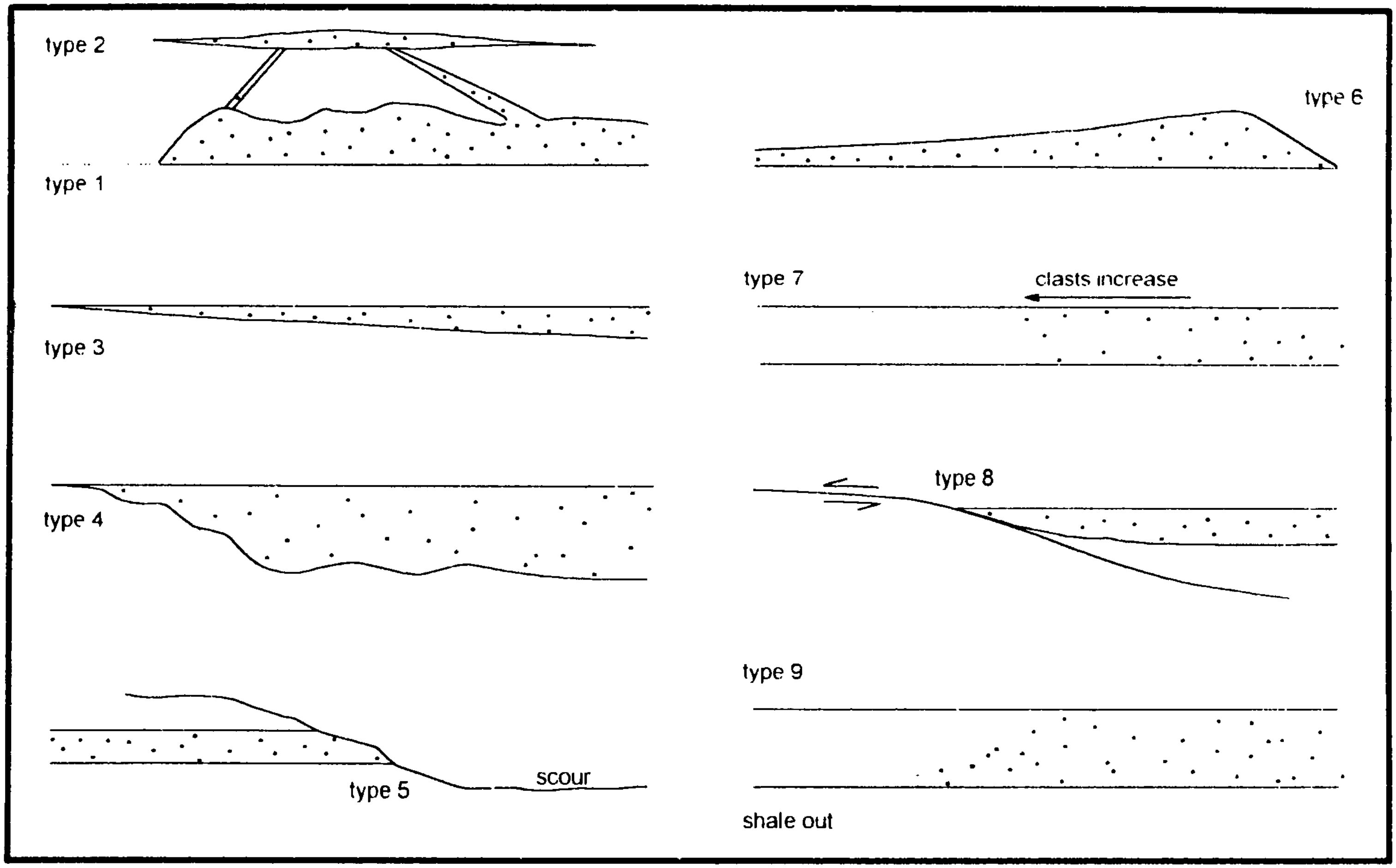


Figure 4.3 Geometry of the termination types. Stipple=sandstone. Dashes or no pattern=shale. Scale varies from about 1 cm = 1 m to 1 cm = 50 cm.

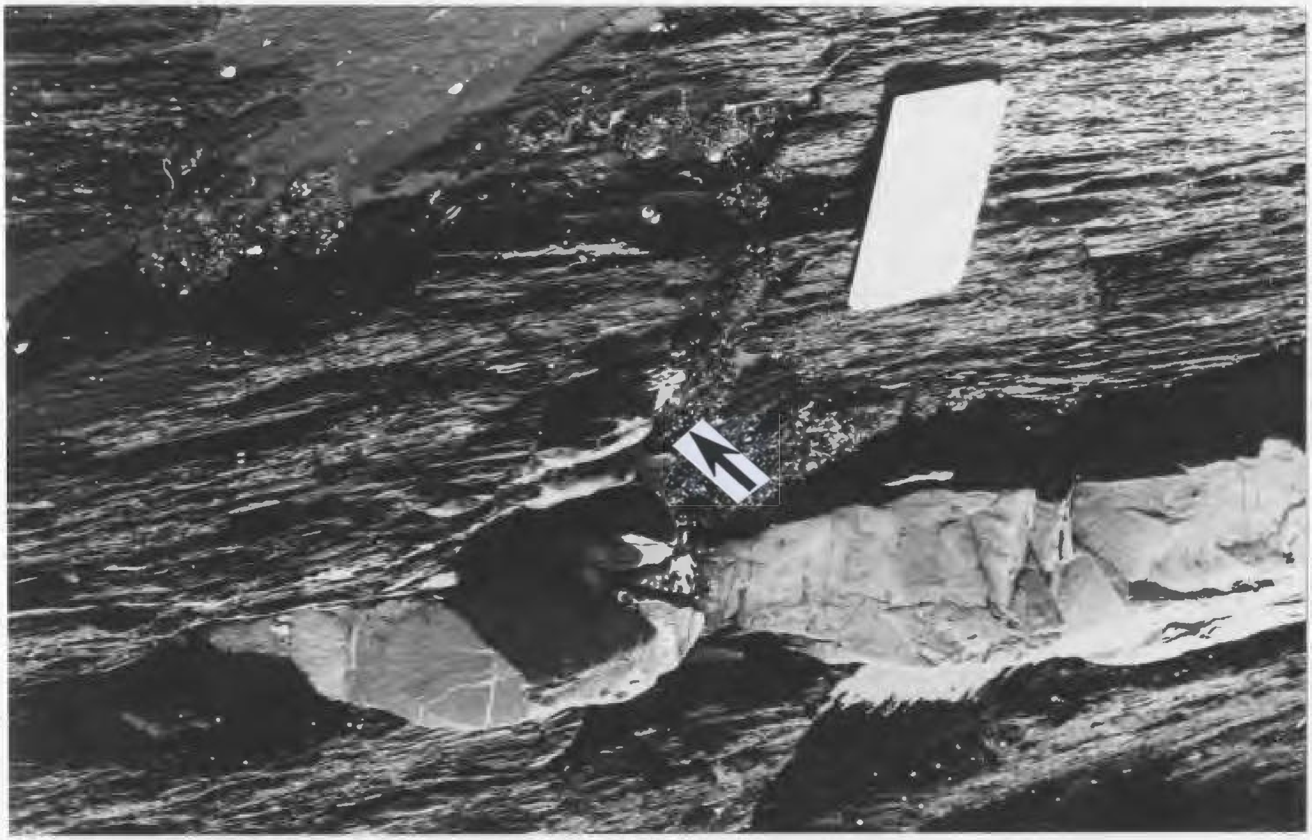


Figure 4.4 Type 1 termination: beds feeding injections. Picture was taken in Section PV5, bed 120 (42.07 - 62.36 m). Notebook size is 11.5×17.7 cm. Dyke (arrow) extends upward from the top of the bed

thickened downcurrent bed would be recognized as a different deposit. Fortunately, this type of termination is uncommon, so that such potential errors in evaluating true bed continuity are reduced.

4.2.2 Type 2 termination: sills

Sills are not included in bed-continuity statistics (e.g. Table 4.1) because they are not primary deposits. However, their shapes and terminations are described here for completeness and comparison. Sills are characterized by a pinch-and-swell shape. Most sills do not persist for a long distance. They have eastern and western terminations on the outcrop. Commonly, dykes can be recognized feeding the sills from below (Fig. 4.5). At one level (Unit D, Fig. 4.1), two sills change stratigraphic position several times over a strike length of ~ 1 km (from the beginning of section PV4 to the end of section PV1).

4.2.3 Type 3 termination: gradual taper

This type of termination occurs by gradual upcurrent and downcurrent thinning of the bed. It is impossible to illustrate such terminations with photographs. These beds have quite smooth and planar bases and tops. They normally are composed of fine-grained sand.

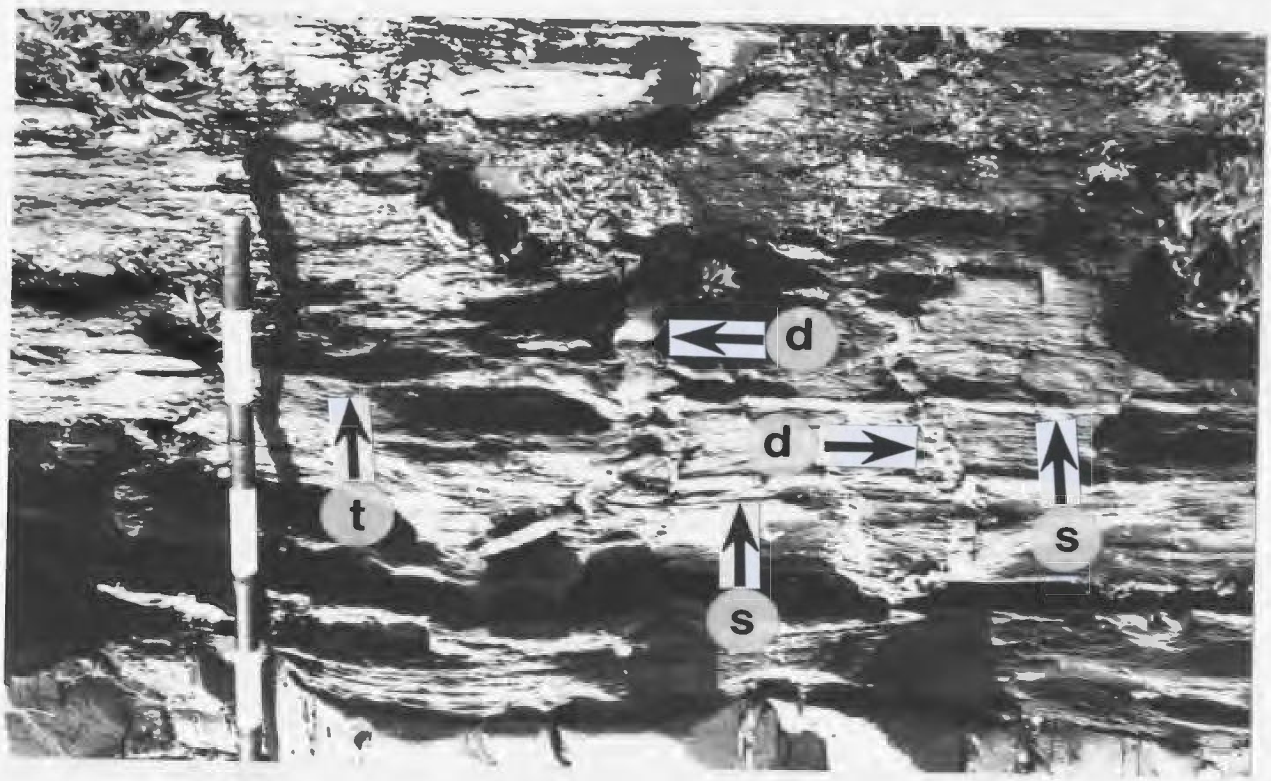


Figure 4.5 Type 2 termination: sills. Picture was taken in Section PV1, bed 85 (26.40 - 28.14 m). Sills, bed termination and dykes are marked by arrows with letters s, t and d, respectively. Scale divisions are 10 cm.

4.2.4 Type 4 termination: scour-and-fill geometry

A scoured base characterizes beds showing this type of termination. Terminations normally have a wedge shape with a flat top (Fig. 4.6). The bed thickness changes rapidly, forming lenticular sand bodies. This type of termination normally occurs in Facies 5 and Facies 6 sandstone beds.

4.2.5. Type 5 termination: erosional truncation

A bed showing this kind of termination normally has a widespread truncated top produced by erosion beneath a subsequent, vigorous turbidity current (Fig. 4.6). This second current may or may not have left deposits (e.g., the irregular sand masses found in laminated shale probably indicate that a turbidity current by-passed with little more than a trace of a deposit). The bed pinches out where erosion removed the deposit completely. Commonly, beds showing this type of termination are associated with beds showing Type 4 terminations.

4.2.6 Type 6 termination: depositional mounds

The single bed with this type of termination has a wedge shape with a flat base (Fig. 4.7). The termination is abrupt. There are no internal structures in this bed.

4.2.7 Type 7 termination: shale-clast "nests"

Some beds appear to be discontinuous because enormous shale clasts occupy the entire thickness of the bed at some localities. The shapes of these apparent

Figure 4.6 Type 4 (T4) termination, scour-and-fill geometry; and Type 5 (T5) termination, erosional truncation. The T4 bed on the right (east) truncates the cross-laminated T5 bed on the left (west). Arrows mark the erosional surface. Picture was taken in Section PV11, bed 152 (48.28 - 48.97 m). Camera lens cap is 5 cm in diameter.

Figure 4.7 Type 6 termination: depositional mounds. The flat based bed beneath the notebook terminates from left to right at the arrow. Picture was taken in the structural block between Section PV5 and Section PV6. Notebook size is 11.5×17.7 cm.

terminations depend on the shapes of the clasts (Fig 4.8). This type of termination normally occurs in Facies 3 sandstone beds, in which shale clasts are abundant. These shale clast "nests", devoid of sandstone matrix, may extend for such a long distance that sandstone beds separated by nothing but shale cannot be correlated with certainty. In such cases, the two sandstones at opposite ends of a shale clast "nest" might be recognized as two different turbidites. During bed tracing, only those beds that could be traced with certainty were noted to be continuous along the outcrop. All other beds were declared to be discontinuous.

4.2.8 Type 8 termination: faulting

Every effort was made to exclude discontinuities caused by faulting from statistics of sandsione bed continuity (e.g., the trust faults in section PV 7 which tectonically thin the turbidite section by about 25 m west of the section -- Fig. 2.7). One termination in the traced section is suspected to result from near-bedding-parallel faulting (Fig. 4.9), because it is associated with a slickensided surface.

4.2.9 Type 9 termination: gradual passage into shale

Several beds of Facies 2 (mud-rich slurry sandstone beds) appear to pass gradually into shale (Fig. 4.10). These terminations could not be precisely located because these muddy beds commonly weather in a recessive manner, like shale, and their colour is the same as the surrounding shale. Enos (1969a) also mentioned this type of termination in Greywacke and type 2 calcisiltite beds.

Figure 4.8 Type 7 termination: shale-clast "nest". Shale clasts in the bed between the arrows increase to the right where they form 100% of the deposit. Picture was taken in Section PV2, bed 127 (54.55 - 54.66 m). Notebook size is 11×17.7 cm.

Figure 4.9 Type 8 termination: faulting. The slickensided surface cutting obliquely from left to right (arrow) is probably a fault plane that results in apparent termination of bed on the left. Picture was taken in Section PV9, bed 165 (60.71 - 60.98 m). Scale divisions are 10 cm.

Figure 4.10 Type 9 termination: gradual passage into shale. The bed below note book, resistant on the right, becomes recessive to the left and resembles shale Facies 13. Picture was taken in Section PV7, bed 264 (96.74 - 96.92 m). Notebook size is 11.5×17.7 cm.

4.3 Factors Controlling Sandstone Bed Continuity

In the traced section, terminations were examined in 60 of the 67 discontinuous beds. Both ends were examined in 14 of these 60 beds, so that a total of 74 bed terminations were examined. The percentage of each type of termination is given in Table 4.1. Two-thirds of all terminations consist of types 3, 4 and 5 (Fig. 4.3).

type	1	2	3	4	5	6	7	8	9
No.	8	n.a.	17	23	10	1	8	1	6
%	10.8	n.a.	23.0	31.1	13.5	1.4	10.8	1.4	8.1

Table 4.1 Percentage of each termination type (sills of type 2 excluded)

Although Enos (1969a) noted a similar number of discontinuous beds, he only described two types of terminations: shingling and shaling out. He ascribed the shingling of beds to the progressive filling of the elongate trough from the east to the west, whereby localized seafloor depressions were created by differential deposition by the preceding currents. Enos did not give any explanation for the termination of beds that shale out.

Based on observations made for this thesis, significant causes of bed discontinuity include the following: (a) scour, with or without flow bypassing, and focussed deposition in scours (Types 4 and 5 = 44.6% of terminations), (b) liquefaction and sand redistribution (Type 1 = 10.8% of terminations), (c) masking of bed continuity by extensive "nests" of shale clasts, some of which were generated by liquefaction and foundering of the fine-grained tops of beds (Type 7 = 10.8% of terminations), and (d) apparent lateral changes in the texture of watery debris flows (Type 9 = 8.1% of terminations). The shingled geometry of termination described by Enos has not been recognized. Instead, it is believed that scour and fill accounts for the geometry he described.

Terminations resulting from depositional thinning on unscoured surfaces (Types 3 and 6 = 24.4% of terminations) require patchy deposition over length scales of tens to hundreds of meters. This might result either from flow non-uniformity (Kneller and Branney, 1995) or from the influence of long-wavelength seafloor irregularity, perhaps caused by depositional topography (e.g. lobe switching), tectonic processes (e.g., synsedimentary faulting, basin tilting), or extensive subsurface liquefaction. The extent of local scouring and evidence for current bypassing suggest that the seafloor was probably not flat. Its microscale and mesoscale topography (*sensu* Normark et al., 1979) are believed to have controlled and localized deposition from unsteady, non-uniform, and locally meandering (Parkash and Middleton, 1970) turbidity currents. The abundance of shale clasts in this part of the Cloridorme Formation is consistent with there having been a rough eroded seafloor and features with local mesoscale relief, where erosion to provide mud clasts might have been focussed.

Evidence for both progressive and abrupt shifting in the location of turbidite deposition is provided by a plot of best-guess depocentres of the traced beds (Fig.

4.11). In this plot, the best-guess depocentre of each bed is approximated by the centre of each bed length measured within the interval of detail bed tracing (sections PV1 to PV9). Even though these points do not represent the actually depocentres of sandstone deposits which are partial or unlimited, their relative position gives an idea of the direction of shifting of the depocentre of successive turbidites, particularly where the depocentre shifted from the west to the east of the outcrop window, or *vice versa*.

As explained in Chapter 3, Facies Association 1 is interpreted to represent the fillings of distributary channels fed from one or more transverse fan (Fig. 3.20), whereas Facies Associations 2, 3, and 4 represent axial deposits of an outer fan, fan fringe, and basin plain, respectively.

In the traced section (Fig. 4.1, back pocket), Units B, C, D, and E are classified as Association 2 deposits (= outer fan), while Unit A is classified as Facies Association 4 deposits (= basin plain). Beds in Unit A tend to be relatively persistent, while beds in Units B, C, D, and E tend to be less continuous. Beds in Unit A are mainly thin siltstone/very fine grained sandstone beds with parallel lamination or ripple lamination, distributed in thick shale packets. They probably accumulated beneath relatively thick low-density turbidity currents that were uninfluenced by the mesotopography of the basin floor.

Most of the sandstone beds in Units B, C, D, and E are coarser than the beds in Unit A. Scours and flutes are relatively common, suggesting that the depositing

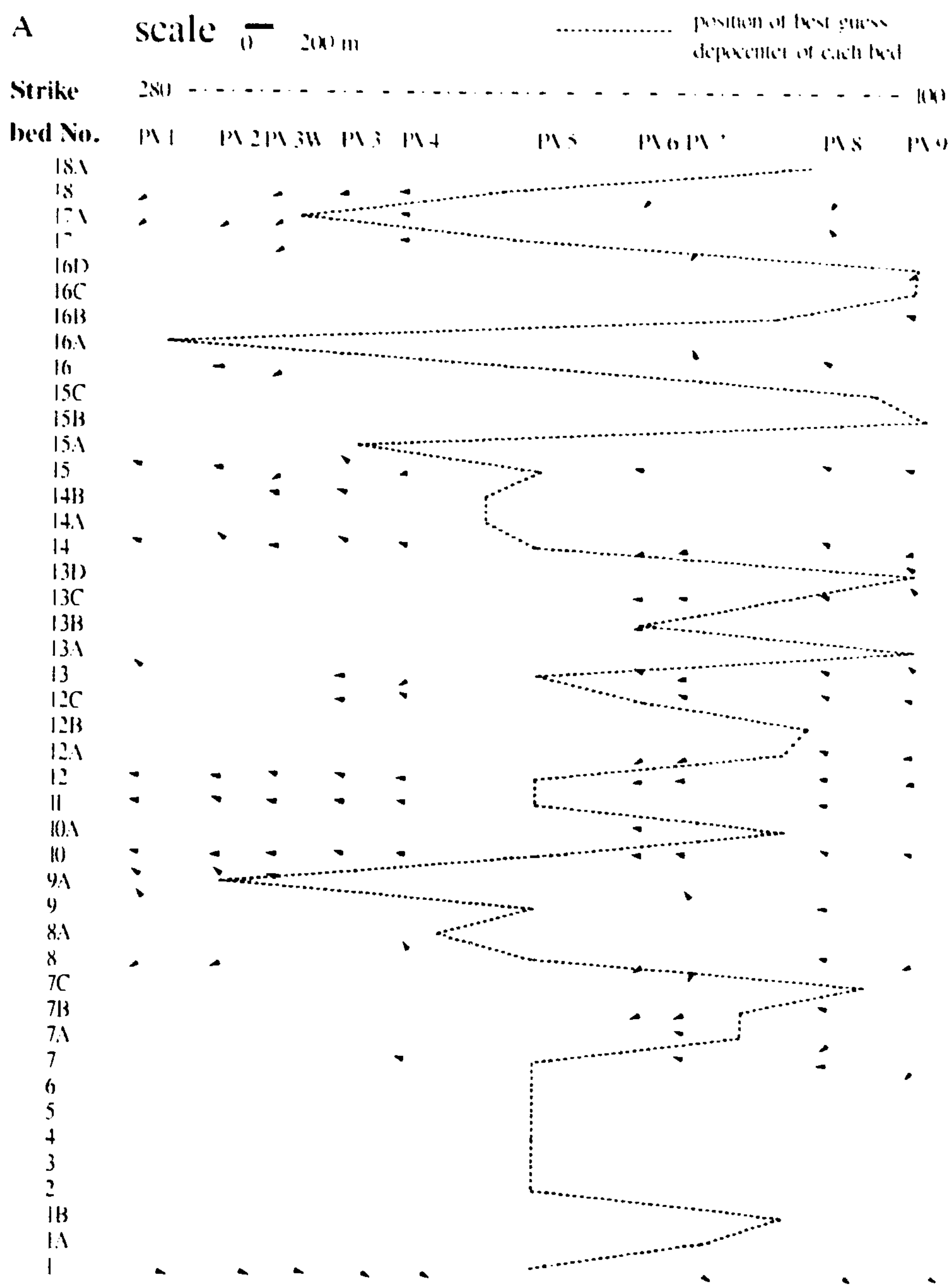
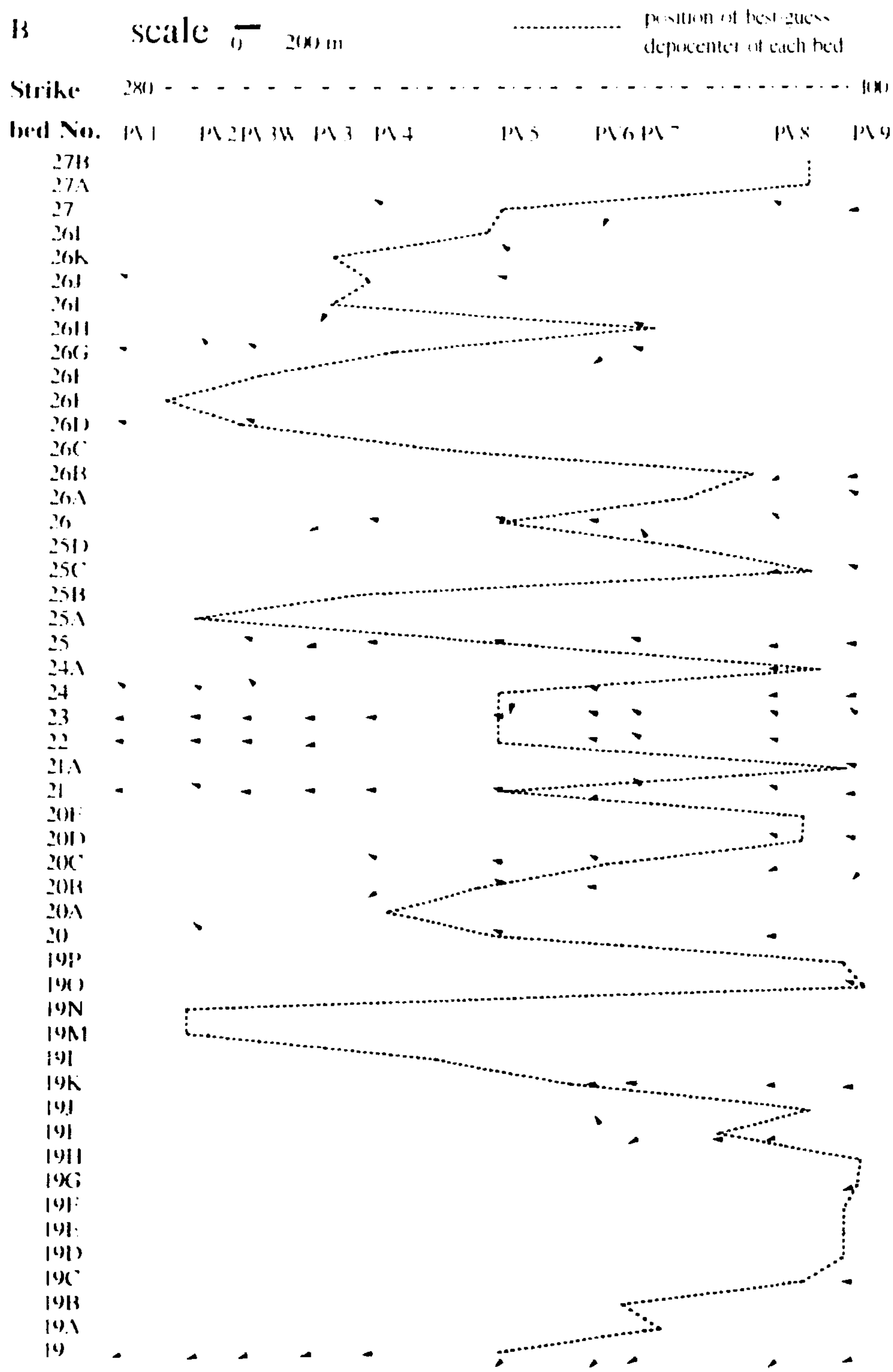


Figure 4.11 Shifting of best-guess depocentre (defined in text) and changes of paleocurrent direction within each bed. The paleocurrent data are the mean values at each section (Appendix 4), plotted relative to strike direction. A and B (next page) are the lower and upper part of the interval of detailed bed tracing in Figure 4.1


B
scale 0 200 m
position of best-guess depocenter of each bed
Strike 280 100
bed No. PV1 PV2 PV3W PV3 PV4 PV5 PV6 PV7 PV8 PV9
27B
27A
27
26L
26K
26J
26I
26H
26G
26F
26E
26D
26C
26B
26A
26
25D
25C
25B
25A
25
24A
24
23
22
21A
21
20E
20D
20C
20B
20A
20
19P
19O
19N
19M
19L
19K
19J
19I
19H
19G
19F
19E
19D
19C
19B
19A
19

currents were vigorous and highly turbulent. The coarse fraction occurs at the base of these beds, indicating that the sand load was concentrated towards the bottom and or front of the currents. Such sand-loaded flows were probably very sensitive to the microscale and mesoscale topography of the basin floor, filling depressions on the basin floor and by-passing local highs. As sea-floor topography changed through time with sequential filling of depressions, the boundaries of turbidite deposition shifted several times from (a) mainly upcurrent from the Grande-Vallee Petite-Vallee area to (b) mainly in this area, to (c) mainly downcurrent of this area. In Figure 4.11, these changes are marked by progressive (gradually shifts) to abrupt changes (lobe or channel switching) in the best-guess depocentre. Figure 4.12 provides an example of how lobe switching would result in some groups of beds extending from section PV9 to a termination in the field area (e.g., beds 25C to 26C, Fig. 4.11), whereas other groups of beds extend from section PV1 to an upcurrent termination zone (e.g., beds 26D to 26K).

Paleocurrent data (Appendix 4) support the suggestion that there was significant sea-floor topography, because the paleoflow directions are quite variable throughout each studied section (Figs. 4.11 and 4.13). Some of this variation may be due to flow meandering in single currents (Parkash and Middleton, 1970). Because the plotted values are bed averages, however, it is more likely that this wide range of paleoflow reflects the different paths taken by turbidity currents crossing an irregular sea floor.

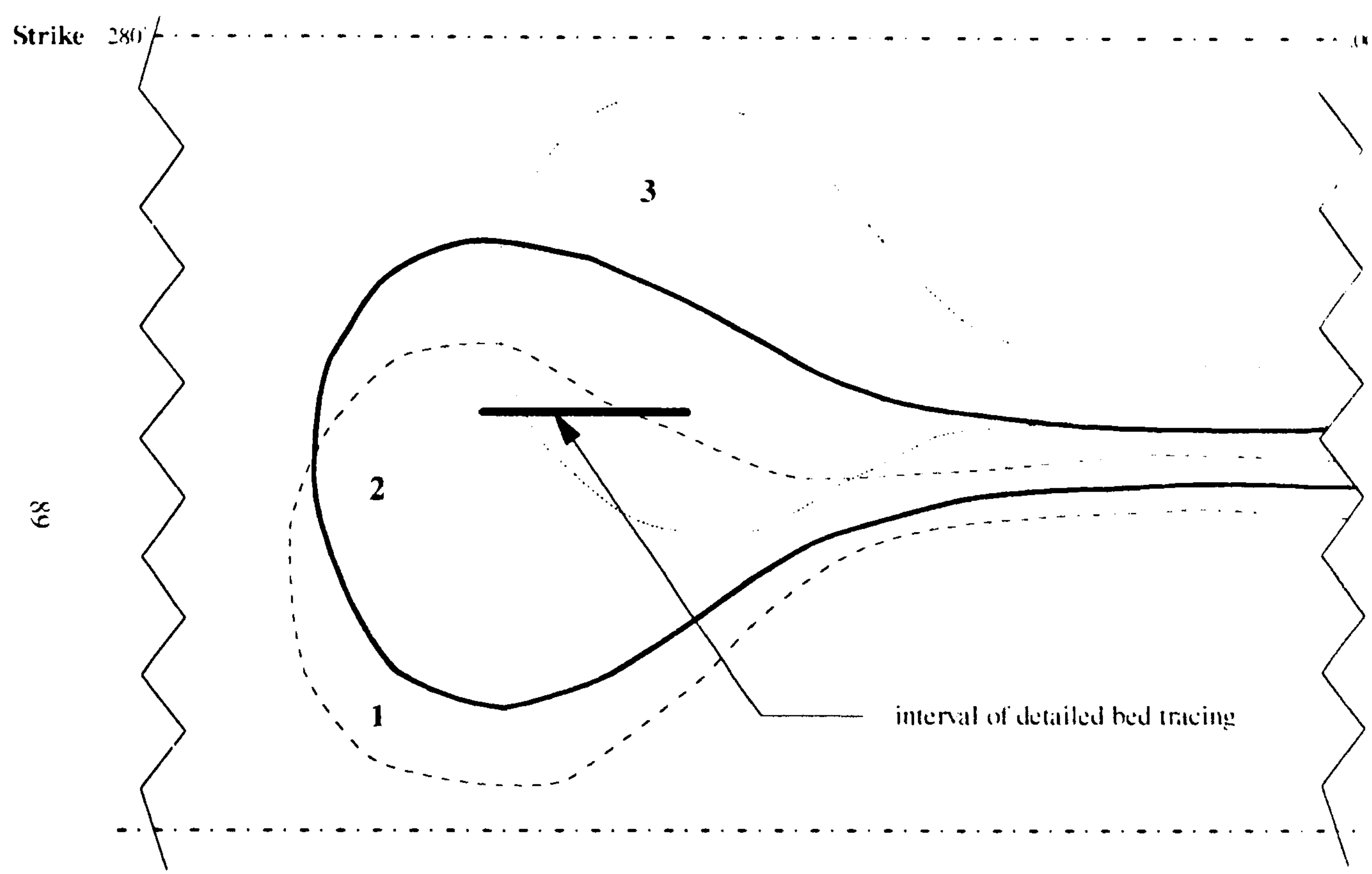


Figure 4.12 Schematic diagram to explain how lobe switching might explain Figure 4.11. Turbidites in lobe 3 would result in a group of beds extending from section PV9 to a termination in the field area, whereas turbidites in lobe 2 would result in groups of beds extending from section PV1 to an upcurrent termination. Turbidites in lobe 2 would be unlimited beds in the field area.

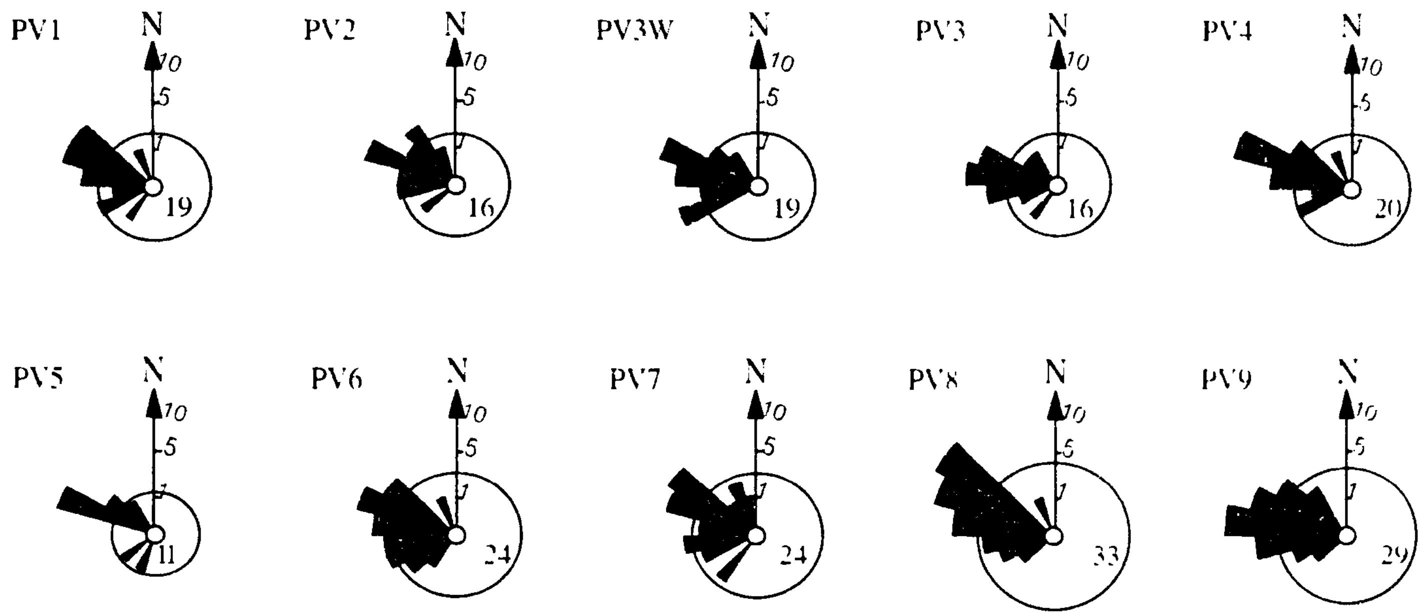


Figure 4.13 Equal-area rose diagrams of average paleocurrent measurements from sole markings in section PV1 to section PV9 in the interval of detailed bed tracing (Fig. 4.1), excluding Facies 9 (megaturbidites) which show flow reversal. For beds from which more than one sole marking was measured, only the average of these mutiple measurements is plotted. The rings enclose 10% of the total number of observations for each 15° sector of the rose diagrams. Total number of observations is indicated to the lower right of each rose diagram. Radial scale (number of measurements) is indicated for each diagram. The paleocurrent data are from Appendix 4.

4.3.1 Role of tectonic setting

The Cloridorme Formation accumulated in an elongate foreland basin, where tectonism was very active (Fig 4.14). Two generations of faults are found in the study area. The earliest set is parallel to bedding or at low angles to bedding, and apparently pre-dates folding (Fig. 2.4, back pocket). Local duplication of beds shows these to be thrust faults, of the type that would be expected along the margin of an evolving foreland basin. Dr. Edward Beutner (Department of Geosciences, Franklin and Marshall College, Lancaster, Pennsylvania, USA) interprets faults of this type to both cut and deform the seafloor of the foreland basin near Madeleine Centre (pers. comm. to R. Hiscott, 1993), in rocks equivalent in age to those at Grande-Vallée (Slivitzky et al., 1991). Syndepositional faulting may have generated local steps on the sea bed sufficient to account for differential deposition over short distances, like in the modern Chile Trench (Thornburg and Kulm, 1987). Active faulting would also have promoted sand liquefaction and injection, although seismic shocks from deeper fault motions would have had the same effect.

4.3.2 Role of depositional environment and flow processes

Both the intense turbulence and erosion recorded by the abundance of small scours and rip-up clasts (Facies 3), and the inferred divergence of turbidity currents suggested by the abundance of climbing ripple lamination (Facies 6), raise the possibility that channels were located immediately upcurrent of the study area. These

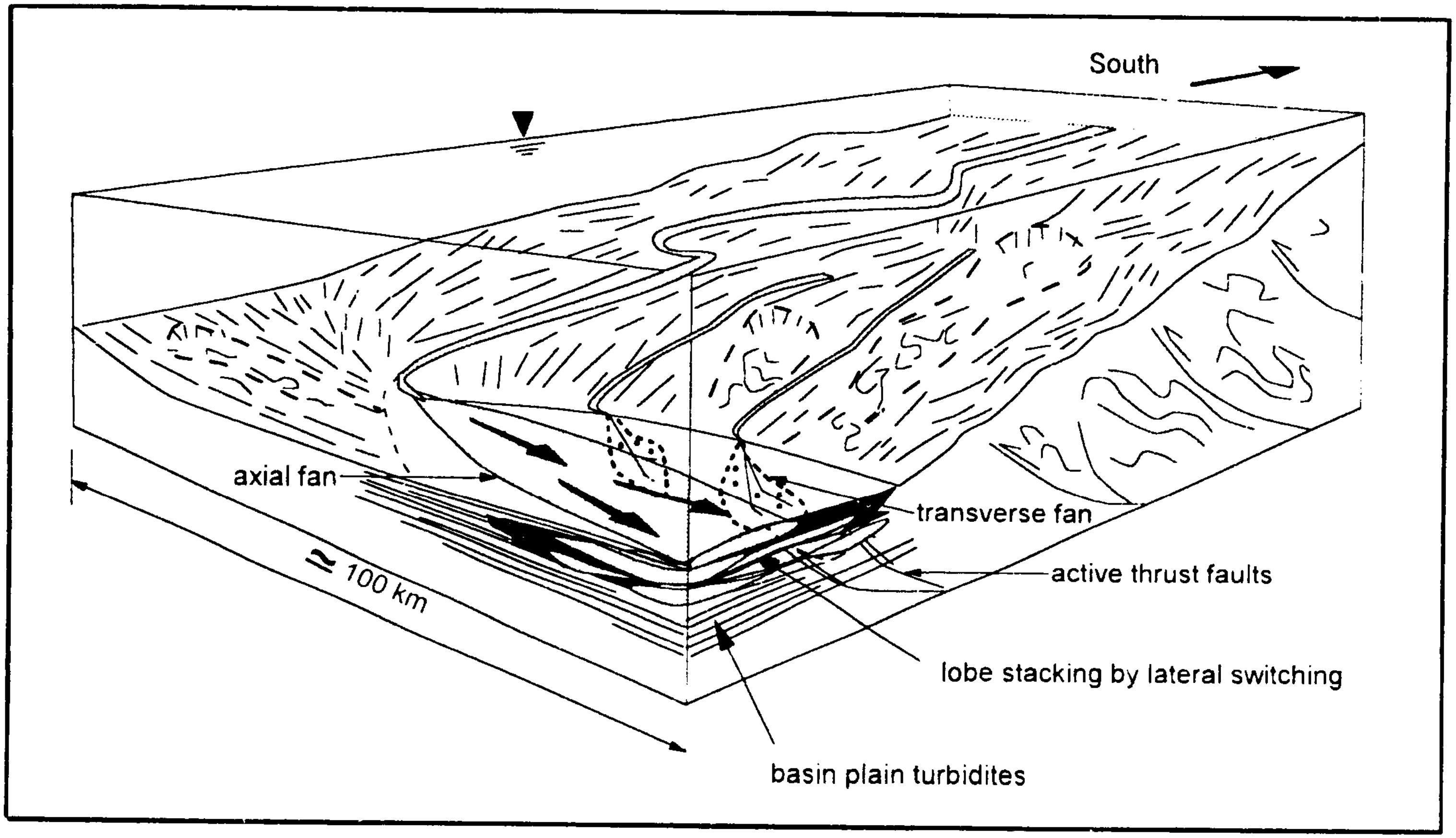


Figure 4.14 Sketch of the foreland basin during the middle Caradoc (modified from Hiscott et al., 1986)

may have extended into the distributary channels interpreted for Facies Association 1. Units B, C, D, and E of the traced section may have been deposited at the termini of the distributary channels of such transverse fans. As turbidity currents spread out from the distributary channels, they might have experienced hydraulic jumps, generating intense turbulence and seafloor scour (Mutti and Normark, 1987). The short distance scale over which beds change thickness and the entire section thins (Fig. 2.7) are consistent with a depositional site near a feeder channel.

4.4 Summary

The geometry and tectonics of the depositional setting (i.e., marginal fans and thrusting) are probably the two major factors responsible for the low sandstone bed continuity in the Cloridorme Formation. Differential deposition and tectonic effects (e.g., faulting, seismically induced liquefaction) produced an irregular basin floor, over which unsteady and non-uniform turbidity currents distributed a patchy record of sand. Some of the turbidity currents largely bypassed this part of the basin.

Other turbidite successions from a similar tectonic setting might also be expected to show low bed continuity, but this aspect of deposits would depend quite strongly on the rates and magnitudes of sea-bed deformation, the frequencies and magnitudes of earthquakes, and proximity to the termini of feeder channels. Tectonic setting alone (e.g. foreland basin) is not a powerful enough discriminating factor on which to base a prediction of bed continuity.

CHAPTER 5

SUMMARY AND CONCLUSIONS

The Cloridorme Formation is a Middle Ordovician turbidite succession which accumulated in an elongate foreland basin. Based on his work in unit G of the β7 member between Grande-Vallée and Petite-Vallée, Enos (1969a) concluded that the lateral continuity of sandstone beds in that area is extremely low. This result is quite different from the results of other studies of foreland basin turbidites. In order to re evaluate and explain the continuity of sandstone beds in the Cloridorme Formation, The following work has been done in unit G:

(1) aerial photographs were shot parallel to the dip and arranged into a photomosaic;

(2) structural reconnaissance was completed in the field area;

(3) 15 bed-by-bed sections were measured;

(4) bed tracing was undertaken, where possible;

(5) facies and bed terminations were described and photographed.

The following conclusions stem from this field work:

(1) There are at least two generations of faults affecting stratal continuity.

(2) Axially flowing turbidity currents were probably supplied by a series of transverse fans; these fans are assumed to have been eroded following subsequent tectonic activity.

(3) Turbidites in the field area probably represent deposits of distributary

channels, the outer fan and fan fringe of a transverse fan, plus basin plain deposits.

(4) Sediment supply was probably controlled by tectonics instead of sea-level fluctuations.

(5) The continuity of sandstone beds is extremely low. Only 27 of the 94 traced beds extend for 3 km. Nine of the 27 beds are locally discontinuous.

(6) A plot of the logarithm of bed length (i.e., log L) against the percentage of beds longer than L (Y) closely follows a linear relationship:

$$Y (\%) = -49(\log L) + 200$$

(7) Some beds taper rather uniformly. Many beds terminate abruptly. Significant causes of bed discontinuity include: (a) scoured and focussed deposition in scours; (b) liquefaction and sand redistribution; (c) extensive "nests" of shale clasts; (d) apparent lateral changes in the texture of watery debris flows; and (e) patchy deposition resulting from flow non-uniformity or from the influence of long-wavelength seafloor irregularity. This inferred seafloor irregularity was caused by depositional topography, tectonic processes, or extensive subsurface liquefaction.

(8) Proximity to marginal fans, and active thrusting are probably the two major factors responsible for the low sandstone continuity in the

Cloridorme Formation.

(9) The continuity of sandstone beds depends not only on tectonic setting, but also on the rates and magnitudes of sea bed deformation, the frequencies and magnitudes of earthquakes, and proximity to the termini of feeder channels. As a result, sand bed continuity cannot be predicted knowing only basin character. There is no inconsistency between the conclusions of Enos (1969a) and other researchers investigating sand-bed continuity in foreland basins, because this part of the Cloridorme Formation was apparently affected to an unusual degree by synsedimentary faulting, sand liquefaction, and erosion just downslope of transverse-fan channels. The transverse fans can only be inferred because they have been eroded from the southern basin margin.

(10) Some aspects of the bed continuity in the Cloridorme Formation can be successfully compared with other geological units characterized by widespread liquefaction (e.g. Nicholls, 1995; Dixon et al., 1995; and Brooke et al., 1995). Field experiments indicate that cores taken in a unit like the Cloridorme Formation would contain little evidence for sand flow or injection. However, disruption of bed continuity by intrastratal flow of liquefied sand, combined with irregular sea-bed topography in areas of active faulting or scour, can affect the overall permeability of such turbidite units. Permeability may be reduced parallel to bedding

because of the limited extent of each bed, but enhanced perpendicular to bedding because of the interconnection of beds by dykes (Cossey, 1994).

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APPENDIX 1

RAW FIELD DATA

Explanation

The following pages contain field data from section PV1 to section PV13N. Columns A-F list the following types of data:

A: bed number, where bed 1 is at the base of the section

B: bed thickness in centimeters

C: cumulative thickness in centimeters

D: numeric code for basal grain size of beds

10 -- mud	50 -- medium grained sand
20 -- silt	60 -- coarse grained sand
30 -- very fine sand	70 -- very coarse grained sand
40 -- fine sand	80 -- pebble

E: numeric code for upper grain size of beds

(see D)

F: facies number (1 to 13)

Section PV1

A	B	C	D	E	F
357	14	12343	30	30	1
356	34	12329	10	10	13
355	13	12295	30	30	1
354	9	12282	10	10	13
353	7	12273	40	30	1
352	20	12266	40	30	1
351	21	12246	30	30	1
350	93	12225	10	10	13
349	26	12132	10	10	12
348	9	12106	10	10	13
347	17	12097	35	30	1
346	33	12080	10	10	13
345	9	12047	35	30	1
344	7	12038	10	10	13
343	14	12031	35	35	1
342	47	12017	10	10	13
341	15	11970	40	35	1
340	72	11955	10	10	13
339	32	11883	40	30	1
338	7	11851	10	10	13
337	15	11844	30	30	7
336	34	11829	50	40	1
335	17	11795	10	10	13
334	16	11778	40	30	1
333	17	11762	10	10	13
332	13	11745	35	35	3
331	6	11732	10	10	13
330	16	11726	40	35	4
329	80	11710	10	10	13
328	7	11630	40	30	1
327	7	11623	10	10	13
326	13	11616	40	30	1
325	190	11603	10	10	13
324	11	11413	40	30	3
323	62	11402	10	10	13
322	73	11340	45	30	1
321	47	11267	10	10	13
320	12	11220	35	30	7
319	51	11208	10	10	13
318	7	11157	30	30	7
317	15	11150	40	10	7
316	22	11135	10	10	13
315	7	11113	30	30	7
314	9	11106	30	10	7
313	385	11097	10	10	13
312	30	10712	10	10	13
311	25	10682	10	10	12
310	18	10657	10	10	13
309	10	10639	35	35	9
308	187	10629	10	10	13
307	48	10442	50	30	5
306	35	10394	30	30	6
305	37	10359	30	10	6
304	35	10322	10	10	13
303	18	10287	50	10	1
302	30	10269	30	30	6
301	15	10239	10	10	13

A	B	C	D	E	F
300	9	10224	50	50	5
299	14	10215	10	10	13
298	11	10201	40	40	1
297	13	10190	10	10	13
296	15	10177	50	40	4
295	37	10162	60	30	1
294	48	10125	10	10	13
293	15	10077	40	30	4
292	16	10062	10	10	13
291	15	10046	40	40	3
290	40	10031	10	10	13
289	11	9991	60	30	11
288	10	9980	10	10	13
287	6	9970	50	30	3
286	39	9964	10	10	13
285	12	9925	30	30	4
284	39	9913	10	10	13
283	7	9874	30	30	4
282	21	9867	10	10	13
281	13	9846	35	35	10
280	29	9833	10	10	13
279	99	9804	40	40	5
278	5	9705	10	10	13
277	7	9700	30	30	7
276	24	9693	10	10	13
275	16	9669	40	40	4
274	8	9653	10	10	13
273	32	9645	40	30	4
272	9	9613	10	10	13
271	10	9604	40	35	1
270	12	9594	10	10	13
269	9	9582	35	35	1
268	19	9573	50	10	1
267	13	9554	45	10	3
266	6	9541	10	10	13
265	15	9535	40	30	1
264	134	9520	10	10	13
263	8	9386	30	30	3
262	16	9378	10	10	13
261	13	9362	55	30	13
260	7	9349	10	10	13
259	22	9342	40	40	13
258	17	9320	40	35	13
257	28	9303	10	10	13
256	31	9275	40	40	8
255	16	9244	55	10	1
254	11	9228	10	10	13
253	13	9217	50	30	1
252	6	9204	10	10	13
251	13	9198	40	30	4
250	67	9185	10	10	13
249	8	9118	35	35	4
248	16	9110	10	10	13
247	14	9094	40	35	1
246	9	9080	10	10	13
245	32	9071	40	30	1
244	102	9039	10	10	13

Section PV1 (continued)

A	B	C	D	E	F
243	15	8937	35	30	1
242	41	8922	10	10	13
241	13	8881	40	30	1
240	20	8868	50	10	4
239	17	8848	50	10	1
238	14	8831	35	10	1
237	59	8817	10	10	13
236	9	8758	35	35	3
235	163	8749	10	10	13
234	35	8586	35	30	4
233	150	8551	10	10	13
232	7	8401	30	30	7
231	181	8394	10	10	13
230	43	8213	10	10	13
229	44	8170	10	10	12
228	41	8126	10	10	13
227	15	8085	40	35	9
226	15	8070	30	30	7
225	12	8055	10	10	13
224	11	8043	30	30	7
223	62	8032	10	10	13
222	11	7970	30	30	6
221	48	7959	10	10	13
220	12	7911	30	30	6
219	18	7899	30	30	7
218	117	7881	10	10	12
217	102	7764	10	10	13
216	6	7662	35	35	3
215	215	7656	10	10	13
214	29	7441	50	50	2
213	15	7412	10	10	13
212	24	7397	60	35	4
211	15	7373	10	10	13
210	12	7358	35	35	2
209	10	7346	10	10	13
208	26	7336	40	30	1
207	15	7310	50	10	1
206	19	7295	60	10	1
205	16	7276	10	10	13
204	18	7260	30	30	6
203	23	7242	30	30	6
202	23	7219	10	10	13
201	13	7196	40	40	2
200	48	7183	55	30	4
199	102	7135	10	10	13
198	12	7033	40	30	3
197	17	7021	40	40	2
196	31	7004	10	10	13
195	31	6973	60	40	1
194	34	6942	45	30	1
193	25	6908	50	10	1
192	6	6883	10	10	13
191	34	6877	50	30	4
190	21	6843	50	30	10
189	47	6822	10	10	13
188	12	6775	35	35	3
187	50	6763	10	10	13

A	B	C	D	E	F
186	18	6713	40	40	3
185	48	6695	10	10	13
184	35	6647	50	40	4
183	69	6612	10	10	13
182	15	6543	50	30	1
181	74	6528	10	10	13
180	15	6454	50	40	1
179	128	6439	10	10	13
178	30	6311	45	40	2
177	14	6281	10	10	13
176	13	6267	55	35	10
175	215	6254	10	10	13
174	24	6039	35	35	4
173	75	6015	10	10	13
172	10	5940	35	30	3
171	16	5930	10	10	13
170	20	5914	35	30	3
169	59	5894	10	10	13
168	13	5835	30	30	6
167	21	5822	10	10	13
166	11	5801	30	30	6
165	38	5790	10	10	13
164	12	5752	30	30	6
163	26	5740	10	10	13
162	20	5714	10	10	13
161	33	5694	10	10	12
160	24	5661	10	10	13
159	14	5637	35	35	9
158	20	5623	10	10	13
157	9	5603	30	30	6
156	18	5594	10	10	13
155	20	5576	30	30	7
154	94	5556	10	10	13
153	11	5462	30	30	7
152	145	5451	10	10	13
151	7	5306	10	10	12
150	45	5299	10	10	13
149	10	5254	50	30	11
148	189	5244	10	10	13
147	16	5055	30	30	6
146	135	5039	10	10	13
145	7	4904	30	30	7
144	134	4897	10	10	13
143	7	4763	30	30	7
142	315	4756	10	10	1
141	97	4441	10	10	12
140	7	4344	55	55	9
139	41	4337	10	10	13
138	7	4296	30	30	7
137	296	4289	10	10	13
136	7	3993	30	30	7
135	8	3986	30	10	7
134	17	3978	30	30	6
133	11	3961	50	10	1
132	9	3950	30	10	7
131	8	3941	10	10	13
130	18	3933	50	30	1

Section PV1 (continued)

A	B	C	D	E	F
129	10	3915	40	10	6
128	10	3905	10	10	13
127	28	3895	60	30	5
126	8	3867	10	10	13
125	22	3859	50	40	5
124	27	3837	50	30	5
123	16	3810	40	40	6
122	28	3794	60	30	6
121	15	3766	40	40	6
120	25	3751	40	40	6
119	21	3726	40	30	6
118	5	3705	40	15	2
117	8	3700	40	40	6
116	10	3692	40	15	7
115	29.	3682	45	35	1
114	17	3653	45	40	6
113	32	3636	50	30	1
112	23	3604	30	30	6
111	11	3581	30	30	6
110	30	3570	30	10	6
109	10	3540	50	30	6
108	47	3530	40	30	6
107	20	3483	10	10	13
106	11	3463	40	30	5
105	62	3452	60	20	1
104	20	3390	40	10	1
103	20	3370	40	40	1
102	6	3350	10	10	13
101	18	3344	55	40	1
100	8	3326	50	10	11
99	13	3318	50	10	1
98	124	3305	10	10	13
97	48	3181	40	30	5
96	6	3133	30	30	7
95	12	3127	35	35	6
94	12	3115	30	30	6
93	20	3103	10	10	13
92	10	3083	50	40	1
91	45	3073	10	10	13
90	9	3028	50	35	11
89	45	3019	10	10	13
88	8	2974	50	30	11
87	118	2966	10	10	13
86	34	2848	30	30	7
85	174	2814	10	10	13
84	28	2640	55	40	4
83	8	2612	50	10	11
82	7	2604	10	10	13
81	11	2597	40	40	1
80	9	2586	30	10	7
79	10	2577	10	10	13
78	9	2567	50	40	4
77	5	2558	10	10	13
76	9	2553	40	30	1
75	7	2544	10	10	13
74	12	2537	40	40	10
73	8	2525	10	10	13

A	B	C	D	E	F
72	17	2517	40	40	4
71	5	2500	10	10	13
70	15	2495	45	10	1
69	9	2480	10	10	13
68	126	2471	50	40	5
67	218	2345	10	10	13
66	10	2127	30	30	7
65	82	2117	10	10	13
64	100	2035	30	30	6
63	31	1935	50	40	1
62	25	1904	40	10	1
61	44	1879	40	40	6
60	27	1835	40	40	6
59	10	1808	10	10	13
58	35	1798	30	30	6
57	10	1763	30	10	7
56	8	1753	30	10	7
55	13	1745	10	10	13
54	20	1732	30	30	6
53	32	1712	10	10	13
52	25	1680	45	40	1
51	15	1655	10	10	13
50	32	1640	50	50	5
49	21	1608	10	10	13
48	19	1587	50	40	1
47	8	1568	10	10	13
46	38	1560	55	40	1
45	58	1522	10	10	13
44	23	1464	50	40	4
43	103	1441	10	10	13
42	27	1338	50	10	2
41	20	1311	10	10	13
40	22	1291	50	45	8
39	8	1269	10	10	13
38	24	1261	50	40	1
37	18	1237	10	10	13
36	25	1219	55	40	4
35	9	1194	10	10	13
34	18	1185	50	40	1
33	38	1167	10	10	13
32	21	1129	50	40	10
31	14	1108	40	40	3
30	75	1094	10	10	13
29	24	1019	45	45	4
28	16	995	10	10	13
27	17	979	50	45	2
26	100	962	10	10	13
25	36	862	60	40	4
24	11	826	10	10	13
23	32	815	45	45	1
22	45	783	10	10	13
21	18	738	50	40	4
20	67	720	10	10	13
19	19	653	30	30	6
18	59	634	10	10	13
17	23	575	50	40	4
16	18	552	10	10	13

Section PV1 (continued)

A	B	C	D	E	F
15	10	534	30	30	7
14	114	524	10	10	13
13	18	410	45	40	4
12	10	392	10	10	13
11	16	382	50	40	1
10	12	366	10	10	13
9	7	354	50	50	1
8	7	347	10	10	13
7	43	340	55	30	10
6	35	297	10	10	13
5	21	262	50	45	3
4	70	241	10	10	13
3	23	171	50	30	10
2	128	148	10	10	13
1	20	20	60	30	1

Section PV2

A	B	C	D	E	F
245	9	9740	35	35	1
244	115	9731	10	10	13
243	13	9616	35	35	1
242	13	9603	10	10	13
241	9	9590	35	35	1
240	17	9581	35	10	1
239	14	9564	10	10	13
238	9	9550	30	30	1
237	35	9541	10	10	13
236	15	9506	30	30	1
235	13	9491	30	10	7
234	7	9478	10	10	13
233	9	9471	30	30	7
232	41	9462	10	10	13
231	16	9421	35	35	1
230	37	9405	10	10	13
229	9	9368	35	35	1
228	19	9359	10	10	13
227	12	9340	50	30	10
226	9	9328	10	10	13
225	18	9319	40	30	1
224	16	9301	40	30	1
223	103	9285	10	10	13
222	20	9182	40	30	4
221	32	9162	10	10	13
220	7	9130	35	35	1
219	19	9123	40	20	1
218	22	9104	40	20	1
217	5	9082	10	10	13
216	14	9077	40	35	1
215	223	9063	10	10	13
214	18	8840	40	30	1
213	34	8822	10	10	13
212	9	8788	40	30	1
211	6	8779	10	10	13
210	12	8773	45	30	1
209	46	8761	10	10	13
208	12	8715	55	40	1
207	68	8703	10	10	13
206	50	8635	50	30	5
205	46	8585	50	30	1
204	22	8539	10	10	13
203	7	8517	40	30	1
202	15	8510	10	10	13
201	10	8495	50	30	3
200	22	8485	50	20	4
199	51	8463	10	10	13
198	18	8412	45	40	5
197	18	8394	10	10	13
196	12	8376	50	30	4
195	10	8364	10	10	13
194	10	8354	35	30	4
193	198	8344	10	10	13
192	12	8146	50	40	10
191	62	8134	10	10	13
190	50	8072	50	30	1
189	585	8022	10	10	13

A	B	C	D	E	F
188	17	7437	40	30	9
187	123	7420	10	10	13
186	36	7297	30	30	6
185	14	7261	10	10	13
184	73	7247	60	30	1
183	38	7174	30	20	6
182	44	7136	30	10	6
181	38	7092	10	10	13
180	23	7054	50	40	1
179	31	7031	10	10	13
178	8	7000	60	30	4
177	13	6992	10	10	13
176	13	6979	50	40	3
175	17	6966	10	10	13
174	40	6949	50	40	1
173	45	6909	40	30	1
172	85	6864	10	10	13
171	20	6779	50	40	4
170	28	6759	10	10	13
169	20	6731	50	30	4
168	166	6711	10	10	13
167	100	6545	45	40	5
166	7	6445	10	10	13
165	10	6438	30	30	7
164	26	6428	10	10	13
163	17	6402	50	40	4
162	4	6385	10	10	13
161	9	6381	45	45	11
160	45	6372	10	10	13
159	10	6327	50	40	1
158	4	6317	10	10	13
157	11	6313	45	40	1
156	17	6302	40	10	1
155	14	6285	35	10	4
154	8	6271	10	10	13
153	16	6263	45	40	4
152	146	6247	10	10	13
151	8	6101	40	30	3
150	19	6093	10	10	13
149	26	6074	40	30	10
148	38	6048	10	10	13
147	39	6010	40	35	4
146	18	5971	50	20	1
145	12	5953	10	10	13
144	24	5941	40	30	4
143	49	5917	10	10	13
142	17	5868	35	30	4
141	15	5851	10	10	13
140	15	5836	40	30	4
139	15	5821	10	10	13
138	14	5806	40	35	1
137	11	5792	10	10	13
136	31	5781	40	30	1
135	100	5750	10	10	13
134	8	5650	30	30	7
133	47	5642	10	10	13
132	15	5595	45	40	1

Section PV2 (continued)

A	B	C	D	E	F
131	24	5580	50	20	1
130	19	5556	45	20	1
129	16	5537	40	20	1
128	55	5521	10	10	13
127	11	5466	30	30	7
126	157	5455	10	10	13
125	32	5298	40	25	10
124	330	5266	10	10	13
123	48	4936	10	10	13
122	47	4888	10	10	12
121	47	4841	10	10	13
120	12	4794	40	30	9
119	103	4782	10	10	13
118	11	4679	30	30	6
117	76	4668	10	10	13
116	45	4592	10	10	12
115	21	4547	10	10	13
114	19	4526	10	10	13
113	24	4507	10	10	12
112	104	4483	10	10	13
111	11	4379	40	30	3
110	254	4368	10	10	13
109	21	4114	40	30	6
108	18	4093	10	10	13
107	22	4075	50	35	1
106	21	4053	10	10	13
105	16	4032	40	30	1
104	44	4016	30	20	6
103	18	3972	50	40	1
102	7	3954	10	10	13
101	24	3947	55	40	1
100	12	3923	10	10	13
99	47	3911	30	30	6
98	24	3864	10	10	13
97	10	3840	30	30	3
96	10	3830	10	10	1
95	34	3820	50	35	8
94	45	3786	10	10	13
93	10	3741	40	40	4
92	55	3731	10	10	13
91	11	3676	40	35	3
90	16	3665	40	20	2
89	40	3649	10	10	13
88	24	3609	50	40	1
87	15	3585	10	10	13
86	26	3570	40	30	1
85	5	3544	10	10	13
84	40	3539	50	30	1
83	25	3499	60	30	4
82	7	3474	10	10	13
81	10	3467	50	30	11
80	48	3457	10	10	13
79	16	3409	40	35	10
78	60	3393	10	10	13
77	19	3333	40	40	2
76	50	3314	10	10	13
75	33	3264	50	50	8

A	B	C	D	E	F
74	58	3231	10	10	13
73	19	3173	40	40	4
72	73	3154	10	10	13
71	35	3081	50	30	1
70	22	3046	25	25	6
69	98	3024	10	10	13
68	10	2926	40	30	7
67	20	2916	10	10	13
66	34	2896	50	40	10
65	15	2862	10	10	13
64	14	2847	50	40	1
63	223	2833	10	10	13
62	12	2610	30	30	1
61	77	2598	10	10	13
60	11	2521	30	30	3
59	19	2510	10	10	13
58	18	2491	30	30	1
57	65	2473	10	10	13
56	11	2408	30	30	6
55	22	2397	10	10	13
54	17	2375	30	30	1
53	38	2358	10	10	13
52	12	2320	30	30	6
51	57	2308	10	10	13
50	30	2251	10	10	12
49	25	2221	10	10	13
48	16	2196	30	30	7
47	25	2180	10	10	13
46	11	2155	30	30	9
45	20	2144	10	10	13
44	7	2124	30	30	7
43	5	2117	10	10	13
42	7	2112	30	30	7
41	105	2105	10	10	13
40	375	2000	10	10	13
39	62	1625	10	10	13
38	15	1563	30	20	6
37	75	1548	10	10	1
36	55	1473	10	10	1
35	17	1418	30	20	6
34	42	1401	10	10	13
33	12	1359	10	10	12
32	92	1347	10	10	13
31	12	1255	10	10	12
30	54	1243	10	10	13
29	183	1189	10	10	13
28	10	1006	40	30	9
27	116	996	10	10	13
26	100	880	10	10	12
25	10	780	40	30	1
24	48	770	10	10	13
23	7	722	20	20	7
22	285	715	10	10	13
21	75	430	30	30	7
20	37	355	50	20	1
19	7	318	10	10	13
18	13	311	50	30	1

Section PV2 (continued)

A	B	C	D	E	F	A	B	C	D	E	F
17	16	298	40	30	1	8	21	164	30	20	6
16	20	282	0	0	13	7	56	143	30	20	6
15	6	262	40	40	7	6	7	87	50	30	6
14	18	256	60	20	1	5	13	80	30	30	6
13	7	238	40	30	5	4	24	67	30	20	6
12	40	231	30	20	7	3	14	43	30	20	6
11	5	191	30	20	1	2	16	29	50	15	6
10	8	186	30	15	7	1	13	13	40	20	1
9	14	178	30	20	6						

Section PV3W

A	B	C	D	E	F
323	126	10933	60	30	5
322	22	10807	10	10	13
321	8	10785	35	30	7
320	14	10777	10	10	13
319	15	10763	40	40	3
318	8	10748	10	10	13
317	12	10740	45	30	3
316	10	10728	10	10	13
315	17	10718	50	30	4
314	14	10701	10	10	13
313	19	10687	55	45	4
312	31	10668	10	10	13
311	10	10637	55	40	1
310	13	10627	40	10	4
309	215	10614	10	10	13
308	13	10399	50	35	10
307	70	10386	10	10	13
306	32	10316	40	35	4
305	135	10284	10	10	13
304	26	10149	35	30	4
303	246	10123	10	10	13
302	18	9877	35	30	4
301	144	9859	10	10	13
300	31	9715	10	10	12
299	13	9684	10	10	13
298	8	9671	40	35	9
297	160	9663	10	10	13
296	9	9503	30	30	6
295	76	9494	70	10	5
294	28	9418	30	30	6
293	53	9390	30	10	6
292	48	9337	10	10	13
291	33	9289	60	55	2
290	7	9256	10	10	13
289	7	9249	30	30	7
288	9	9242	10	10	13
287	16	9233	30	30	6
286	6	9217	10	10	13
285	16	9211	40	30	1
284	8	9195	10	10	13
283	16	9187	55	30	3
282	118	9171	10	10	13
281	8	9053	45	35	3
280	62	9045	10	10	13
279	7	8983	35	35	1
278	66	8976	10	10	13
277	17	8910	40	40	4
276	20	8893	10	10	13
275	11	8873	35	30	4
274	23	8862	10	10	13
273	37	8839	50	30	5
272	53	8802	60	50	5
271	35	8749	60	30	5
270	24	8714	60	30	1
269	29	8690	10	10	13
268	28	8661	60	40	8
267	12	8633	10	10	13

A	B	C	D	E	F
266	15	8621	50	50	1
265	23	8606	10	10	13
264	8	8583	50	35	4
263	17	8575	50	35	4
262	14	8558	40	35	1
261	5	8544	10	10	13
260	15	8539	40	30	1
259	15	8524	35	10	4
258	5	8509	10	10	13
257	17	8504	50	30	4
256	144	8487	10	10	13
255	14	8343	35	35	3
254	17	8329	10	10	13
253	20	8312	35	30	1
252	42	8292	10	10	13
251	35	8250	60	30	4
250	5	8215	10	10	13
249	11	8210	50	30	1
248	5	8199	10	10	13
247	8	8194	40	30	1
246	18	8186	40	10	2
245	13	8168	35	10	3
244	43	8155	10	10	13
243	14	8112	40	30	1
242	15	8098	35	10	5
241	29	8083	35	30	1
240	10	8054	10	10	13
239	14	8044	55	30	4
238	10	8030	10	10	13
237	30	8020	50	10	1
236	172	7990	10	10	13
235	17	7818	60	30	1
234	21	7801	55	10	1
233	7	7780	10	10	13
232	15	7773	50	35	1
231	65	7758	10	10	13
230	8	7693	30	30	3
229	50	7685	10	10	13
228	7	7635	10	10	12
227	126	7628	10	10	13
226	31	7502	40	30	4
225	132	7471	10	10	13
224	25	7339	10	10	13
223	7	7314	30	30	7
222	11	7307	30	10	7
221	204	7296	10	10	13
220	32	7092	10	10	13
219	42	7060	10	10	12
218	41	7018	10	10	13
217	16	6977	45	35	9
216	12	6961	30	10	7
215	12	6949	10	10	13
214	15	6937	30	30	7
213	61	6922	10	10	13
212	8	6861	30	30	7
211	65	6853	10	10	13
210	20	6788	10	10	12

Section PV3W (continued)

A	B	C	D	E	F
209	10	6768	10	10	13
208	17	6758	10	10	12
207	22	6741	10	10	13
206	24	6719	10	10	12
205	116	6695	10	10	13
204	8	6579	40	30	1
203	231	6571	10	10	13
202	11	6340	30	30	6
201	16	6329	55	30	1
200	17	6313	10	10	13
199	23	6296	60	30	1
198	38	6273	10	10	13
197	25	6235	55	30	1
196	6	6210	10	10	13
195	20	6204	60	35	1
194	5	6184	10	10	5
193	22	6179	60	40	5
192	11	6157	70	30	8
191	12	6146	30	30	7
190	5	6134	10	10	13
189	19	6129	30	30	6
188	17	6110	30	10	6
187	26	6093	10	10	13
186	21	6067	55	50	8
185	50	6046	10	10	13
184	18	5996	50	30	4
183	57	5978	10	10	13
182	7	5921	40	35	1
181	11	5914	50	40	1
180	7	5903	10	10	13
179	7	5896	30	30	7
178	33	5889	10	10	13
177	20	5856	55	35	1
176	12	5836	10	10	13
175	28	5824	50	30	1
174	16	5796	10	10	13
173	21	5780	30	30	1
172	36	5759	35	30	1
171	18	5723	35	10	6
170	6	5705	10	10	13
169	8	5699	55	30	4
168	51	5691	10	10	13
167	17	5640	40	30	10
166	40	5623	10	10	13
165	11	5583	30	30	7
164	19	5572	45	45	2
163	57	5553	10	10	13
162	45	5496	50	30	4
161	14	5451	10	10	13
160	9	5437	30	30	3
159	33	5428	10	10	13
158	9	5395	35	30	4
157	72	5386	10	10	13
156	15	5314	55	55	2
155	11	5299	10	10	13
154	10	5288	30	30	3
153	5	5278	10	10	13

A	B	C	D	E	F
152	10	5273	30	30	6
151	60	5263	10	10	13
150	29	5203	35	30	10
149	46	5174	10	10	13
148	22	5128	70	55	10
147	15	5106	55	55	10
146	18	5091	10	10	13
145	19	5073	60	30	10
144	223	5054	10	10	13
143	23	4831	35	35	1
142	86	4808	10	10	13
141	8	4722	35	30	7
140	12	4714	30	10	6
139	12	4702	40	30	3
138	67	4690	10	10	13
137	13	4623	30	30	6
136	25	4610	10	10	13
135	12	4585	30	30	6
134	44	4573	10	10	13
133	10	4529	30	30	6
132	38	4519	10	10	13
131	21	4481	10	10	13
130	30	4460	10	10	12
129	22	4430	10	10	13
128	15	4408	40	30	9
127	28	4393	10	10	13
126	9	4365	30	30	6
125	19	4356	10	10	13
124	7	4337	30	30	7
123	117	4330	10	10	13
122	14	4213	30	30	6
121	151	4199	10	10	13
120	5	4048	10	10	12
119	11	4043	10	10	13
118	8	4032	30	30	7
117	9	4024	10	10	13
116	8	4015	30	30	7
115	45	4007	10	10	13
114	7	3962	30	30	7
113	168	3955	10	10	13
112	15	3787	30	30	6
111	115	3772	10	10	13
110	14	3657	30	30	6
109	57	3643	10	10	13
108	17	3586	10	10	12
107	104	3569	10	10	13
106	16	3465	10	10	12
105	28	3449	10	10	13
104	9	3421	30	30	7
103	206	3412	10	10	13
102	10	3206	35	10	1
101	113	3196	10	10	13
100	52	3083	10	10	13
99	58	3031	10	10	12
98	9	2973	30	30	3
97	324	2964	10	10	13
96	6	2640	55	30	5

Section PV3W (continued)

A	B	C	D	E	F
95	19	2634	55	55	5
94	9	2615	10	10	13
93	7	2606	30	30	7
92	23	2599	55	10	5
91	18	2576	60	60	5
90	62	2558	60	30	5
89	8	2496	10	10	13
88	28	2488	30	30	6
87	15	2460	30	10	6
86	63	2445	70	30	5
85	41	2382	35	35	1
84	10	2341	55	30	1
83	12	2331	40	10	6
82	35	2319	70	30	5
81	35	2284	40	35	1
80	78	2249	55	10	5
79	43	2171	60	55	5
78	20	2128	60	55	5
77	74	2108	70	55	5
76	18	2034	70	35	1
75	10	2016	30	10	7
74	32	2006	60	30	5
73	17	1974	10	10	13
72	7	1957	50	40	11
71	37	1950	10	10	13
70	10	1913	50	30	1
69	16	1903	10	10	13
68	6	1887	30	30	7
67	7	1881	10	10	13
66	19	1874	35	30	10
65	62	1855	10	10	13
64	35	1793	35	30	1
63	25	1758	30	10	6
62	8	1733	30	10	7
61	49	1725	10	10	13
60	9	1676	55	45	1
59	7	1667	10	10	13
58	7	1660	50	30	11
57	8	1653	30	10	3
56	56	1645	10	10	13
55	11	1589	25	25	7
54	8	1578	10	10	13
53	10	1570	35	30	3
52	55	1560	10	10	13
51	7	1505	30	30	7
50	24	1498	10	10	13
49	35	1474	30	30	7
48	193	1439	10	10	13
47	20	1246	55	55	4
46	28	1226	40	35	4
45	6	1198	10	10	12
44	9	1192	40	30	1
43	35	1183	10	10	13
42	8	1148	45	30	1
41	12	1140	10	10	13
40	16	1128	55	30	4
39	16	1112	10	10	
38	12	1096	35	30	1
37	21	1084	10	10	13
36	13	1063	40	35	1
35	174	1050	10	10	13
34	6	876	40	35	1
33	14	870	30	10	7
32	15	856	10	10	13
31	16	841	30	30	6
30	13	825	30	10	7
29	7	812	10	10	13
28	71	805	35	30	6
27	61	734	30	30	6
26	68	673	30	30	6
25	15	605	10	10	13
24	18	590	30	30	7
23	5	572	10	10	13
22	20	567	30	30	6
21	31	547	10	10	13
20	14	516	30	30	6
19	8	502	10	10	13
18	24	494	30	30	6
17	10	470	10	10	13
16	52	460	60	50	5
15	20	408	60	35	1
14	8	388	10	10	13
13	20	380	30	30	6
12	8	360	30	10	7
11	6	352	10	10	13
10	14	346	30	30	6
9	61	332	10	10	13
8	35	271	55	55	1
7	21	236	10	10	13
6	12	215	30	30	7
5	62	203	60	10	1
4	9	141	10	10	13
3	38	132	60	40	1
2	33	94	10	10	13
1	61	61	60	50	1

Section PV3

A	B	C	D	E	F	A	B	C	D	E	F
346	32	12564	40	35	5	289	11	11109	40	35	10
345	13	12532	10	10	13	288	134	11098	10	10	13
344	10	12519	30	30	7	287	6	10964	10	10	12
343	18	12509	40	10	1	286	246	10958	10	10	13
342	123	12491	10	10	13	285	66	10712	10	10	13
341	11	12368	35	35	1	284	8	10646	30	30	7
340	25	12357	10	10	13	283	190	10638	10	10	13
339	9	12332	35	35	4	282	54	10448	10	10	13
338	15	12323	10	10	13	281	44	10394	10	10	12
337	9	12308	35	35	4	280	42	10350	10	10	13
336	70	12299	10	10	13	279	12	10308	40	40	9
335	9	12229	35	35	4	278	18	10296	30	30	7
334	18	12220	10	10	13	277	12	10278	10	10	13
333	13	12202	35	35	1	276	10	10266	30	30	7
332	31	12189	10	10	13	275	67	10256	10	10	13
331	86	12158	40	35	5	274	7	10189	30	30	7
330	10	12072	10	10	13	273	57	10182	10	10	13
329	9	12062	40	40	1	272	4	10125	10	10	13
328	20	12053	10	10	13	271	24	10121	10	10	12
327	28	12033	40	35	1	270	9	10097	10	10	13
326	18	12005	10	10	13	269	9	10088	10	10	13
325	23	11987	40	30	4	268	24	10079	10	10	13
324	13	11964	10	10	13	267	25	10055	10	10	12
323	17	11951	35	35	4	266	114	10030	10	10	13
322	20	11934	10	10	13	265	7	9916	35	35	3
321	8	11914	30	30	7	264	259	9909	10	10	13
320	7	11906	10	10	13	263	11	9650	30	30	7
319	13	11899	35	35	1	262	21	9639	10	10	13
318	13	11886	35	35	1	261	20	9618	50	30	4
317	7	11873	10	10	13	260	8	9598	30	10	7
316	14	11866	35	30	1	259	16	9590	35	10	7
315	14	11852	40	10	1	258	27	9574	35	30	3
314	5	11838	10	10	13	257	7	9547	10	10	13
313	18	11833	40	35	4	256	12	9540	10	10	13
312	155	11815	10	10	13	255	25	9528	40	40	4
311	9	11660	30	30	3	254	19	9503	50	10	1
310	23	11651	10	10	13	253	31	9484	70	10	8
309	20	11628	35	30	4	252	29	9453	30	30	6
308	57	11608	10	10	13	251	20	9424	30	10	6
307	10	11551	40	30	4	250	19	9404	10	10	13
306	13	11541	40	10	1	249	14	9385	50	40	10
305	32	11528	10	10	13	248	29	9371	40	10	2
304	7	11496	35	35	4	247	52	9342	10	10	13
303	47	11489	10	10	13	246	9	9290	40	35	4
302	8	11442	40	35	1	245	54	9281	10	10	13
301	5	11434	10	10	13	244	36	9227	40	40	2
300	38	11429	35	30	5	243	28	9191	10	10	13
299	12	11391	10	10	13	242	12	9163	40	40	4
298	10	11379	50	35	1	241	19	9151	10	10	13
297	7	11369	10	10	13	240	27	9132	40	10	1
296	25	11362	35	30	6	239	9	9105	10	10	13
295	116	11337	10	10	13	238	30	9096	40	30	1
294	10	11221	35	35	1	237	11	9066	10	10	13
293	55	11211	10	10	13	236	21	9055	30	30	1
292	19	11156	55	35	1	235	20	9034	35	30	1
291	18	11137	40	35	1	234	17	9014	40	10	1
290	10	11119	10	10	13	233	9	8997	10	10	13

Section PV3 (cintinued)

A	B	C	D	E	F
232	13	8988	50	30	4
231	52	8975	10	10	13
230	13	8923	40	30	10
229	50	8910	10	10	13
228	32	8860	40	40	2
227	60	8828	10	10	13
226	40	8768	40	40	4
225	51	8728	10	10	13
224	17	8677	35	35	4
223	84	8660	10	10	13
222	9	8576	35	35	4
221	27	8567	10	10	13
220	8	8540	30	30	7
219	60	8532	10	10	13
218	8	8472	35	35	10
217	19	8464	35	35	10
216	39	8445	10	10	13
215	30	8406	50	40	2
214	25	8376	10	10	13
213	13	8351	50	35	4
212	188	8338	10	10	13
211	11	8150	35	35	2
210	20	8139	10	10	13
209	14	8119	35	30	3
208	11	8105	35	30	1
207	11	8094	10	10	13
206	11	8083	30	30	6
205	69	8072	10	10	13
204	11	8003	35	30	3
203	14	7992	30	10	6
202	11	7978	40	40	6
201	12	7967	30	30	6
200	77	7955	10	10	13
199	14	7878	30	30	6
198	32	7864	10	10	13
197	20	7832	10	10	13
196	42	7812	10	10	12
195	15	7770	10	10	13
194	8	7755	30	30	7
193	13	7747	40	30	9
192	32	7734	10	10	13
191	10	7702	30	30	6
190	21	7692	10	10	13
189	152	7671	10	10	13
188	8	7519	30	30	7
187	182	7511	10	10	13
186	7	7329	35	30	7
185	18	7322	10	10	13
184	8	7304	40	30	7
183	8	7296	30	10	7
182	19	7288	10	10	13
181	13	7269	35	10	7
180	182	7256	10	10	13
179	10	7074	30	30	7
178	131	7064	10	10	13
177	10	6933	30	30	7
176	66	6923	10	10	13

A	B	C	D	E	F
175	8	6857	10	10	12
174	138	6849	10	10	13
173	18	6711	10	10	12
172	26	6693	10	10	13
171	9	6667	35	30	7
170	39	6658	10	10	13
169	12	6619	10	10	13
168	18	6607	30	30	7
167	132	6589	10	10	13
166	6	6457	10	10	12
165	8	6451	30	30	7
164	94	6443	10	10	13
163	128	6349	10	10	12
162	358	6221	10	10	13
161	10	5863	35	35	7
160	17	5853	35	10	7
159	13	5836	40	10	5
158	16	5823	40	10	5
157	7	5807	55	10	5
156	32	5800	40	40	6
155	37	5768	70	35	5
154	34	5731	40	30	6
153	19	5697	60	60	2
152	41	5678	70	30	5
151	32	5637	30	30	6
150	16	5605	10	10	13
149	28	5589	35	35	2
148	65	5561	40	35	5
147	56	5496	40	35	5
146	65	5440	50	40	5
145	61	5375	40	35	2
144	263	5314	60	40	5
143	56	5051	10	10	13
142	17	4995	40	40	1
141	26	4978	30	30	6
140	8	4952	10	10	13
139	8	4944	35	35	1
138	19	4936	30	30	6
137	34	4917	10	10	13
136	12	4883	40	35	1
135	17	4871	30	30	7
134	74	4854	10	10	13
133	20	4780	30	30	7
132	25	4760	10	10	13
131	6	4735	35	35	7
130	129	4729	10	10	13
129	7	4600	30	30	7
128	39	4593	10	10	13
127	42	4554	10	10	13
126	142	4512	10	10	13
125	30	4370	40	30	4
124	18	4340	10	10	13
123	10	4322	40	35	1
122	9	4312	10	10	13
121	6	4303	35	35	1
120	24	4297	10	10	13
119	6	4273	40	35	1

Section PV3 (cintinued)

A	B	C	D	E	F
118	10	4267	10	10	13
117	15	4257	40	30	1
116	326	4242	10	10	13
115	102	3916	55	30	5
114	15	3814	10	10	13
113	38	3799	35	35	1
112	11	3761	30	30	7
111	10	3750	30	10	7
110	37	3740	30	10	7
109	8	3703	10	10	6
108	34	3695	30	30	6
107	75	3661	50	10	1
106	5	3586	10	10	13
105	24	3581	30	30	6
104	12	3557	30	10	6
103	16	3545	30	10	6
102	62	3529	10	10	13
101	33	3467	40	35	1
100	30	3434	10	10	13
99	12	3404	50	50	5
98	19	3392	10	10	13
97	35	3373	50	40	1
96	13	3338	10	10	13
95	7	3325	35	35	1
94	13	3318	10	10	13
93	37	3305	50	35	4
92	170	3268	10	10	13
91	63	3098	50	30	1
90	7	3035	10	10	13
89	21	3028	50	30	1
88	23	3007	40	10	6
87	46	2984	70	10	1
86	34	2938	10	10	13
85	20	2904	45	40	2
84	91	2884	10	10	13
83	31	2793	40	30	8
82	72	2762	10	10	13
81	16	2690	40	40	4
80	99	2674	10	10	13
79	31	2575	60	35	10
78	8	2544	10	10	13
77	38	2536	45	40	1
76	21	2498	10	10	13
75	18	2477	40	30	10
74	27	2459	10	10	13
73	11	2432	50	40	4
72	98	2421	10	10	13
71	8	2323	30	30	7
70	32	2315	10	10	13
69	7	2283	30	30	7
68	7	2276	10	10	13
67	14	2269	50	40	1
66	44	2255	10	10	13
65	13	2211	35	35	6
64	94	2198	10	10	13
63	32	2104	45	40	10
62	56	2072	10	10	13
61	21	2016	40	35	1
60	57	1995	10	10	13

A	B	C	D	E	F
59	14	1938	40	40	4
58	17	1924	10	10	13
57	23	1907	50	40	1
56	136	1884	10	10	13
55	8	1748	50	45	11
54	16	1740	60	10	10
53	30	1724	10	10	13
52	20	1694	50	30	4
51	10	1674	10	10	13
50	11	1664	50	35	1
49	29	1653	10	10	13
48	63	1624	70	30	1
47	8	1561	30	10	7
46	10	1553	35	10	7
45	25	1543	10	10	13
44	12	1518	45	40	1
43	26	1506	10	10	13
42	32	1480	50	35	1
41	5	1448	10	10	13
40	23	1443	50	35	1
39	11	1420	10	10	13
38	20	1409	55	30	1
37	5	1389	10	10	13
36	34	1384	50	45	4
35	6	1350	10	10	13
34	20	1344	50	40	1
33	14	1324	50	10	1
32	31	1310	10	10	13
31	44	1279	10	10	13
30	35	1235	10	10	12
29	27	1200	10	10	13
28	13	1173	40	30	9
27	32	1160	10	10	13
26	12	1128	45	30	10
25	10	1116	40	10	10
24	23	1106	10	10	13
23	11	1083	50	40	1
22	62	1072	10	10	13
21	17	1010	55	30	1
20	8	993	10	10	13
19	20	985	35	35	3
18	17	965	10	10	13
17	17	948	60	30	1
16	52	931	10	10	13
15	13	879	35	30	1
14	172	866	10	10	13
13	50	694	40	30	6
12	404	644	10	10	13
11	15	240	50	40	1
10	14	225	10	10	13
9	45	211	60	30	1
8	7	166	10	10	13
7	28	159	55	35	1
6	58	131	10	10	13
5	9	73	35	30	7
4	9	64	10	10	13
3	11	55	55	45	1
2	29	44	10	10	13
1	15	15	50	50	4

Section PV4

A	B	C	D	E	F
302	12	10105	10	10	13
301	25	10093	35	30	1
300	77	10068	10	10	13
299	9	9991	30	30	6
298	32	9982	10	10	13
297	22	9950	30	30	6
296	19	9928	10	10	13
295	10	9909	30	30	6
294	84	9899	10	10	13
293	9	9815	35	30	1
292	5	9806	10	10	13
291	24	9801	35	30	1
290	24	9777	10	10	13
289	7	9753	30	30	3
288	63	9746	10	10	13
287	17	9683	35	30	1
286	48	9666	10	10	13
285	2	9618	30	30	7
284	13	9616	10	10	13
283	16	9603	30	30	6
282	15	9587	35	30	4
281	30	9572	10	10	13
280	21	9542	35	30	4
279	439	9521	10	10	13
278	11	9082	40	40	1
277	13	9071	10	10	13
276	11	9058	40	35	1
275	38	9047	10	10	13
274	21	9009	40	35	4
273	48	8988	10	10	13
272	33	8940	50	35	4
271	11	8907	20	20	13
270	8	8896	30	30	7
269	24	8888	10	10	13
268	19	8864	50	35	4
267	13	8845	10	10	13
266	12	8832	10	10	13
265	13	8820	30	30	3
264	147	8807	10	10	13
263	8	8660	30	30	7
262	15	8652	10	10	13
261	7	8637	30	30	3
260	38	8630	10	10	13
259	7	8592	35	30	1
258	106	8585	10	10	13
257	5	8479	35	35	1
256	5	8474	10	10	13
255	22	8469	40	30	4
254	11	8447	30	30	1
253	7	8436	10	10	13
252	15	8429	35	35	4
251	115	8414	10	10	13
250	8	8299	35	30	1
249	18	8291	50	30	5
248	8	8273	35	30	1
247	22	8265	10	10	13
246	21	8243	40	30	4
245	68	8222	10	10	13
244	5	8154	30	30	4
243	187	8149	10	10	13
242	12	7962	40	30	4
241	136	7950	10	10	13
240	22	7814	40	40	4
239	21	7792	10	10	13
238	36	7771	40	35	10
237	18	7735	40	30	10
236	27	7717	40	10	3
235	49	7690	10	10	13
234	11	7641	35	35	1
233	6	7630	10	10	13
232	10	7624	35	35	3
231	5	7614	10	10	13
230	17	7609	35	35	3
229	13	7592	10	10	13
228	14	7579	40	40	4
227	79	7565	10	10	13
226	25	7486	35	35	2
225	32	7461	10	10	13
224	15	7429	40	35	1
223	46	7414	10	10	13
222	20	7368	40	35	4
221	15	7348	10	10	13
220	16	7333	50	40	4
219	6	7317	10	10	13
218	16	7311	40	35	1
217	6	7295	10	10	13
216	8	7289	35	35	5
215	14	7281	50	35	1
214	125	7267	10	10	13
213	15	7142	35	35	3
212	56	7127	10	10	13
211	19	7071	35	30	1
210	18	7052	50	10	1
209	13	7034	35	10	2
208	21	7021	35	10	2
207	106	7000	10	10	13
206	24	6894	10	10	12
205	93	6870	10	10	13
204	14	6777	40	35	4
203	92	6763	10	10	13
202	17	6671	40	35	2
201	9	6654	10	10	13
200	22	6645	40	35	2
199	34	6623	10	10	13
198	13	6589	30	30	7
197	17	6576	30	10	7
196	5	6559	10	10	13
195	9	6554	30	30	7
194	10	6545	10	10	13
193	32	6535	40	40	1
192	61	6503	45	10	1
191	11	6442	35	10	1
190	5	6431	10	10	13
189	8	6426	30	30	3

Section PV4 (continued)

A	B	C	D	E	F	A	B	C	D	E	F
188	15	6418	10	10	13	131	11	4618	40	35	1
187	15	6403	60	30	1	130	111	4607	10	10	13
186	17	6388	35	35	2	129	12	4496	40	40	3
185	10	6371	10	10	13	128	23	4484	10	10	13
184	16	6361	40	35	2	127	11	4461	50	30	1
183	39	6345	10	10	13	126	7	4450	10	10	13
182	20	6306	45	35	4	125	7	4443	35	30	4
181	15	6286	10	10	13	124	67	4436	10	10	13
180	8	6271	35	35	3	123	21	4369	35	35	4
179	18	6263	10	10	13	122	17	4348	10	10	13
178	20	6245	50	35	4	121	10	4331	35	35	4
177	92	6225	10	10	13	120	49	4321	10	10	13
176	13	6133	40	35	1	119	11	4272	35	35	1
175	163	6120	10	10	13	118	18	4261	10	10	13
174	20	5957	40	35	2	117	15	4243	30	30	6
173	89	5937	10	10	13	116	55	4228	60	30	1
172	20	5848	40	10	4	115	19	4173	30	30	6
171	71	5828	10	10	13	114	25	4154	60	10	5
170	9	5757	40	30	4	113	24	4129	50	10	1
169	15	5748	40	10	4	112	10	4105	10	10	13
168	18	5733	10	10	13	111	17	4095	40	40	2
167	7	5715	35	35	3	110	15	4078	10	10	13
166	31	5708	10	10	13	109	10	4063	45	45	4
165	10	5677	35	30	1	108	10	4053	10	10	13
164	215	5667	10	10	13	107	12	4043	50	35	1
163	6	5452	30	30	7	106	10	4031	10	10	13
162	66	5446	10	10	13	105	11	4021	40	40	1
161	12	5380	35	35	1	104	17	4010	10	10	13
160	132	5368	10	10	13	103	22	3993	40	35	4
159	27	5236	10	10	13	102	33	3971	10	10	13
158	38	5209	10	10	12	101	11	3938	35	30	4
157	7	5171	10	10	13	100	53	3927	10	10	13
156	13	5164	35	30	9	99	17	3874	35	35	4
155	123	5151	10	10	13	98	56	3857	10	10	13
154	9	5028	30	30	7	97	17	3801	30	30	3
153	14	5019	10	10	13	96	11	3784	10	10	13
152	35	5005	30	30	6	95	9	3773	50	30	11
151	23	4970	10	10	13	94	51	3764	10	10	13
150	26	4947	40	40	2	93	39	3713	35	30	4
149	12	4921	10	10	13	92	16	3674	35	30	1
148	24	4909	30	30	6	91	5	3658	10	10	13
147	13	4885	40	40	2	90	9	3653	35	35	1
146	13	4872	10	10	13	89	7	3644	10	10	13
145	16	4859	30	30	6	88	8	3637	35	35	3
144	20	4843	30	30	6	87	6	3629	10	10	13
143	17	4823	10	10	13	86	56	3623	35	35	4
142	7	4806	30	30	7	85	26	3567	10	10	13
141	9	4799	30	30	7	84	11	3541	50	35	1
140	43	4790	10	10	13	83	78	3530	35	30	5
139	22	4747	60	30	1	82	10	3452	10	10	13
138	10	4725	30	10	7	81	11	3442	40	35	4
137	6	4715	10	10	13	80	24	3431	10	10	13
136	25	4709	40	40	1	79	37	3407	35	30	1
135	17	4684	10	10	13	78	96	3370	10	10	13
134	17	4667	30	30	6	77	12	3274	35	35	1
133	13	4650	30	10	7	76	8	3262	10	10	13
132	19	4637	30	10	7	75	11	3254	40	35	1

Section PV4 (continued)

A	B	C	D	E	F
74	48	3243	10	10	13
73	15	3195	50	30	1
72	20	3180	50	10	1
71	12	3160	10	10	13
70	14	3148	40	35	1
69	310	3134	10	10	13
68	11	2824	35	35	4
67	102	2813	10	10	13
66	6	2711	30	30	7
65	79	2705	10	10	13
64	8	2626	30	30	7
63	216	2618	10	10	13
62	37	2402	10	10	13
61	33	2365	10	10	12
60	34	2332	10	10	13
59	14	2298	40	35	9
58	116	2284	10	10	13
57	10	2168	30	30	6
56	38	2158	10	10	13
55	21	2120	10	10	12
54	38	2099	10	10	13
53	24	2061	10	10	12
52	376	2037	10	10	13
51	37	1661	40	35	6
50	17	1624	55	30	5
49	13	1607	10	10	13
48	9	1594	35	35	1
47	26	1585	35	35	8
46	17	1559	10	10	13
45	28	1542	50	30	1
44	17	1514	50	10	1
43	10	1497	10	10	13
42	38	1487	60	30	1
41	23	1449	30	10	6
40	21	1426	30	10	6
39	21	1405	10	10	13
38	15	1384	40	40	1

A	B	C	D	E	F
37	18	1369	10	10	13
36	13	1351	50	30	4
35	36	1338	10	10	13
34	27	1302	40	40	2
33	62	1275	10	10	13
32	33	1213	40	10	2
31	23	1180	10	10	13
30	14	1157	40	40	1
29	15	1143	10	10	13
28	7	1128	35	30	1
27	6	1121	10	10	13
26	16	1115	50	30	1
25	19	1099	30	30	6
24	18	1080	50	35	1
23	17	1062	30	10	6
22	37	1045	50	35	1
21	15	1008	30	30	6
20	20	993	40	30	1
19	79	973	10	10	13
18	15	894	35	35	10
17	63	879	10	10	13
16	16	816	40	40	1
15	64	800	10	10	13
14	29	736	40	40	4
13	78	707	10	10	13
12	13	629	35	35	4
11	67	616	10	10	13
10	23	549	40	40	2
9	135	526	10	10	13
8	16	391	40	40	2
7	37	375	10	10	13
6	25	338	50	40	1
5	230	313	10	10	13
4	9	83	40	40	2
3	34	74	10	10	13
2	13	40	35	35	1
1	27	27	30	30	6

Section PV5

A	B	C	D	E	F
222	21	7641	30	30	1
221	9	7620	10	10	13
220	14	7611	30	30	1
219	35	7597	10	10	13
218	8	7562	30	30	7
217	32	7554	10	10	13
216	10	7522	30	30	7
215	34	7512	10	10	13
214	16	7478	30	30	6
213	20	7462	10	10	13
212	14	7442	30	30	1
211	10	7428	10	10	13
210	60	7418	40	30	5
209	11	7358	30	30	3
208	15	7347	10	10	13
207	7	7332	30	30	4
206	28	7325	10	10	13
205	10	7297	30	30	3
204	19	7287	10	10	13
203	155	7268	35	30	5
202	12	7113	10	10	13
201	22	7101	30	30	1
200	7	7079	10	10	13
199	14	7072	30	30	3
198	83	7058	10	10	13
197	10	6975	30	30	6
196	42	6965	10	10	13
195	8	6923	30	30	6
194	37	6915	10	10	13
193	25	6878	30	30	6
192	18	6853	10	10	13
191	10	6835	30	30	6
190	90	6825	10	10	13
189	13	6735	30	30	1
188	32	6722	30	30	1
187	39	6690	10	10	13
186	9	6651	30	30	7
185	63	6642	10	10	13
184	12	6579	30	30	3
183	56	6567	10	10	13
182	15	6511	30	30	6
181	16	6496	30	30	4
180	255	6480	10	10	13
179	68	6225	10	10	12
178	22	6157	35	10	9
177	167	6135	10	10	13
176	10	5968	40	30	4
175	15	5958	40	10	1
174	36	5943	10	10	13
173	11	5907	30	30	3
172	81	5896	10	10	13
171	18	5815	35	30	4
170	61	5797	10	10	13
169	12	5736	30	30	4
168	25	5724	10	10	13
167	7	5699	30	30	7
166	168	5692	10	10	13

A	B	C	D	E	F
165	12	5524	30	30	7
164	30	5512	20	20	7
163	119	5482	10	10	13
162	22	5363	30	30	1
161	22	5341	30	10	3
160	24	5319	30	30	2
159	109	5295	10	10	13
158	44	5186	40	30	1
157	13	5142	50	10	1
156	6	5129	10	10	13
155	9	5123	50	30	11
154	38	5114	10	10	13
153	17	5076	40	30	3
152	157	5059	10	10	13
151	10	4902	30	30	1
150	98	4892	10	10	13
149	12	4794	35	30	4
148	148	4782	10	10	13
147	16	4634	30	30	1
146	27	4618	10	10	13
145	26	4591	40	30	4
144	18	4565	40	10	1
143	6	4547	10	10	13
142	16	4541	30	30	1
141	37	4525	10	10	13
140	9	4488	30	30	7
139	8	4479	10	10	13
138	7	4471	30	30	1
137	26	4464	10	10	13
136	17	4438	30	30	3
135	28	4421	10	10	13
134	7	4393	30	30	3
133	85	4386	10	10	13
132	16	4301	30	30	6
131	49	4285	10	10	13
130	29	4236	30	30	4
129	26	4207	10	10	13
128	20	4181	40	30	4
127	18	4161	10	10	13
126	17	4143	60	30	4
125	8	4126	10	10	13
124	20	4118	40	30	1
123	5	4098	10	10	13
122	24	4093	30	30	10
121	204	4069	10	10	13
120	12	3865	30	30	1
119	5	3853	10	10	13
118	16	3848	40	30	10
117	12	3832	10	10	13
116	11	3820	30	30	3
115	98	3809	10	10	13
114	20	3711	10	10	12
113	89	3691	10	10	13
112	10	3602	40	30	1
111	66	3592	10	10	13
110	24	3526	30	30	6
109	27	3502	10	10	13

Section PV5 (continued)

A	B	C	D	E	F
108	25	3475	40	30	8
107	14	3450	10	10	13
106	12	3436	30	30	7
105	5	3424	10	10	13
104	20	3419	30	30	6
103	10	3399	10	10	13
102	12	3389	30	30	6
101	11	3377	10	10	13
100	8	3366	30	30	7
99	17	3358	10	10	13
98	36	3341	50	30	1
97	15	3305	30	30	6
96	4	3290	10	10	13
95	10	3286	30	30	6
94	10	3276	10	10	13
93	8	3266	40	30	4
92	18	3258	30	30	8
91	6	3240	10	10	13
90	8	3234	30	30	7
89	13	3226	10	10	13
88	16	3213	60	30	4
87	5	3197	10	10	13
86	55	3192	40	30	8
85	35	3137	10	10	13
84	33	3102	30	30	4
83	32	3069	10	10	13
82	13	3037	35	30	4
81	424	3024	10	10	13
80	14	2600	30	30	1
79	62	2586	10	10	13
78	7	2524	30	30	1
77	16	2517	10	10	13
76	11	2501	40	30	2
75	67	2490	10	10	13
74	13	2423	35	30	1
73	11	2410	30	20	4
72	166	2399	10	10	13
71	30	2233	10	10	13
70	25	2203	40	35	4
69	100	2178	10	10	13
68	23	2078	40	35	4
67	158	2055	10	10	13
66	36	1897	10	10	12
65	11	1861	10	10	13
64	10	1850	30	30	6
63	147	1840	10	10	13
62	68	1693	50	30	1
61	11	1625	60	60	2
60	46	1614	10	10	13
59	51	1568	30	30	6
58	14	1517	10	10	13
57	14	1503	30	30	6
56	17	1489	10	10	13
55	10	1472	30	30	7
54	8	1462	30	10	7
53	47	1454	10	10	13
52	24	1407	40	35	4
51	19	1383	10	10	13
50	10	1364	30	30	7
49	24	1354	35	30	6
48	12	1330	10	10	13
47	28	1318	50	30	1
46	11	1290	10	10	13
45	26	1279	40	40	2
44	5	1253	10	10	13
43	19	1248	50	35	1
42	12	1229	10	10	13
41	59	1217	40	30	8
40	25	1158	10	10	13
39	22	1133	50	30	1
38	28	1111	10	10	13
37	16	1083	40	30	1
36	17	1067	30	10	7
35	63	1050	10	10	3
34	13	987	40	35	13
33	78	974	10	10	5
32	73	896	40	35	1
31	14	823	10	10	13
30	11	809	35	30	1
29	14	798	10	10	13
28	7	784	30	30	7
27	7	777	10	10	13
26	65	770	50	35	5
25	15	705	10	10	13
24	22	690	40	35	1
23	17	668	10	10	13
22	14	651	40	30	10
21	9	637	35	10	3
20	9	628	10	10	13
19	7	619	35	30	1
18	7	612	10	10	13
17	9	605	30	30	7
16	10	596	35	35	7
15	7	586	40	35	3
14	109	579	10	10	13
13	12	470	40	30	1
12	55	458	10	10	13
11	12	403	30	30	3
10	14	391	10	10	13
9	49	377	60	30	1
8	67	328	10	10	13
7	30	261	40	30	1
6	9	231	10	10	13
5	11	222	35	30	5
4	19	211	10	10	13
3	43	192	35	30	1
2	47	149	0	0	13
1	102	102	35	35	1

Section PV6

A	B	C	D	E	F
247	10	7373	40	40	1
246	70	7363	10	10	13
245	16	7293	40	30	1
244	89	7277	10	10	13
243	22	7188	30	30	1
242	325	7166	10	10	13
241	17	6841	30	30	10
240	9	6824	30	30	10
239	14	6815	10	10	13
238	6	6801	30	30	7
237	92	6795	10	10	13
236	31	6703	30	30	6
235	21	6672	40	40	1
234	6	6651	10	10	13
233	10	6645	50	30	1
232	21	6635	40	30	2
231	21	6614	10	10	13
230	16	6593	40	30	10
229	46	6577	10	10	13
228	10	6531	30	30	3
227	48	6521	10	10	13
226	7	6473	30	30	3
225	106	6466	10	10	13
224	10	6360	30	30	4
223	21	6350	10	10	13
222	7	6329	30	30	7
221	21	6322	10	10	13
220	15	6301	30	30	7
219	98	6286	10	10	13
218	10	6188	30	30	3
217	34	6178	10	10	13
216	6	6144	20	20	7
215	18	6138	10	10	13
214	6	6120	20	20	7
213	73	6114	10	10	13
212	13	6041	35	35	4
211	30	6028	10	10	13
210	25	5998	35	30	1
209	6	5973	10	10	13
208	20	5967	35	35	1
207	12	5947	10	10	13
206	22	5935	40	30	1
205	11	5913	10	10	13
204	13	5902	30	30	4
203	9	5889	10	10	13
202	10	5880	30	30	10
201	12	5870	10	10	13
200	7	5858	30	30	3
199	12	5851	10	10	13
198	13	5839	30	30	3
197	24	5826	10	10	13
196	15	5802	30	30	4
195	66	5787	10	10	13
194	7	5721	30	30	3
193	29	5714	10	10	13
192	16	5685	30	30	1
191	13	5669	10	10	13

A	B	C	D	E	F
190	23	5656	30	30	4
189	6	5633	10	10	13
188	22	5627	30	30	4
187	25	5605	10	10	13
186	19	5580	40	30	1
185	5	5561	10	10	13
184	23	5556	30	30	1
183	8	5533	10	10	13
182	19	5525	40	30	4
181	10	5506	10	10	13
180	29	5496	55	30	10
179	16	5467	35	30	1
178	20	5451	10	10	13
177	15	5431	30	30	7
176	165	5416	10	10	13
175	14	5251	40	30	4
174	13	5237	10	10	13
173	7	5224	30	30	3
172	50	5217	10	10	13
171	24	5167	10	10	12
170	57	5143	10	10	13
169	8	5086	30	30	7
168	41	5078	10	10	13
167	17	5037	35	35	6
166	55	5020	10	10	13
165	11	4965	30	30	7
164	17	4954	10	10	13
163	6	4937	30	30	7
162	24	4931	10	10	13
161	17	4907	45	30	1
160	7	4890	30	30	7
159	10	4883	10	10	13
158	33	4873	30	30	6
157	10	4840	40	30	1
156	46	4830	30	10	6
155	13	4784	30	10	7
154	62	4771	30	30	6
153	6	4709	10	10	13
152	20	4703	30	30	6
151	5	4683	10	10	13
150	11	4678	30	30	6
149	6	4667	10	10	13
148	7	4661	35	35	1
147	7	4654	10	10	13
146	19	4647	30	30	6
145	13	4628	10	10	13
144	36	4615	30	30	6
143	23	4579	40	30	4
142	22	4556	10	10	13
141	12	4534	30	30	7
140	14	4522	10	10	13
139	9	4508	60	30	4
138	12	4499	10	10	13
137	17	4487	40	35	4
136	106	4470	10	10	13
135	16	4364	35	30	4
134	17	4348	10	10	13

Section PV6 (continued)

A	B	C	D	E	F
133	8	4331	30	30	3
132	15	4323	10	10	13
131	12	4308	30	30	1
130	123	4296	10	10	13
129	10	4173	30	30	1
128	90	4163	10	10	13
127	15	4073	30	30	3
126	140	4058	10	10	13
125	5	3918	30	30	7
124	66	3913	10	10	13
123	7	3847	40	40	3
122	11	3840	10	10	13
121	12	3829	35	35	8
120	8	3817	10	10	13
119	14	3809	30	30	3
118	10	3795	30	10	1
117	33	3785	10	10	13
116	8	3752	30	30	1
115	204	3744	10	10	13
114	34	3540	40	30	4
113	319	3506	10	10	13
112	7	3187	30	30	9
111	174	3180	10	10	13
110	8	3006	30	30	7
109	44	2998	10	10	13
108	25	2954	30	30	6
107	33	2929	30	30	6
106	5	2896	10	10	13
105	17	2891	30	30	6
104	14	2874	30	10	6
103	23	2860	30	30	6
102	13	2837	30	30	6
101	12	2824	10	10	13
100	15	2812	30	30	6
99	26	2797	30	30	6
98	43	2771	30	30	6
97	14	2728	10	10	13
96	25	2714	45	30	2
95	15	2689	10	10	13
94	33	2674	40	35	1
93	36	2641	10	10	13
92	9	2605	30	30	1
91	20	2596	10	10	13
90	26	2576	40	35	4
89	27	2550	50	40	1
88	12	2523	10	10	13
87	31	2511	50	30	1
86	46	2480	10	10	13
85	8	2434	30	30	4
84	34	2426	10	10	13
83	10	2392	30	30	1
82	36	2382	10	10	13
81	18	2346	45	30	1
80	16	2328	30	10	7
79	55	2312	10	10	13
78	15	2257	50	30	4
77	7	2242	30	30	7

A	B	C	D	E	F
76	21	2235	10	10	13
75	12	2214	30	30	3
74	78	2202	10	10	13
73	37	2124	50	35	5
72	7	2087	30	30	7
71	11	2080	10	10	13
70	11	2069	35	30	1
69	17	2058	10	10	13
68	60	2041	55	30	5
67	10	1981	40	35	1
66	8	1971	10	10	13
65	19	1963	45	40	4
64	18	1944	10	10	13
63	13	1926	45	30	1
62	5	1913	10	10	13
61	9	1908	30	30	1
60	13	1899	10	10	13
59	9	1886	40	30	1
58	19	1877	10	10	13
57	17	1858	40	10	4
56	57	1841	10	10	13
55	7	1784	40	30	1
54	50	1777	10	10	13
53	12	1727	40	30	1
52	32	1715	10	10	13
51	9	1683	30	30	1
50	25	1674	10	10	13
49	17	1649	35	30	4
48	13	1632	10	10	13
47	55	1619	50	30	1
46	24	1564	40	10	2
45	45	1540	10	10	13
44	14	1495	50	30	1
43	11	1481	40	10	1
42	9	1470	10	10	13
41	13	1461	30	30	3
40	63	1448	10	10	13
39	25	1385	40	30	4
38	99	1360	35	10	5
37	4	1261	10	10	13
36	20	1257	50	30	1
35	15	1237	10	10	1
34	12	1222	30	30	7
33	19	1210	50	10	10
32	23	1191	10	10	13
31	16	1168	40	35	2
30	92	1152	10	10	13
29	14	1060	45	35	1
28	9	1046	30	10	1
27	25	1037	10	10	13
26	20	1012	40	35	4
25	11	992	10	10	13
24	14	981	35	35	1
23	10	967	10	10	13
22	8	957	30	30	3
21	8	949	10	10	13
20	12	941	40	30	1

Section PV6 (continued)

A	B	C	D	E	F
19	5	929	10	10	13
18	24	924	35	30	1
17	175	900	10	10	13
16	6	725	10	10	12
15	87	719	10	10	13
14	7	632	30	30	7
13	17	625	10	10	13
12	14	608	30	30	3
11	70	594	10	10	13
10	9	524	30	30	4

A	B	C	D	E	F
9	89	515	10	10	13
8	23	426	30	30	3
7	31	403	10	10	13
6	7	372	30	30	7
5	51	365	10	10	13
4	8	314	30	30	7
3	235	306	10	10	13
2	34	71	10	10	13
1	37	37	10	10	12

Section PV7

A	B	C	D	E	F
311	14	10657	10	10	13
310	26	10643	40	30	4
309	10	10617	30	30	7
308	27	10607	10	10	13
307	31	10580	40	40	1
306	14	10549	10	10	13
305	13	10535	40	35	4
304	12	10522	10	10	13
303	12	10510	50	30	1
302	18	10498	10	10	13
301	10	10480	40	30	1
300	8	10470	30	30	7
299	18	10462	30	30	6
298	22	10444	30	30	6
297	5	10422	10	10	13
296	29	10417	55	30	2
295	10	10388	30	30	7
294	24	10378	10	10	13
293	33	10354	50	40	5
292	8	10321	30	30	7
291	18	10313	50	10	4
290	10	10295	10	10	13
289	15	10285	55	35	4
288	11	10270	10	10	13
287	17	10259	50	40	4
286	19	10242	10	10	13
285	18	10223	55	30	1
284	31	10205	40	30	8
283	8	10174	10	10	13
282	17	10166	50	30	1
281	76	10149	10	10	13
280	17	10073	40	30	1
279	12	10056	30	30	7
278	47	10044	10	10	13
277	20	9997	50	30	4
276	8	9977	30	30	7
275	17	9969	10	10	13
274	16	9952	30	30	1
273	63	9936	10	10	13
272	53	9873	55	30	5
271	18	9820	10	10	13
270	16	9802	40	30	1
269	6	9786	10	10	13
268	11	9780	30	30	3
267	8	9769	10	10	13
266	47	9761	50	30	5
265	22	9714	50	35	1
264	18	9692	40	40	2
263	16	9674	50	30	1
262	10	9658	30	10	7
261	9	9648	10	10	13
260	10	9639	40	40	1
259	10	9629	40	10	3
258	13	9619	10	10	13
257	10	9606	50	30	1
256	46	9596	10	10	13
255	8	9550	30	30	10

A	B	C	D	E	F
254	37	9542	10	10	13
253	11	9505	30	30	3
252	9	9494	10	10	13
251	42	9485	40	30	1
250	6	9443	10	10	13
249	23	9437	40	40	1
248	30	9414	40	40	2
247	25	9384	10	10	13
246	6	9359	30	30	7
245	5	9353	10	10	13
244	11	9348	55	30	1
243	15	9337	40	30	1
242	13	9322	10	10	13
241	16	9309	40	30	1
240	24	9293	10	10	13
239	2	9269	0	0	13
238	20	9267	10	10	13
237	18	9247	35	30	4
236	15	9229	40	30	4
235	24	9214	10	10	13
234	22	9190	40	30	4
233	14	9168	10	10	13
232	19	9154	55	30	1
231	9	9135	10	10	13
230	21	9126	30	30	7
229	28	9105	55	30	1
228	16	9077	10	10	13
227	31	9061	40	30	4
226	82	9030	10	10	13
225	15	8948	40	30	1
224	8	8933	40	10	3
223	30	8925	10	10	13
222	14	8895	40	40	4
221	8	8881	10	10	13
220	19	8873	40	30	4
219	20	8854	10	10	13
218	8	8834	40	30	1
217	28	8826	35	10	1
216	26	8798	10	10	13
215	9	8772	30	30	3
214	134	8763	10	10	13
213	6	8629	10	10	12
212	110	8623	10	10	13
211	12	8513	30	30	4
210	57	8501	10	10	13
209	10	8444	30	30	3
208	74	8434	10	10	13
207	7	8360	30	30	3
206	6	8353	10	10	13
205	20	8347	35	35	3
204	21	8327	10	10	13
203	8	8306	30	30	7
202	8	8298	10	10	13
201	6	8290	10	10	12
200	20	8284	10	10	13
199	6	8264	30	30	7
198	6	8258	10	10	13

A	B	C	D	E	F
197	6	8252	30	30	7
196	174	8246	10	10	13
195	12	8072	30	30	7
194	20	8060	10	10	13
193	70	8040	10	10	12
192	34	7970	10	10	13
191	14	7936	35	30	9
190	57	7922	10	10	13
189	26	7865	30	30	7
188	48	7839	10	10	13
187	22	7791	10	10	13
186	16	7769	10	10	13
185	10	7753	30	30	7
184	11	7743	10	10	13
183	6	7732	30	30	7
182	24	7726	10	10	13
181	22	7702	10	10	13
180	33	7680	10	10	12
179	154	7647	10	10	13
178	13	7493	35	30	3
177	353	7480	10	10	13
176	9	7127	30	30	6
175	5	7118	10	10	13
174	10	7113	60	40	1
173	8	7103	10	10	13
172	14	7095	30	30	7
171	22	7081	50	30	1
170	19	7059	10	10	13
169	22	7040	40	35	1
168	97	7018	40	35	1
167	6	6921	10	10	13
166	47	6915	60	30	1
165	12	6868	30	30	7
164	11	6856	10	10	13
163	10	6845	30	30	7
162	39	6835	70	10	1
161	7	6796	30	30	7
160	36	6789	65	10	1
159	30	6753	10	10	13
158	33	6723	40	30	1
157	5	6690	10	10	13
156	8	6685	30	30	7
155	47	6677	55	30	8
154	89	6630	10	10	13
153	14	6541	40	35	1
152	30	6527	10	10	13
151	7	6497	30	30	3
150	40	6490	40	35	8
149	22	6450	10	10	13
148	10	6428	35	30	1
147	44	6418	10	10	13
146	14	6374	40	35	5
145	15	6360	30	30	6
144	61	6345	60	30	1
143	15	6284	10	10	13
142	37	6269	45	30	1
141	40	6232	10	10	13

A	B	C	D	E	F
140	7	6192	30	30	7
139	12	6185	10	10	13
138	19	6173	50	30	4
137	91	6154	10	10	13
136	23	6063	40	35	1
135	93	6040	10	10	13
134	35	5947	60	40	1
133	20	5912	10	10	13
132	8	5892	30	30	7
131	158	5884	10	10	13
130	25	5726	45	35	5
129	8	5701	30	30	7
128	7	5693	10	10	13
127	24	5686	40	30	1
126	235	5662	10	10	13
125	12	5427	40	30	1
124	21	5415	10	10	13
123	20	5394	30	30	7
122	88	5374	10	10	13
121	20	5286	35	35	4
120	106	5266	10	10	13
119	15	5160	30	30	6
118	77	5145	10	10	13
117	5	5068	30	30	7
116	14	5063	30	30	6
115	64	5049	10	10	13
114	36	4985	10	10	12
113	23	4949	10	10	13
112	15	4926	35	35	9
111	282	4911	10	10	13
110	11	4629	30	30	7
109	176	4618	10	10	13
108	5	4442	10	10	12
107	24	4437	10	10	13
106	5	4413	30	30	7
105	23	4408	10	10	13
104	10	4385	30	30	7
103	305	4375	10	10	13
102	12	4070	30	30	1
101	91	4058	10	10	13
100	37	3967	10	10	12
99	43	3930	10	10	13
98	7	3887	30	30	7
97	216	3880	10	10	13
96	11	3664	30	30	7
95	71	3653	10	10	13
94	7	3582	30	30	7
93	140	3575	10	10	13
92	73	3435	10	10	13
91	82	3362	10	10	12
90	338	3280	10	10	13
89	6	2942	30	30	7
88	7	2936	10	10	13
87	15	2929	30	30	1
86	13	2914	30	10	7
85	8	2901	30	30	7
84	8	2893	10	10	13

Section PV7 (continued)

A	B	C	D	E	F
83	17	2885	30	30	7
82	20	2868	30	30	7
81	11	2848	30	30	7
80	8	2837	30	30	7
79	11	2829	30	30	7
78	8	2818	30	30	7
77	10	2810	30	30	7
76	9	2800	30	30	7
75	17	2791	30	30	1
74	9	2774	10	10	13
73	29	2765	30	30	1
72	17	2736	10	10	13
71	6	2719	30	30	7
70	9	2713	30	10	7
69	5	2704	10	10	13
68	6	2699	30	30	7
67	39	2693	10	10	13
66	6	2654	30	30	1
65	22	2648	10	10	13
64	29	2626	55	30	4
63	10	2597	30	30	7
62	12	2587	30	30	7
61	8	2575	30	10	7
60	22	2567	30	10	1
59	10	2545	30	10	7
58	11	2535	30	10	7
57	42	2524	30	30	1
56	10	2482	10	10	13
55	37	2472	70	30	1
54	11	2435	10	10	13
53	16	2424	30	30	7
52	14	2408	30	30	7
51	11	2394	10	10	13
50	47	2383	40	30	1
49	43	2336	10	10	13
48	10	2293	30	30	7
47	86	2283	10	10	13
46	79	2197	30	30	6
45	91	2118	40	10	6
44	68	2027	10	10	13
43	6	1959	30	30	7

A	B	C	D	E	F
42	10	1953	30	10	7
41	10	1943	10	10	7
40	78	1933	50	30	1
39	27	1855	30	30	6
38	39	1828	35	30	5
37	6	1789	10	10	13
36	10	1783	35	30	1
35	37	1773	10	10	13
34	13	1736	50	30	1
33	7	1723	50	10	1
32	13	1716	50	10	4
31	11	1703	30	30	13
30	11	1692	40	30	1
29	205	1681	10	10	13
28	6	1476	30	30	4
27	204	1470	10	10	13
26	23	1266	35	30	7
25	330	1243	10	10	13
24	11	913	30	30	6
23	31	902	10	10	13
22	65	871	30	30	8
21	82	806	50	40	1
20	20	724	30	30	6
19	51	704	10	10	13
18	9	653	30	30	6
17	6	644	10	10	13
16	46	638	30	30	6
15	19	592	10	10	13
14	61	573	45	40	2
13	41	512	10	10	13
12	7	471	30	30	7
11	105	464	10	10	13
10	46	359	40	30	1
9	42	313	10	10	13
8	57	271	50	40	2
7	17	214	50	10	1
6	14	197	10	10	13
5	39	183	50	30	1
4	18	144	10	10	13
3	48	126	55	30	4
2	34	78	10	10	13
1	44	44	45	40	4

Section PV8

A	B	C	D	E	F
233	8	7261	30	30	7
232	9	7253	30	30	7
231	11	7244	30	10	7
230	6	7233	10	10	13
229	9	7227	30	30	7
228	103	7218	10	10	13
227	7	7115	30	30	7
226	87	7108	10	10	13
225	27	7021	30	30	4
224	28	6994	10	10	13
223	9	6966	30	30	6
222	13	6957	30	10	6
221	80	6944	10	10	13
220	8	6864	30	30	3
219	282	6856	10	10	13
218	8	6574	30	30	7
217	186	6566	10	10	13
216	23	6380	40	40	5
215	32	6357	10	10	13
214	13	6325	55	30	5
213	29	6312	10	10	13
212	14	6283	30	30	6
211	9	6269	65	30	5
210	5	6260	10	10	13
209	27	6255	30	30	6
208	15	6228	60	30	5
207	11	6213	30	30	7
206	14	6202	10	10	13
205	57	6188	30	30	6
204	8	6131	10	10	13
203	29	6123	30	30	6
202	25	6094	10	10	13
201	28	6069	30	30	6
200	26	6041	70	30	5
199	20	6015	30	30	6
198	61	5995	30	30	6
197	35	5934	40	30	6
196	7	5899	10	10	13
195	31	5892	30	30	6
194	28	5861	70	30	5
193	17	5833	30	30	7
192	10	5816	30	10	7
191	14	5806	60	10	1
190	16	5792	30	30	7
189	34	5776	55	30	5
188	31	5742	10	10	13
187	17	5711	50	30	1
186	29	5694	10	10	13
185	7	5665	30	30	3
184	35	5658	10	10	13
183	26	5623	50	30	10
182	13	5597	30	10	6
181	41	5584	10	10	13
180	20	5543	50	40	4
179	13	5523	30	30	7
178	32	5510	10	10	13
177	11	5478	30	30	7

A	B	C	D	E	F
176	24	5467	10	10	13
175	26	5443	30	30	6
174	24	5417	30	30	6
173	89	5393	45	30	5
172	68	5304	50	30	5
171	35	5236	10	10	13
170	13	5201	50	40	4
169	7	5188	10	10	13
168	30	5181	40	30	4
167	22	5151	50	10	1
166	18	5129	40	10	3
165	27	5111	40	10	1
164	19	5084	40	10	1
163	20	5065	30	10	3
162	13	5045	10	10	13
161	16	5032	40	30	1
160	39	5016	10	10	13
159	12	4977	30	30	3
158	58	4965	10	10	13
157	17	4907	35	30	4
156	47	4890	10	10	13
155	13	4843	40	30	10
154	30	4830	10	10	13
153	21	4800	30	30	3
152	9	4779	10	10	13
151	9	4770	30	30	7
150	6	4761	10	10	13
149	47	4755	40	30	1
148	18	4708	30	10	7
147	22	4690	50	10	1
146	33	4668	10	10	13
145	10	4635	50	35	1
144	22	4625	35	30	4
143	8	4603	30	20	7
142	10	4595	10	10	13
141	6	4585	35	30	1
140	13	4579	20	20	13
139	24	4566	35	30	3
138	31	4542	20	20	13
137	20	4511	50	30	1
136	17	4491	50	35	1
135	37	4474	40	30	4
134	10	4437	30	10	7
133	21	4427	10	10	13
132	29	4406	50	30	4
131	20	4377	10	10	13
130	33	4357	40	30	4
129	91	4324	10	10	13
128	17	4233	40	30	1
127	11	4216	40	30	1
126	26	4205	10	10	13
125	7	4179	40	30	1
124	5	4172	10	10	13
123	19	4167	50	30	1
122	14	4148	10	10	13
121	16	4134	40	35	10
120	22	4118	10	10	13

Section PV8 (continued)

A	B	C	D	E	F
119	9	4096	30	30	7
118	20	4087	40	10	1
117	30	4067	10	10	13
116	13	4037	35	30	3
115	161	4024	10	10	13
114	8	3863	10	10	12
113	50	3855	10	10	13
112	25	3805	35	30	3
111	33	3780	10	10	13
110	8	3747	30	30	3
109	213	3739	10	10	13
108	32	3526	30	30	4
107	21	3494	10	10	13
106	10	3473	30	30	7
105	11	3463	10	10	13
104	5	3452	10	10	12
103	34	3447	10	10	13
102	6	3413	30	30	7
101	46	3407	10	10	13
100	22	3361	10	10	12
99	84	3339	10	10	13
98	5	3255	30	30	7
97	50	3250	10	10	13
96	9	3200	30	30	7
95	14	3191	10	10	13
94	24	3177	10	10	13
93	87	3153	10	10	12
92	43	3066	10	10	13
91	15	3023	35	30	9
90	20	3008	10	10	13
89	19	2988	30	30	6
88	43	2969	10	10	13
87	8	2926	30	30	7
86	32	2918	10	10	13
85	20	2886	10	10	12
84	11	2866	10	10	13
83	7	2855	30	30	7
82	36	2848	10	10	13
81	19	2812	10	10	13
80	26	2793	10	10	12
79	124	2767	10	10	13
78	7	2643	40	30	7
77	291	2636	10	10	13
76	10	2345	30	30	7
75	11	2335	10	10	13
74	12	2324	55	30	10
73	7	2312	10	10	13
72	9	2305	30	30	7
71	7	2296	10	10	13
70	33	2289	55	30	5
69	14	2256	10	10	13
68	33	2242	40	30	1
67	10	2209	10	10	13
66	95	2199	40	30	5
65	27	2104	55	30	1
64	6	2077	10	10	13
63	34	2071	55	30	5
62	5	2037	10	10	13
61	19	2032	50	30	1
60	25	2013	10	10	13

A	B	C	D	E	F
59	45	1988	50	45	8
58	101	1943	10	10	13
57	54	1842	50	30	5
56	9	1788	10	10	13
55	13	1779	30	30	6
54	13	1766	10	10	13
53	33	1753	40	35	2
52	20	1720	10	10	13
51	19	1700	45	35	1
50	6	1681	10	10	13
49	14	1675	35	30	1
48	7	1661	10	10	13
47	13	1654	40	35	1
46	12	1641	10	10	13
45	16	1629	50	35	1
44	11	1613	10	10	13
43	30	1602	55	35	1
42	10	1572	10	10	13
41	7	1562	30	30	7
40	25	1555	60	30	4
39	11	1530	10	10	13
38	15	1519	40	30	4
37	74	1504	10	10	13
36	13	1430	35	35	10
35	88	1417	10	10	13
34	18	1329	35	35	1
33	14	1311	10	10	13
32	16	1297	30	30	1
31	18	1281	10	10	13
30	23	1263	40	35	4
29	88	1240	10	10	13
28	27	1152	40	35	1
27	107	1125	10	10	13
26	35	1018	50	35	1
25	108	983	10	10	13
24	21	875	30	30	4
23	8	854	40	35	4
22	61	846	10	10	13
21	34	785	55	35	5
20	6	751	10	10	13
19	9	745	30	30	6
18	18	736	10	10	13
17	12	718	40	30	1
16	242	706	10	10	13
15	17	464	40	30	1
14	22	447	10	10	13
13	10	425	30	30	7
12	84	415	10	10	13
11	13	331	30	30	7
10	9	318	10	10	13
9	21	309	30	30	4
8	58	288	10	10	13
7	11	230	30	30	7
6	46	219	10	10	13
5	14	173	30	30	6
4	102	159	10	10	13
3	12	57	30	30	7
2	30	45	10	10	13
1	15	15	30	30	6

Section PV9

A	B	C	D	E	F
236	30	7481	10	10	12
235	7	7451	10	10	13
234	12	7444	30	30	1
233	23	7432	30	30	1
232	27	7409	10	10	13
231	13	7382	45	30	1
230	10	7369	10	10	13
229	21	7359	30	30	1
228	11	7338	35	30	1
227	53	7327	10	10	13
226	9	7274	30	30	6
225	9	7265	10	10	13
224	10	7256	30	30	6
223	6	7246	10	10	13
222	15	7240	30	30	6
221	19	7225	30	30	6
220	16	7206	30	30	6
219	27	7190	30	30	6
218	52	7163	30	30	6
217	32	7111	30	30	6
216	26	7079	55	30	1
215	30	7053	70	30	1
214	14	7023	30	30	6
213	13	7009	30	30	6
212	11	6996	30	30	6
211	49	6985	30	30	6
210	9	6936	30	30	6
209	13	6927	60	30	1
208	19	6914	10	10	13
207	28	6895	60	30	1
206	38	6867	10	10	13
205	20	6829	50	40	5
204	9	6809	10	10	1
203	21	6800	30	30	13
202	50	6779	30	30	6
201	11	6729	60	30	1
200	14	6718	10	10	1
199	14	6704	50	45	13
198	15	6690	10	10	1
197	12	6675	30	30	13
196	7	6663	10	10	1
195	23	6656	30	30	13
194	10	6633	30	10	1
193	25	6623	30	10	1
192	22	6598	10	10	13
191	35	6576	40	30	2
190	31	6541	10	10	13
189	12	6510	50	40	1
188	22	6498	10	10	13
187	14	6476	50	30	1
186	19	6462	10	10	13
185	18	6443	30	30	7
184	12	6425	10	10	13
183	43	6413	30	30	1
182	20	6370	30	30	7
181	43	6350	10	10	13
180	15	6307	50	40	4

A	B	C	D	E	F
179	9	6292	10	10	13
178	6	6283	30	30	7
177	11	6277	30	30	7
176	62	6266	10	10	13
175	21	6204	30	30	2
174	26	6183	10	10	13
173	11	6157	30	30	6
172	14	6146	30	10	6
171	23	6132	50	30	1
170	11	6109	10	10	13
169	27	6098	50	30	1
168	16	6071	10	10	13
167	13	6055	50	40	1
166	7	6042	10	10	13
165	13	6035	40	30	2
164	15	6022	10	10	13
163	22	6007	50	30	1
162	8	5985	10	10	13
161	19	5977	55	30	6
160	23	5958	50	10	5
159	24	5935	40	10	1
158	24	5911	40	10	4
157	23	5887	10	10	13
156	11	5864	40	30	1
155	12	5853	10	10	13
154	10	5841	50	30	4
153	128	5831	10	10	13
152	19	5703	35	30	4
151	28	5684	10	10	13
150	9	5656	30	30	1
149	48	5647	10	10	13
148	13	5599	30	30	3
147	27	5586	10	10	13
146	18	5559	40	35	4
145	5	5541	10	10	13
144	121	5536	40	30	5
143	6	5415	10	10	13
142	10	5409	30	30	6
141	9	5399	10	10	13
140	27	5390	40	30	1
139	13	5363	30	10	7
138	5	5350	10	10	13
137	22	5345	30	30	6
136	33	5323	30	30	6
135	31	5290	60	30	1
134	6	5259	10	10	13
133	17	5253	50	40	1
132	22	5236	50	10	5
131	19	5214	40	35	5
130	13	5195	10	10	13
129	9	5182	30	30	1
128	25	5173	50	10	4
127	5	5148	10	10	13
126	7	5143	30	30	7
125	12	5136	10	10	13
124	8	5124	35	35	4
123	5	5116	10	10	13

Section PV9 (continued)

A	B	C	D	E	F
122	15	5111	55	40	4
121	18	5096	10	10	13
120	26	5078	50	35	4
119	27	5052	10	10	13
118	16	5025	30	30	4
117	10	5009	10	10	13
116	25	4999	40	40	2
115	38	4974	10	10	13
114	9	4936	30	30	7
113	46	4927	10	10	13
112	18	4881	45	30	1
111	15	4863	40	30	1
110	33	4848	10	10	13
109	22	4815	40	35	2
108	10	4793	10	10	13
107	17	4783	40	30	4
106	23	4766	10	10	13
105	10	4743	35	30	1
104	15	4733	50	30	5
103	13	4718	40	10	1
102	46	4705	10	10	13
101	17	4659	40	30	4
100	173	4642	10	10	13
99	8	4469	10	10	12
98	54	4461	10	10	13
97	39	4407	35	30	1
96	32	4368	10	10	13
95	8	4336	30	30	7
94	221	4328	10	10	13
93	29	4107	35	30	2
92	27	4078	10	10	13
91	8	4051	30	30	7
90	278	4043	10	10	13
89	13	3765	30	30	7
88	23	3752	10	10	13
87	92	3729	10	10	12
86	46	3637	10	10	13
85	15	3591	40	30	9
84	39	3576	10	10	13
83	11	3537	30	10	7
82	11	3526	30	30	7
81	31	3515	10	10	13
80	20	3484	10	10	12
79	10	3464	10	10	13
78	8	3454	30	30	7
77	23	3446	10	10	13
76	8	3423	30	30	7
75	14	3415	10	10	13
74	19	3401	10	10	13
73	28	3382	10	10	12
72	150	3354	10	10	13
71	8	3204	40	30	1
70	10	3196	30	10	7
69	513	3186	10	10	13
68	11	2673	30	30	7
67	9	2662	10	10	13
66	14	2653	50	30	1
65	23	2639	10	10	13
64	26	2616	60	30	1
63	19	2590	10	10	13
62	39	2571	50	30	5
61	75	2532	40	30	5
60	17	2457	50	30	1
59	24	2440	30	30	7
58	20	2416	60	30	1
57	11	2396	30	10	13
56	32	2385	55	10	1
55	30	2353	10	10	13
54	7	2323	35	35	8
53	12	2316	10	10	13
52	11	2304	30	30	10
51	86	2293	10	10	13
50	37	2207	50	30	5
49	23	2170	10	10	13
48	30	2147	35	35	8
47	17	2117	10	10	13
46	11	2100	40	30	1
45	11	2089	10	10	13
44	14	2078	35	30	1
43	8	2064	10	10	13
42	23	2056	35	35	1
41	8	2033	10	10	13
40	24	2025	35	30	1
39	29	2001	40	30	1
38	9	1972	10	10	13
37	43	1963	60	30	4
36	23	1920	50	10	4
35	77	1897	10	10	13
34	8	1820	30	30	7
33	73	1812	10	10	13
32	21	1739	30	30	1
31	22	1718	30	10	1
30	9	1696	30	30	7
29	20	1687	40	30	1
28	90	1667	10	10	13
27	16	1577	30	30	3
26	36	1561	40	35	4
25	91	1525	10	10	13
24	40	1434	50	30	1
23	120	1394	10	10	13
22	14	1274	40	30	4
21	8	1260	10	10	13
20	24	1252	35	30	4
19	9	1228	10	10	13
18	7	1219	30	30	7
17	34	1212	10	10	13
16	31	1178	55	30	5
15	11	1147	10	10	13
14	11	1136	50	30	1
13	271	1125	10	10	13
12	20	854	40	30	4
11	20	834	10	10	13
10	18	814	30	30	1
9	345	796	10	10	13
8	14	451	30	30	6
7	76	437	10	10	13
6	34	361	10	10	12
5	12	327	10	10	13
4	19	315	30	20	1
3	9	296	35	35	9
2	276	287	10	10	13
1	11	11	30	30	7

Section PV10

A	B	C	D	E	F
214	8	6181	30	30	7
213	12	6173	10	10	13
212	15	6161	35	30	1
211	7	6146	10	10	13
210	14	6139	60	30	1
209	11	6125	10	10	13
208	11	6114	30	30	7
207	11	6103	30	10	7
206	7	6092	10	10	13
205	28	6085	30	30	7
204	12	6057	30	30	7
203	9	6045	30	30	7
202	10	6036	30	30	7
201	5	6026	30	10	7
200	11	6021	30	30	7
199	13	6010	30	30	6
198	19	5997	30	30	1
197	9	5978	10	10	13
196	9	5969	30	30	7
195	8	5960	10	10	13
194	94	5952	65	30	5
193	20	5858	30	30	6
192	15	5838	10	10	13
191	13	5823	50	10	1
190	8	5810	30	30	7
189	18	5802	10	10	13
188	14	5784	35	35	1
187	10	5770	35	10	1
186	23	5760	60	55	4
185	14	5737	10	10	13
184	10	5723	30	30	7
183	7	5713	30	10	7
182	5	5706	10	10	13
181	32	5701	55	45	1
180	42	5669	30	30	6
179	20	5627	55	30	6
178	24	5607	40	30	6
177	10	5583	30	10	1
176	12	5573	10	10	13
175	14	5561	50	35	1
174	19	5547	10	10	13
173	8	5528	30	30	7
172	8	5520	40	35	1
171	91	5512	10	10	13
170	28	5421	30	30	1
169	22	5393	10	10	13
168	20	5371	30	30	6
167	47	5351	10	10	13
166	7	5304	30	30	7
165	10	5297	30	10	7
164	12	5287	10	10	13
163	13	5275	30	30	1
162	18	5262	30	10	1
161	66	5244	10	10	13
160	16	5178	60	30	4
159	7	5162	30	30	7
158	11	5155	30	10	7
157	14	5144	10	10	13
156	15	5130	30	30	7
155	20	5115	50	30	1
154	10	5095	30	30	7
153	8	5085	30	30	7
152	12	5077	30	10	7
151	13	5065	10	10	13
150	5	5052	30	30	7
149	14	5047	50	10	1
148	8	5033	10	10	13
147	21	5025	50	30	5
146	33	5004	40	30	5
145	9	4971	40	30	1
144	5	4962	10	10	13
143	10	4957	50	30	1
142	14	4947	40	30	2
141	76	4933	10	10	13
140	9	4857	40	30	1
139	157	4848	10	10	13
138	8	4691	35	30	1
137	185	4683	10	10	13
136	7	4498	30	30	7
135	171	4491	10	10	13
134	21	4320	40	35	4
133	137	4299	10	10	13
132	17	4162	45	40	1
131	10	4145	30	30	7
130	13	4135	10	10	13
129	7	4122	30	30	7
128	17	4115	10	10	13
127	238	4098	55	50	5
126	7	3860	30	30	7
125	12	3853	30	30	7
124	11	3841	30	10	7
123	14	3830	30	10	7
122	26	3816	10	10	13
121	40	3790	30	30	6
120	11	3750	10	10	13
119	15	3739	30	30	6
118	10	3724	10	10	13
117	54	3714	55	50	1
116	6	3660	30	30	7
115	22	3654	10	10	13
114	29	3632	30	30	7
113	32	3603	10	10	13
112	13	3571	30	30	6
111	12	3558	30	30	6
110	74	3546	30	30	6
109	67	3472	30	30	6
108	10	3405	30	30	7
107	17	3395	30	10	6
106	65	3378	70	30	1
105	13	3313	10	10	13
104	83	3300	55	50	5
103	29	3217	30	30	1
102	15	3188	10	10	13
101	16	3173	50	45	1

Section PV10 (continued)

A	B	C	D	E	F
100	23	3157	10	10	13
99	16	3134	55	55	2
98	18	3118	10	20	13
97	75	3100	55	30	5
96	11	3025	30	30	7
95	7	3014	10	10	13
94	38	3007	60	30	1
93	45	2969	10	10	13
92	13	2924	50	35	1
91	267	2911	10	10	13
90	25	2644	70	30	5
89	13	2619	10	10	13
88	20	2606	60	30	1
87	25	2586	10	10	13
86	21	2561	50	40	1
85	8	2540	10	10	13
84	12	2532	40	40	2
83	142	2520	10	10	13
82	38	2378	50	30	4
81	18	2340	10	10	13
80	8	2322	30	30	1
79	5	2314	10	10	13
78	21	2309	40	40	1
77	50	2288	10	10	13
76	19	2238	40	35	3
75	56	2219	10	10	13
74	28	2163	55	40	8
73	24	2135	10	10	13
72	26	2111	60	30	4
71	28	2085	10	10	13
70	19	2057	50	40	1
69	24	2038	10	10	13
68	17	2014	40	30	4
67	69	1997	10	10	13
66	9	1928	35	35	2
65	18	1919	10	10	13
64	19	1901	55	40	4
63	53	1882	10	10	13
62	12	1829	30	30	7
61	7	1817	10	10	13
60	10	1810	30	30	7
59	32	1800	10	10	13
58	18	1768	40	30	6
57	17	1750	10	10	13
56	10	1733	40	40	2
55	6	1723	30	10	7
54	127	1717	10	10	13
53	19	1590	45	35	1
52	14	1571	10	10	13
51	28	1557	55	30	1
50	35	1529	10	10	13
49	26	1494	40	40	1
48	48	1468	10	10	13
47	20	1420	55	40	4
46	244	1400	10	10	13
45	29	1156	55	35	1
44	9	1127	10	10	13
43	11	1118	55	30	1
42	23	1107	10	10	13
41	11	1084	30	30	1
40	7	1073	10	10	13
39	21	1066	55	30	1
38	12	1045	10	10	13
37	59	1033	30	30	2
36	5	974	10	10	13
35	54	969	50	30	5
34	11	915	30	30	7
33	17	904	10	10	13
32	9	887	30	30	7
31	20	878	40	30	1
30	63	858	10	10	13
29	8	795	30	30	7
28	24	787	10	10	13
27	33	763	60	30	5
26	34	730	65	30	1
25	8	696	10	10	13
24	32	688	55	30	4
23	23	656	10	10	13
22	22	633	40	35	1
21	42	611	10	10	13
20	8	569	40	40	2
19	14	561	10	10	13
18	27	547	10	10	13
17	45	520	10	10	12
16	27	475	10	10	13
15	7	448	40	40	9
14	74	441	10	10	13
13	9	367	35	30	7
12	43	358	60	30	5
11	52	315	10	10	13
10	10	263	30	30	6
9	6	253	10	10	13
8	8	247	30	30	6
7	12	239	10	10	13
6	48	227	55	30	1
5	12	179	30	30	7
4	35	167	55	30	5
3	50	132	55	30	10
2	50	82	10	10	13
1	32	32	40	30	1

Section PV11

A	B	C	D	E	F
268	8	7913	30	30	3
267	219	7905	10	10	13
266	7	7686	40	30	1
265	78	7679	10	10	13
264	6	7601	30	30	7
263	92	7595	10	10	12
262	216	7503	10	10	13
261	14	7287	30	30	7
260	5	7273	10	10	13
259	9	7268	30	30	6
258	190	7259	10	10	13
257	8	7069	30	30	7
256	8	7061	10	10	13
255	17	7053	50	30	1
254	23	7036	50	30	1
253	30	7013	50	30	1
252	5	6983	10	10	13
251	9	6978	30	30	7
250	9	6969	30	30	7
249	8	6960	30	10	7
248	6	6952	10	10	13
247	23	6946	30	30	6
246	7	6923	30	30	7
245	13	6916	30	30	6
244	9	6903	30	10	6
243	10	6894	30	10	6
242	11	6884	30	30	6
241	13	6873	30	30	6
240	15	6860	30	10	6
239	39	6845	40	30	1
238	15	6806	30	30	6
237	6	6791	10	10	13
236	6	6785	30	30	7
235	41	6779	10	10	13
234	8	6738	35	30	1
233	7	6730	30	30	7
232	7	6723	40	10	1
231	7	6716	30	30	7
230	12	6709	30	10	7
229	5	6697	10	10	13
228	8	6692	30	30	7
227	8	6684	30	10	7
226	14	6676	10	10	13
225	18	6662	50	30	1
224	10	6644	10	10	13
223	19	6634	30	30	6
222	7	6615	30	10	7
221	6	6608	50	40	11
220	16	6602	30	30	6
219	12	6586	50	35	1
218	7	6574	40	30	1
217	14	6567	50	10	1
216	10	6553	35	30	1
215	14	6543	30	10	13
214	15	6529	50	30	2
213	13	6514	10	10	13
212	17	6501	50	30	4

A	B	C	D	E	F
211	43	6484	10	10	13
210	7	6441	30	30	7
209	34	6434	10	10	13
208	9	6400	30	30	3
207	35	6391	10	10	13
206	22	6356	50	30	1
205	9	6334	10	10	13
204	9	6325	30	30	7
203	27	6316	30	30	6
202	8	6289	10	10	13
201	7	6281	30	30	7
200	35	6274	30	10	6
199	18	6239	30	10	6
198	9	6221	10	10	13
197	10	6212	30	30	7
196	9	6202	10	10	13
195	8	6193	30	10	1
194	18	6185	55	10	5
193	14	6167	55	10	5
192	7	6153	10	10	13
191	7	6146	55	30	11
190	6	6139	10	10	13
189	15	6133	30	30	7
188	7	6118	30	30	7
187	27	6111	30	10	1
186	15	6084	30	10	1
185	9	6069	10	10	13
184	22	6060	30	30	1
183	20	6038	70	10	1
182	11	6018	10	10	13
181	10	6007	30	30	7
180	42	5997	10	10	13
179	7	5955	50	30	1
178	10	5948	10	10	13
177	48	5938	55	30	5
176	42	5890	50	35	1
175	16	5848	10	10	13
174	17	5832	30	30	6
173	20	5815	55	10	1
172	7	5795	40	40	1
171	9	5788	40	30	2
170	9	5779	10	10	13
169	23	5770	50	30	1
168	47	5747	10	10	13
167	7	5700	30	30	7
166	33	5693	10	10	13
165	16	5660	55	35	1
164	144	5644	10	10	13
163	13	5500	50	30	1
162	168	5487	10	10	13
161	7	5319	30	30	7
160	226	5312	10	10	13
159	17	5086	40	40	1
158	121	5069	10	10	13
157	7	4948	50	50	5
156	16	4941	30	30	7
155	13	4925	30	30	7

A	B	C	D	E	F
154	8	4912	10	10	13
153	7	4904	30	30	7
152	69	4897	50	50	5
151	66	4828	10	10	13
150	28	4762	30	30	6
149	13	4734	30	30	6
148	15	4721	30	30	6
147	17	4706	30	30	6
146	14	4689	30	30	6
145	36	4675	10	10	13
144	11	4639	30	30	6
143	5	4628	10	10	13
142	13	4623	30	30	6
141	93	4610	30	30	6
140	39	4517	10	10	13
139	18	4478	30	30	6
138	6	4460	30	30	7
137	29	4454	30	30	6
136	12	4425	30	30	1
135	55	4413	30	30	6
134	53	4358	30	30	6
133	57	4305	50	30	1
132	9	4248	10	10	13
131	17	4239	30	30	6
130	69	4222	55	40	5
129	9	4153	30	30	7
128	12	4144	10	10	13
127	41	4132	50	30	1
126	10	4091	10	10	13
125	43	4081	55	55	1
124	13	4038	10	10	13
123	29	4025	30	30	1
122	68	3996	50	30	1
121	11	3928	10	10	13
120	40	3917	70	30	1
119	44	3877	10	10	13
118	12	3833	40	40	1
117	19	3821	10	10	13
116	12	3802	30	30	7
115	9	3790	30	30	7
114	16	3781	10	10	13
113	41	3765	60	55	5
112	12	3724	30	30	7
111	11	3712	30	30	7
110	282	3701	10	10	13
109	42	3419	55	40	5
108	202	3377	10	10	13
107	34	3175	50	40	4
106	81	3141	10	10	13
105	22	3060	50	35	4
104	20	3038	10	10	13
103	10	3018	20	20	12
102	50	3008	10	10	13
101	20	2958	45	35	1
100	85	2938	10	10	13
99	46	2853	60	35	1
98	37	2807	10	10	13

A	B	C	D	E	F
97	8	2770	30	30	3
96	17	2762	10	10	13
95	27	2745	45	45	2
94	77	2718	10	10	13
93	16	2641	55	30	10
92	35	2625	10	10	13
91	7	2590	30	30	7
90	14	2583	10	10	13
89	11	2569	10	10	12
88	6	2558	10	10	13
87	7	2552	30	30	7
86	12	2545	10	10	13
85	8	2533	30	30	7
84	9	2525	10	10	13
83	12	2516	30	30	6
82	13	2504	50	35	1
81	17	2491	10	10	13
80	11	2474	40	30	1
79	12	2463	40	30	6
78	87	2451	10	10	13
77	17	2364	50	30	5
76	12	2347	10	10	13
75	34	2335	55	30	1
74	95	2301	10	10	13
73	19	2206	50	50	1
72	32	2187	10	10	13
71	19	2155	50	50	1
70	196	2136	10	10	13
69	29	1940	50	45	2
68	39	1911	10	10	13
67	25	1872	60	30	1
66	5	1847	10	10	13
65	8	1842	30	30	7
64	9	1834	10	10	13
63	89	1825	45	40	5
62	10	1736	30	10	7
61	20	1726	30	10	6
60	7	1706	10	10	13
59	19	1699	30	30	6
58	7	1680	10	10	13
57	7	1673	30	30	7
56	31	1666	55	30	1
55	50	1635	10	10	13
54	16	1585	45	40	1
53	9	1569	30	30	7
52	21	1560	10	10	13
51	41	1539	60	30	5
50	57	1498	70	30	5
49	10	1441	30	30	7
48	25	1431	10	10	13
47	45	1406	55	30	5
46	23	1361	10	10	13
45	60	1338	60	50	1
44	24	1278	10	10	13
43	34	1254	10	10	12
42	20	1220	10	10	13
41	92	1200	10	10	13

Section PV11 (continued)

A	B	C	D	E	F	A	B	C	D	E	F
40	11	1108	35	30	4	20	60	795	55	35	5
39	13	1097	10	10	13	19	5	735	10	10	13
38	27	1084	40	30	1	18	16	730	70	40	5
37	14	1057	10	10	13	17	13	714	30	30	7
36	20	1043	60	30	5	16	141	701	10	10	13
35	9	1023	30	10	7	15	9	560	30	30	7
34	10	1014	30	10	7	14	79	551	10	10	13
33	6	1004	10	10	13	13	29	472	30	30	8
32	12	998	30	30	1	12	12	443	30	30	6
31	50	986	10	10	13	11	162	431	10	10	13
30	9	936	30	30	7	10	7	269	40	40	11
29	10	927	30	10	7	9	7	262	10	10	13
28	15	917	10	10	13	8	31	255	55	50	5
27	24	902	55	40	1	7	23	224	60	55	1
26	7	878	10	10	13	6	16	201	10	10	13
25	9	871	30	30	7	5	9	185	40	40	1
24	5	862	10	10	13	4	69	176	10	10	13
23	26	857	30	30	6	3	17	107	50	50	2
22	21	831	60	30	5	2	39	90	10	10	13
21	15	810	30	30	7	1	51	51	60	30	1

Section PV12

A	B	C	D	E	F
197	8	8792	30	30	7
196	13	8784	30	30	6
195	25	8771	60	35	8
194	9	8746	30	30	7
193	35	8737	10	10	13
192	8	8702	30	30	1
191	41	8694	10	10	13
190	8	8653	30	30	7
189	8	8645	10	10	13
188	12	8637	30	30	1
187	13	8625	30	30	1
186	11	8612	30	30	7
185	23	8601	10	10	13
184	8	8578	30	30	7
183	37	8570	10	10	13
182	13	8533	30	30	6
181	39	8520	10	10	13
180	10	8481	30	30	6
179	17	8471	30	30	6
178	5	8454	10	10	13
177	16	8449	30	30	6
176	17	8433	30	30	6
175	11	8416	30	10	6
174	29	8405	10	10	13
173	9	8376	30	30	4
172	8	8367	10	10	13
171	12	8359	35	30	1
170	17	8347	10	10	13
169	7	8330	30	30	7
168	9	8323	30	10	7
167	98	8314	10	10	13
166	21	8216	30	30	7
165	28	8195	10	10	13
164	17	8167	30	30	4
163	55	8150	10	10	13
162	8	8095	30	30	1
161	45	8087	60	30	5
160	8	8042	10	10	13
159	17	8034	30	30	6
158	22	8017	30	30	6
157	42	7995	40	30	1
156	22	7953	35	10	1
155	5	7931	10	10	13
154	13	7926	30	30	1
153	12	7913	30	10	1
152	10	7901	10	10	13
151	39	7891	45	30	5
150	401	7852	10	10	13
149	7	7451	30	30	1
148	14	7444	10	10	13
147	24	7430	30	30	1
146	13	7406	30	30	7
145	10	7393	10	10	13
144	7	7383	30	30	7
143	10	7376	10	10	13
142	8	7366	35	30	7
141	236	7358	10	10	13

A	B	C	D	E	F
140	26	7122	55	30	1
139	15	7096	10	10	13
138	16	7081	45	45	4
137	21	7065	35	10	1
136	23	7044	45	10	2
135	84	7021	10	10	13
134	23	6937	30	30	1
133	13	6914	10	10	13
132	75	6901	35	35	6
131	110	6826	40	30	1
130	39	6716	40	40	1
129	43	6677	40	40	1
128	47	6634	45	35	1
127	8	6587	40	35	1
126	15	6579	40	40	1
125	27	6564	50	40	1
124	5	6537	10	10	13
123	20	6532	50	50	1
122	7	6512	30	30	7
121	72	6505	65	35	5
120	11	6433	30	30	7
119	36	6422	10	10	13
118	31	6386	55	45	4
117	73	6355	10	10	13
116	16	6282	30	30	6
115	36	6266	10	10	13
114	34	6230	60	30	5
113	8	6196	10	10	13
112	36	6188	40	30	6
111	51	6152	10	10	13
110	27	6101	70	30	1
109	10	6074	10	10	13
108	24	6064	60	55	1
107	32	6040	10	10	13
106	44	6008	55	35	4
105	68	5964	10	10	13
104	58	5896	60	55	1
103	319	5838	10	10	13
102	45	5519	55	30	1
101	14	5474	10	10	13
100	38	5460	60	30	1
99	200	5422	10	10	13
98	43	5222	60	50	4
97	1005	5179	10	10	13
96	13	4174	35	30	1
95	11	4161	10	10	13
94	23	4150	40	30	1
93	128	4127	10	10	13
92	23	3999	35	30	1
91	38	3976	10	10	13
90	23	3938	50	40	1
89	197	3915	10	10	13
88	24	3718	55	30	1
87	48	3694	10	10	13
86	22	3646	30	30	1
85	21	3624	35	30	1
84	24	3603	10	10	13

Section PV12 (continued)

A	B	C	D	E	F
83	59	3579	45	30	5
82	41	3520	10	10	13
81	23	3479	55	40	4
80	83	3456	10	10	13
79	39	3373	55	30	1
78	20	3334	10	10	13
77	61	3314	70	30	5
76	27	3253	10	10	13
75	40	3226	70	30	5
74	14	3186	30	30	7
73	11	3172	35	30	1
72	50	3161	10	10	12
71	38	3111	10	10	13
70	82	3073	55	30	1
69	38	2991	30	10	6
68	44	2953	55	30	1
67	10	2909	10	10	13
66	54	2899	60	30	5
65	9	2845	30	30	7
64	23	2836	35	10	6
63	25	2813	30	30	6
62	15	2788	10	10	13
61	26	2773	30	30	6
60	13	2747	30	10	6
59	13	2734	10	10	13
58	96	2721	65	30	5
57	33	2625	30	10	6
56	28	2592	30	30	6
55	49	2564	70	30	5
54	17	2515	30	10	6
53	69	2498	55	35	5
52	11	2429	30	30	6
51	20	2418	30	30	6
50	48	2398	60	30	5
49	40	2350	10	10	13
48	16	2310	40	35	1
47	32	2294	50	10	1
46	53	2262	10	10	13
45	12	2209	30	30	7
44	11	2197	10	10	13
43	7	2186	30	30	7
42	76	2179	10	10	13
41	28	2103	30	30	6
40	128	2075	10	10	13
39	87	1947	50	35	5
38	53	1860	55	35	1
37	782	1807	10	10	13
36	12	1025	35	30	1
35	35	1013	60	10	1
34	13	978	30	30	7
33	63	965	10	10	13
32	12	902	30	30	7
31	13	890	10	10	13
30	8	877	30	30	7
29	25	869	30	30	6
28	38	844	30	30	6
27	18	806	30	30	6
26	24	788	60	45	4
25	34	764	30	30	7
24	29	730	30	30	6
23	13	701	30	10	6
22	44	688	65	35	7
21	12	644	30	30	7
20	13	632	70	30	5
19	23	619	60	30	5
18	14	596	30	30	7
17	27	582	60	30	5
16	56	555	30	30	6
15	27	499	30	30	6
14	7	472	40	35	1
13	21	465	10	10	13
12	36	444	60	35	4
11	22	408	10	10	13
10	52	386	65	35	5
9	50	334	70	30	1
8	59	284	10	10	13
7	10	225	40	30	1
6	39	215	10	10	13
5	13	176	30	30	7
4	94	163	10	10	13
3	9	69	35	30	7
2	33	60	10	10	13
1	27	27	55	30	1

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A	B	C	D	E	F
623	34	16584	10	10	12
622	7	16550	10	10	13
621	10	16543	50	40	9
620	285	16533	10	10	13
619	9	16248	30	30	7
618	7	16239	10	10	13
617	11	16232	30	30	7
616	7	16221	10	10	13
615	14	16214	30	30	7
614	21	16200	35	30	7
613	14	16179	30	10	1
612	42	16165	10	10	13
611	13	16123	30	30	1
610	13	16110	35	35	1
609	7	16097	30	10	13
608	12	16090	30	10	7
607	23	16078	30	30	7
606	18	16055	10	10	13
605	16	16037	55	30	4
604	26	16021	10	10	13
603	12	15995	30	30	4
602	7	15983	35	10	1
601	10	15976	30	10	1
600	42	15966	10	10	13
599	11	15924	30	30	7
598	7	15913	35	35	1
597	8	15906	35	30	1
596	12	15898	30	30	1
595	46	15886	10	10	13
594	19	15840	30	30	7
593	49	15821	10	10	13
592	18	15772	50	30	4
591	38	15754	10	10	13
590	10	15716	50	30	1
589	103	15706	10	10	13
588	8	15603	35	30	1
587	79	15595	10	10	13
586	13	15516	30	30	1
585	7	15503	10	10	13
584	7	15496	30	30	7
583	54	15489	10	10	13
582	20	15435	50	30	1
581	69	15415	10	10	13
580	8	15346	30	30	7
579	8	15338	40	10	1
578	12	15330	10	10	13
577	38	15318	55	30	5
576	29	15280	40	30	1
575	6	15251	10	10	13
574	18	15245	40	30	1
573	10	15227	55	10	4
572	8	15217	10	10	13
571	15	15209	35	30	1
570	14	15194	40	10	1
569	23	15180	60	30	1
568	6	15157	10	10	13
567	9	15151	30	30	7

A	B	C	D	E	F
566	8	15142	30	10	7
565	166	15134	10	10	13
564	9	14968	55	30	1
563	83	14959	10	10	13
562	16	14876	30	10	4
561	21	14860	10	10	13
560	7	14839	30	30	7
559	174	14832	10	10	13
558	15	14658	60	30	4
557	20	14643	10	10	13
556	30	14623	50	30	1
555	9	14593	10	10	13
554	21	14584	45	30	1
553	14	14563	30	10	6
552	36	14549	40	30	4
551	7	14513	10	10	13
550	12	14506	35	35	4
549	16	14494	10	10	13
548	25	14478	45	35	1
547	20	14453	10	10	13
546	27	14433	50	30	2
545	6	14406	30	10	7
544	12	14400	10	10	13
543	9	14388	30	30	7
542	16	14379	30	10	6
541	30	14363	30	30	6
540	16	14333	30	30	6
539	15	14317	30	30	6
538	27	14302	55	35	5
537	15	14275	30	30	6
536	16	14260	30	10	6
535	16	14244	30	30	7
534	43	14228	10	10	13
533	8	14185	30	30	7
532	107	14177	10	10	13
531	52	14070	30	30	6
530	12	14018	10	10	13
529	72	14006	30	30	6
528	18	13934	30	30	6
527	22	13916	30	30	6
526	31	13894	60	10	1
525	47	13863	10	10	13
524	55	13816	55	55	5
523	27	13761	30	30	6
522	14	13734	30	10	1
521	18	13720	10	10	13
520	13	13702	30	30	6
519	8	13689	10	10	13
518	20	13681	60	30	1
517	10	13661	45	10	1
516	48	13651	55	30	1
515	12	13603	10	10	13
514	87	13591	60	30	5
513	7	13504	10	10	13
512	50	13497	70	10	5
511	114	13447	10	10	13
510	31	13333	60	55	1

Section PV13 (continued)

A	B	C	D	E	F
509	11	13302	30	10	7
508	223	13291	10	10	13
507	11	13068	35	35	1
506	49	13057	10	10	13
505	27	13008	50	40	1
504	85	12981	10	10	13
503	18	12896	50	40	2
502	48	12878	45	10	2
501	58	12830	10	10	13
500	17	12772	50	40	1
499	85	12755	10	10	13
498	22	12670	45	35	1
497	8	12648	10	10	13
496	13	12640	40	40	2
495	78	12627	10	10	13
494	28	12549	55	45	1
493	46	12521	10	10	13
492	33	12475	50	45	2
491	88	12442	10	10	13
490	22	12354	60	30	1
489	40	12332	10	10	13
488	7	12292	30	30	7
487	12	12285	30	10	6
486	10	12273	30	10	7
485	7	12263	10	10	13
484	9	12256	30	30	7
483	11	12247	10	10	13
482	9	12236	30	30	6
481	49	12227	60	10	1
480	14	12178	10	10	13
479	7	12164	40	35	1
478	6	12157	10	10	13
477	13	12151	30	30	7
476	42	12138	10	10	13
475	6	12096	40	30	1
474	51	12090	10	10	13
473	19	12039	55	30	1
472	96	12020	10	10	13
471	18	11924	60	45	1
470	41	11906	10	10	13
469	21	11865	55	40	4
468	100	11844	10	10	13
467	8	11744	30	30	7
466	88	11736	10	10	13
465	21	11648	60	30	5
464	43	11627	10	10	13
463	9	11584	30	30	7
462	7	11575	10	10	13
461	14	11568	70	30	5
460	11	11554	10	10	13
459	23	11543	30	30	6
458	9	11520	30	10	6
457	13	11511	10	10	13
456	28	11498	60	30	5
455	16	11470	40	30	5
454	12	11454	10	10	13
453	6	11442	30	30	7

A	B	C	D	E	F
452	9	11436	10	10	13
451	8	11427	30	30	7
450	19	11419	10	10	13
449	43	11400	60	30	5
448	52	11357	10	10	13
447	13	11305	50	30	1
446	7	11292	30	30	7
445	25	11285	10	10	13
444	29	11260	60	30	1
443	9	11231	10	10	13
442	29	11222	65	30	5
441	9	11193	10	10	13
440	21	11184	60	45	2
439	26	11163	10	10	13
438	8	11137	35	35	2
437	19	11129	10	10	13
436	48	11110	10	10	12
435	14	11062	10	10	13
434	60	11048	10	10	13
433	17	10988	60	30	1
432	10	10971	10	10	13
431	60	10961	40	30	5
430	7	10901	10	10	13
429	8	10894	35	30	1
428	21	10886	30	10	13
427	11	10865	10	10	1
426	6	10854	30	30	6
425	6	10848	10	10	13
424	7	10842	40	30	1
423	10	10835	30	10	1
422	37	10825	10	10	13
421	23	10788	70	30	10
420	54	10765	35	10	8
419	11	10711	10	10	13
418	8	10700	40	30	1
417	19	10692	10	10	13
416	46	10673	60	30	5
415	21	10627	30	30	6
414	7	10606	10	10	13
413	24	10599	50	30	5
412	30	10575	50	35	5
411	17	10545	30	30	7
410	11	10528	10	10	13
409	30	10517	65	30	5
408	185	10487	10	10	13
407	34	10302	30	30	2
406	11	10268	30	10	7
405	56	10257	10	10	13
404	14	10201	40	40	1
403	26	10187	10	10	13
402	17	10161	10	10	12
401	18	10144	10	10	13
400	39	10126	50	40	5
399	23	10087	10	10	13
398	7	10064	50	35	4
397	20	10057	50	35	4
396	49	10037	10	10	13

Section PV13 (continued)

A	B	C	D	E	F
395	28	9988	50	30	2
394	11	9960	10	10	13
393	16	9949	70	35	1
392	27	9933	10	10	13
391	13	9906	30	30	7
390	8	9893	10	10	13
389	15	9885	35	35	4
388	9	9870	10	10	13
387	7	9861	30	30	7
386	10	9854	10	10	13
385	9	9844	50	35	11
384	17	9835	30	30	7
383	66	9818	10	10	13
382	10	9752	50	35	11
381	16	9742	10	10	13
380	9	9726	50	35	11
379	13	9717	10	10	13
378	18	9704	50	40	4
377	9	9686	10	10	13
376	17	9677	40	40	2
375	254	9660	10	10	13
374	8	9406	50	30	11
373	9	9398	30	30	7
372	8	9389	30	30	7
371	10	9381	30	10	7
370	9	9371	10	10	13
369	9	9362	30	30	1
368	11	9353	30	30	7
367	16	9342	30	30	7
366	12	9326	10	10	13
365	38	9314	30	30	7
364	8	9276	10	10	13
363	30	9268	55	35	1
362	6	9238	30	30	7
361	11	9232	30	10	1
360	16	9221	35	30	6
359	8	9205	30	30	7
358	9	9197	10	10	13
357	15	9188	35	35	5
356	51	9173	40	30	1
355	19	9122	30	10	6
354	8	9103	30	30	7
353	14	9095	40	30	1
352	9	9081	30	10	7
351	12	9072	40	35	5
350	25	9060	30	30	6
349	19	9035	60	30	5
348	7	9016	55	30	5
347	20	9009	60	10	1
346	13	8989	55	10	5
345	45	8976	65	50	5
344	28	8931	55	50	5
343	22	8903	60	55	5
342	48	8881	80	55	5
341	20	8833	55	55	5
340	30	8813	55	40	5
339	11	8783	10	10	13

A	B	C	D	E	F
338	11	8772	40	35	1
337	15	8761	40	10	1
336	22	8746	10	10	13
335	14	8724	40	35	1
334	21	8710	50	10	5
333	32	8689	50	40	1
332	35	8657	10	10	13
331	20	8622	40	35	1
330	20	8602	35	30	1
329	12	8582	30	10	7
328	7	8570	10	10	13
327	11	8563	40	35	1
326	29	8552	40	30	1
325	11	8523	40	35	1
324	30	8512	10	10	13
323	18	8482	35	30	1
322	13	8464	30	10	7
321	10	8451	30	10	7
320	7	8441	10	10	13
319	17	8434	35	30	1
318	28	8417	50	40	5
317	11	8389	10	10	13
316	18	8378	35	30	1
315	21	8360	70	35	1
314	5	8339	10	10	13
313	9	8334	30	30	7
312	10	8325	30	30	7
311	10	8315	30	30	7
310	5	8305	10	10	13
309	10	8300	35	30	1
308	30	8290	30	30	7
307	8	8260	10	10	13
306	13	8252	30	30	7
305	18	8239	10	10	13
304	12	8221	30	30	7
303	11	8209	30	30	7
302	17	8198	10	10	13
301	7	8181	40	30	11
300	40	8174	10	10	13
299	12	8134	30	30	7
298	12	8122	30	30	7
297	7	8110	30	30	7
296	14	8103	10	10	13
295	8	8089	40	30	7
294	5	8081	10	10	13
293	9	8076	30	30	7
292	10	8067	30	30	7
291	9	8057	10	10	13
290	11	8048	30	30	7
289	37	8037	70	10	5
288	15	8000	30	30	6
287	34	7985	80	40	5
286	37	7951	30	10	6
285	16	7914	55	35	5
284	21	7898	70	40	5
283	28	7877	30	30	2
282	8	7849	10	10	13

Section PV13 (continued)

A	B	C	D	E	F
281	18	7841	30	30	1
280	22	7823	10	10	13
279	23	7801	30	30	2
278	24	7778	30	30	2
277	13	7754	10	10	13
276	34	7741	30	30	6
275	7	7707	30	30	7
274	17	7700	10	10	13
273	15	7683	35	30	6
272	8	7668	30	30	7
271	17	7660	60	10	2
270	29	7643	10	10	13
269	20	7614	50	50	2
268	30	7594	10	10	13
267	53	7564	60	30	5
266	6	7511	10	10	13
265	12	7505	50	50	11
264	10	7493	10	10	13
263	19	7483	50	35	1
262	12	7464	10	10	13
261	41	7452	55	30	5
260	5	7411	10	10	13
259	11	7406	55	50	4
258	14	7395	10	10	13
257	7	7381	30	30	7
256	6	7374	10	10	13
255	12	7368	50	45	1
254	12	7356	10	10	13
253	68	7344	65	10	5
252	20	7276	30	10	6
251	70	7256	70	10	5
250	12	7186	70	60	5
249	17	7174	70	65	5
248	9	7157	60	40	1
247	19	7148	60	10	5
246	10	7129	55	10	5
245	10	7119	50	30	5
244	11	7109	55	30	5
243	11	7098	35	35	1
242	14	7087	40	40	1
241	28	7073	10	10	13
240	8	7045	30	30	1
239	6	7037	10	10	13
238	18	7031	40	40	2
237	10	7013	30	10	1
236	9	7003	10	10	13
235	13	6994	40	35	1
234	14	6981	10	10	13
233	22	6967	50	40	1
232	18	6945	50	10	1
231	11	6927	50	30	11
230	33	6916	10	10	13
229	27	6883	35	35	2
228	21	6856	10	10	13
227	29	6835	30	30	2
226	7	6806	10	10	13
225	13	6799	30	30	1

A	B	C	D	E	F
224	22	6786	10	10	13
223	10	6764	45	35	1
222	21	6754	10	10	13
221	16	6733	50	35	4
220	12	6717	10	10	13
219	31	6705	55	30	5
218	42	6674	10	10	13
217	6	6632	30	30	1
216	11	6626	10	10	13
215	19	6615	40	35	4
214	83	6596	10	10	13
213	7	6513	30	30	1
212	7	6506	10	10	13
211	13	6499	50	30	1
210	11	6486	35	30	10
209	268	6475	10	10	13
208	12	6207	10	10	12
207	266	6195	10	10	13
206	15	5929	30	30	3
205	37	5914	10	10	13
204	9	5877	35	30	1
203	21	5868	50	50	2
202	29	5847	10	10	13
201	55	5818	55	35	5
200	9	5763	10	10	13
199	15	5754	40	40	2
198	28	5739	10	10	13
197	6	5711	30	30	7
196	9	5705	10	10	13
195	7	5696	30	30	7
194	29	5689	10	10	13
193	25	5660	30	30	6
192	17	5635	30	30	7
191	12	5618	30	30	7
190	35	5606	40	30	5
189	28	5571	40	30	2
188	37	5543	10	10	13
187	20	5506	60	30	1
186	18	5486	60	10	1
185	7	5468	10	10	13
184	8	5461	50	40	11
183	19	5453	70	30	5
182	30	5434	30	30	6
181	8	5404	10	10	13
180	9	5396	30	30	7
179	66	5387	70	10	5
178	15	5321	30	10	7
177	8	5306	10	10	13
176	60	5298	60	30	5
175	20	5238	30	10	6
174	50	5218	55	30	5
173	48	5168	55	30	5
172	21	5120	50	35	1
171	19	5099	55	40	1
170	9	5080	40	35	1
169	25	5071	10	10	13
168	15	5046	55	40	1

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A	B	C	D	E	F
167	5	5031	30	10	7
166	70	5026	30	30	6
165	88	4956	55	30	5
164	32	4868	50	30	5
163	13	4836	30	30	6
162	34	4823	30	10	6
161	16	4789	30	10	6
160	28	4773	30	10	6
159	45	4745	60	30	1
158	32	4700	10	10	13
157	10	4668	40	30	3
156	33	4658	10	10	13
155	13	4625	30	30	7
154	34	4612	10	10	13
153	11	4578	30	30	1
152	10	4567	50	30	11
151	10	4557	30	30	7
150	7	4547	10	10	13
149	9	4540	50	35	1
148	33	4531	60	10	1
147	5	4498	10	10	13
146	39	4493	50	30	1
145	7	4454	10	10	13
144	7	4447	35	35	1
143	11	4440	30	10	7
142	52	4429	65	30	5
141	22	4377	60	10	5
140	31	4355	75	50	5
139	26	4324	30	30	6
138	27	4298	30	30	6
137	8	4271	10	10	13
136	15	4263	30	30	6
135	34	4248	10	10	13
134	35	4214	60	40	1
133	37	4179	10	10	13
132	11	4142	45	40	1
131	10	4131	10	10	13
130	10	4121	45	30	3
129	31	4111	10	10	13
128	10	4080	60	50	11
127	20	4070	10	10	13
126	25	4050	50	35	4
125	199	4025	10	10	13
124	17	3826	50	35	1
123	25	3809	60	10	10
122	23	3784	50	10	1
121	12	3761	45	10	10
120	9	3749	10	10	13
119	13	3740	50	35	1
118	9	3727	10	10	13
117	26	3718	50	35	4
116	278	3692	10	10	13
115	13	3414	30	30	7
114	18	3401	10	10	13
113	52	3383	10	10	12
112	17	3331	10	10	13
111	54	3314	10	10	13

A	B	C	D	E	F
110	35	3260	55	30	1
109	89	3225	10	10	13
108	27	3136	50	35	4
107	221	3109	10	10	13
106	21	2888	45	35	1
105	10	2867	50	30	1
104	18	2857	50	10	1
103	28	2839	10	10	13
102	27	2811	80	30	1
101	5	2784	10	10	13
100	14	2779	30	30	7
99	34	2765	50	30	5
98	8	2731	10	10	13
97	19	2723	60	30	1
96	15	2704	10	10	13
95	7	2689	30	30	7
94	13	2682	50	35	1
93	15	2669	10	10	13
92	15	2654	60	30	4
91	10	2639	10	10	13
90	32	2629	55	50	4
89	12	2597	50	30	1
88	7	2585	10	10	13
87	13	2578	50	30	1
86	55	2565	10	10	13
85	14	2510	50	40	1
84	18	2496	10	10	13
83	11	2478	40	40	1
82	55	2467	10	10	13
81	9	2412	50	45	5
80	34	2403	10	10	13
79	10	2369	30	30	3
78	39	2359	10	10	13
77	22	2320	50	40	1
76	20	2298	10	10	13
75	12	2278	40	30	1
74	19	2266	10	10	13
73	7	2247	30	30	3
72	6	2240	10	10	13
71	8	2234	50	40	3
70	10	2226	30	30	1
69	27	2216	10	10	13
68	23	2189	50	40	4
67	12	2166	10	10	13
66	31	2154	60	30	4
65	14	2123	10	10	13
64	29	2109	50	40	4
63	59	2080	10	10	13
62	11	2021	40	40	3
61	213	2010	10	10	13
60	33	1797	50	30	8
59	74	1764	10	10	13
58	19	1690	50	30	10
57	23	1671	55	50	1
56	7	1648	10	10	13
55	12	1641	40	40	4
54	20	1629	10	10	13

Section PV13 (continued)

A	B	C	D	E	F
53	18	1609	50	40	4
52	14	1591	10	10	13
51	16	1577	50	30	4
50	30	1561	10	10	13
49	20	1531	40	40	2
48	356	1511	10	10	13
47	22	1155	40	30	6
46	21	1133	10	10	13
45	8	1112	35	30	1
44	16	1104	10	10	13
43	9	1088	35	30	1
42	11	1079	10	10	13
41	117	1068	50	30	5
40	5	951	10	10	13
39	53	946	50	30	1
38	31	893	40	35	1
37	10	862	10	10	13
36	10	852	35	35	1
35	18	842	10	10	13
34	8	824	35	35	1
33	40	816	10	10	13
32	14	776	40	40	4
31	28	762	10	10	13
30	9	734	35	30	10
29	49	725	10	10	13
28	28	676	50	30	1
27	40	648	10	10	13

A	B	C	D	E	F
26	21	608	30	30	1
25	10	587	30	30	6
24	34	577	10	10	13
23	14	543	50	50	5
22	8	529	10	10	13
21	10	521	50	45	2
20	9	511	10	10	13
19	30	502	50	30	5
18	22	472	60	30	5
17	15	450	30	30	6
16	5	435	10	10	13
15	14	430	50	40	2
14	7	416	30	10	7
13	21	409	40	10	1
12	6	388	10	10	13
11	29	382	55	50	1
10	16	353	10	10	13
9	34	337	50	35	1
8	41	303	10	10	13
7	46	262	60	30	5
6	52	216	60	50	2
5	33	164	10	10	13
4	10	131	50	50	5
3	33	121	10	10	13
2	24	88	50	50	4
1	64	64	10	10	13

Section PV13N

A	B	C	D	E	F
70	34	1686	10	10	12
69	6	1652	10	10	13
68	12	1646	50	50	9
67	330	1634	10	10	13
66	6	1304	30	30	7
65	10	1298	10	10	13
64	20	1288	40	30	1
63	15	1268	30	30	6
62	9	1253	10	10	13
61	14	1244	40	30	1
60	12	1230	30	30	7
59	37	1218	10	10	13
58	11	1181	20	20	7
57	6	1170	10	10	13
56	20	1164	30	30	7
55	10	1144	30	30	7
54	12	1134	30	10	1
53	9	1122	10	10	13
52	14	1113	30	30	6
51	12	1099	30	30	7
50	19	1087	10	10	13
49	9	1068	60	30	11
48	11	1059	10	10	13
47	26	1048	30	30	7
46	15	1022	50	30	1
45	7	1007	30	10	1
44	14	1000	40	10	4
43	21	986	10	10	13
42	11	965	35	30	1
41	10	954	10	10	13
40	9	944	30	30	7
39	9	935	35	10	2
38	8	926	35	35	1
37	9	918	50	30	11
36	44	909	10	10	13

A	B	C	D	E	F
35	14	865	30	30	7
34	28	851	10	10	13
33	10	823	40	35	4
32	6	813	10	10	13
31	23	807	50	30	10
30	26	784	10	10	13
29	12	758	35	35	4
28	182	746	10	10	13
27	12	564	30	30	7
26	13	552	10	10	13
25	7	539	30	30	7
24	36	532	10	10	13
23	12	496	30	30	7
22	6	484	10	10	13
21	20	478	30	30	7
20	14	458	10	10	13
19	18	444	30	30	7
18	13	426	30	30	7
17	10	413	30	30	7
16	41	403	10	10	13
15	8	362	30	30	7
14	24	354	50	30	1
13	10	330	30	10	7
12	9	320	30	30	7
11	54	311	10	10	13
10	9	257	50	30	5
9	101	248	55	30	5
8	34	147	55	40	1
7	22	113	50	40	1
6	9	91	35	10	1
5	11	82	10	10	13
4	15	71	50	40	5
3	5	56	10	10	13
2	9	51	35	35	1
1	42	42	60	10	1

APPENDIX 3

BED LENGTH AND BED NUMBER OF EACH TRACED BED IN FIGURE 4.1

Explanation

1. This appendix serves as a link between Figure 4.1 and Appendix 1. With the following information, each of the 94 traced beds is cross-referenced to individual section measurements in Appendix 1. Additional information about each bed (e.g. internal structures) is shown graphically in Figure 4.1 and Appendix 2.

2. For beds that are less than 7 cm thick or not present where a particular section was measured, the bed number of the shale packet (Facies 13) containing the bed (or at the same level) is recorded. Symbol "p" in brackets is used to indicate this situation; for example, 232(p).

3. In some cases, amalgamated beds carry one bed number. In these cases, each part of the bed is identified with a letter, in brackets, to show its relative stratigraphic position:

u -- upper m -- middle l -- lower

4. For beds with at least one end originating beyond the tracing interval (Section PV1 to Section PV9), their bed lengths are preceded by a " > " (greater than) symbol. Other bed lengths are from the eastern to the western termination point.

number of continuous beds from Figure 4.1	bed number for each section where present (see Appendix 1)										bed length (m)
	PV1	PV2	PV3W	PV3	PV4	PV5	PV6	PV7	PV8	PV9	
									175	173	>620
									174	172	>620
27	281	167(u)	273	331(u)	119	32(u)	73	272	173	171	>3300
					117	32(m)	72				970
	279(u)	167(m)	272	331(m)	116(u)	32(l)	71(p)				>1840
	279(m)	167(m)	271	331(l)	116(l)	30	71(p)				>2140
				329							80
								271(p)			80
	279(l)	167(l)	270	327	115	28	70	270			>2370
			269(p)								200
	277	165									>360
	275	163	268	325	114						>1030
					113	26(u)					760
							68	266(u)	172	169	>1160
						26(l)	67	266(l)	171(p)	167	1510
26	273	161	266	323	111	24	65	265	170	165	>3300
							64(p)	264	169(p)		690
									168	163	>570
				321	109						370
	272(p)	159	264								>630
25	271	157	263	319	107	22	63	263	167	161	>3300
									166	160	>500
24	269	156	262	318	106(p)	21	61	262	165	159	>3300
23	268	155	260	316	105	19	59	260	164	158	>3300
22	267	154	259	315	104(p)	17	58(p)	259	163	157(p)	>3300
										156	>250

continued

number of continuous beds from Figure 4.1	bed number for each section where present (see Appendix 1)										bed length (m)
	PV1	PV2	PV3W	PV3	PV4	PV5	PV6	PV7	PV8	PV9	
21	265	153	257	313	103	15	57	257	161	154	>3300
									159	153(p)	560
									157	152	>650
					101	14(p)	55	255	155	150	>2380
					99	13	53				1180
	263	151	255	311	97		51	254			>2340
20	258	149	253(p)			11	49	253	153	148	>3300
									151	147(p)	>280
										146	>80
	256(u)	147(u)	252(u)								>580
	256(l)	147(l)	252(l)								>580
			251(u)	309(u)	93(u)	9(u)	47(u)				1560
			251(l)	309(l)	93(l)	9(l)	47(l)	251	149	144	>2720
									148	142	>560
							46	249	147	141(p)	1350
										141(p)	30
										140	>130
										139	>250
										137	>250
										136	>250
									145	135	>610
							45(p)	248			70
								246			150
19	255	146	249	307	92	7	44	244	144	133	>3300

continued

number of continuous beds from Figure 4.1	bed number for each section where present (see Appendix 1)										bed length (m)
	PV1	PV2	PV3W	PV3	PV4	PV5	PV6	PV7	PV8	PV9	
								243(u)	143	132	>1060
18	253	144(u)	247	306	90	5	43	243(l)	141		>3090
	250	144(l)	246	305(p)	88						>1310
17	250(p)	143(p)	245	304	86	3	41	241	139	131(u)	>3300
										131(l)	>150
										129	>180
							40(p)	237	137	128	>1360
	250(p)										>200
16	250(p)	142	243	302	84		39	236	136	126	>3300
									135(u)	125(p)	430
										124	>80
			242	300(u)	83(u)						680
15	249	140	241	300(l)	83(l)	1	38	234	135(l)	122	>3300
	247	138	239	298	81		36	232	134		>2940
	245(u)	136(u)	237(u)	296(u)	79(u)		34	230	133(p)		>2940
14	245(l)	136(l)	237(l)	296(l)	79(l)		33	229	132	120	>3300
										118	>170
							31	227	130	116	>1330
							30(p)				170
										114	80
13	243	134	236(p)	294	77		29	225	128	112	>3300
				293(p)	75		28	224	127	111	>2490
									125		390
					74(p)		26	222	123	109	>1280

continued

number of continuous beds from Figure 4.1	bed number for each section where present (see Appendix 1)										bed length
	PV1	PV2	PV3W	PV3	PV4	PV5	PV6	PV7	PV8	PV9	
12	241	132	235	292	73		24	220	121	107	>3300
11	240	131	234	291	72		22	218	119	105	>3300
							20	217(u)	118(u)	104	>1260
10	239	130	232	289	70		18	217(l)	118(l)	103	>3300
	238	129	231(p)								>680
9	236	127	230				17(p)	215	116	101	>3300
	234(u)	125(u)	226(u)	286(p)	69(p)		14	212			2450
8	234(l)	125(l)	226(l)		68		12	211	112	97	>3300
									110	95	>570
							10	209	109(p)		1400
							9(p)	207	109(p)		1350
7	233(p)	124(p)	225(p)	285(p)	66		8	205	108	93	>3300
6	233(p)	124(p)	225(p)	285(p)	65(p)		7(p)	204(p)	107(p)	92(p)	>3300
5	233(p)	124(p)	225(p)	285(p)	65(p)		6	203	106	91	>3300
4	233(p)	124(p)	225(p)	285(p)	65(p)		5(p)	202(p)	105(p)	90(p)	>3300
3	233(p)	124(p)	223	285(p)	65(p)		5(p)	199	103(p)	90(p)	>3300
2	232(p)	124(p)	222	284	64		4	197	102	90(p)	>3300
							3(p)	196(p)	98	90(p)	>1260
							3(p)	195	96	89	>1970
1	227	120	217	279	59			191	91	85	>3300

APPENDIX 4

SECTION-BY-SECTION PALEOCURRENT DATA IN THE INTERVAL OF DETAILED BED TRACING

Explanation

1. In the left hand column of each page, numbers 1 to 27 are the numbers of continuous beds in Figure 4.1. Numbers followed by a letter (e.g., 15A) indicate traced beds shorter than 3 km. Stratigraphically, beds with a letter lie above the continuous bed that bears the same number. For example, bed 15A is stratigraphically above bed 15. For beds designated by the same number followed by different letters, stratigraphic height increases alphabetically.

2. Each field section has up to three columns. The first is the local bed number (Appendix 1 and 3). The second is corrected flow directions at, or east and west of, the section line. The last is the average paleocurrent direction for the bed.

3. Paleocurrent directions were measured where flutes and grooves are available.

4. The orientations were recorded as the acute angles between the strike direction and the sole markings. These orientations were then corrected to their original state (i.e., horizontal bedding) by rotation around the strike line. Fold plunges are < 10° in the field area.

5. Values with an asterisk (*) are paleocurrent measurements based on grooves. The directions were determined with reference to the directions of flutes elsewhere on the same bed. Where no flutes are present, it has been assumed in converting data from grooves that the paleocurrents flowed generally from east to west (Enos, 1969a, b).

bed numbering for tracing	paleocurrent measurements																														
	PV1											PV2							PV3w												
	bed	west									AVG	bed	west				east	AVG	bed	west						east					AVG
	No.	80m	70m	60m	50m	40m	30m	20m	10m	0m		No.	20m	15m	10m	0m	10m		No.	50m	40m	30m	20m	10m	0m	10m	20m	30m	40m	50m	
27B																															
27A																															
27	281											167(u)							273												
26L																															
26K	279(u)											167(m)							272												
26J	279(m	300*									300	167(m)							271												
26I																															
26H																															
26G	279(l)		305*				268	295	305		293	167(l)	330					330	270			290						305*		330*	308
26F																			269(p)												
26E	277											165																			
26D	275							290*			290	163							268	263*								330*			297
26C																															
26B																															
26A																															
26	273											161							266												
25D																															
25C																															
25B																															
25A	272(p)											159							264												
25	271											157							263	320*							278				299
24A																															
24	269	310*		305*		315*	300*		325*	305*	310	156				315*	290*	303	262									320*	325*	330*	325
23	268	285*				280	230	310	280	275	277	155	285		285		285	285	260	285	270	280		280	280	285	280	275*	270	280	279
22	267	290		275		280	280	290	300	275	284	154	300		285*		275	287	259	280	290*	285		280	275	300	285		290	290	284
21A																															
21	265	275*		285	280	280	255*	300*	292	280*	281	153			315*	290*		303	257		265				282			290		270	277
20E																															
20D																															
20C																															
20B																															
20A	263											151							255												
20	258											149				320*		320	253(p)												
19P																															
19O																															
19N	256(u)											147(u)							252(u)												
19M	256(l)											147(l)							252(l)												
19L																			251(u)												
19K																			251(l)												
19J																															
19I																															
19H																															
19G																															
19F																															
19E																															
19D																															
19C																															
19B																															
19A																															
19	255	275		285		240	250	250	255	295	264	146		270		265	245	260	249						255		260		255	280	263
18A																															
18	253	230*		250		240			250		243	144(u)							247	260				260	260	255	255		260	290	263
17A	250	250*						240*			245	144(l)			240		237	239	246			245				250*	250			253	250
17	250(p)											143(p)							245				250*	240*	245*	235*	240*		260	230	243
16D																															
16C																															
16B																															
16A	250(p)																														
16	250(p)											142					278*	278	243		260		260				235				252
15C																															
15B																															
15A																			242												
15	249		285	295*	300*	295*	305*	300	298*	330	301	140		268			310	289	241	260						265	265	263	250	210*	252
14B	247											138							239								287	287	295	295	291
14A	245(u)											136(u)							237(u)												
14	245(l)				300*						300	136(l)					320*	320	237(l)	275					265			300	285	295	284
13D																															
13C																															
13B																															
13A																															
13	243	238*			215*					205*	219	134							236(p)												
12C																															
12B																															
12A																															
12	241		292	292	285			290		280	288	132	278		290	290	285	286	235	315	300	305	290	300			280	295	295		298
11	240		290	285	300	290		280		290	289	131	312				282	297	234	278	285	285	320*	287	268		290	290	297	287	289
10A																															
10	239	275	252*	330*	330			280		278	291	130			282		282	282	232	315	275	280	255	280			270			330	286
9A	238	300*	320*	315*	310	315*		300*		325*	312	129			312	315*	320*	316	231(p)	315*					220*		365*				300
9	236			330*						335*	333	127							230												
8A	234(u)											125(u)							226(u)												
8	234(l)		215*					285*		260*	253	125(l)				258*		258	226(l)												
7C																															
7B																															
7A																															
7	233(p)											124(p)							225(p)												
6	233(p)											124(p)							225(p)												
5	233(p)											124(p)							225(p)												
4	233(p)											124(p)							225(p)												
3	233(p)											124(p)							223												
2	232(p)											124(p)							222												
1B																															
1A																															
1	227	115	120	120	115			120	120	125	119	120	125		120	120	120	121	217	115	115	115		120	115	115	117				116

continued..

paleocurrent measurements

PV3

bed numbering for tracing	bed No.	west 20m	west 15m	west 10m	0m	east 10m	east 20m	east 30m	AVG
27B									
27A									
27	331(u)								
26L									
26K	331(m)								
26J	331(l)								
26I	329				215				215
26H									
26G	327								
26F									
26E									
26D	325								
26C									
26B									
26A									
26	323		248*			253*	255*		252
25D									
25C									
25B	321								
25A									
25	319			270		270			270
24A									
24	318								
23	316		262		275	278	305	275	279
22	315		283		265	260			269
21A									
21	313		282		275	290			282
20E									
20D									
20C									
20B									
20A	311								
20									
19P									
19O									
19N									
19M									
19L	309(u)								
19K	309(l)								
19J									
19I									
19H									
19G									
19F									
19E									
19D									
19C									
19B									
19A									
19	307		267						267
18A									
18	306				260	262	285		269
17A	305(p)								
17	304								
16D									
16C									
16B									
16A									
16	302								
15C									
15B									
15A	300(u)								
15	300(l)		317*		335*	325*	305*		321
14B	298	305				290			298
14A	296(u)								
14	296(l)			310		310			310
13D									
13C									
13B									
13A									
13	294				265*	285*	278*		276
12C	293(p)			268*		290*	290*		283
12B									
12A									
12	292	295		295	290		290		293
11	291	290		290	290	290	295		291
10A									
10	289	295		290	300	290	285		292
9A									
9									
8A	286(p)								
8									
7C									
7B									
7A									
7	285(p)								
6	285(p)								
5	285(p)								
4	285(p)								
3	285(p)								
2	284								
1B									
1A									
1	279	130				120		130	127

PV4

bed numbering for tracing	bed No.	west 70m	west 60m	west 50m	west 40m	west 30m	west 20m	west 10m	east 0m	east 10m	east 20m	AVG
27B												
27A												
27	119					310						310
26L	117											
26K	116(u)											
26J	116(l)											
26I												
26H												
26G	115											
26F												
26E												
26D	114											
26C	113											
26B												
26A												
26	111	290	290									290
25D												
25C												
25B	109											
25A												
25	107	280	295	270				285	285	290	300*	286
24A												
24	106(p)											
23	105	280	280	275*			272	290	285	278	288	281
22	104(p)											
21A												
21	103		295*	295*	300*		280	275	272			286
20E												
20D												
20C	101		335*				292*	302*	310	310	300*	308
20B	99			238*			270*	262*			240*	253
20A	97											
20												
19P												
19O												
19N												
19M												
19L	93(u)											
19K	93(l)											
19J												
19I												
19H												
19G												
19F												
19E												
19D												
19C												
19B												
19A												
19	92	268*			275		275	275	270			273
18A												
18	90	300			250	272	290		285	270		278
17A	88		295*	280*								288
17	86		280*	290*								285
16D												
16C												
16B												
16A												
16	84											
15C												
15B												
15A	83(u)											
15	83(l)				265	268	270					268
14B	81											
14A	79(u)											
14	79(l)	290*		263				285*	260*	370		294
13D												
13C												
13B												
13A												
13	77	235*		265*			260*	230*	260*			250
12C	75	305*		305*		295*	310*	305*				304
12B												
12A	74(p)											
12	73	270		290	290		282	265	290	285		282
11	72	290	295	285	290		290	288	290	290		290
10A												
10	70	300	290	305	285		285	290	288	270		289
9A												
9												
8A	69(p)											
8	68							370*	300*			335
7C												
7B												
7A												
7	66	300*						290*				295
6	65(p)											
5	65(p)											
4	65(p)											
3	65(p)											
2	64											
1B												
1A												
1	59				132	125	125	125				127

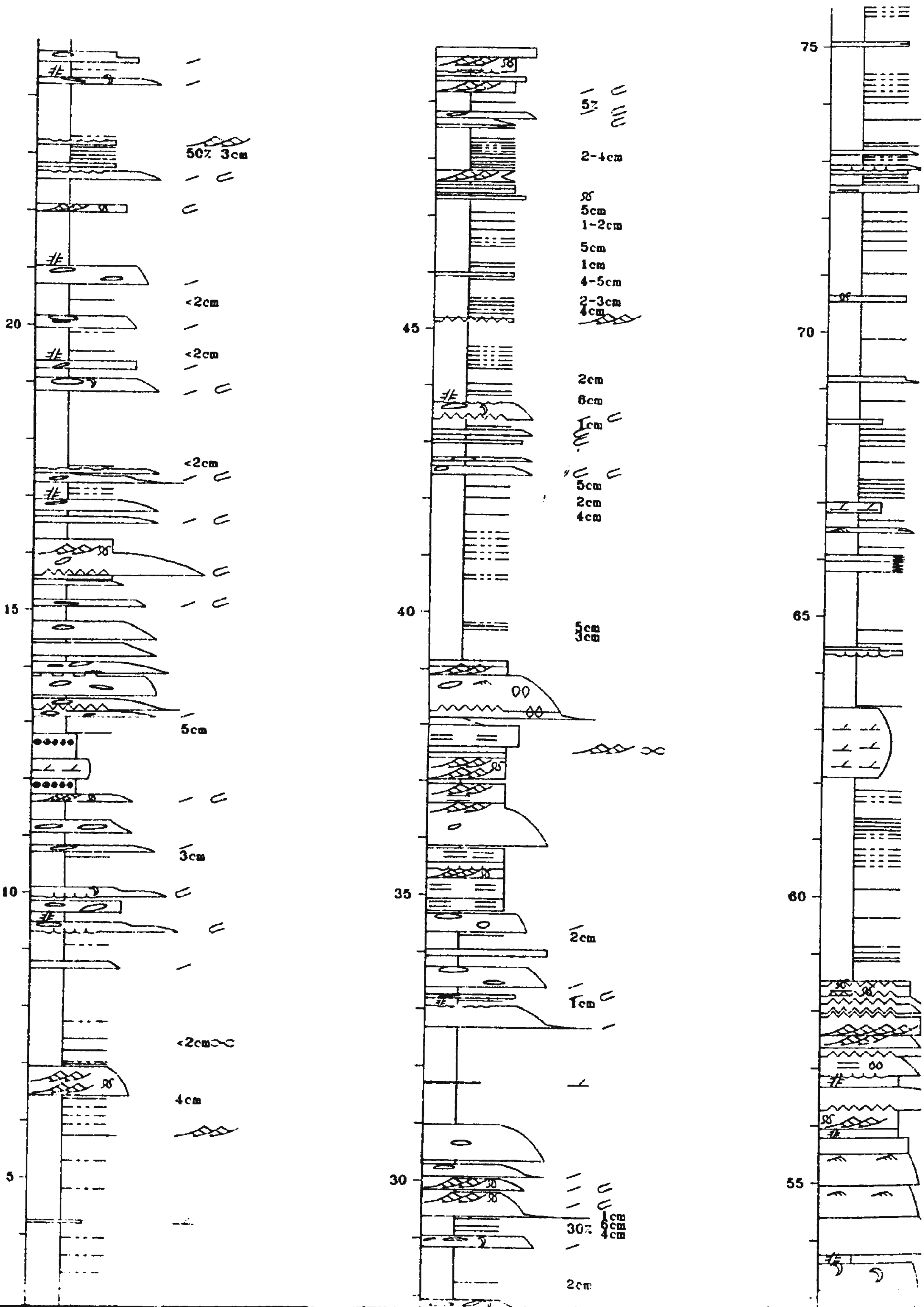
PV5 and PV6

bed numbering for tracing	PV5 bed No.	PV5 0m	PV6 bed No.	PV6 west 50m	west 40m	west 30m	west 20m	west 10m	east 0m	east 10m	PV6 AVG
27B											
27A											
27	32(u)		73			215*					215
26L	32(m)		72								
26K	32(l)	320	71(p)								
26J	30	295*	71(p)								
26I											
26H											
26G	28		70				245				245
26F											
26E											
26D											
26C	26(u)										
26B			68								
26A	26(l)		67								
26	24	295*	65	285*	290*						288
25D			64(p)								
25C											
25B											
25A											
25	22	290	63	300							
24A											
24	21	200	61						300		300
23	19	290	59	295*					305		300
22	17		58(p)	295							295
21A											
21	15	290	57	255							255
20E											
20D											
20C	13(p)	290	55	310				315	300		308
20B	13	305	53						285		285
20A			51								
20	11	300*	49								
19P											
19O											
19N											
19M											
19L	9(u)		47(u)								
19K	9(l)		47(l)	280*							280
19J											
19I			46		340*						340
19H											
19G											
19F											
19E											
19D											
19C											
19B			45(p)								
19A											
19	7	235*	44	240	230						235
18A											
18	5		43				230				230
17A											
17	3		41								
16D											
16C											
16B			40(p)								
16A											
16			39								
15C											
15B											
15A											
15	1		38	290*							290
14B			36								
14A			34								
14			33			240*				280*	260
13D											
13C			31	280*		295*				278*	284
13B			30(p)					270			270
13A											
13			29	310	300	295*					302
12C			28								
12B											
12A			26		250*	260*	260*		240*		253
12			24	285*			275*		272*		271
11			22								
10A			20	300		295*			280		292
10			18	290	300	280	280				288
9A											
9			17(p)								
8A			14								
8			12	230*	245*	215*	215*	235*	345*	240*	246
7C											
7B			10	215*	230*	210*	230*	360*	345*	235*	261
7A			9(p)								
7			8								
6			7(p)								
5			6								
4			5(p)								
3			5(p)								
2			4								
1B			3(p)								
1A			3(p)								
1											

continued..

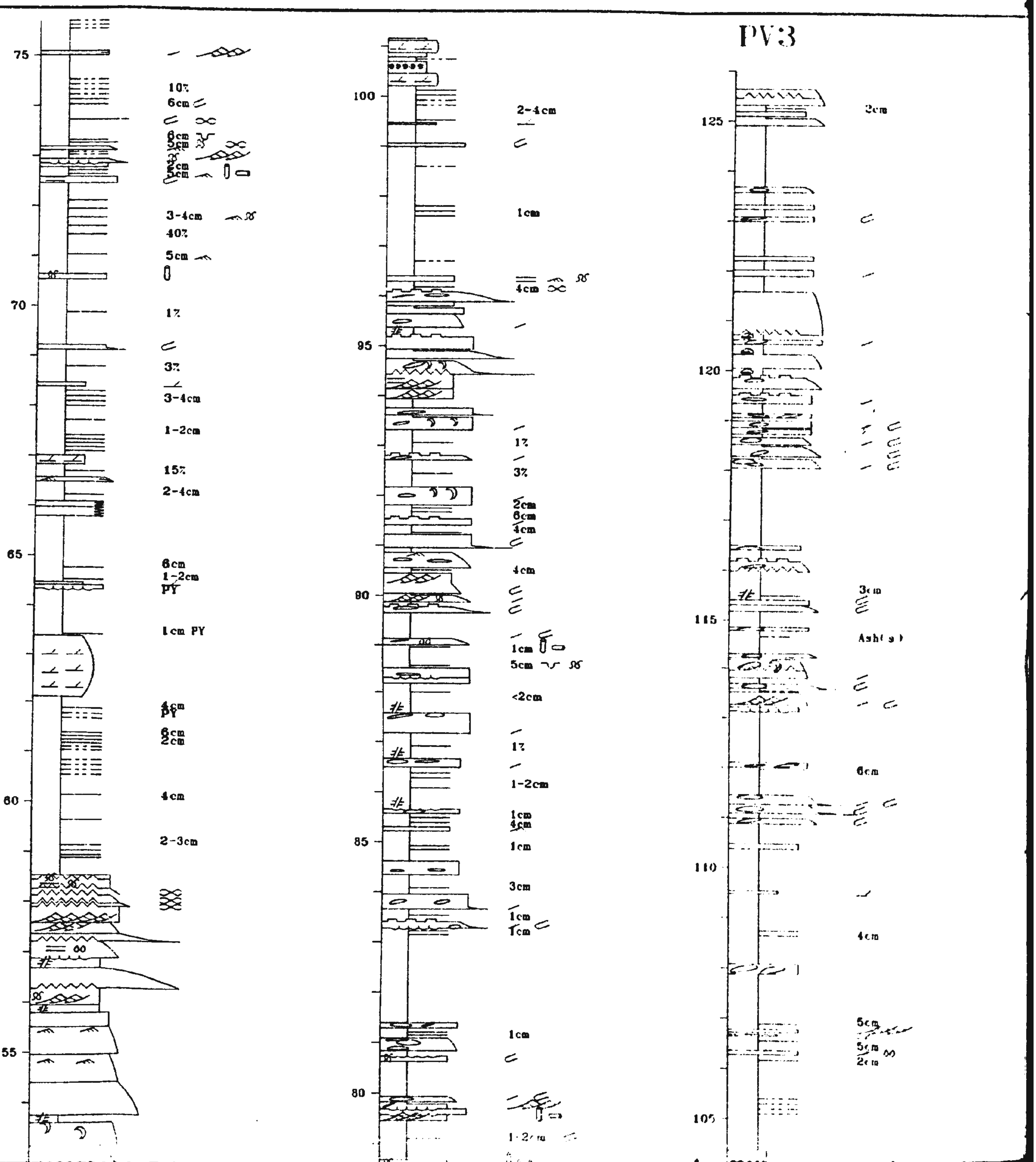
bed numbering for tracing	paleocurrent measurements																												
	PV7						PV8												PV9										
	bed No.	west 20m	10m	0m	east 10m	AVG	bed No.	west 180m	160m	140m	120	100m	80m	60m	40m	20m	0m	AVG	bed No.	west 30m	20m	10m	0m	east 10m	20m	30m	40m	50m	AVG
27B							175												173										
27A							174												172										
27	272						173				335*	285*					295	305	171				265*	270*	290				274
26L																													
26K																													
26J																													
26I																													
26H	271(p)				299	299																							
26G	270				297*	297																							
26F																													
26E																													
26D																													
26C																													
26B	266(u)						172										260	260	169	235*		255*	260*	300	307			263*	270
26A	266(l)						171(p)												167			310*	295*						303
26	265						170					340*	275*					308	165										
25D	264				340*	340	169(p)																						
25C							168					275	255			300*		277	163				300*						300
25B																													
25A																													
25	263				300	300	167								275			275	161					292	260*		300*		284
24A							166								280			280	160										
24	262						165	260*	250*			310*						273	159				275*	270*			270*		272
23	260				305	305	164			295*		310*	310*		300*		300*	303	158	290*	310*	310*	310*	307*	315*	325*	330*		312
22	259				310	310	163					300*	300*	280*	300*	305*	290*	298	157(p)										
21A																			156			290*		290*		300*			293
21	257				320	320	161			300								300	154								275*		275
20E							159												153(p)										
20D							157	295*	282*	320*		310*			297*			301	152	315*	300*	265*							293
20C	255						155	260	260	258	260*				273*			262	150			230*	230*						230
20B																													
20A	254																												
20	253						153				285*							285	148										
19P							151												147(p)										
19O																			146	295*	300*								298
19N																													
19M																													
19L																													
19K	251				285*	285	149	275*	310		275			280	290	260	260	279	144	265*	265	265*		305*					275
19J							148												142										
19I	249			250		250	147	268	265	245			260*	260	265	265	265	262	141(p)										
19H																			141(p)										
19G																			140		260*		270*	255		250	268		261
19F																			139										
19E																			137										
19D																			136										
19C							145												135	315*		260*		275*	270*				280
19B	248																												
19A	246																												
19	244			250		250	144	248	275	240*					205*			242	133	265	260			250	262				259
18A	243(u)						143												132										
18	243(l)						141			225								225											
17A																													
17	241			220*		220	139			330*								330	131(u)										
16D																			131(l)	240*	240*	228*					220*	320*	250
16C																			129										
16B	237						137												128			270*				370	265	275*	295
16A																													
16	236		350*			350	136									310*	305*	306	126										
15C							135(u)												125(p)										
15B																			124										
15A																													
15	234						135(l)									315*	292	304	122					263*	275	265*	270*	255*	266
14B	232						134																						
14A	230						133(p)																						
14	229	260*		265*	278*	268	132									305		305	120					275	260*	255		260*	264
13D																			118						315*	300*	305*	310*	308
13C	227	280	297		290*	289	130	305	295*				310		305	290	290*	299	116								340*	315*	328
13B																													
13A																			114										
13	225		270			270	128	305	300			305	305	310	295			303	112								320*		320
12C	224		305*			305	127	305*	307*						300		310	306	111					280	295*	300*	300		294
12B							125																						
12A	222		260	265*	245*	257	123	290*					305*		290*		290	294	109				292*	268		245*	285*		273
12	220		273*	287*	275	278	121	290	280							295	290	289	107					280	260				270
11	218						119	285							290			288	105										
10A	217(u)						118(u)												104										
10	217(l)			295	290	293	118(l)	300	300				305		320	315	290	305	103				310*		290	290			297
9A																													
9	215			340*		340	116						273*		280*	295	290	285	101										
8A	212																												
8	211	210*		200	210	207	112			305*			290	302	290	280*	292	293	97		270		255*	265			260*	250*	260
7C							110												95										
7B	209	280*		253*	250*	261	109(p)	240*		355*								298											
7A	207			300*		300	109(p)		245*						230*	295	210*	245											
7	205			300*		300	108	250*				280*				285	285	275	93		240*		240*						240
6	204(p)						107(p)												92(p)										
5	203						106												91										
4	202(p)						105(p)												90(p)										
3	199						103(p)												90(p)										
2	197						102												90(p)										
1B	196(p)						98												90(p)										
1A	195						96												89										
1	191			135	130	133	91		140	140		140	130	127	145	137		137	85				132						132

D

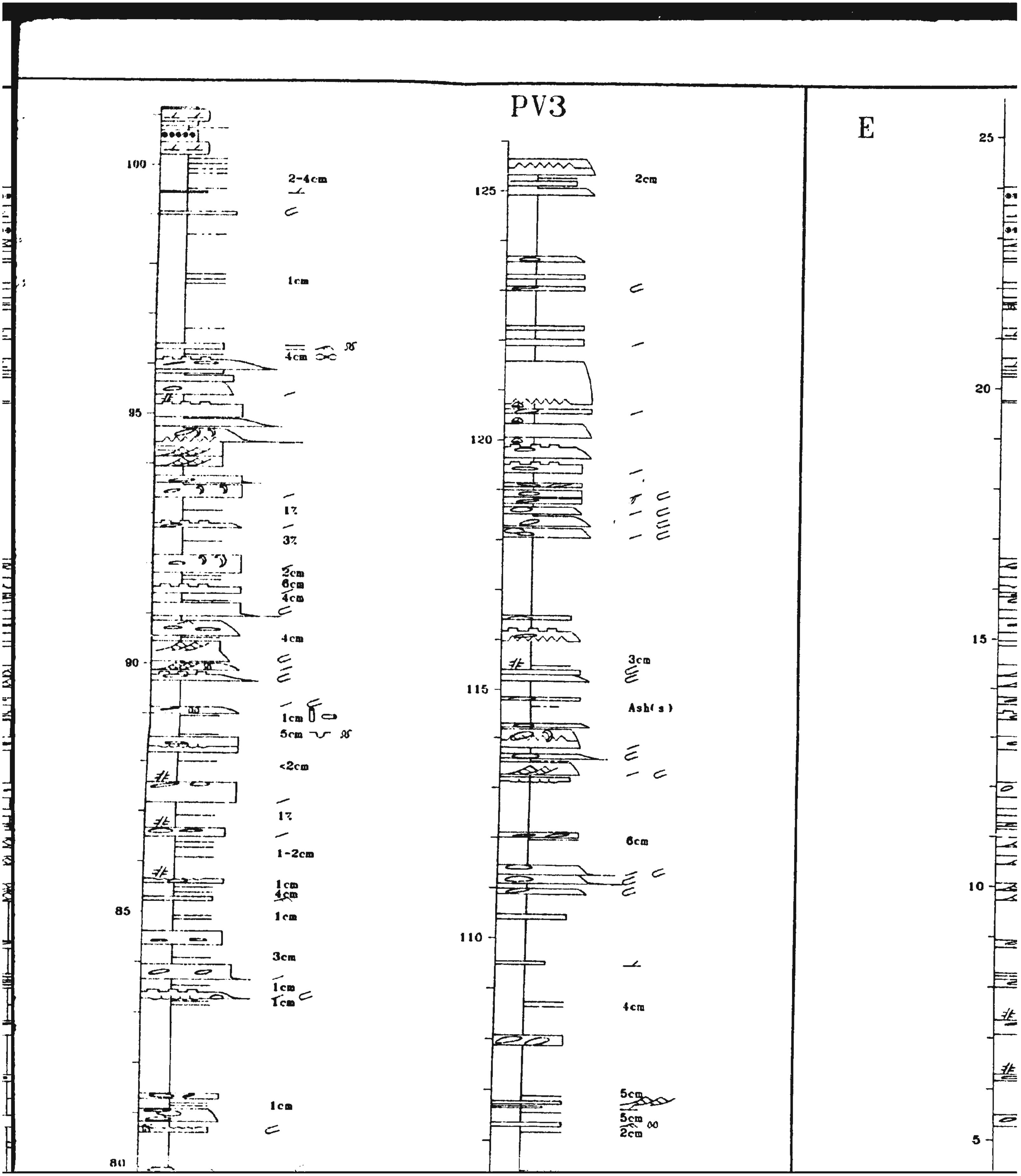


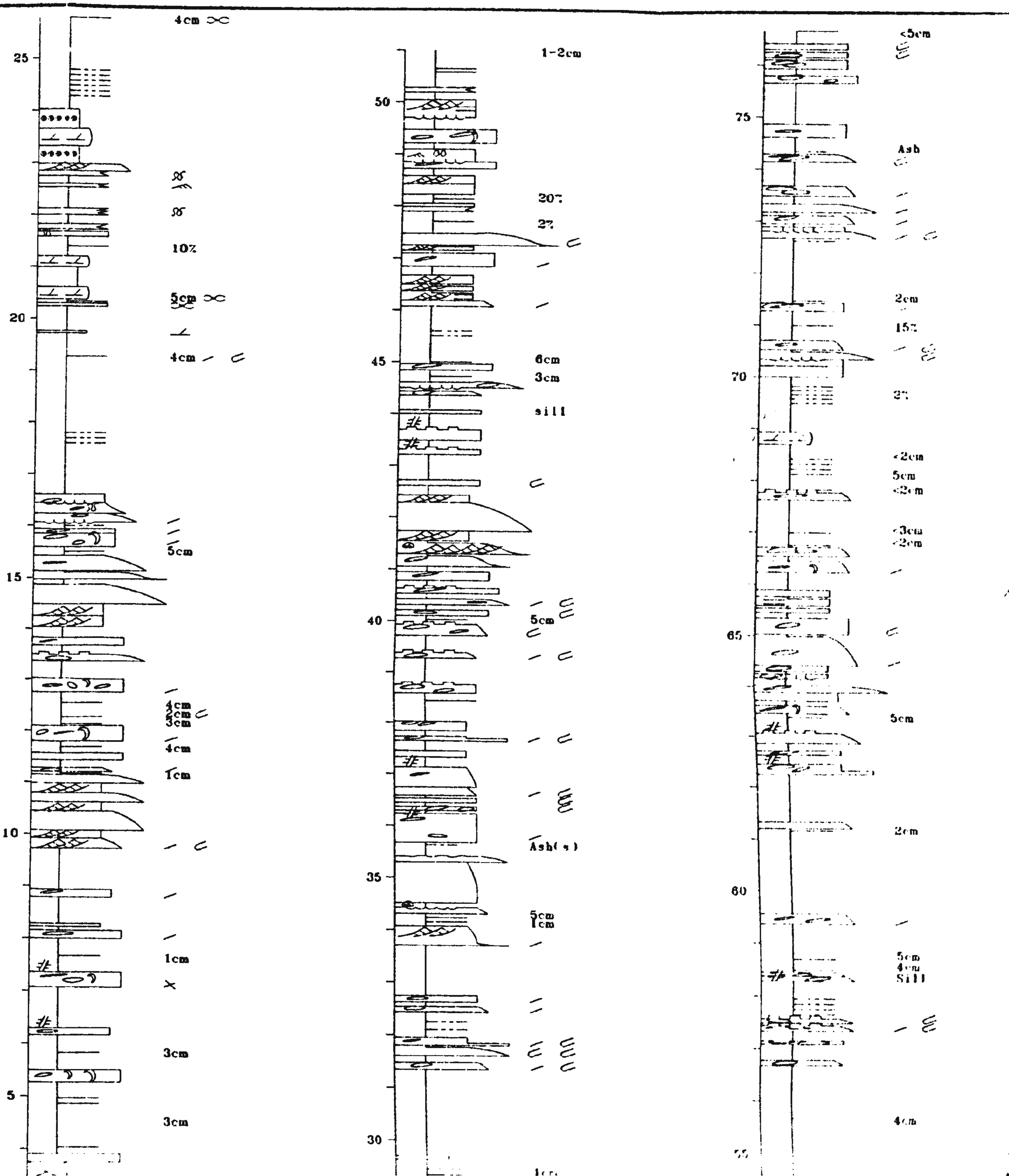
5
10
15
20
30
35
40
45
55
60
65
70
75
50% 3cm
<2cm
<2cm
<2cm
5cm
3cm
<2cm
4cm
5%
2-4cm
5cm
1-2cm
5cm
1cm
4-5cm
2-3cm
4cm
2cm
6cm
1cm
5cm
2cm
4cm
5cm
3cm
2cm
1cm
1cm
6cm
30%
4cm
2cm

PV3

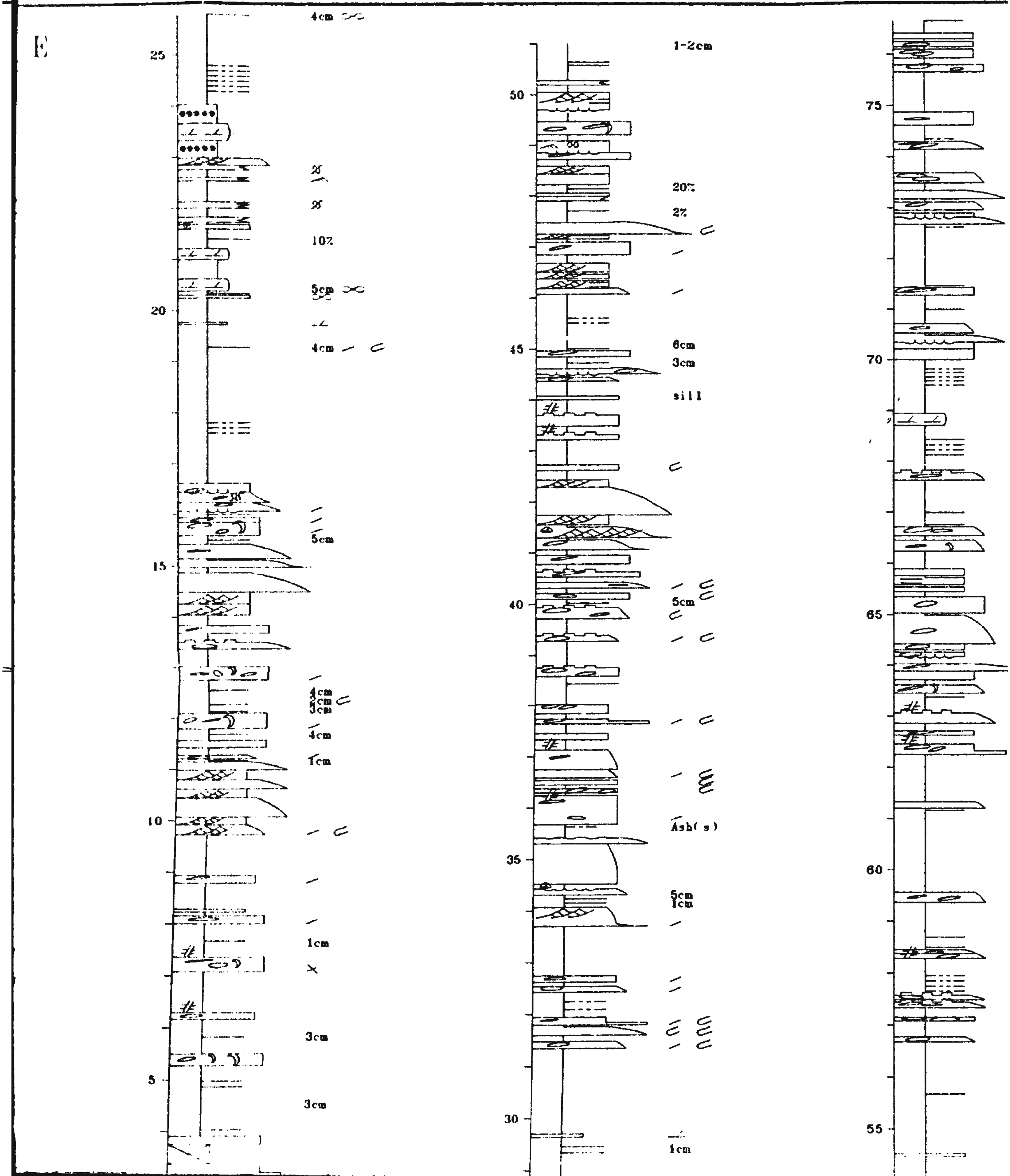


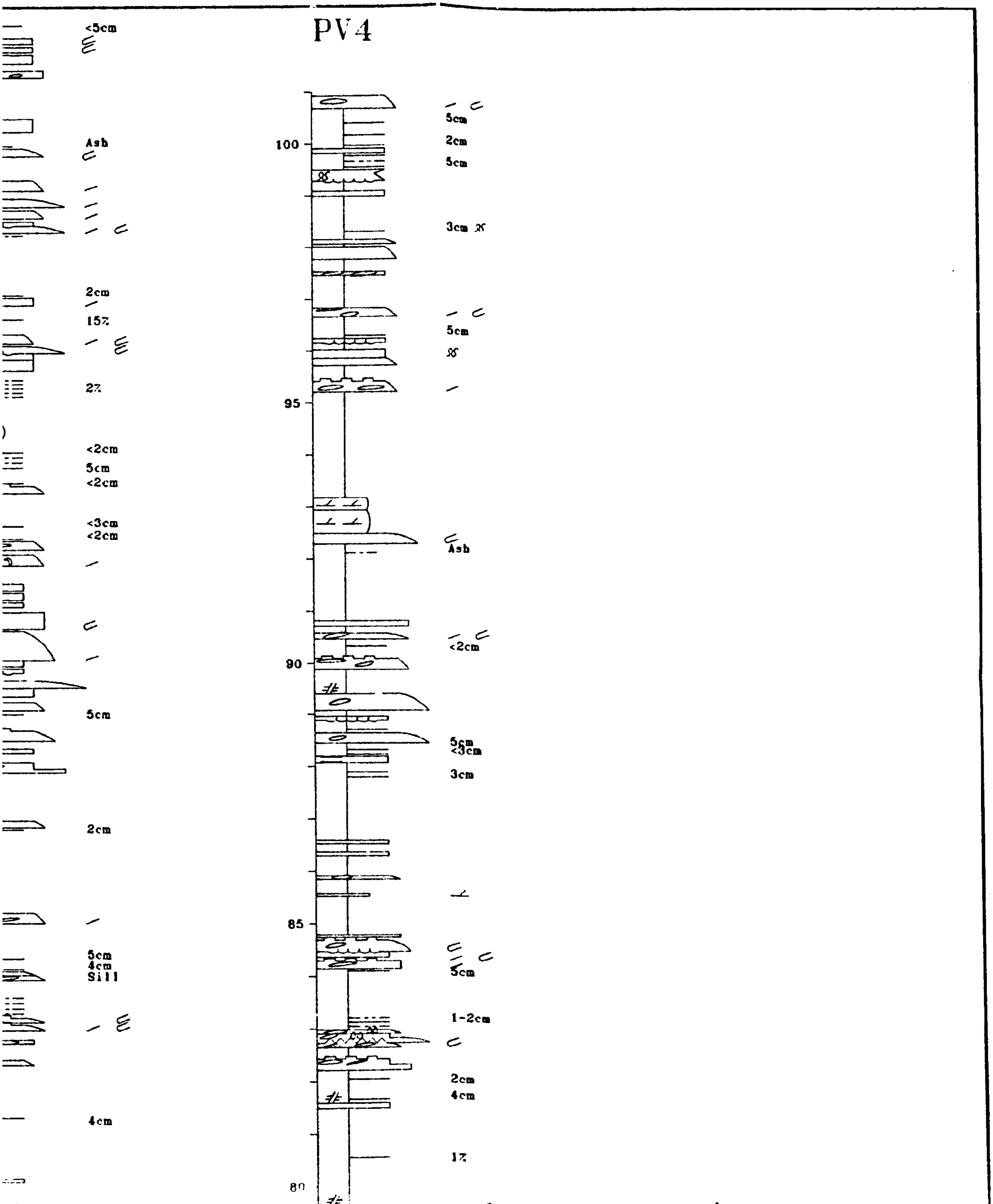
75
70
65
60
55
10%
6cm
3-4cm
40%
5cm
1%
3%
3-4cm
1-2cm
15%
2-4cm
6cm
1-2cm
PY
1cm PY
4cm
PY
6cm
2cm
4cm
2-3cm
100
95
90
85
80
2-4cm
1cm
4cm
1%
3%
2cm
6cm
4cm
4cm
1cm
5cm
<2cm
1%
1-2cm
1cm
4cm
1cm
3cm
1cm
1cm
1cm
1-2cm
125
120
115
110
105
2cm
3cm
Ash(s)
6cm
4cm
5cm
5cm
2cm


PV3
E
100
95
90
85
80
125
120
115
110
25
20
15
10
5
2-4cm
1cm
4cm
1%
3%
2cm
6cm
4cm
4cm
1cm
5cm
<2cm
1%
1-2cm
1cm
4cm
1cm
3cm
1cm
1cm
1cm
2cm
3cm
Ash(s)
6cm
4cm
5cm
5cm
2cm

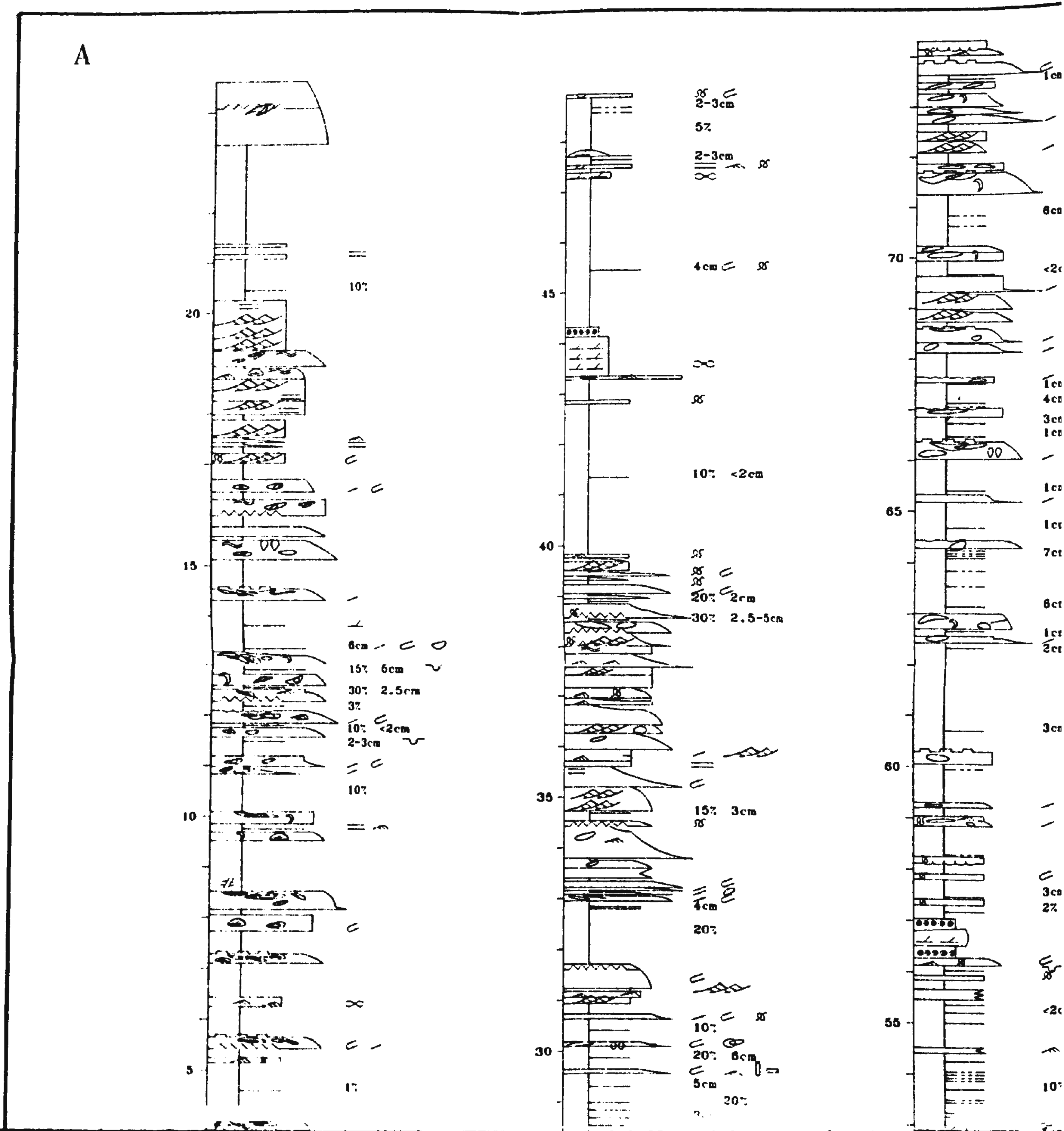


25
20
15
10
5
4cm
10%
5cm
4cm
5cm
4cm
2cm
3cm
4cm
1cm
1cm
3cm
3cm
50
45
40
35
30
1-2cm
20%
2%
6cm
3cm
sill
5cm
Ash(s)
5cm
1cm
75
70
65
60
<5cm
Ash
2cm
15%
2%
<2cm
5cm
<2cm
<3cm
<2cm
5cm
2cm
5cm
4cm
Sill
4cm

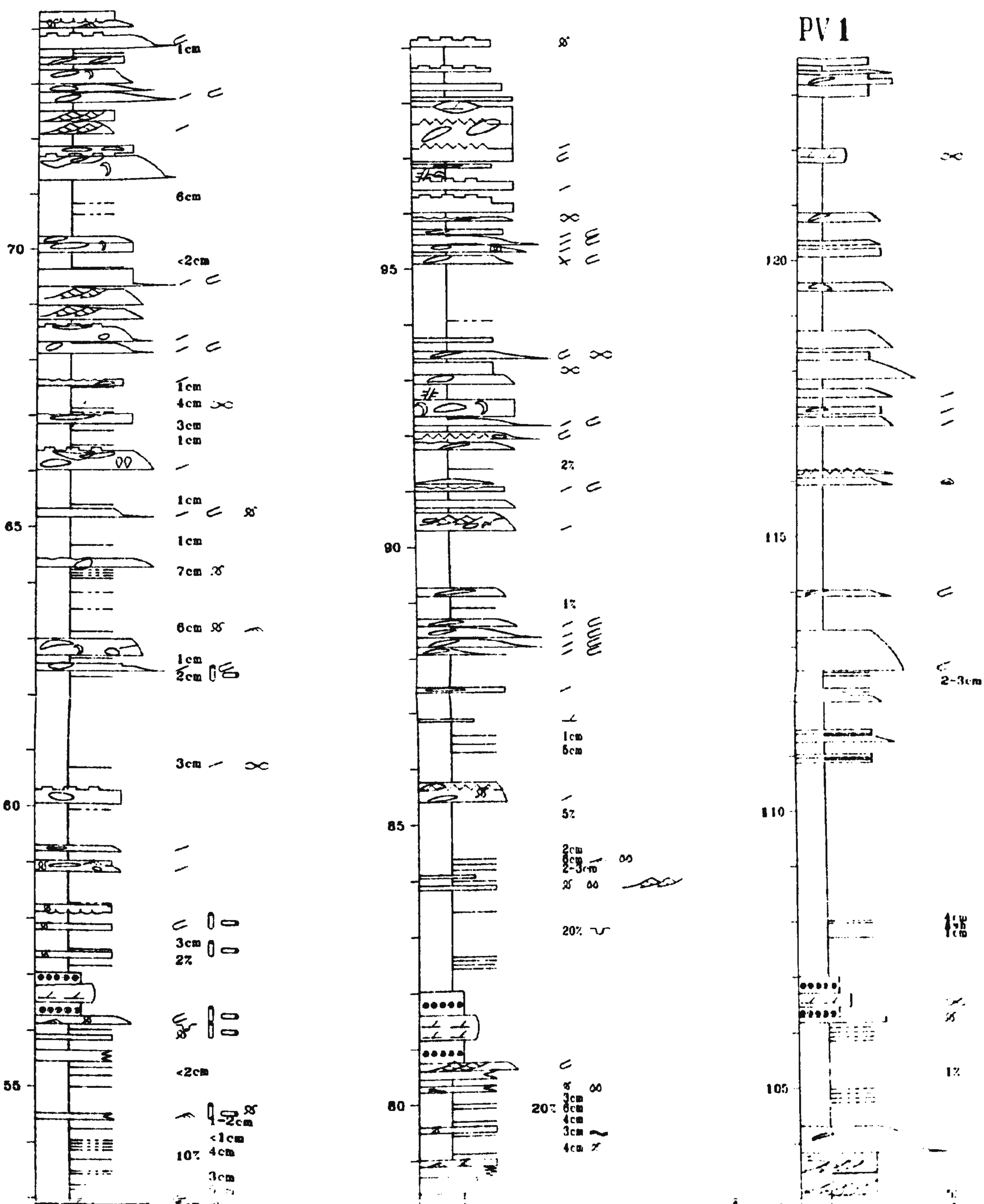

E
4cm
25
10%
5cm
20
4cm
5cm
15
4cm
3cm
3cm
4cm
1cm
10
1cm
3cm
5
3cm
1-2cm
50
20%
2%
6cm
45
3cm
sill
5cm
40
Ash(s)
35
5cm
1cm
30
1cm
75
70
65
60
55

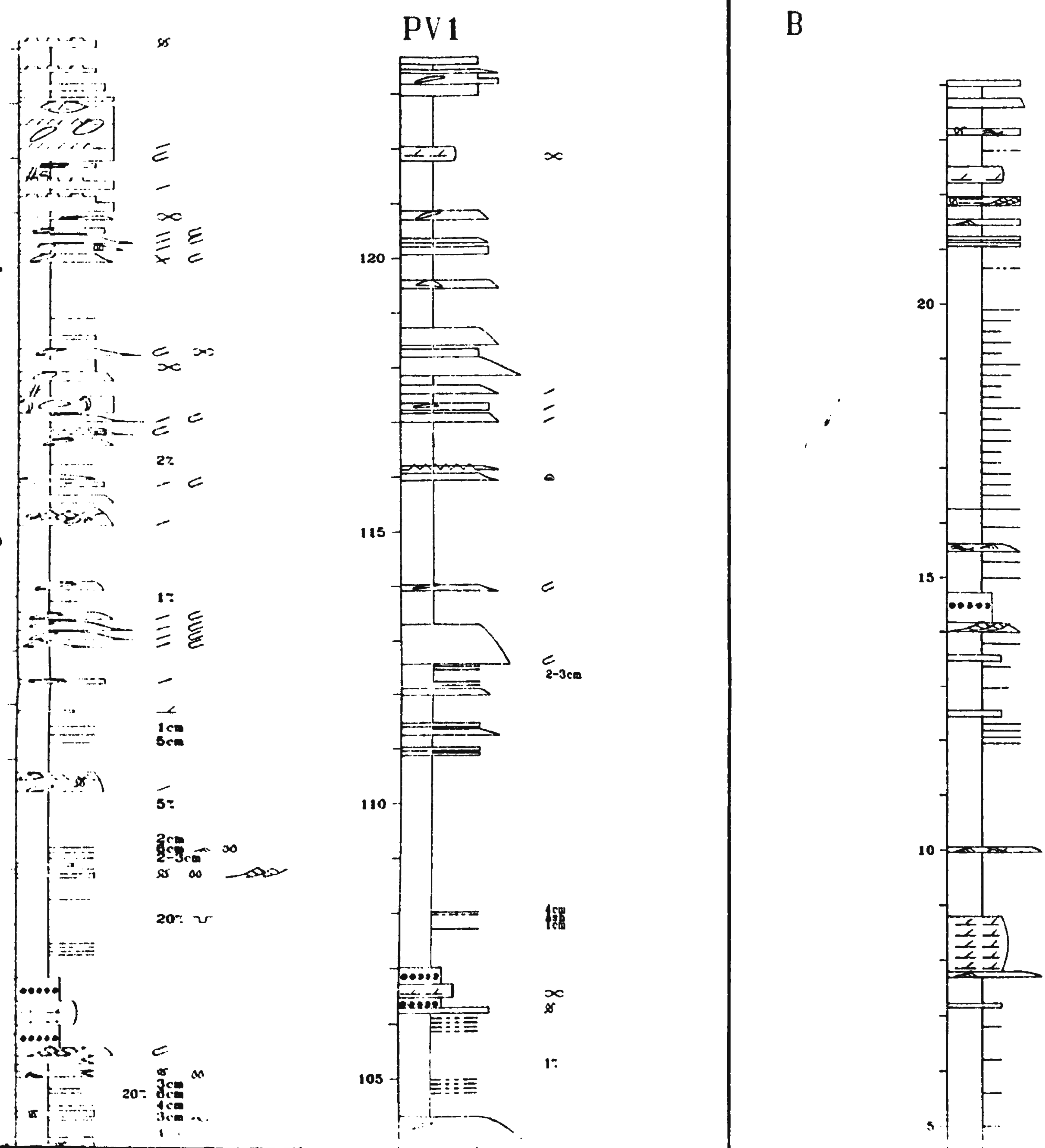


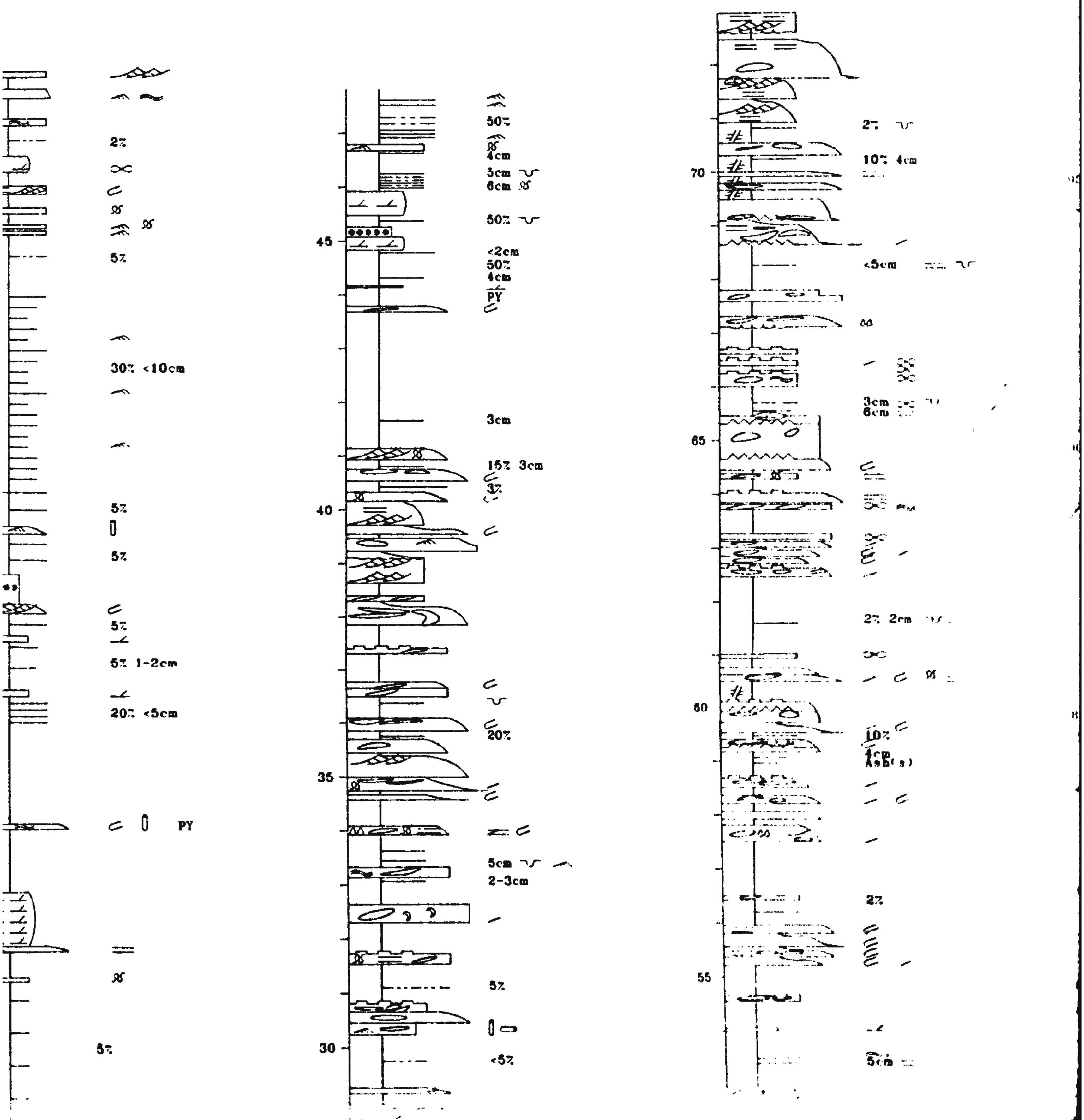
PV4
<5cm
Asb
2cm
15%
2%
<2cm
5cm
<2cm
<3cm
<2cm
5cm
2cm
5cm
4cm
Sill
4cm
100
95
90
85
80
5cm
2cm
5cm
3cm
5cm
Asb
<2cm
5cm
<3cm
3cm
5cm
1-2cm
2cm
4cm
1%

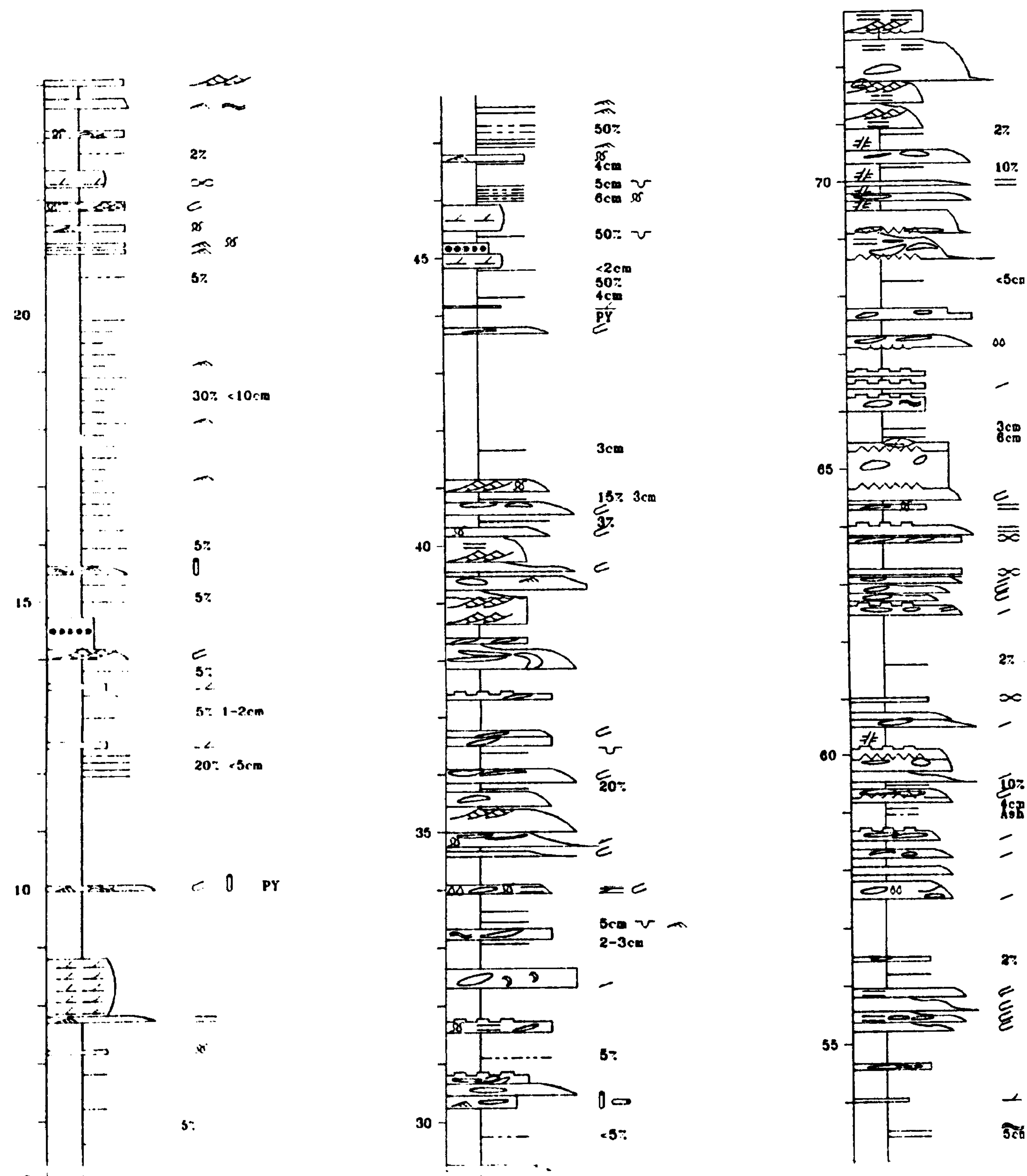


A
5
10
15
20
30
35
40
45
55
60
65
70
10%
1%
6cm
15% 6cm
30% 2.5cm
3%
10% <2cm
2-3cm
2-3cm
5%
4cm
10% <2cm
20% 2cm
30% 2.5-5cm
15% 3cm
4cm
20%
10%
20% 6cm
5cm
20%

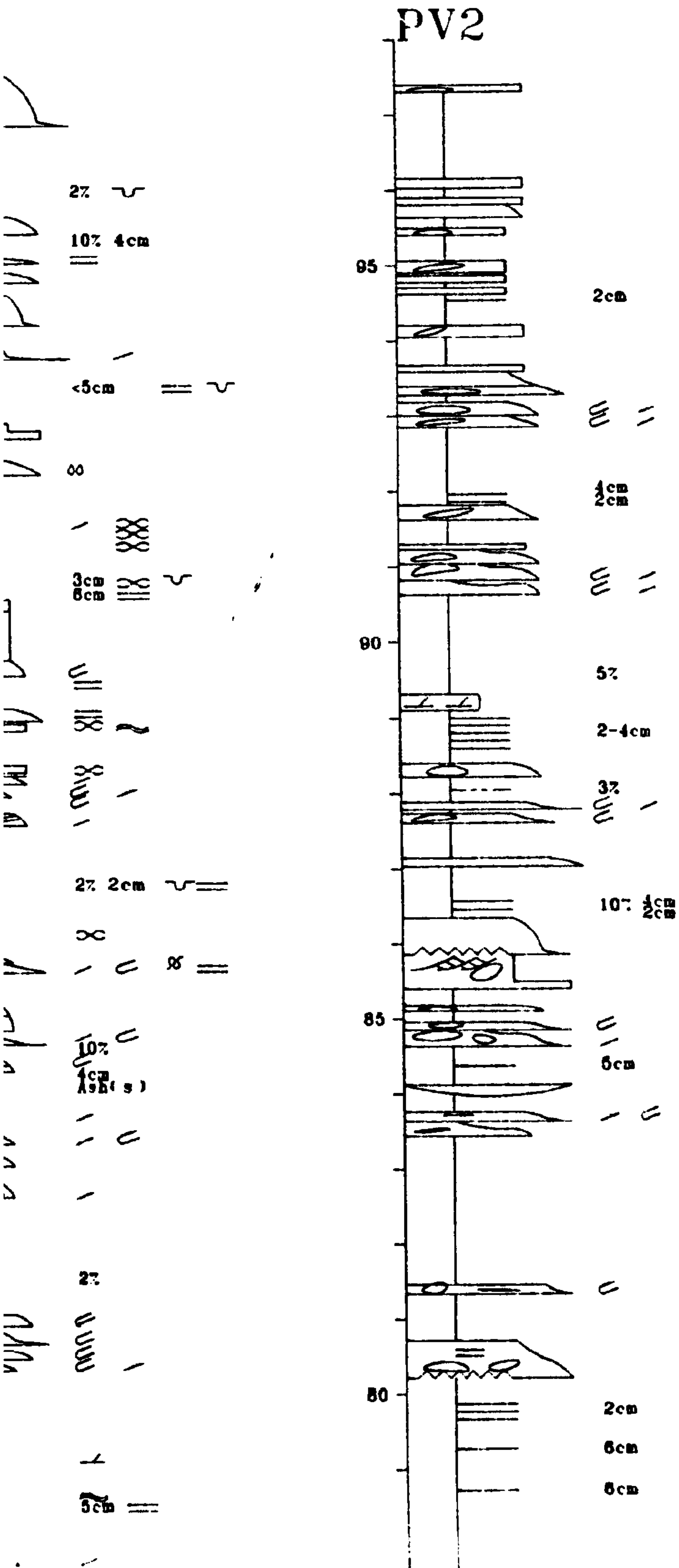

PV 1
70
65
60
55
95
90
85
80
120
115
110
105

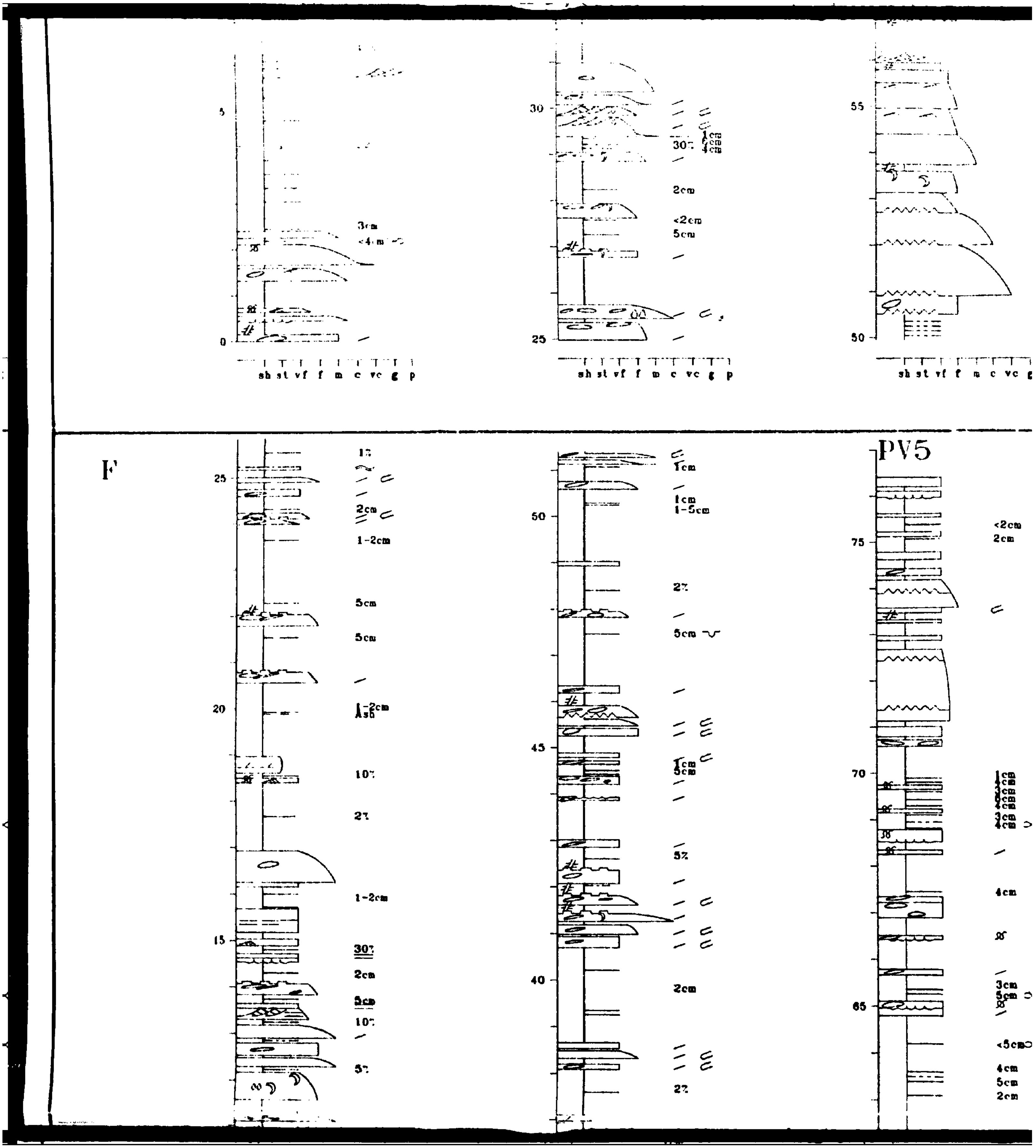

PV1
B
120
115
110
105
20
15
10
5
85
80

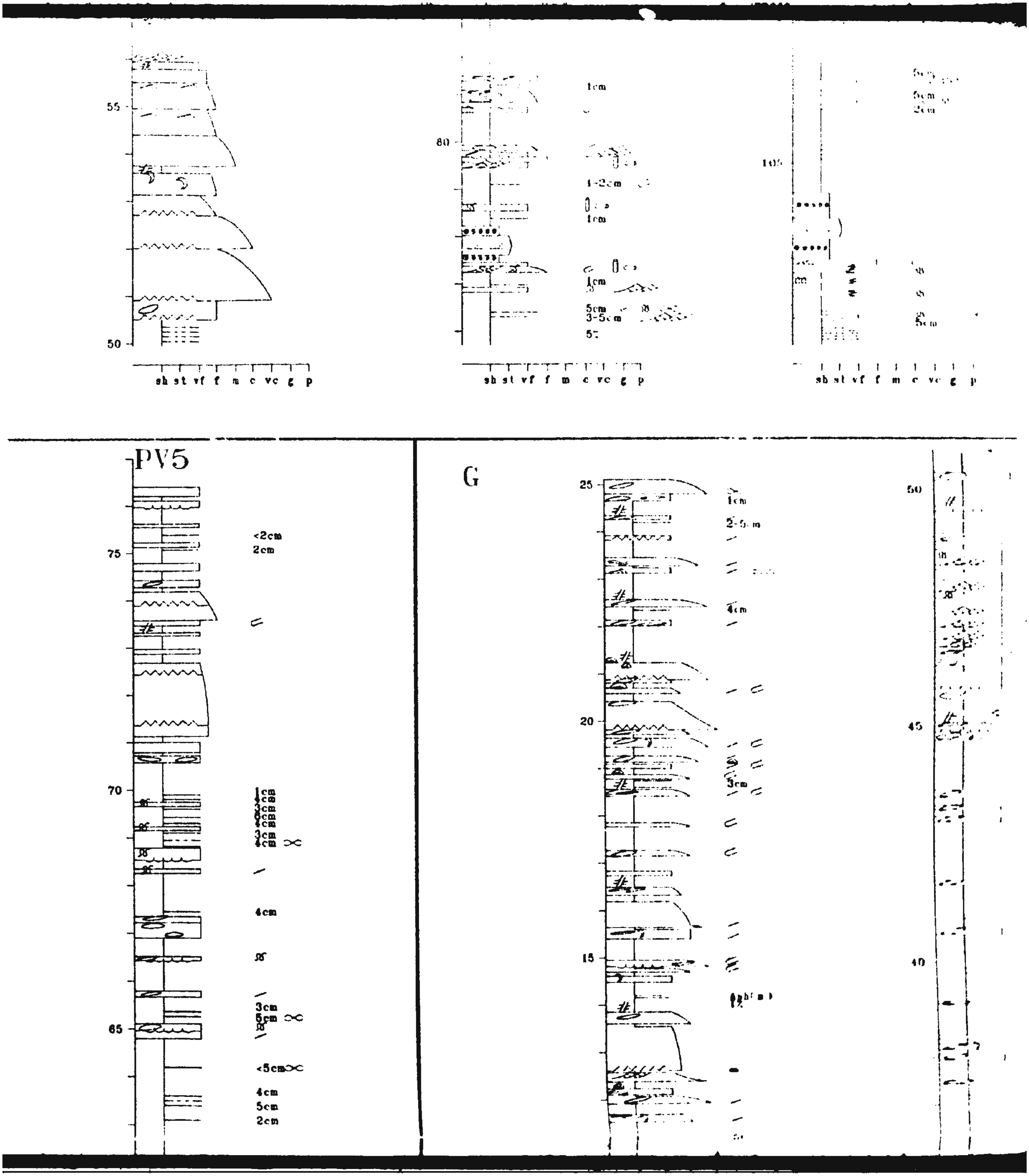

45
40
35
30
70
65
60
55
2%
5%
30% <10cm
5%
5%
5%
5% 1-2cm
20% <5cm
PY
5%
50%
4cm
5cm
6cm
50%
<2cm
50%
4cm
PY
3cm
15% 3cm
3%
20%
5cm
2-3cm
5%
<5%
2%
10% 4cm
<5cm
3cm
6cm
2% 2cm
10%
4cm
Ash(s)
2%
5cm



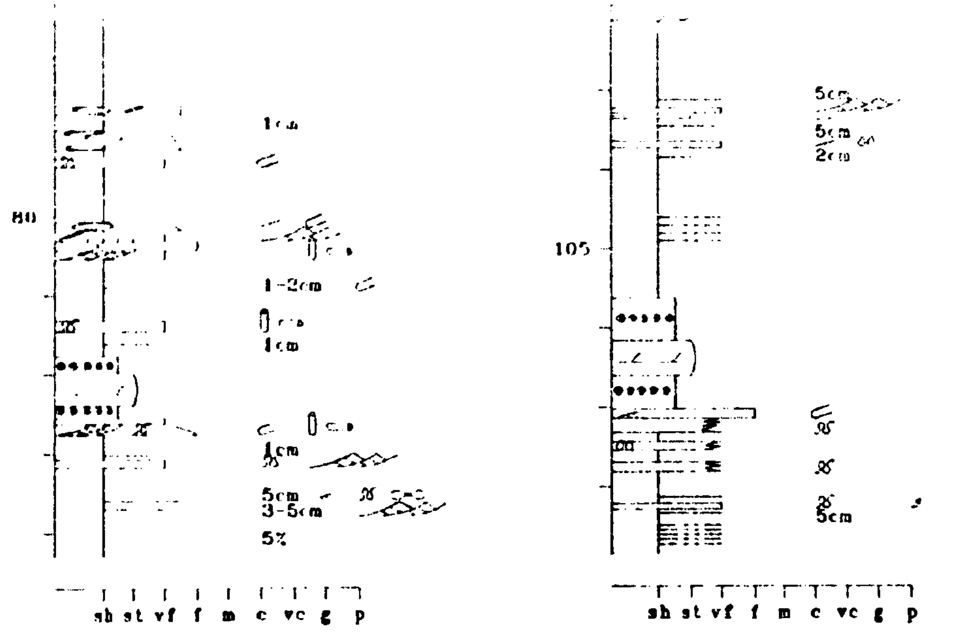
20
15
10
2%
5%
30% <10cm
5%
5%
5%
5% 1-2cm
20% <5cm
PY
5%
45
40
35
30
50%
4cm
5cm
6cm
50%
<2cm
50%
4cm
PY
3cm
15% 3cm
3%
20%
5cm
2-3cm
5%
<5%
70
65
60
55
2%
10%
<5cm
3cm
6cm
2%
10%
4cm
Ash
2%


PV2
95
90
85
80
2cm
4cm
2cm
5%
2-4cm
3%
10% 4cm 2cm
5cm
2cm
6cm
8cm
2%
10% 4cm
<5cm
3cm
6cm
2% 2cm
10%
4cm
ASH(s)
2%
5cm


F
PV5
sh st vf f m c vc g p

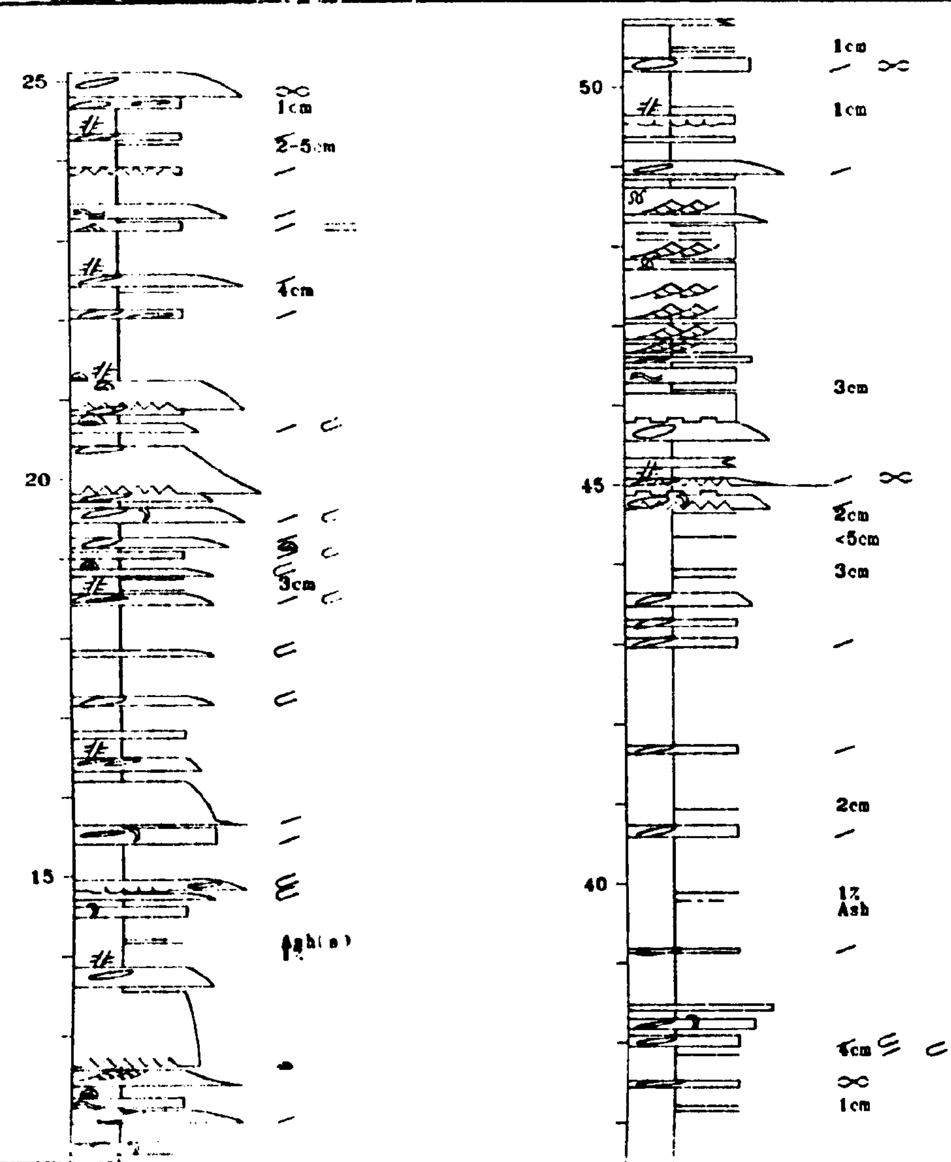


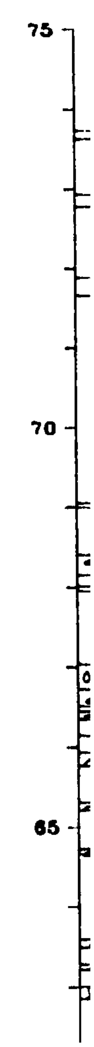
PV5
G
sh st vf f m c vc g p

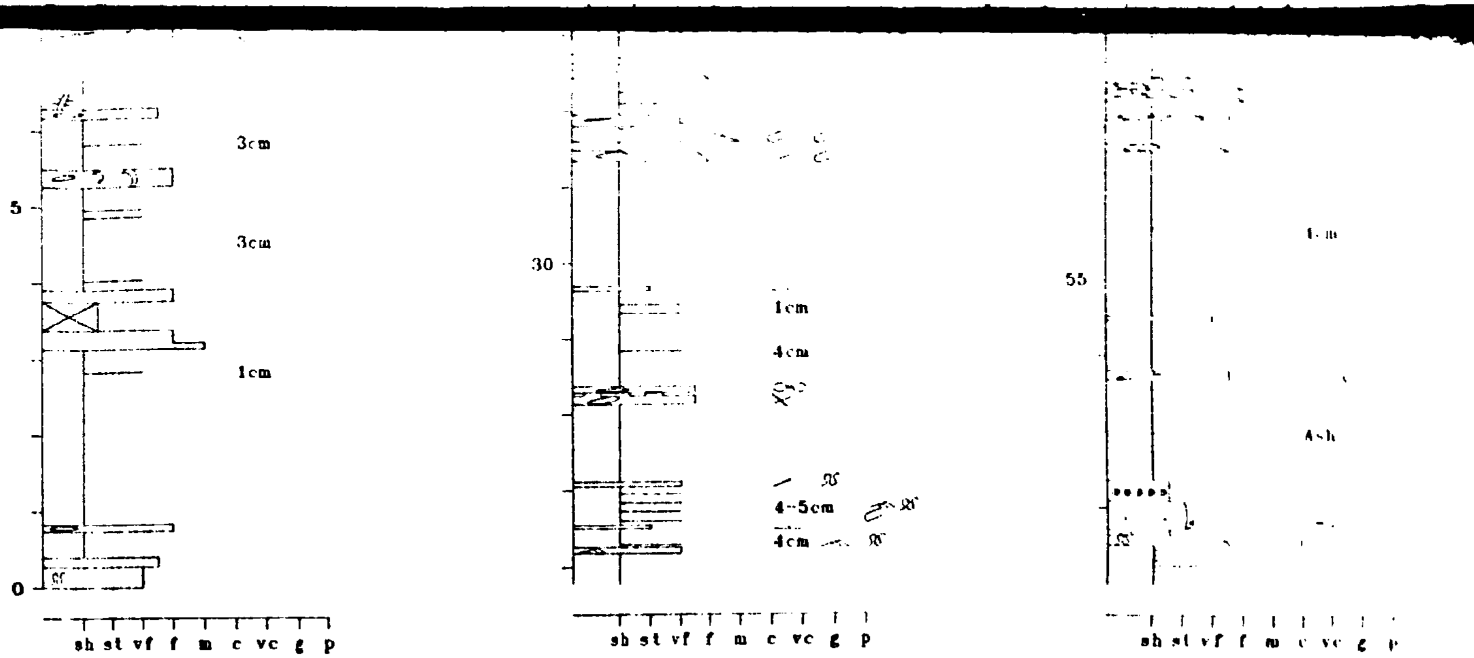

80
105
1cm
1-2cm
5cm
3-5cm
5%
5cm
2cm
sh st vf f m c vc g p
sh st vf f m c vc g p


5
0

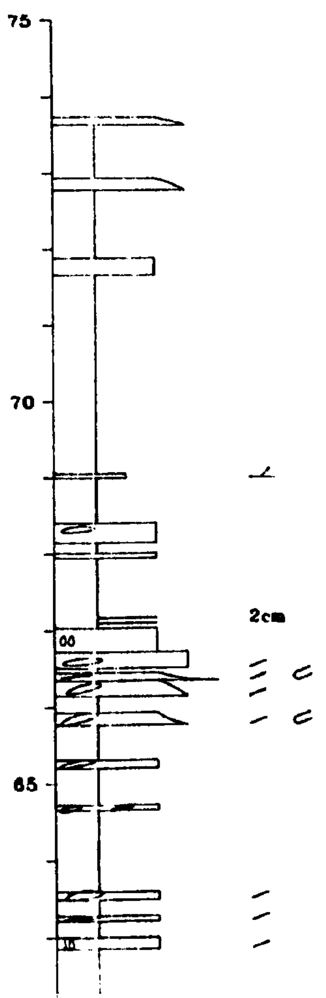
G


25
20
15
50
45
40
1cm
2-5cm
4cm
3cm
3cm
2cm
<5cm
2cm
1%
Ash
1cm


75
70
65



PV6



KE

Symbols

ripple

convolute

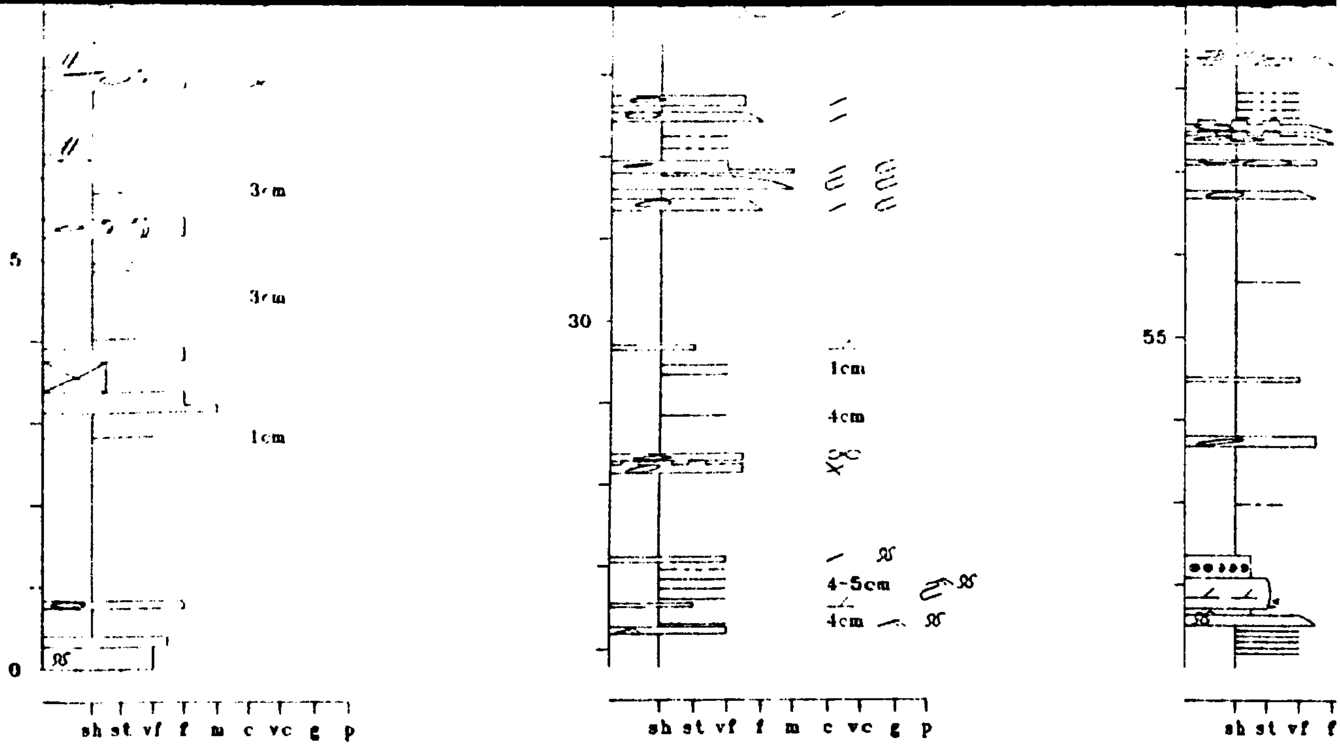
parallel lamination

wavy lamination

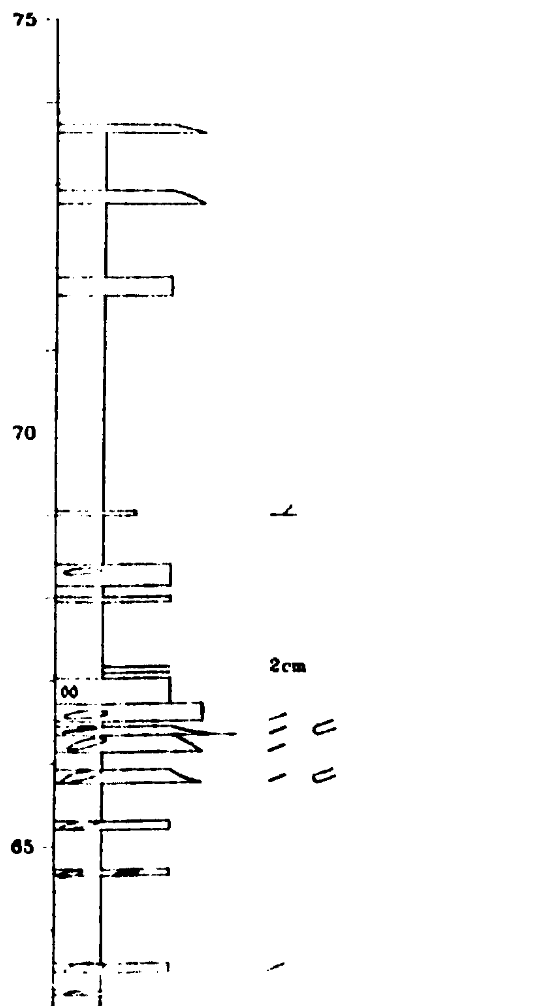
concretion

load balls

fluid escape

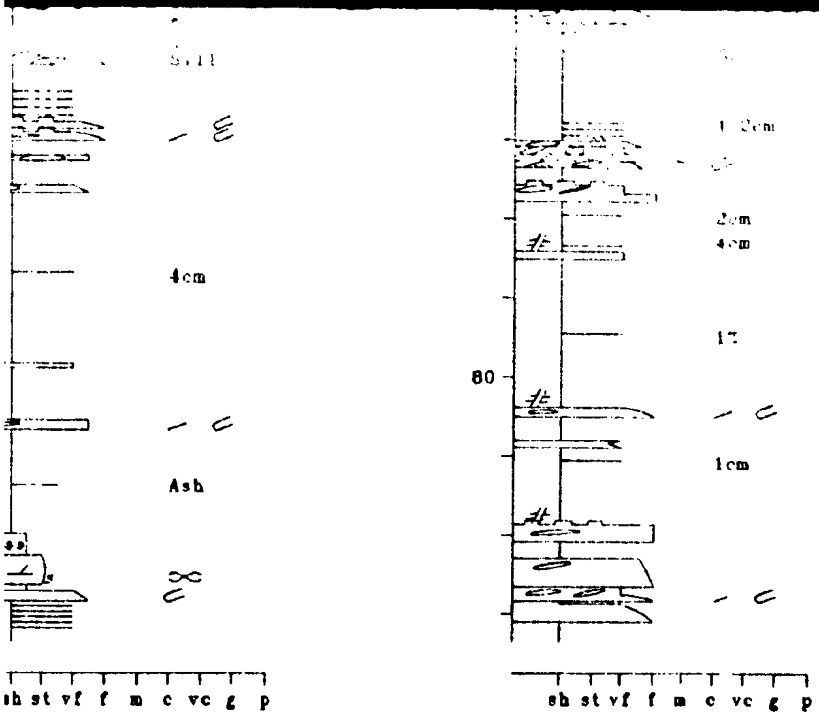


PV6

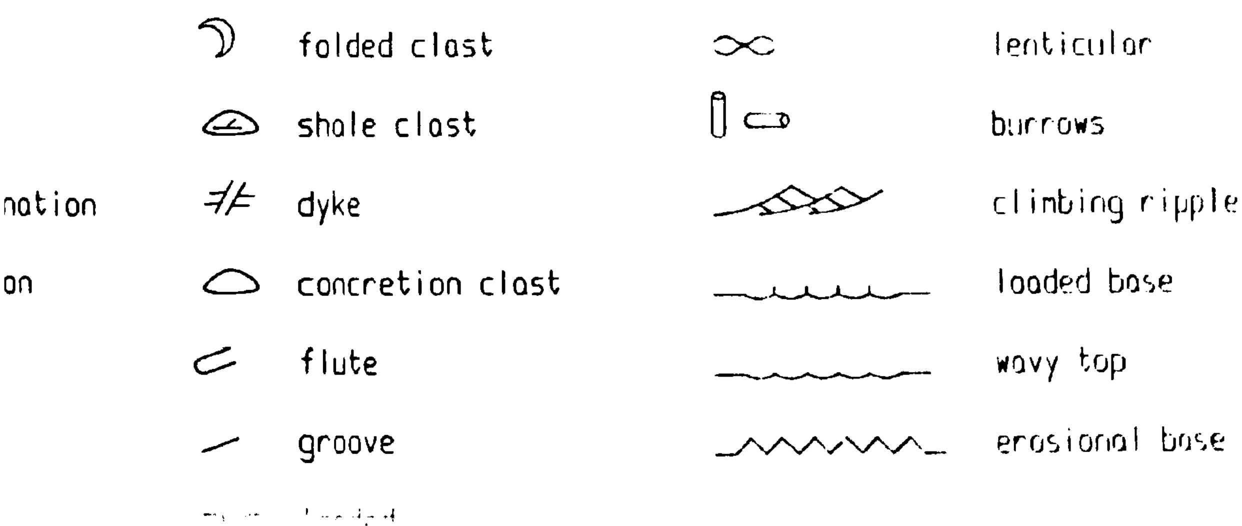


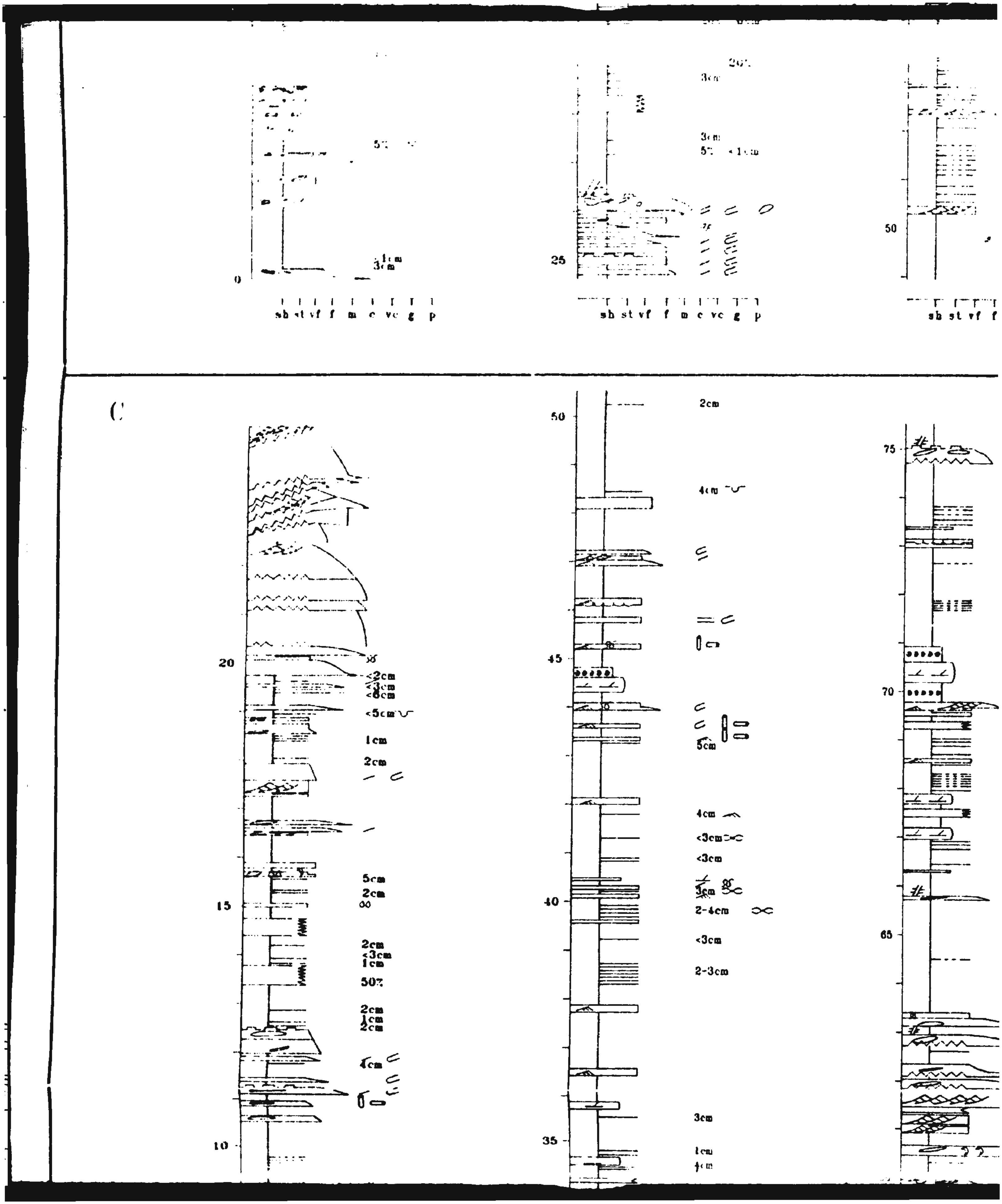
Symbols

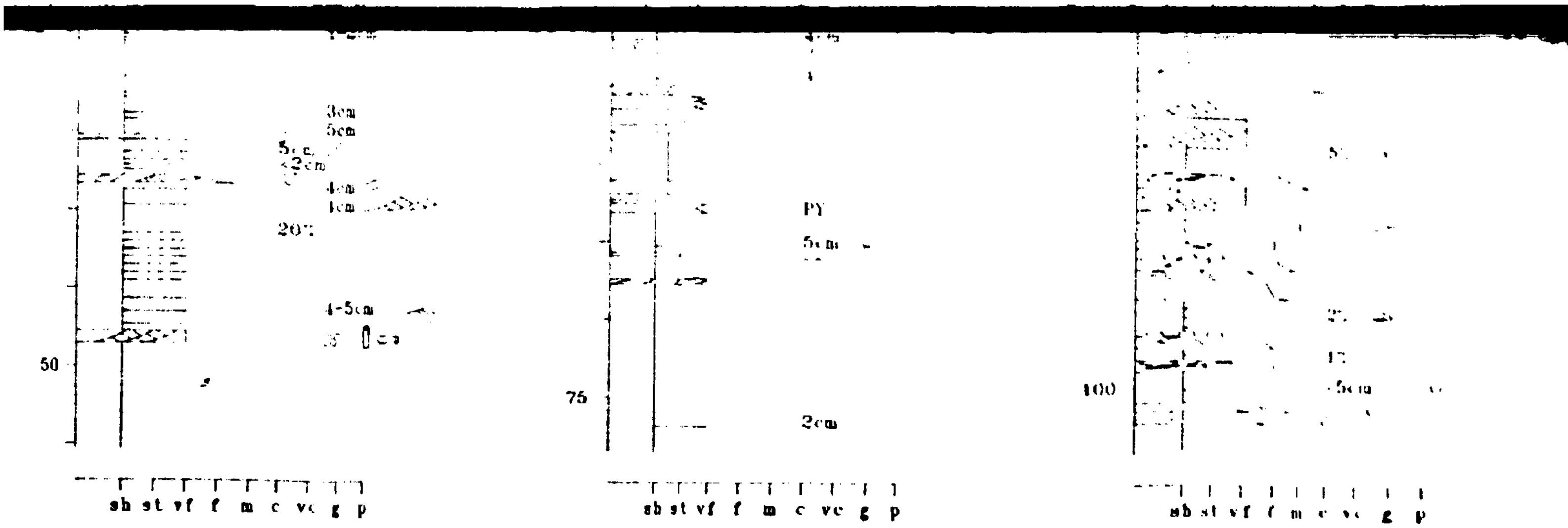
- ripple
- convolute
- parallel lamination
- wavy lamination
- concretion
- load balls


4cm
Ash
80
2cm
4cm
1cm
sh st vf f m c vc g p
sh st vf f m c vc g p

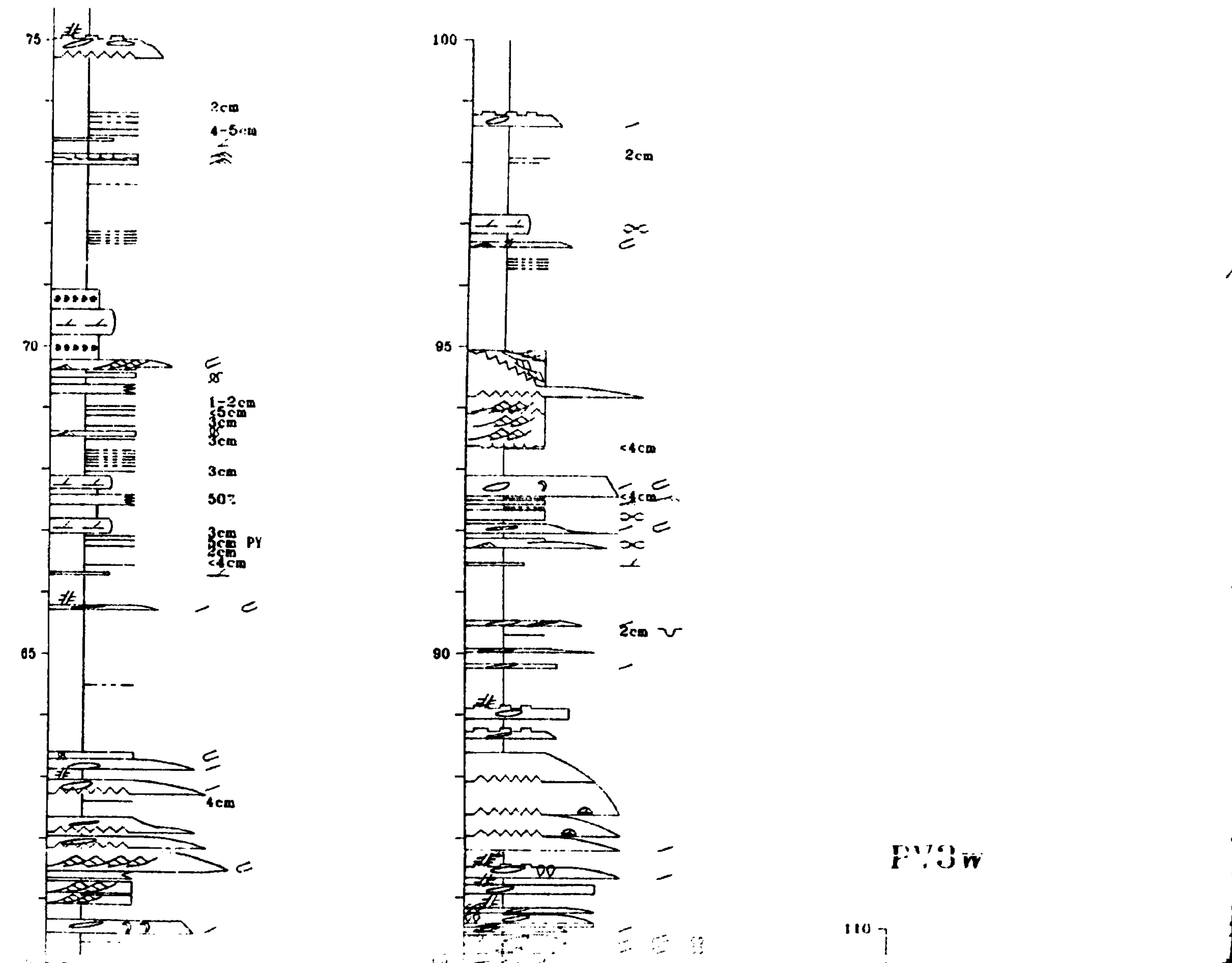
KEY


nation
on
folded clast
shale clast
dyke
concretion clast
flute
groove
lenticular
burrows
climbing ripple
loaded base
wavy top
erosional base


C
0
25
50
sh st vf f m c vc g p
sh st vf f m c vc g p
sh st vf f
3cm
5%
<1cm
10
15
20
35
40
45
50
65
70
75
<2cm
<3cm
<5cm
1cm
2cm
5cm
2cm
2cm
<3cm
1cm
50%
2cm
1cm
2cm
4cm
2cm
4cm
5cm
4cm
<3cm
<3cm
3cm
2-4cm
<3cm
2-3cm
3cm
1cm

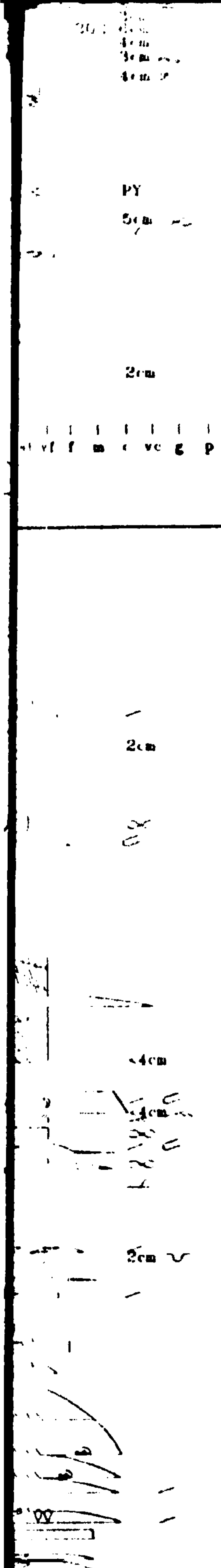


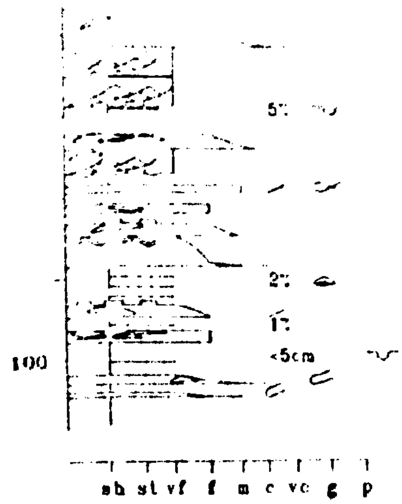
50
75
100
3cm
5cm
4-5cm
20%
PY
2cm
sh st vf f m c vc g p
sh st vf f m c vc g p
sh st vf f m c vc g p

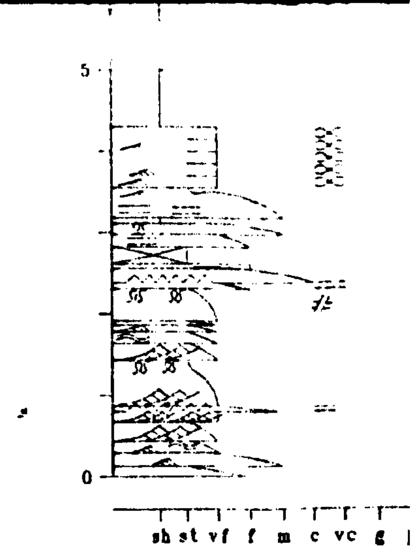


75
70
65
100
95
90
110
2cm
4-5cm
1-2cm
<5cm
3cm
3cm
50%
3cm
2cm
PY
<4cm
4cm
2cm
<4cm
<4cm
2cm

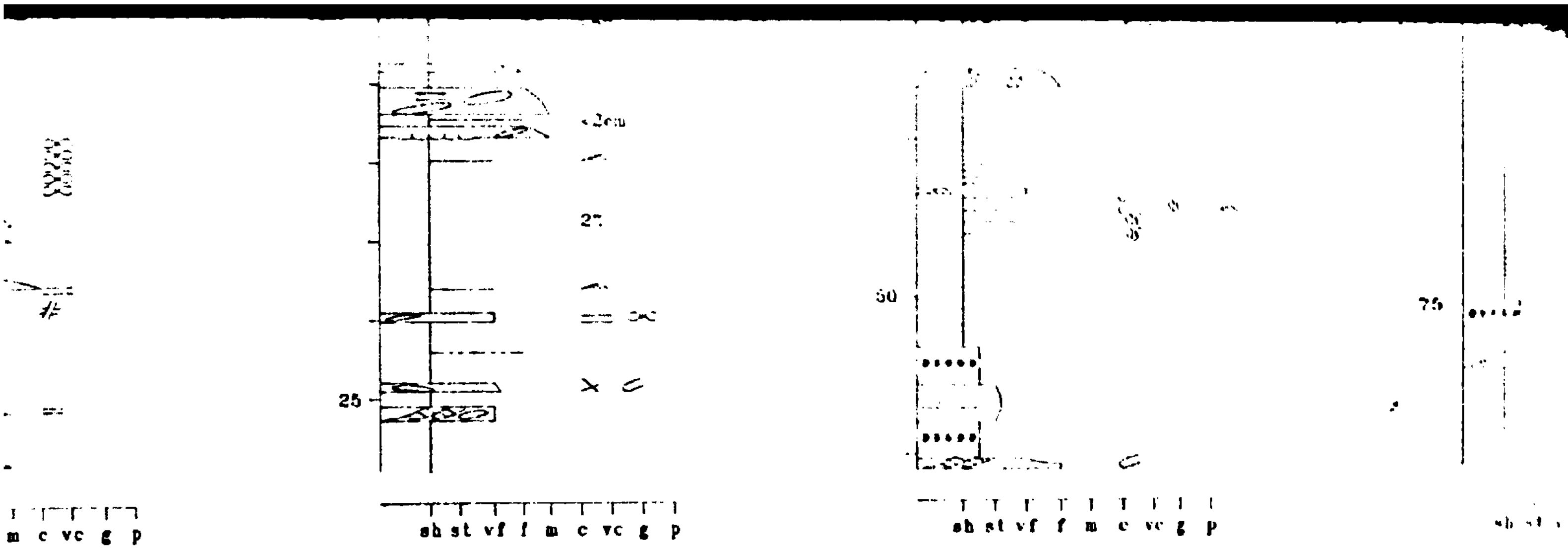
PV3w


PY
5cm
2cm
vf f m c vc g p
2cm
<4cm
2cm


5%
2%
1%
<5cm
100
sh st vf f m c vc g p


5
0
sh st vf f m c vc g

PY3w

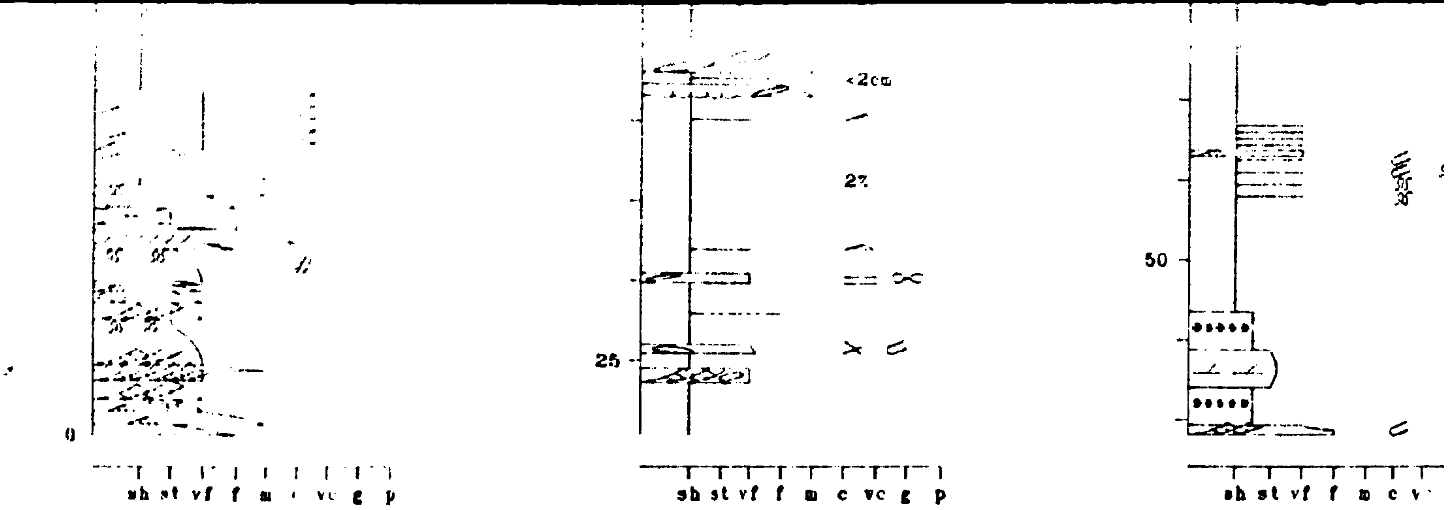


KEY

Symbols

- ripple
- convolute
- parallel lamination
- wavy lamination
- concretion
- load balls
- fluid escape
- folded clast
- shale clast
- dyke
- concretion clast
- flute
- groove
- loaded

Grain size and others

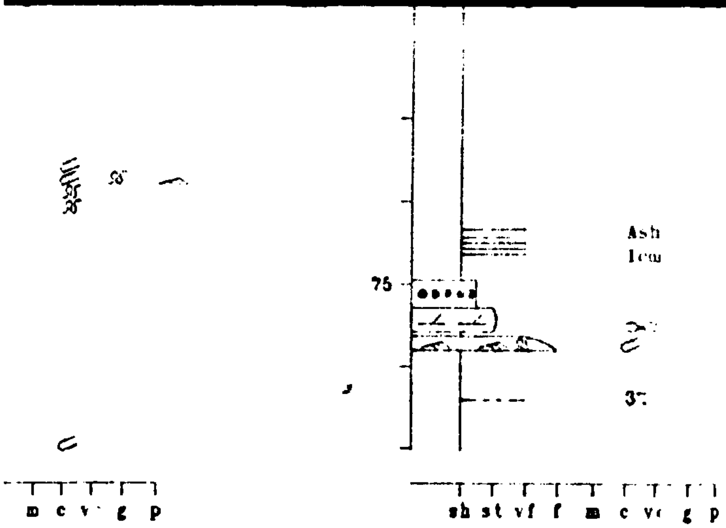


KEY

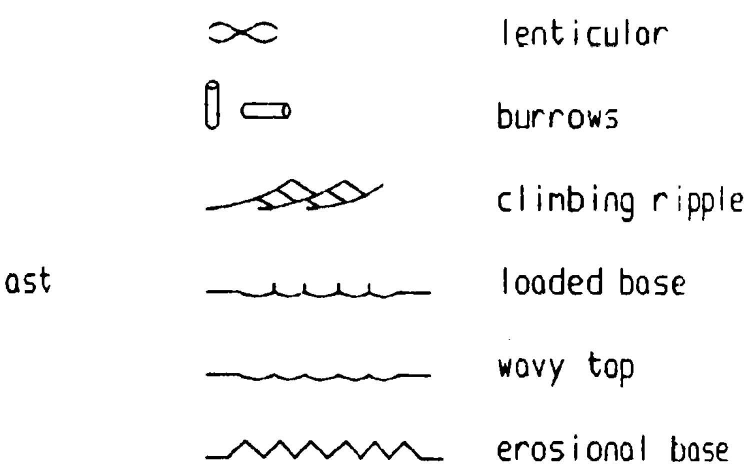
Symbols

ripple	folded clast
convolute	shale clast
parallel lamination	dyke
wavy lamination	concretion clast
concretion	flute
load balls	groove
fluid escape	loaded

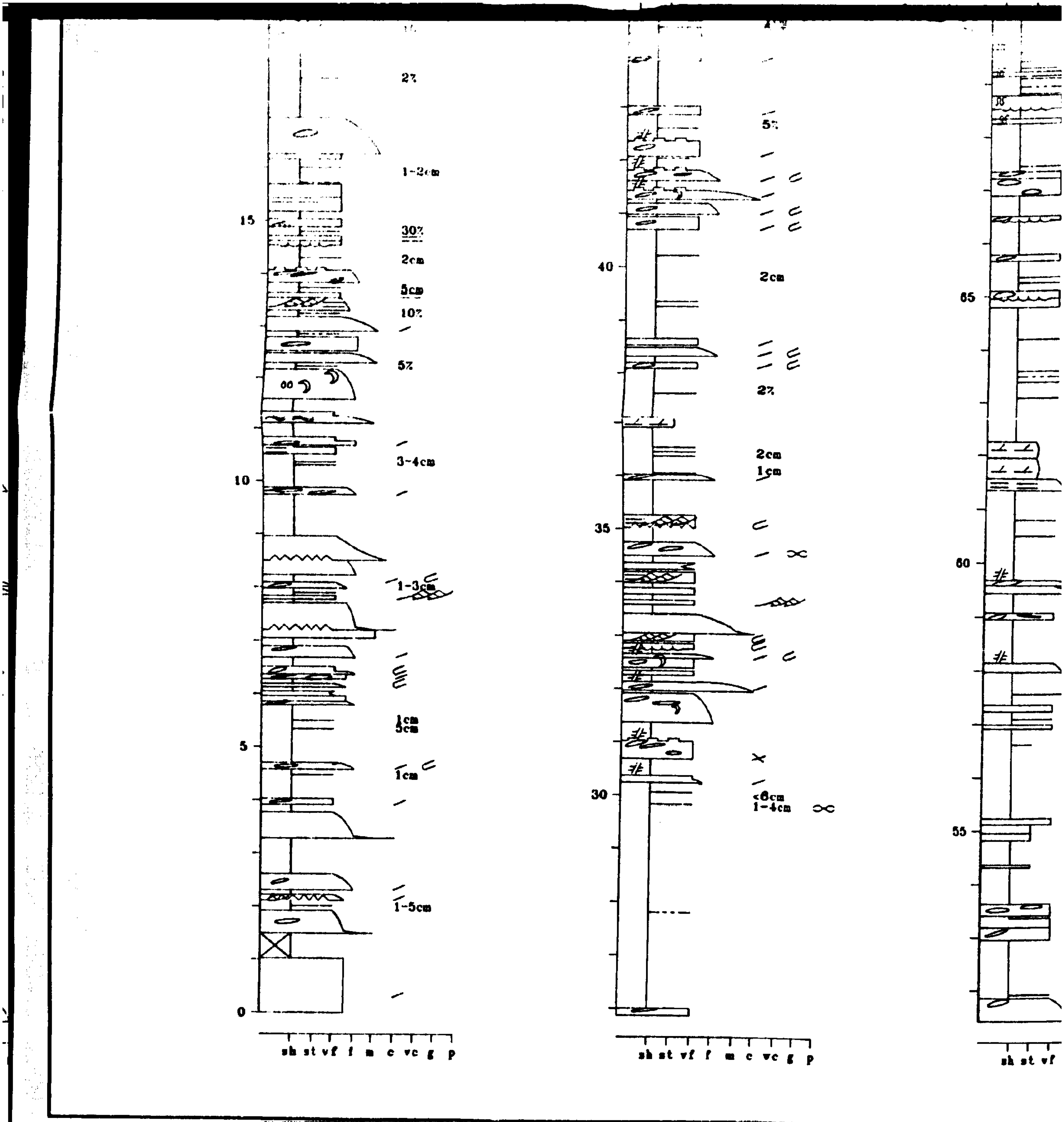
Grain size and others



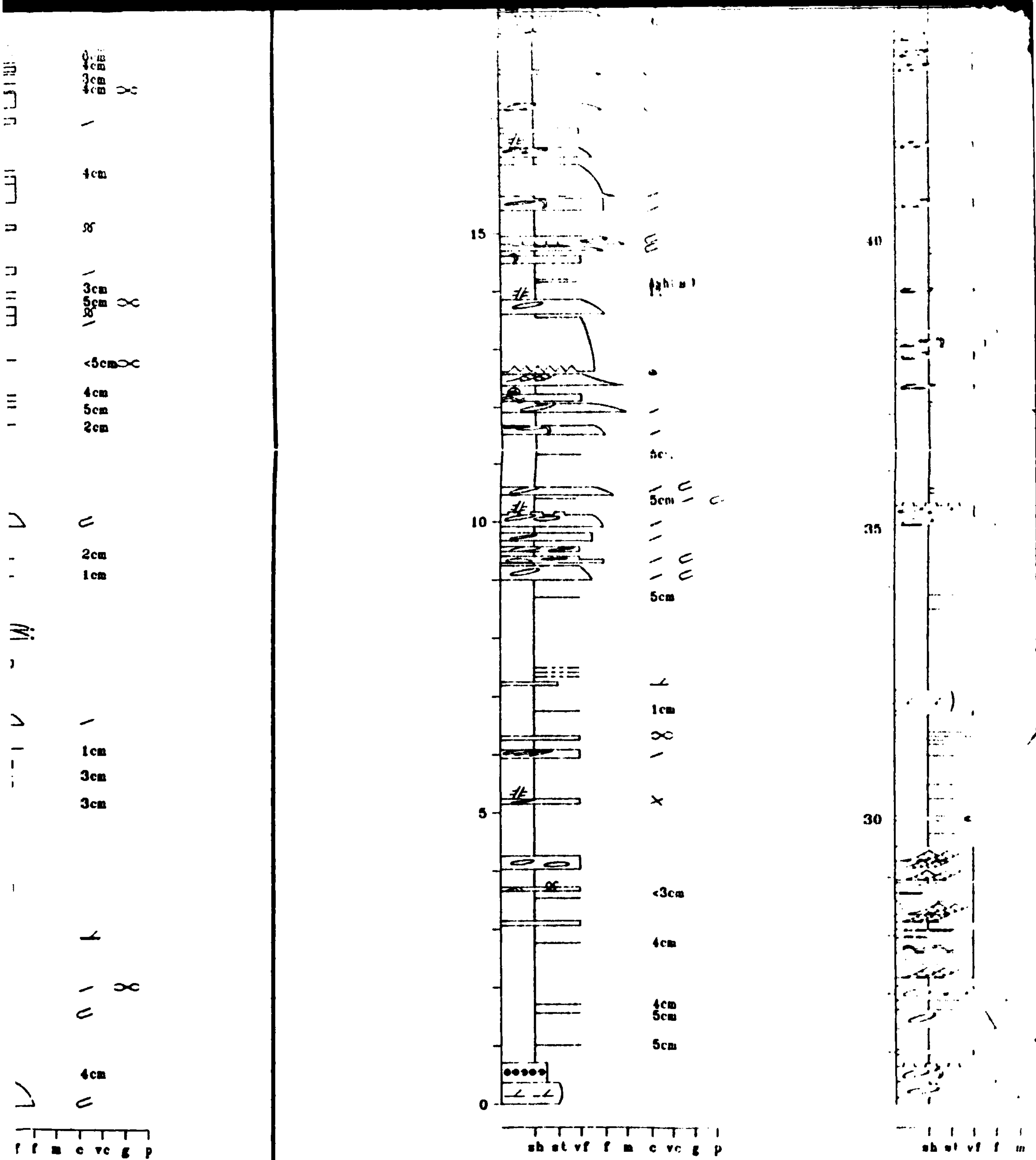
Ash
1cm
75
m c v g p
sh st vf f m c vc g p



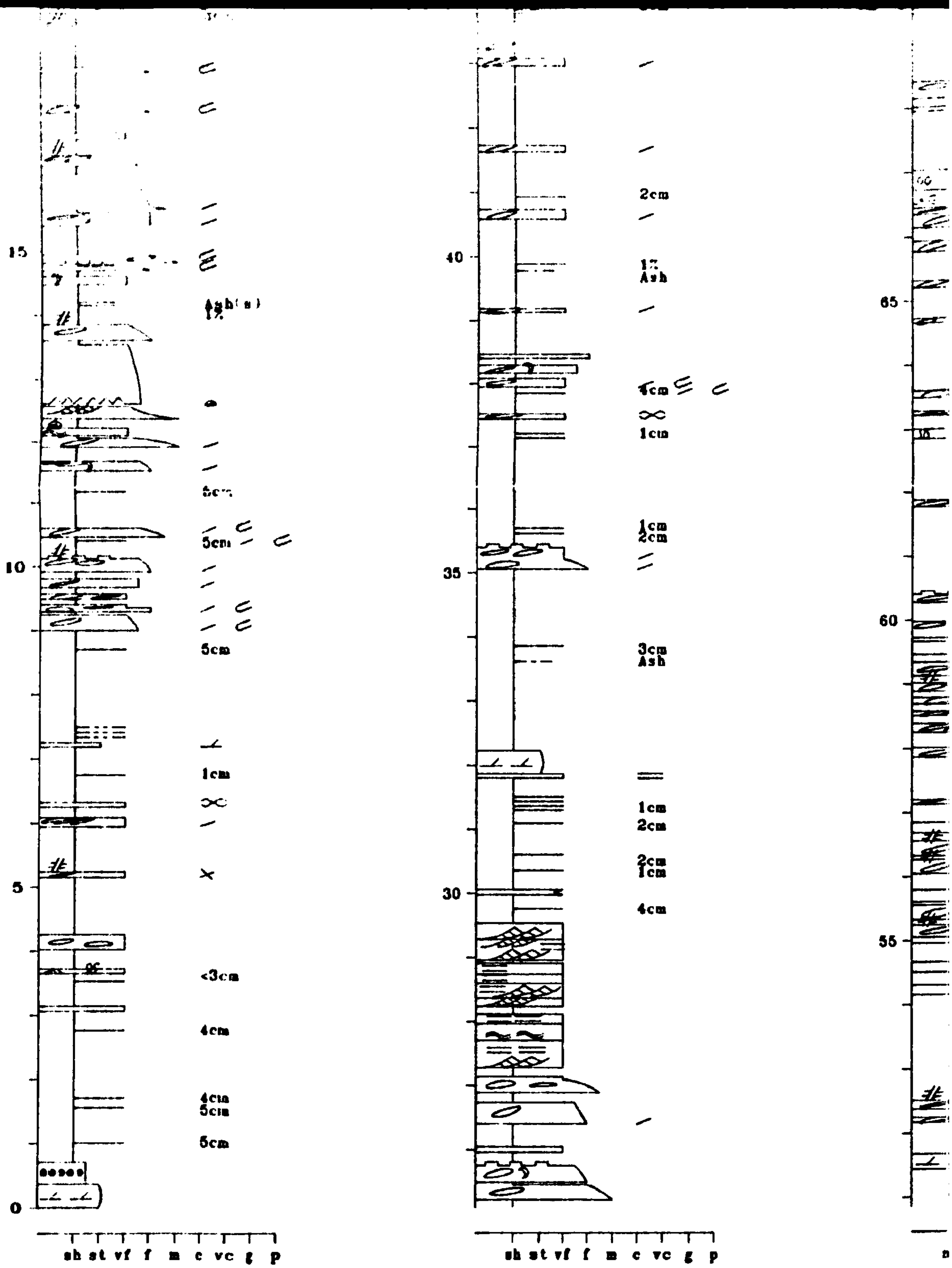
ast
lenticular
burrows
climbing ripple
loaded base
wavy top
erosional base



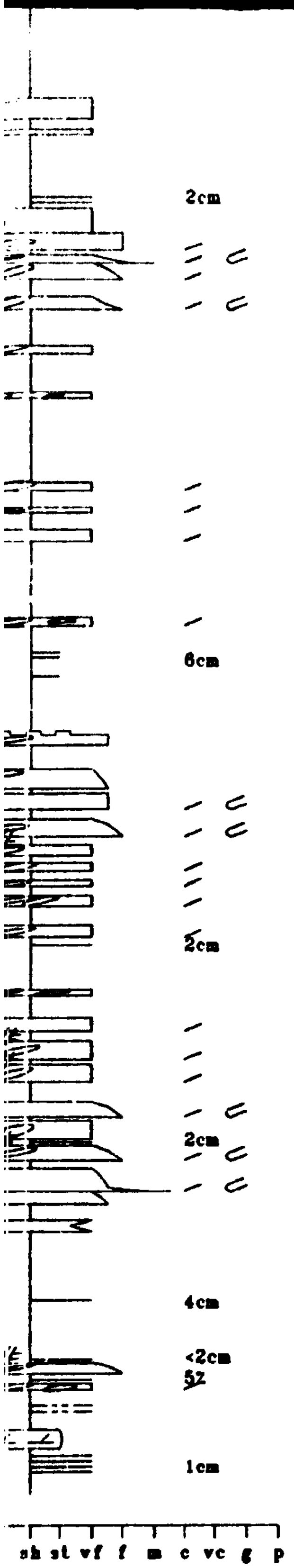
Appendix 1 (D-G) Bed-by-bed sections. D - Section PV3; E - Secti



ion PV4; F - Section PV5; G - Section PV6.



- Section PV5; G - Section PV6.



convolute

parallel lamination

wavy lamination

concretion flute

load balls

fluid escape

Grain size and others

sh -- shale

st -- silt

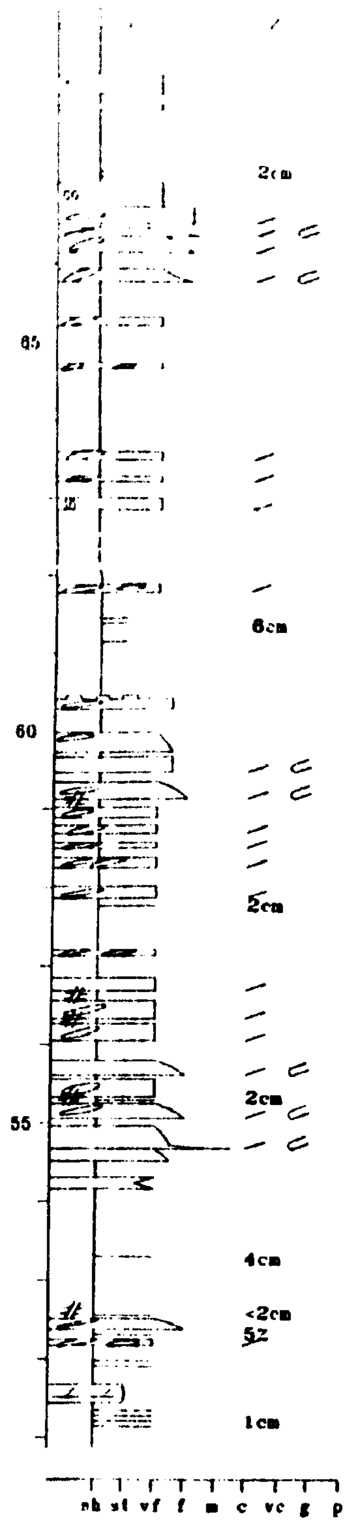
vf -- very fine sand

f -- fine sand

% -- sand component in a laminated shale pa

cm -- thickness of sand laminaes in a lamina

B* -- a marker horizon for lateral correlatio



[illegible]

convolute

parallel lamination

wavy lamination

concretion

load balls

fluid escape

Grain size and others

sh -- shale

st -- silt

vf -- very fine sand

f -- fine sand

% -- sand component in a laminat

cm -- thickness of sand laminaes

B* -- a marker horizon for latera

folded clast	[illegible]
shale clast	burrows
dyke	climbing ripple
concretion clast	loaded base
flute	wavy top
groove	erosional base
loaded	

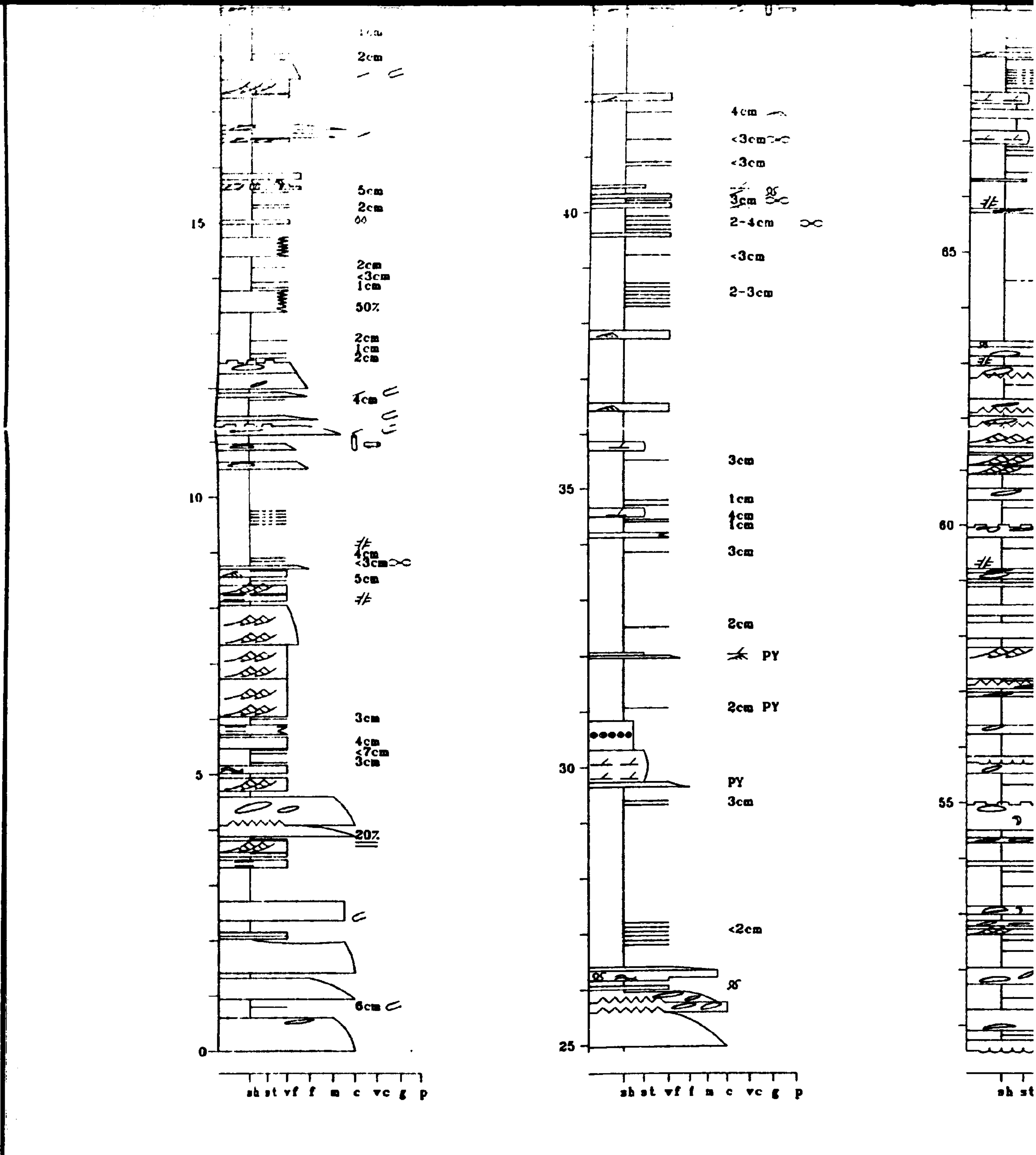
:ion

m -- medium sand	g -- gravel
c -- coarse sand	p -- pebble
vc -- very coarse sand	py -- pyrite

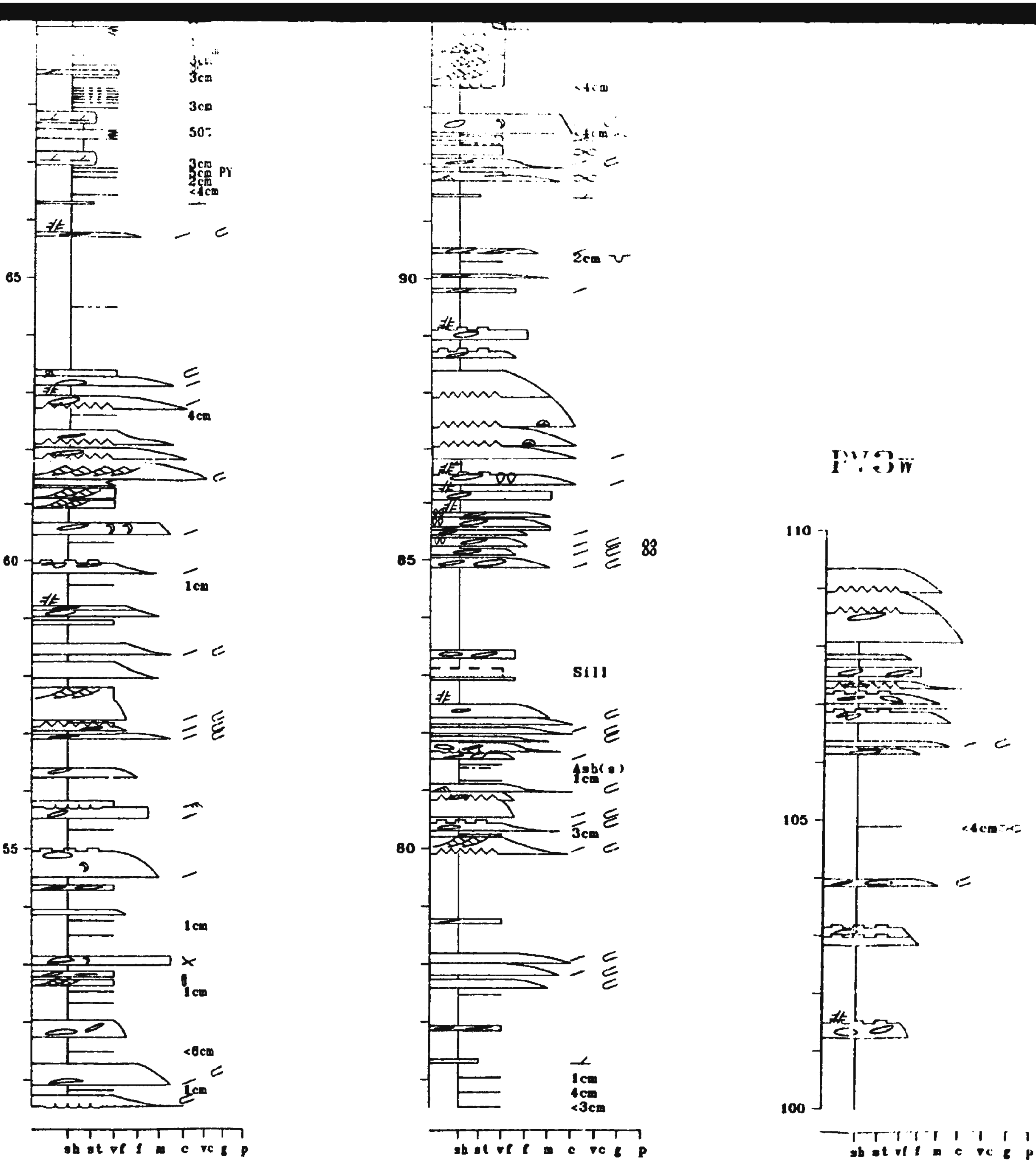
a laminated shale package

laminaes in a laminated shale package

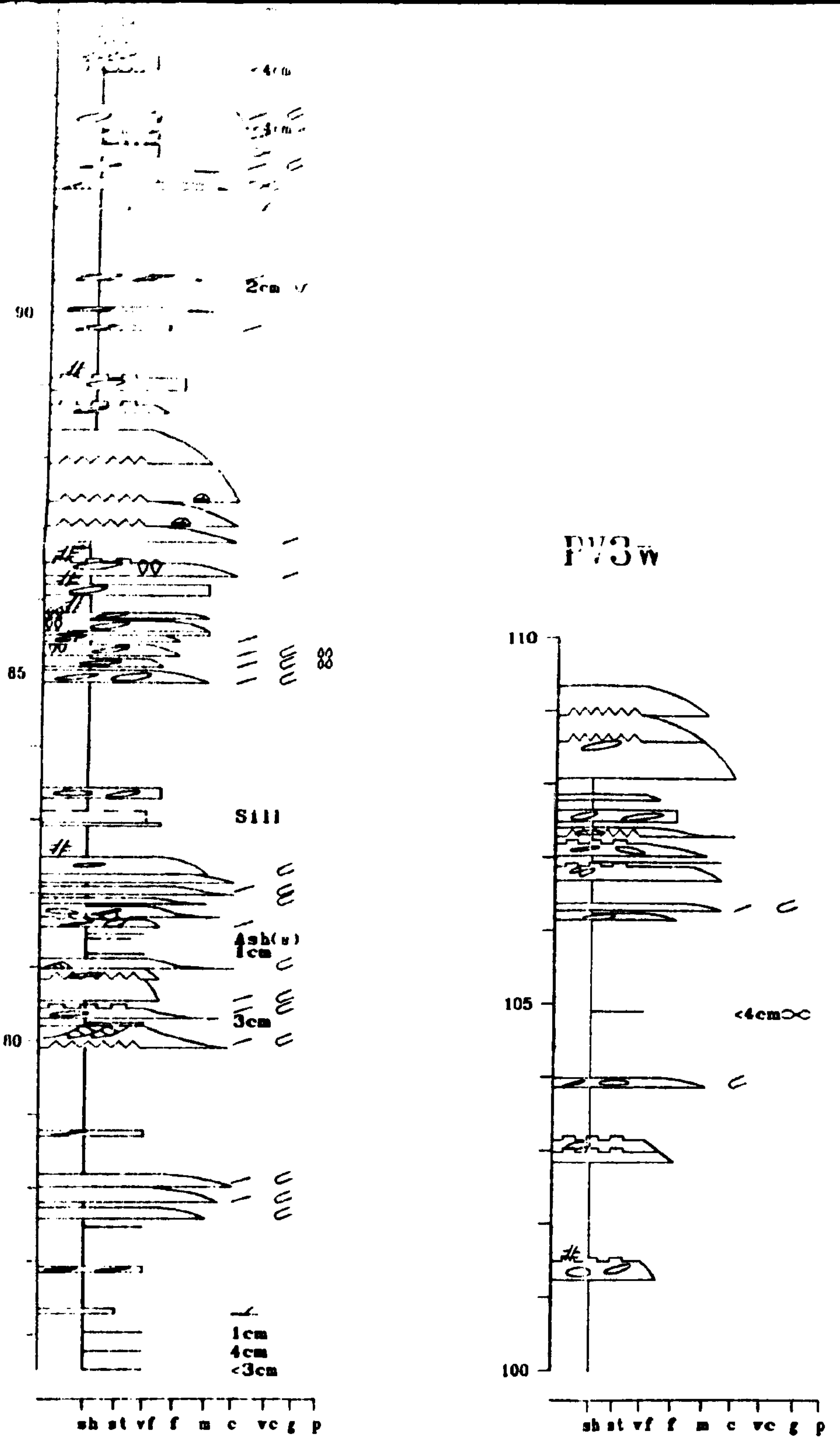
or lateral correlation between sections PV1 and PV9



Appendix 1 (A-C) Bed-by-bed sections. A - Section PV1; B - Sec



B - Section PV2; C - Section PV3w.


PV3w
110
105
100
90
85
80
<4cm
2cm
S111
4sh(s)
1cm
3cm
1cm
4cm
<3cm
<4cm
sh st vf f m c vc g p
sh st vf f m c vc g p

ection PV3w.

convolute	shale clast
parallel lamination	dyke
wavy lamination	concretion clast
concretion	flute
load balls	groove
fluid escape	loaded

Grain size and others

sh -- shale

st -- silt

vf -- very fine sand

f -- fine sand

m -- medium sand

c -- coarse sand

vc -- very coarse sand

% -- sand component in a laminated shale package

cm -- thickness of sand laminae in a laminated shale package

B* -- a marker horizon for lateral correlation between sections PV1 and I ripple

convolute

parallel lamination

wavy lamination

concretion

load balls

fluid escape

folded clast

shale clast

dyke

concretion clast

flute

groove

loaded

Grain size and others

sh -- shale

st -- silt

vf -- very fine sand

f -- fine sand

m -- medium s

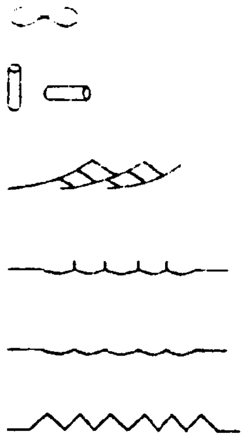
c -- coarse s

vc -- very coa

% -- sand component in a laminated shale package

cm -- thickness of sand laminaes in a laminated shale pac

B* -- a marker horizon for lateral correlation between se



lenticular

burrows

climbing ripple

clast — loaded base

wavy top

erosional base

edium sand — g -- gravel

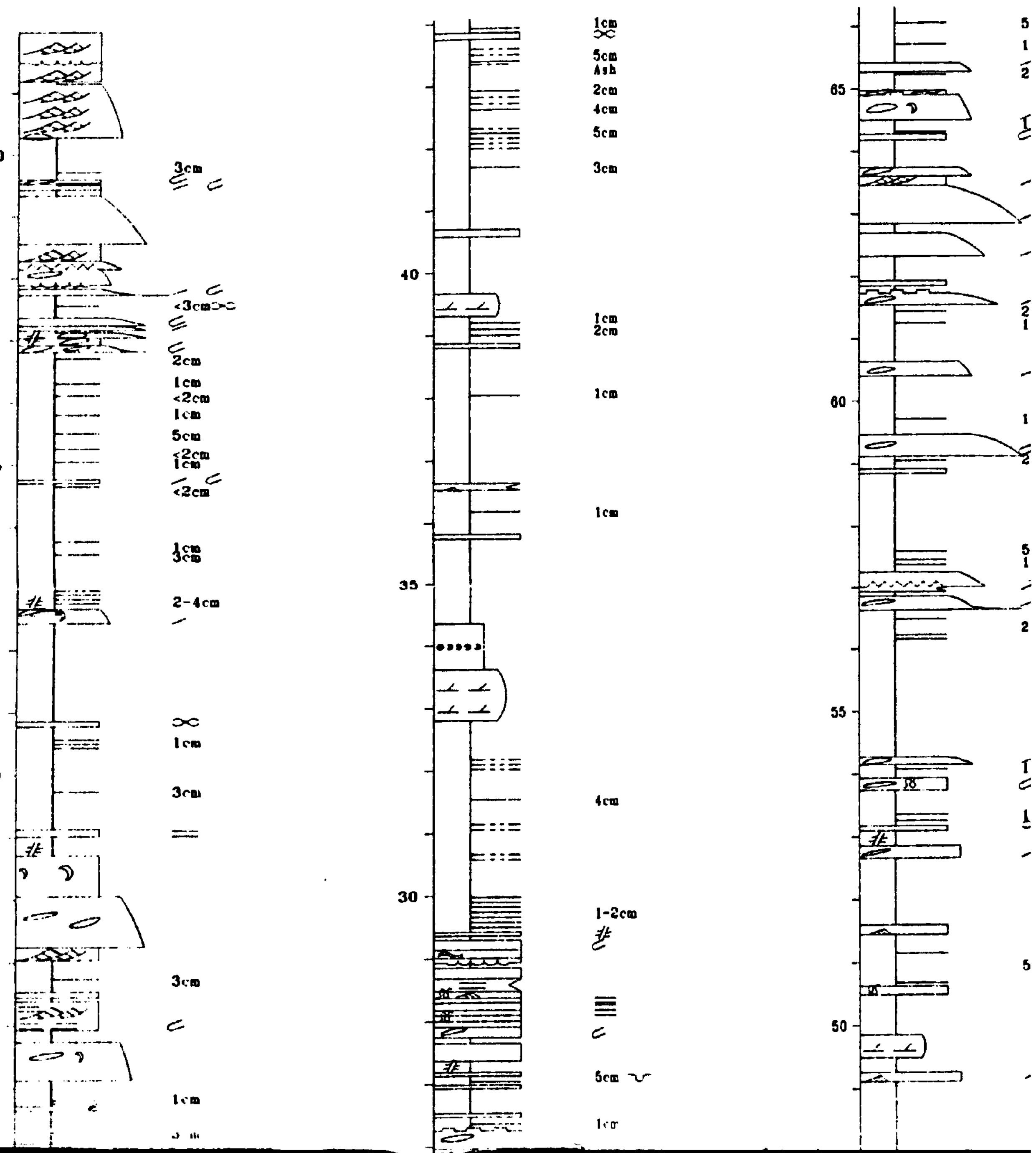
oarse sand — p -- pebble

ery coarse sand — py -- pyrite

ole package

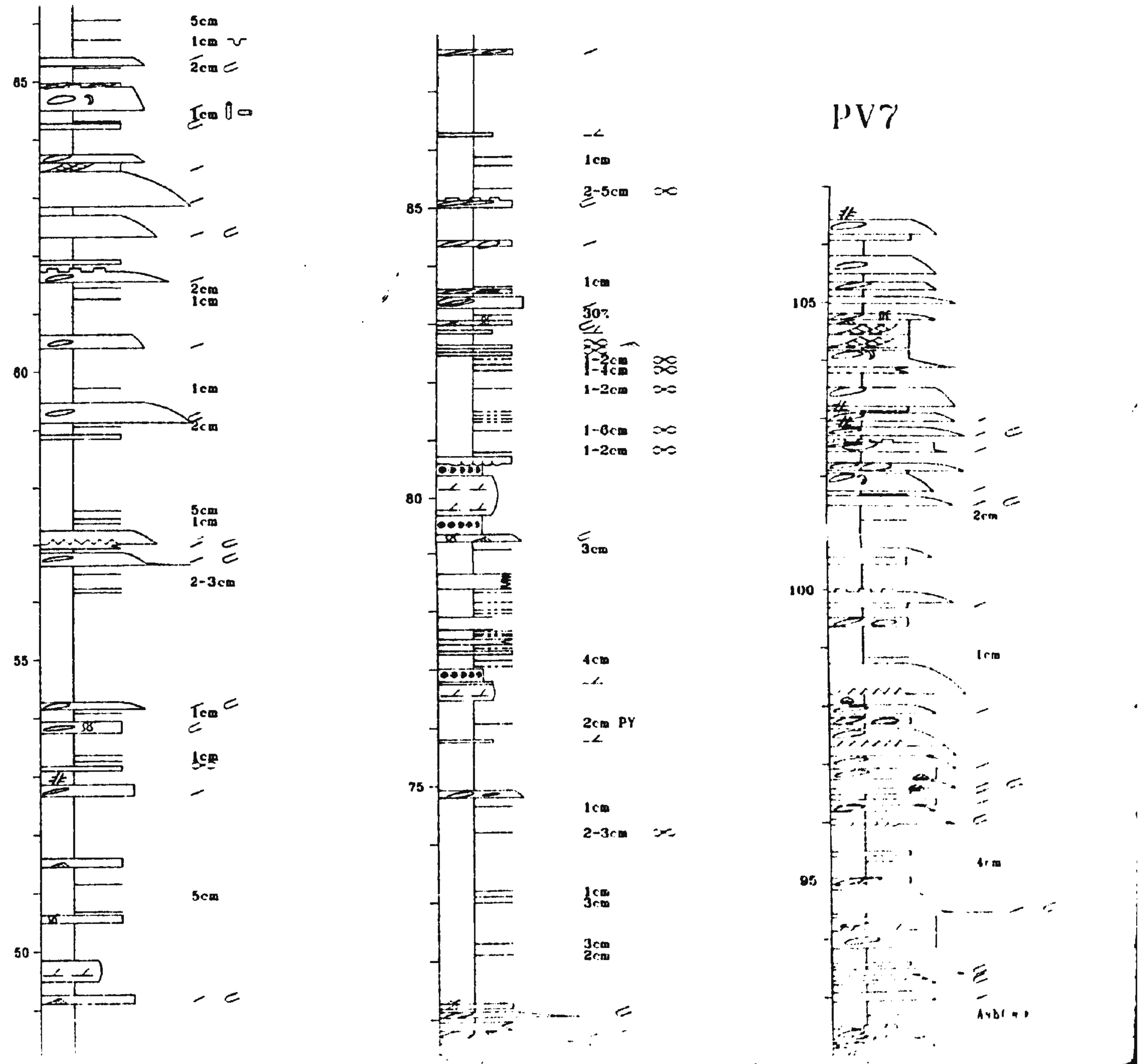
ween sections PV1 and PV9

II

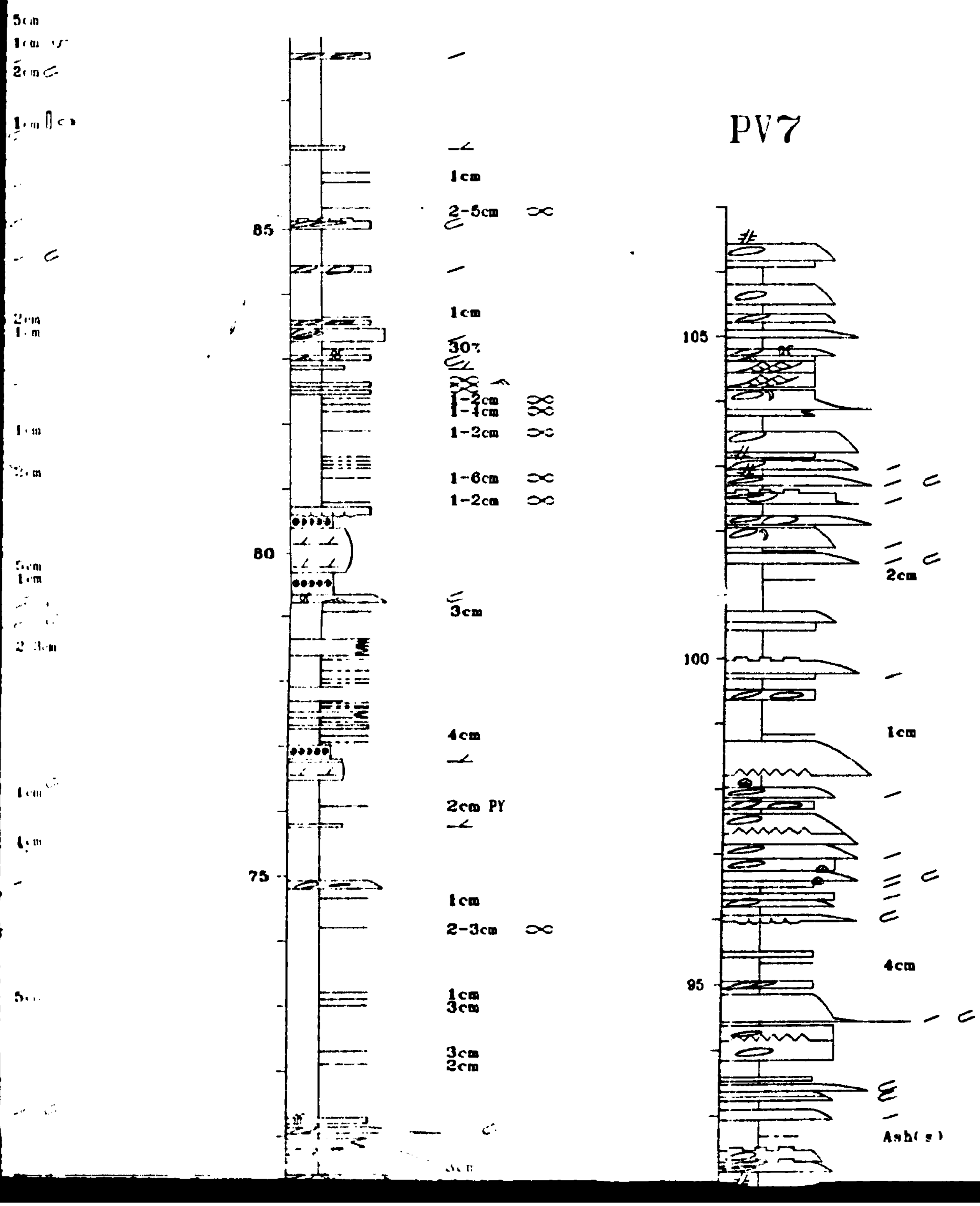


20
15
10
5
3cm
<3cm
2cm
1cm
<2cm
1cm
5cm
<2cm
1cm
<2cm
1cm
3cm
2-4cm
1cm
3cm
3cm
1cm
40
35
30
1cm
5cm
Ash
2cm
4cm
5cm
3cm
1cm
2cm
1cm
1cm
4cm
1-2cm
5cm
65
60
55
50

PV7

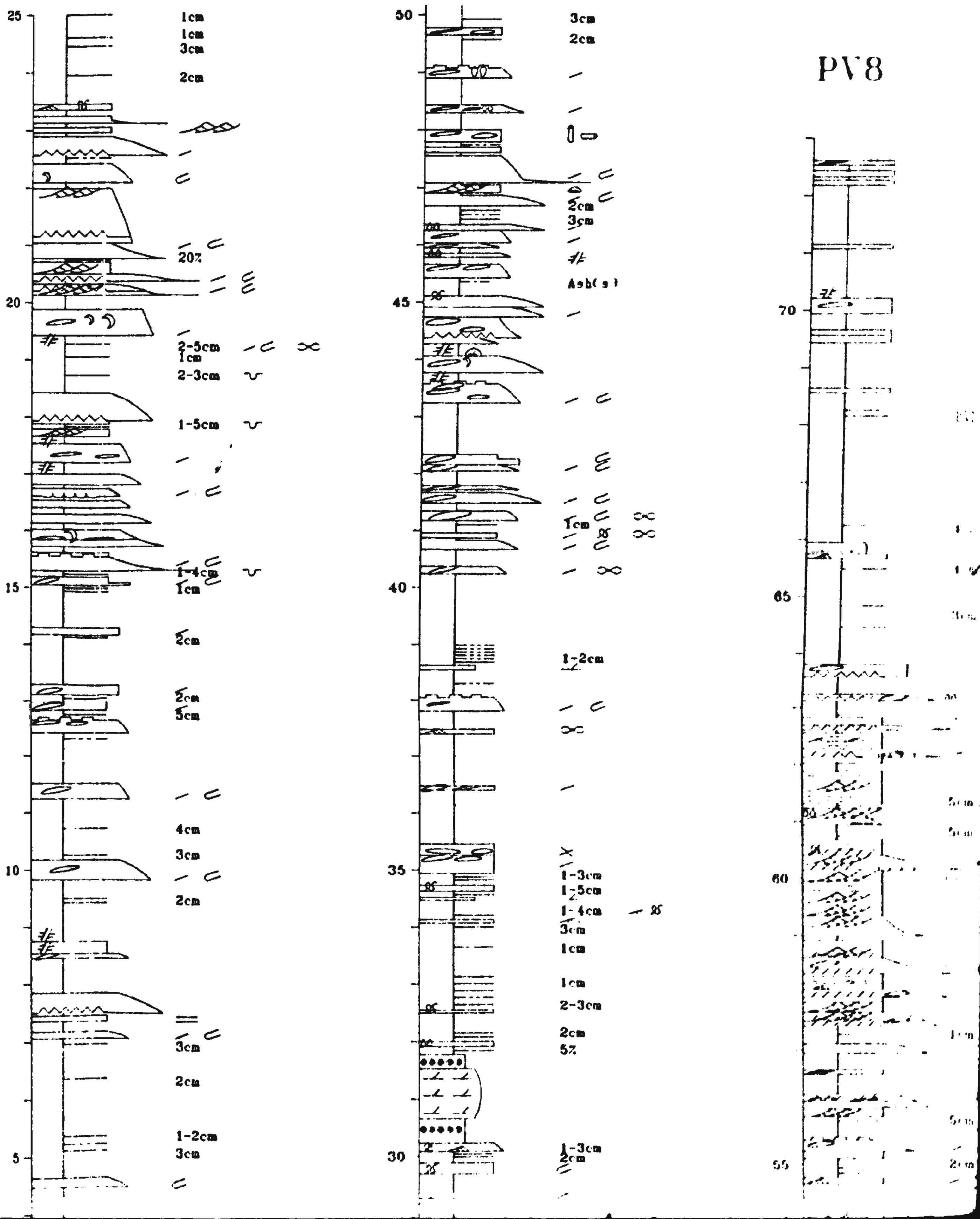


65
60
55
50
5cm
1cm
2cm
2-3cm
85
80
75
30%
1-5cm
1-4cm
1-2cm
1-6cm
3cm
4cm
2cm PY
105
100
95

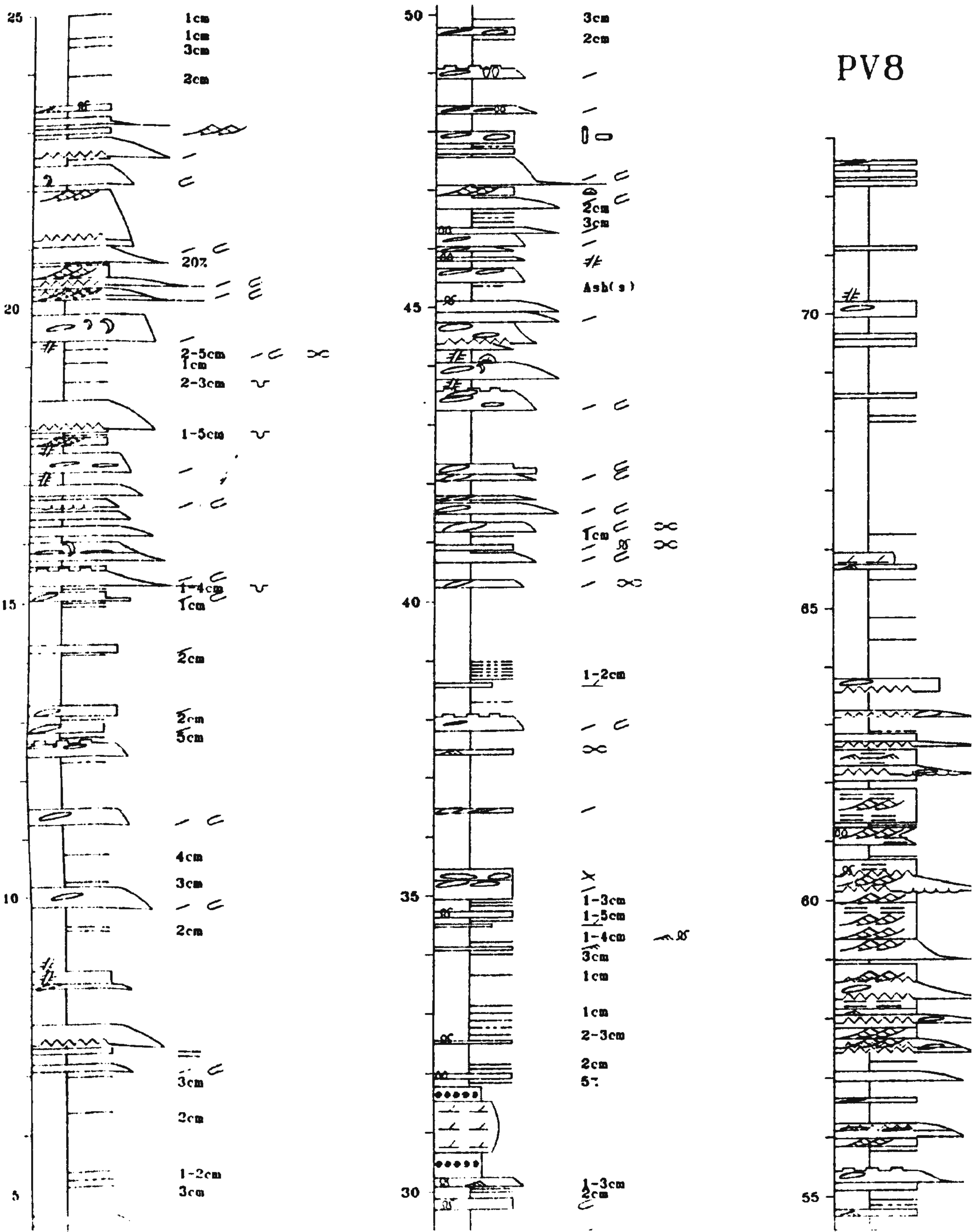


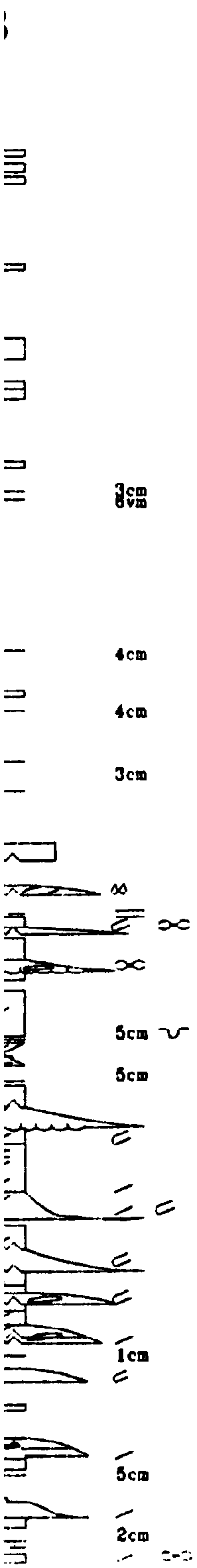
PV7
85
80
75
105
100
95
1cm
2-5cm
1cm
30%
1-2cm
1-4cm
1-2cm
1-6cm
1-2cm
3cm
4cm
2cm PY
1cm
2-3cm
1cm
3cm
3cm
2cm
2cm
1cm
4cm
Ash(s)

I

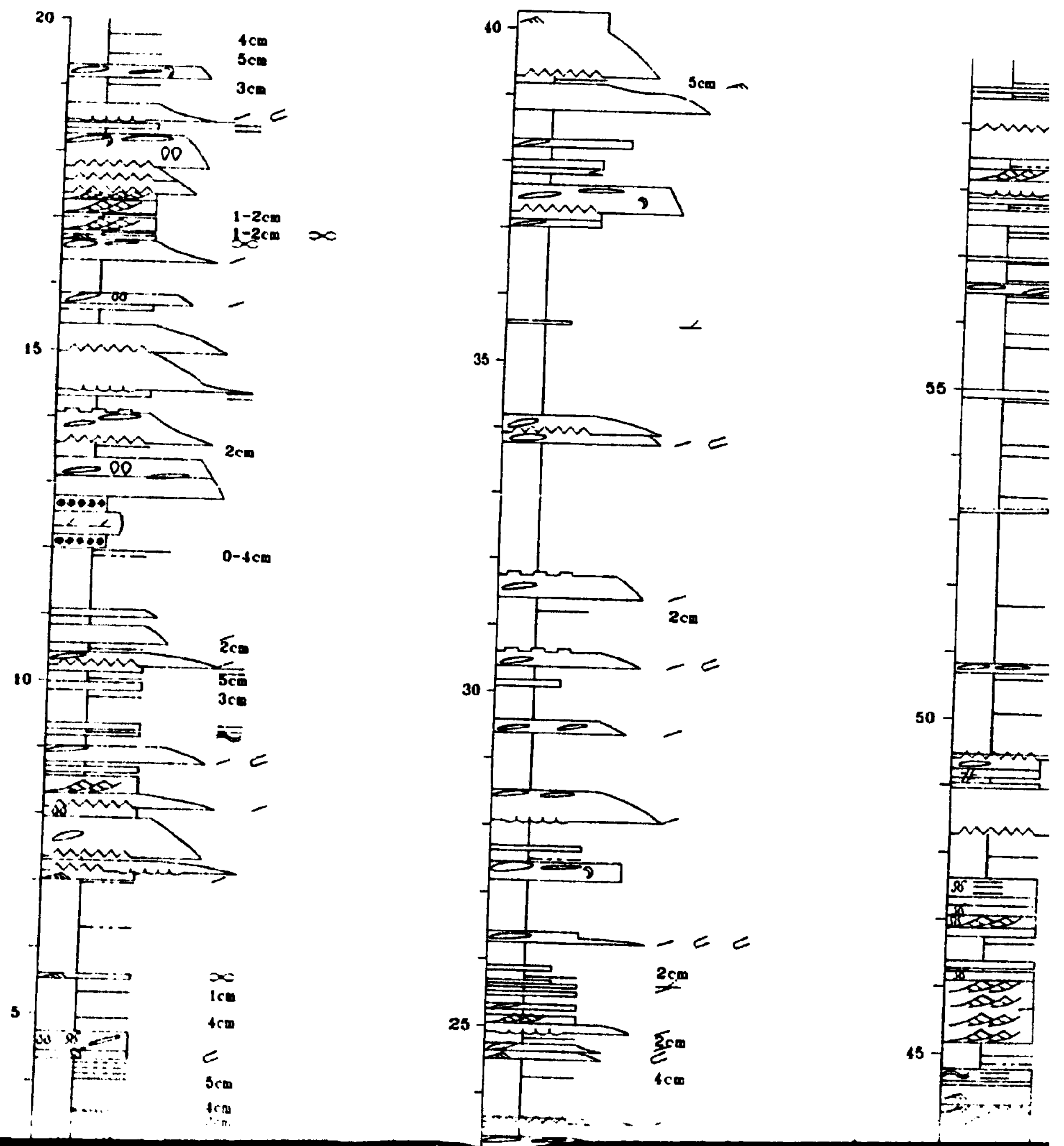


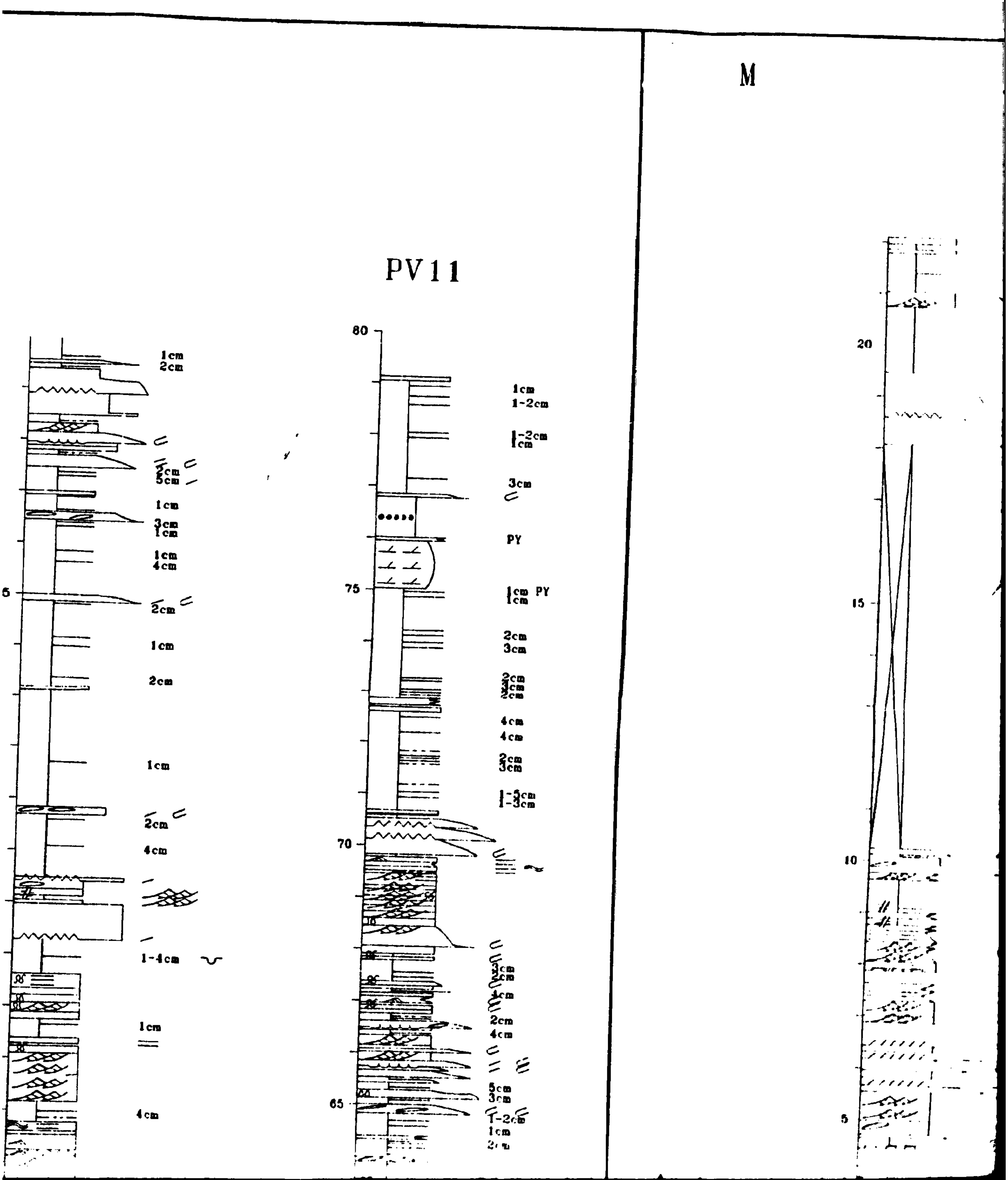
I

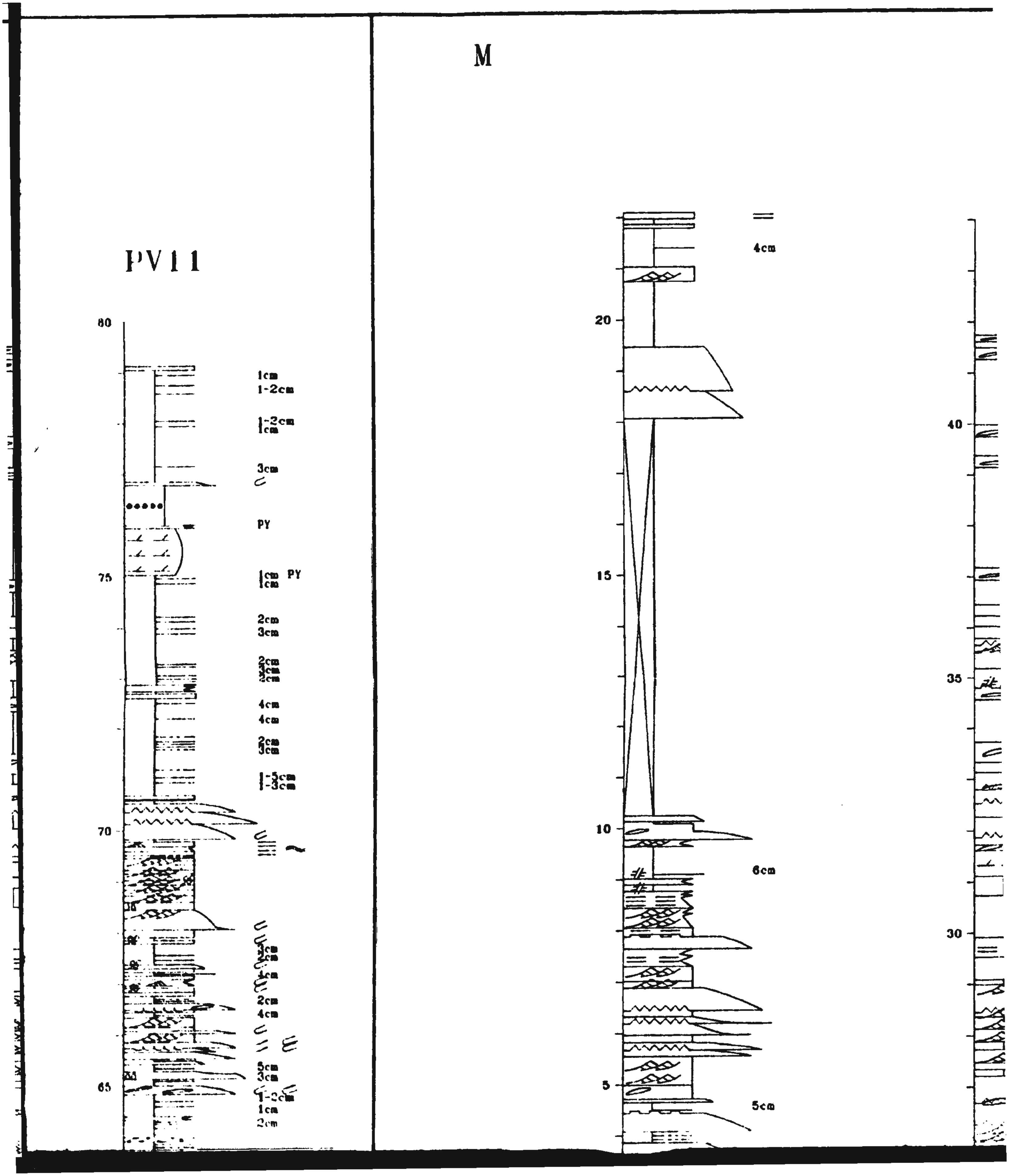

PV8
25
20
15
10
5
50
45
40
35
30
70
65
60
55
1cm
1cm
3cm
2cm
20%
2-5cm
1cm
2-3cm
1-5cm
1-4cm
1cm
2cm
2cm
5cm
4cm
3cm
2cm
3cm
2cm
1-2cm
3cm
3cm
2cm
2cm
3cm
Ash(s)
1cm
1-2cm
1-3cm
1-5cm
1-4cm
3cm
1cm
1cm
2-3cm
2cm
5%
1-3cm
2cm


3cm
4cm
4cm
3cm
5cm
5cm
1cm
5cm
2cm

L

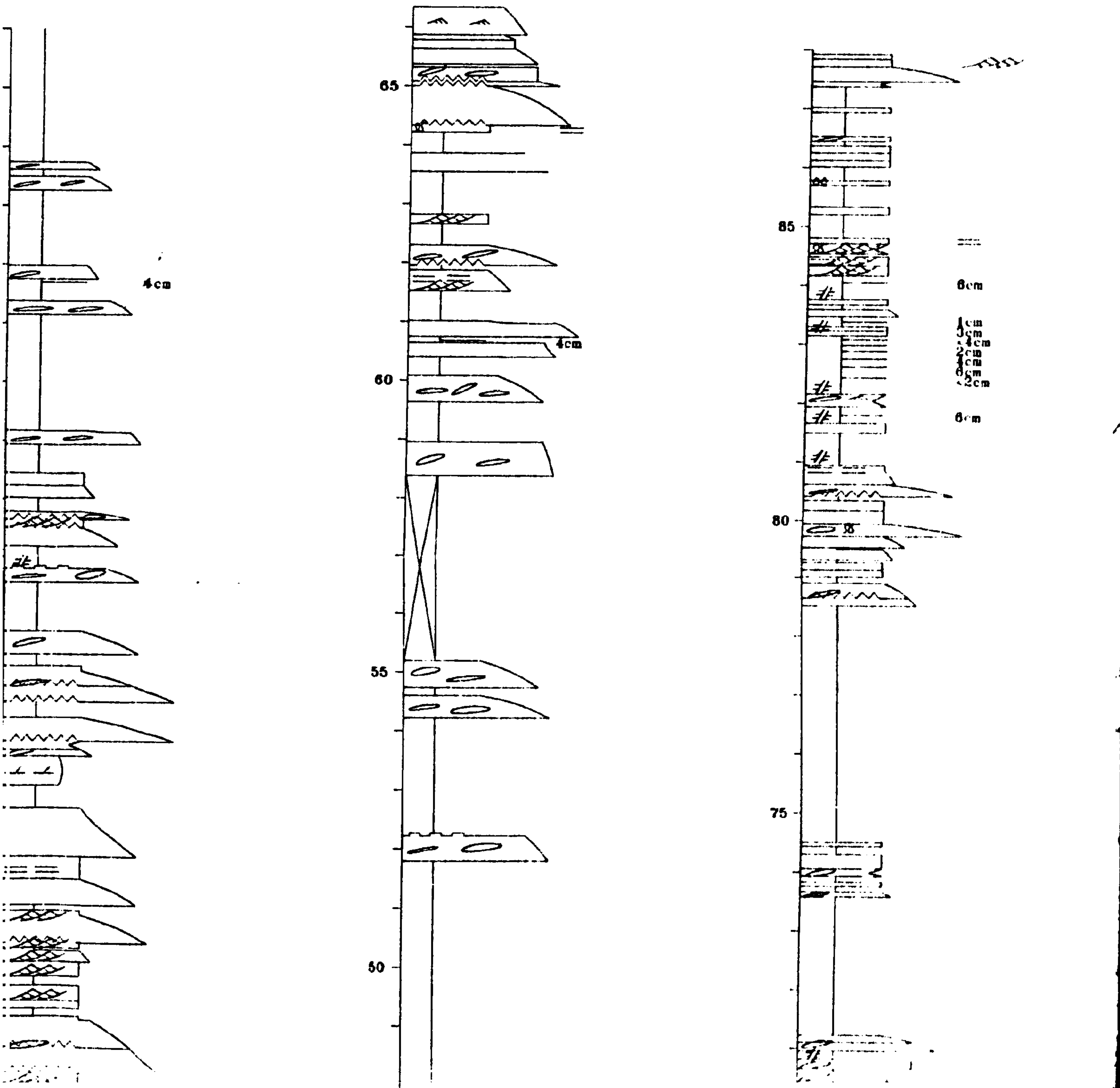

20
4cm
5cm
3cm
1-2cm
1-2cm
15
2cm
0-4cm
2cm
10
5cm
3cm
5
1cm
4cm
5cm
4cm
40
5cm
35
2cm
30
2cm
25
2cm
4cm
55
50
45


PV11
M
80
75
70
65
20
15
10
5
1cm
2cm
1-2cm
3cm
PY
4cm
5cm
1-4cm
1-5cm
1-3cm

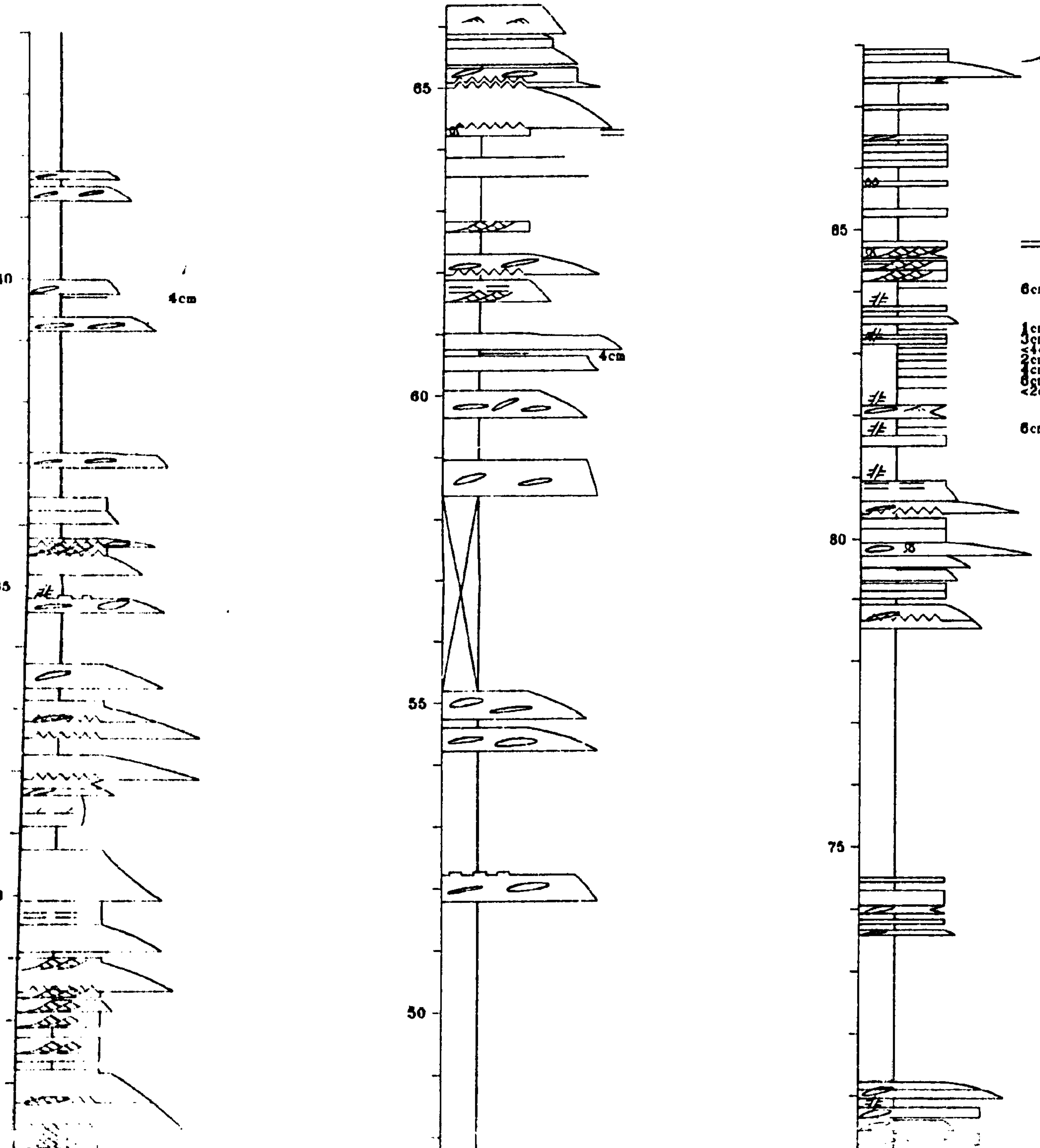


M
PV11
80
75
70
65
1cm
1-2cm
1-2cm
1cm
3cm
PY
1cm PY
1cm
2cm
3cm
2cm
3cm
2cm
4cm
4cm
2cm
3cm
1-5cm
1-3cm
3cm
2cm
4cm
2cm
4cm
5cm
3cm
1-2cm
1cm
2cm
20
15
10
5
4cm
6cm
5cm
40
35
30

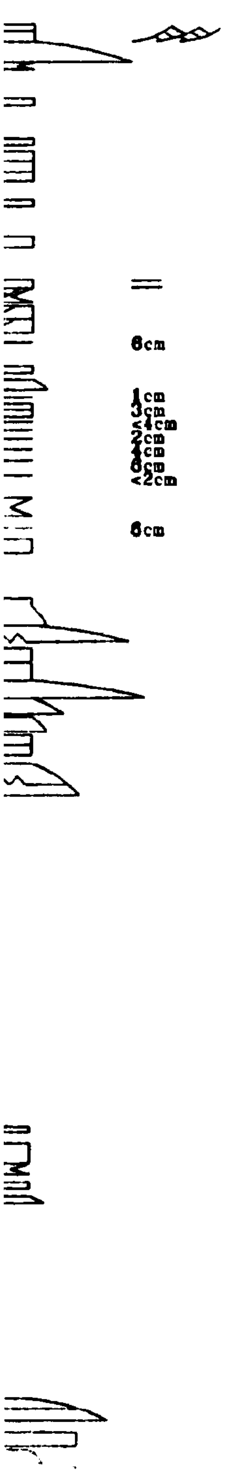
PV 12



PV12

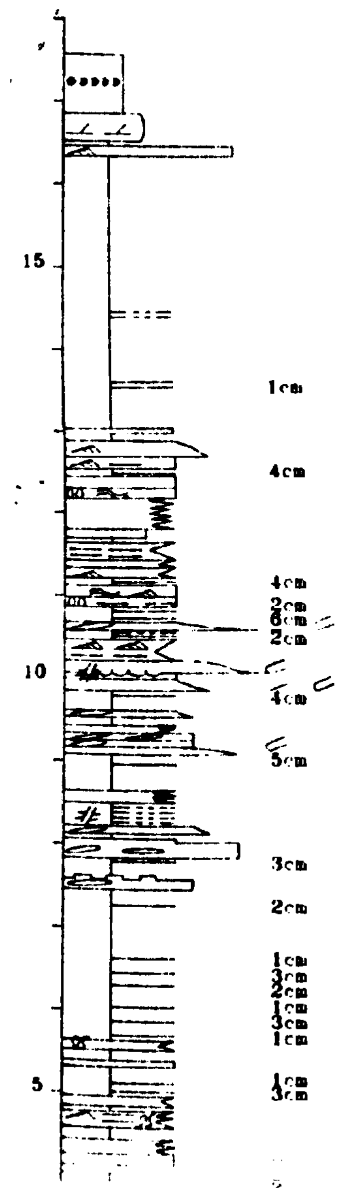


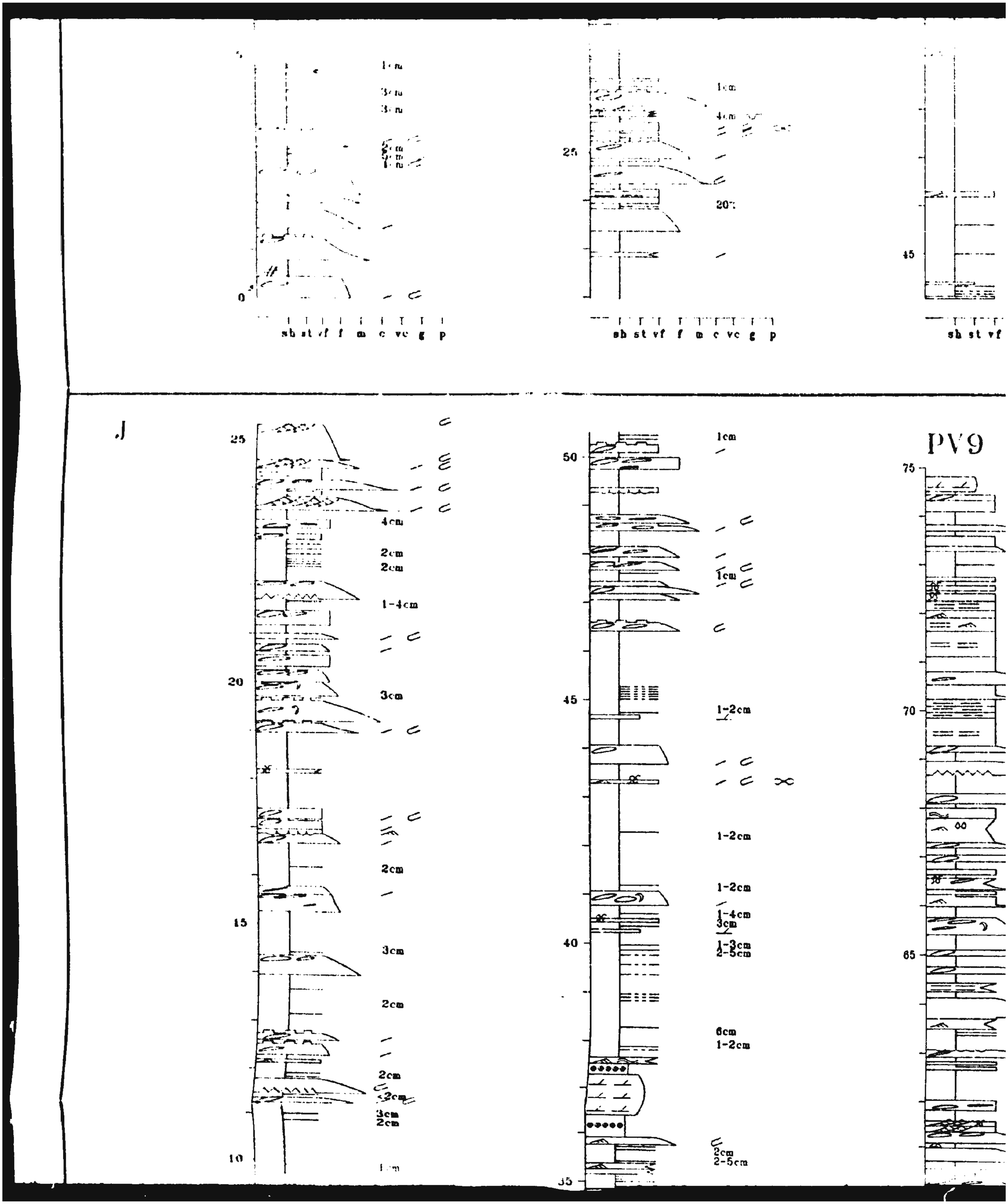
12


6cm
1cm
3cm
6cm

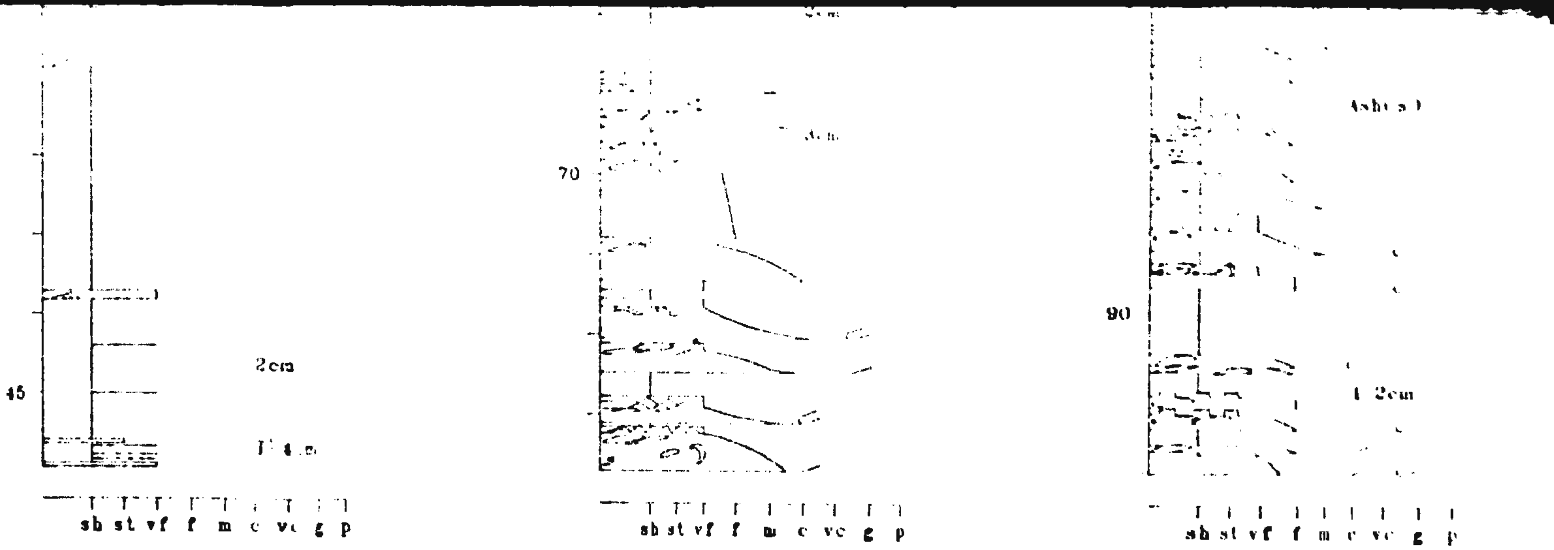
0

PV13N


15
10
5
1cm
4cm
4cm
2cm
2cm
4cm
5cm
3cm
2cm
1cm
3cm
2cm
1cm
3cm
1cm
1cm
3cm

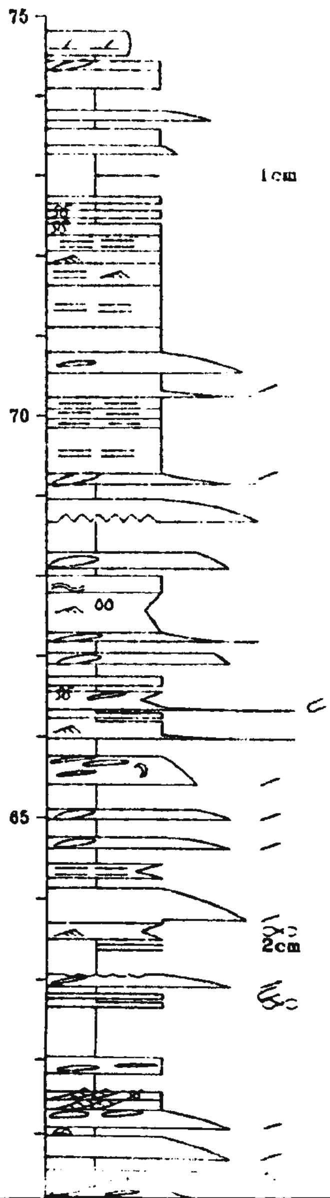


J
PV9
sh st vf f m c vc g p



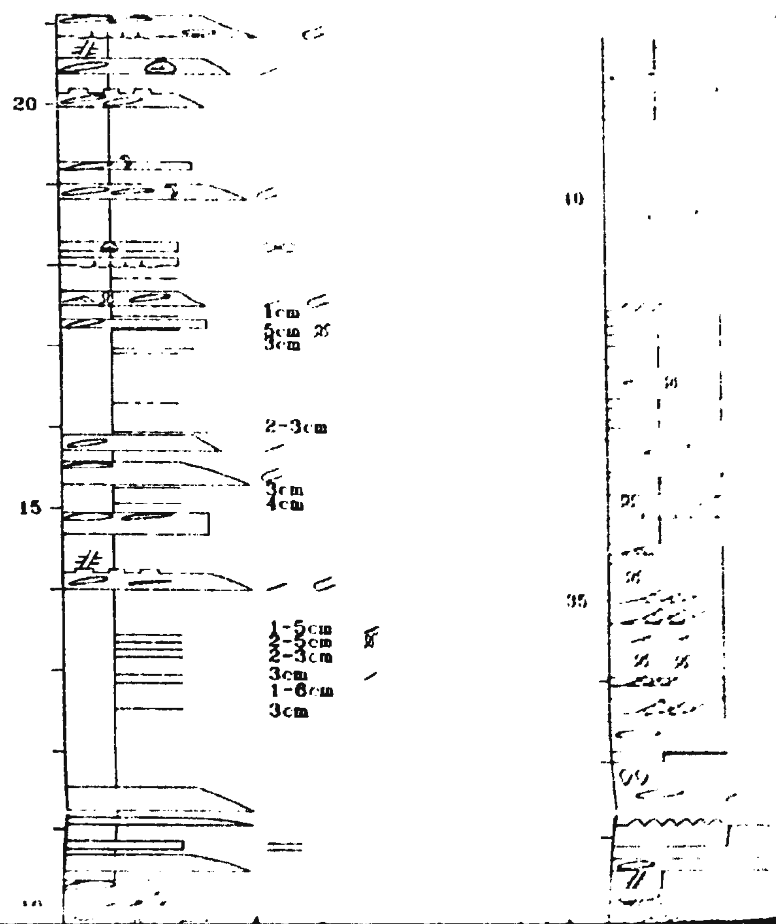
45
2cm
70
90
1-2cm
sh st vf f m c vc g p
sh st vf f m c vc g p
sh st vf f m c vc g p

PV9

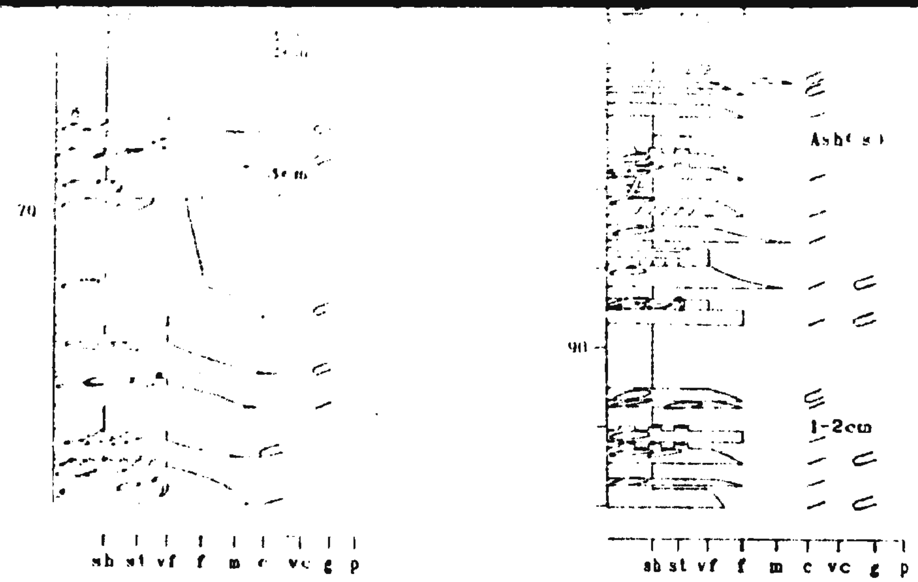


75
1cm
70
65
2cm

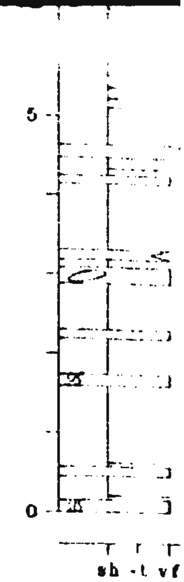
K



20
1cm
5cm
3cm
2-3cm
5cm
4cm
15
1-5cm
2-5cm
2-3cm
3cm
1-6cm
3cm
40
35

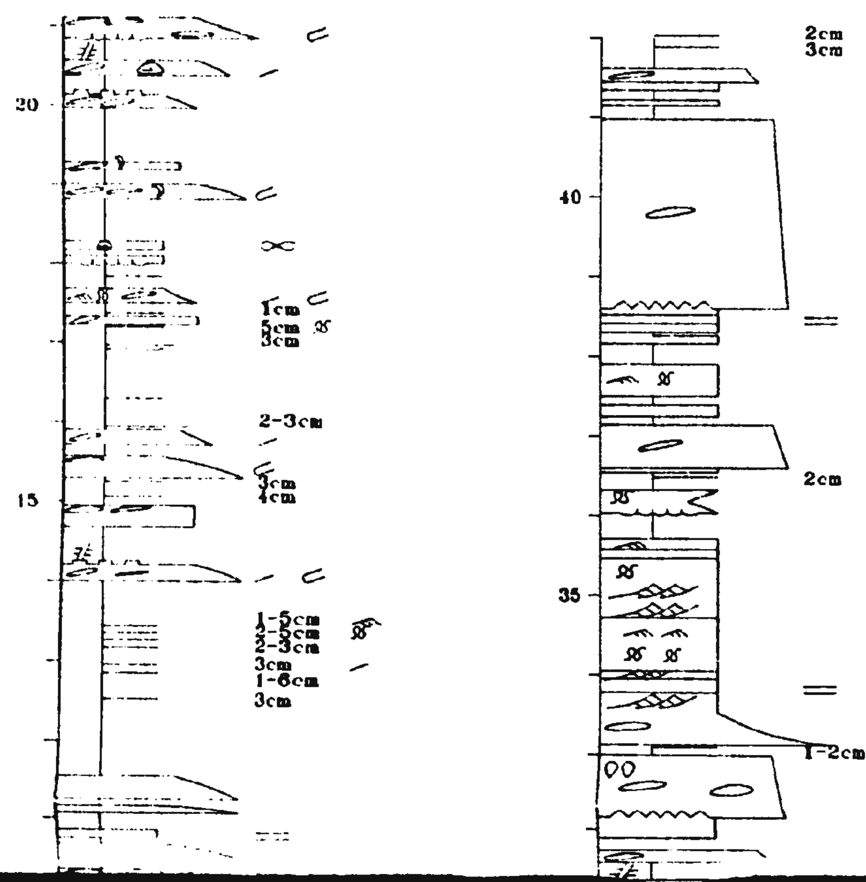


70
90
Ash(s)
1-2cm
sh st vf f m c vc g p
sh st vf f m c vc g p



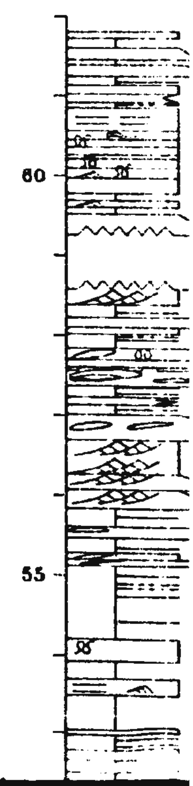
5
0

K

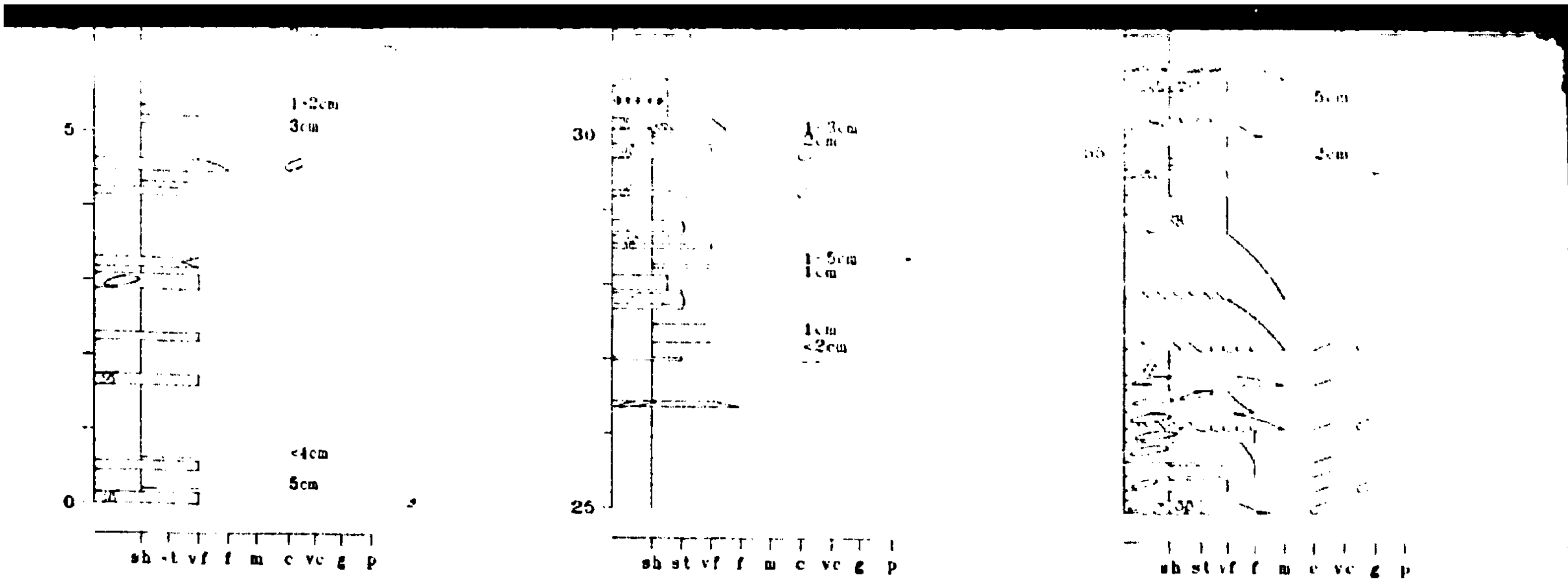


20
15
40
35
1cm
5cm
3cm
2-3cm
3cm
4cm
1-5cm
2-5cm
2-3cm
3cm
1-6cm
3cm
2cm
3cm
2cm
1-2cm

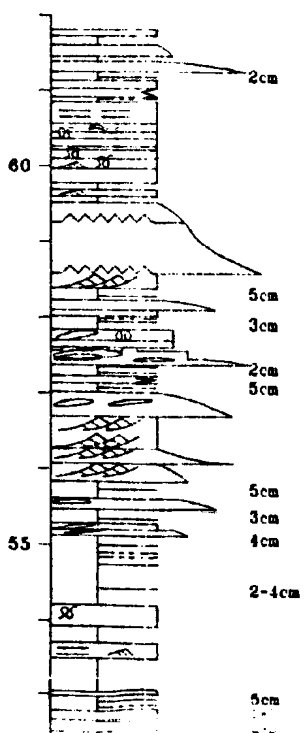
PV10



60
55



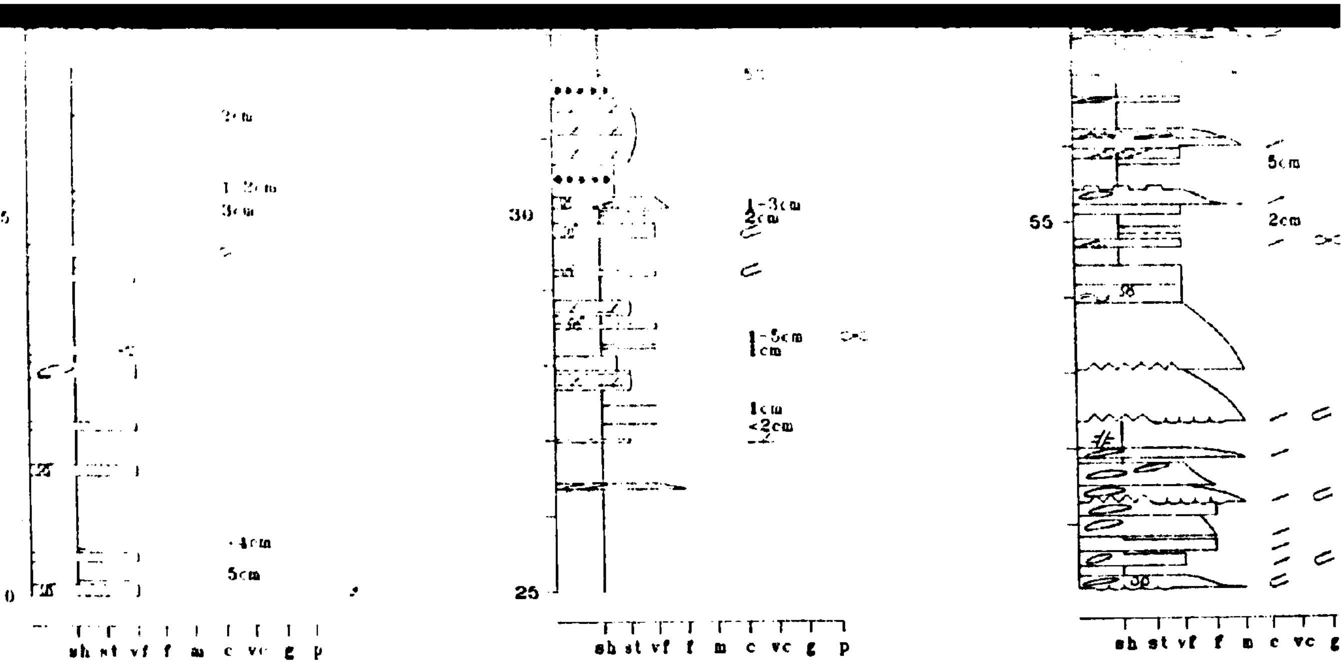
PV10



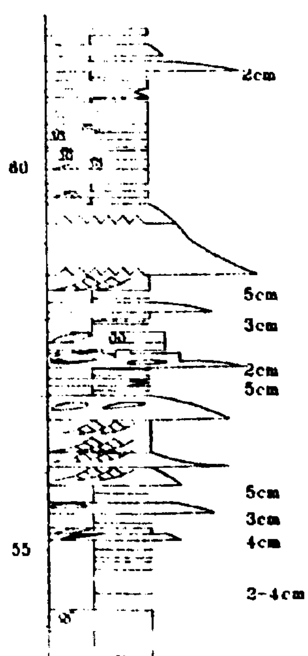
KEY

Symbols

- ripple
- convolute
- parallel lamination
- wavy lamination
- concretion
- load balls
- fluid escape
- folde
- shale cl
- dyke
- concret
- flute
- groove
- loaded

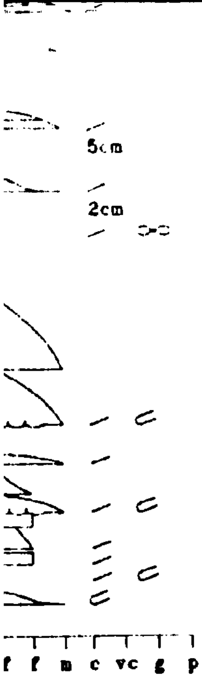


PV10



Symbols

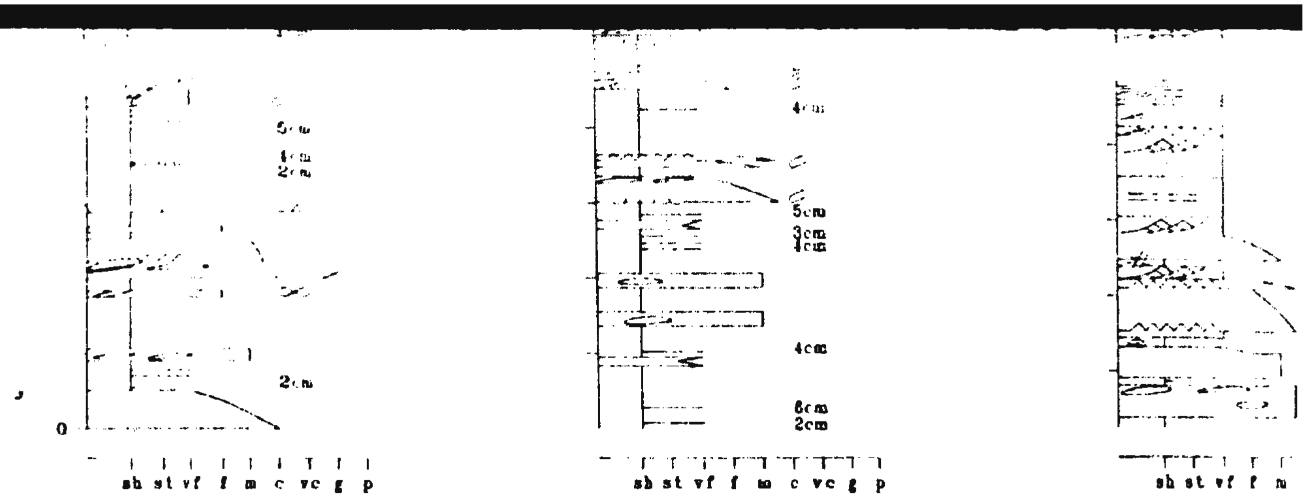
- ripple
- convolute
- parallel lamination
- wavy lamination
- concretion
- load balls
- fluid escape



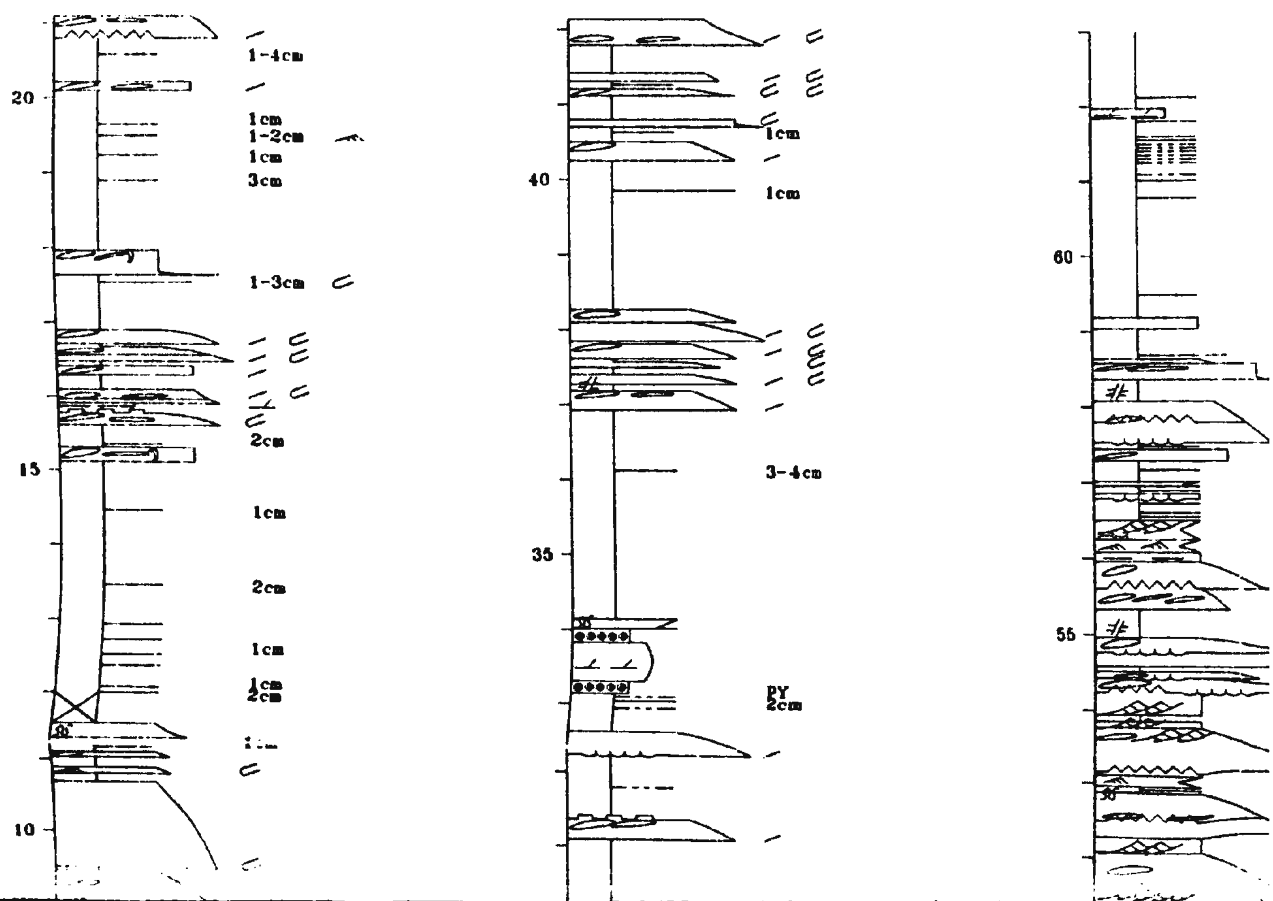
KEY

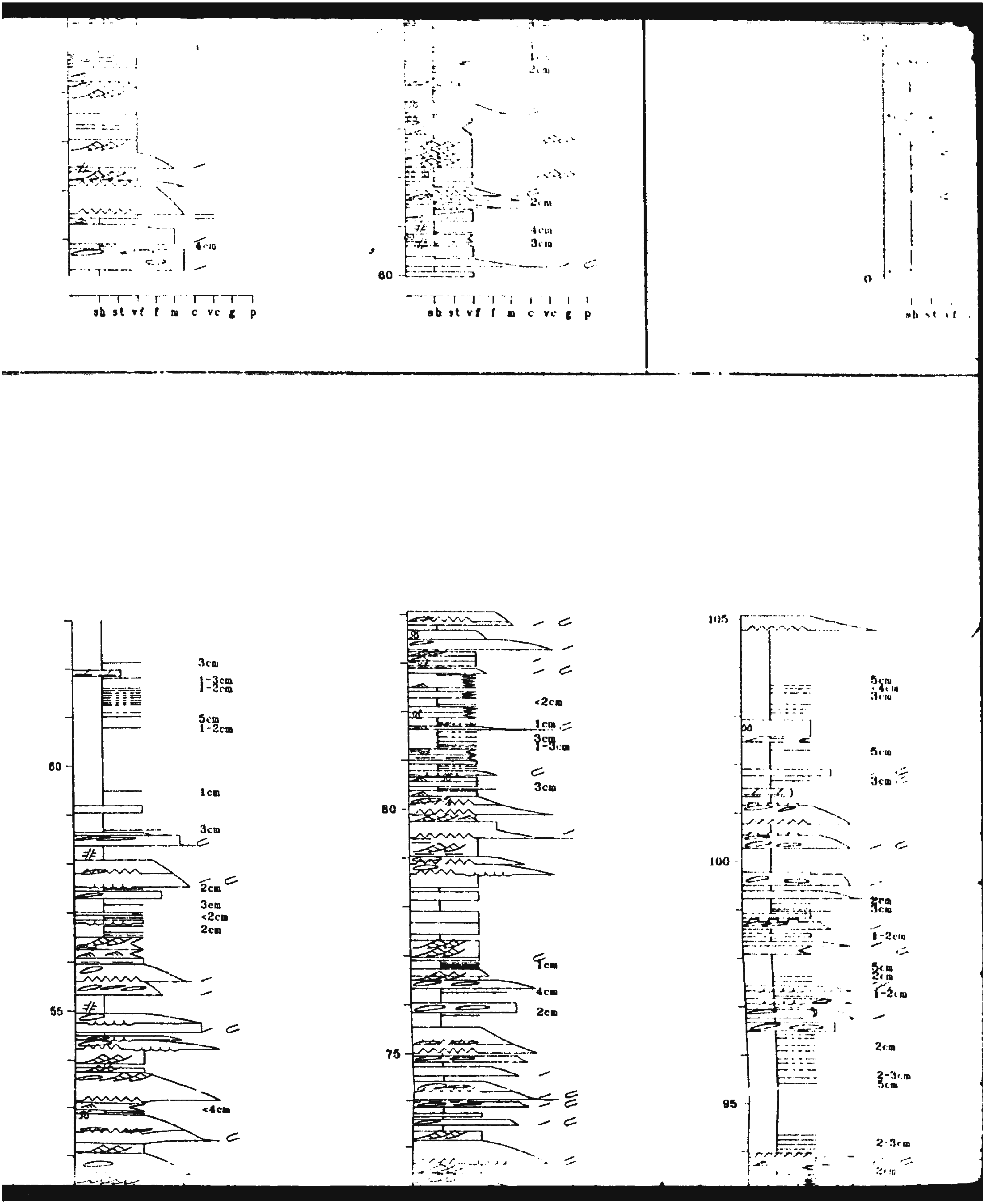
on

	folded clast		lenticular
	shale clast		burrows
	dyke		climbing ripple
	concretion clast		loaded base
	flute		wavy top
	groove		erosional base
	loaded		

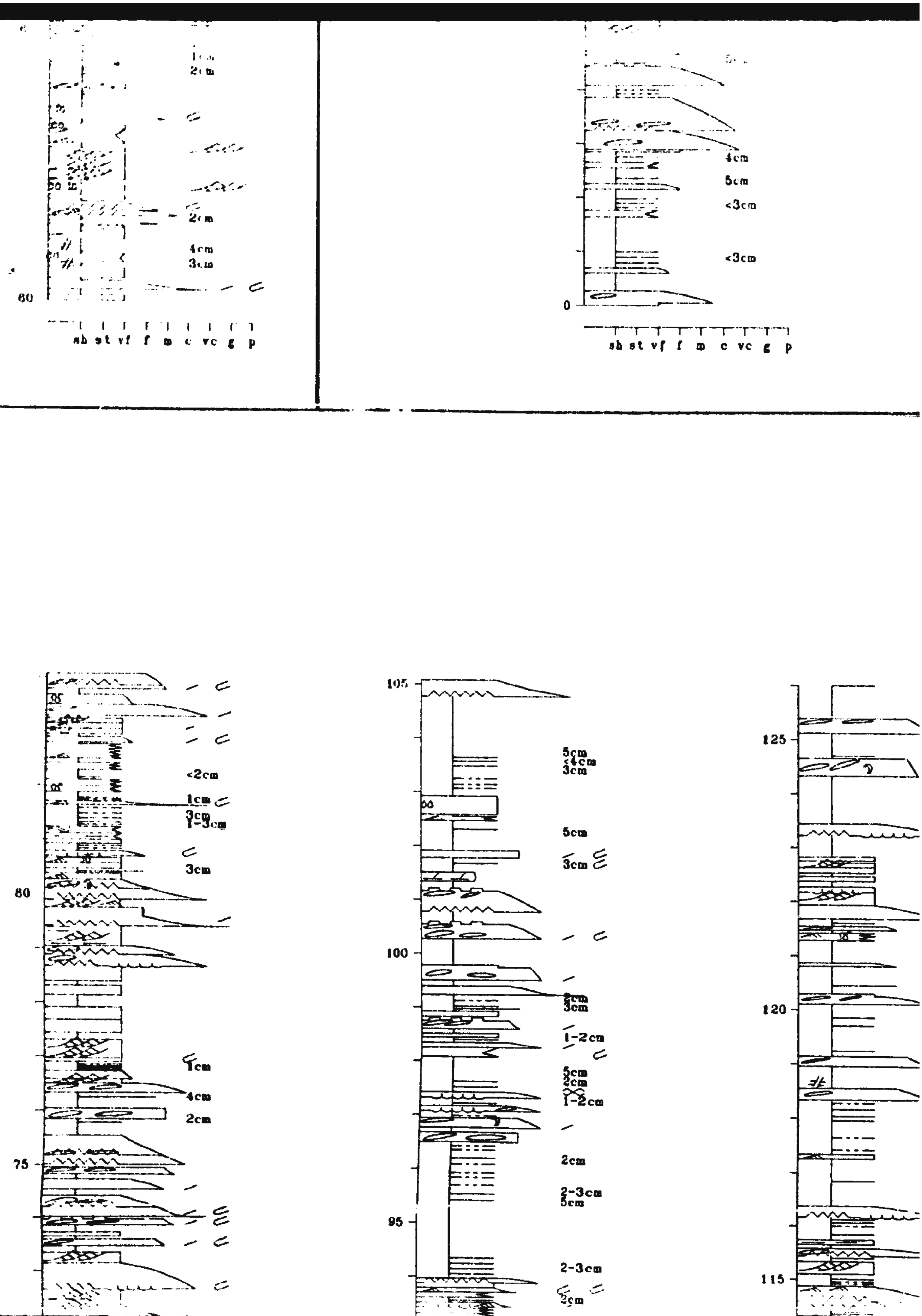

5cm
4cm
2cm
2cm
0
4cm
5cm
3cm
4cm
4cm
6cm
2cm
sh st vf f m c vc g p
sh st vf f m c vc g p
sh st vf f m

N

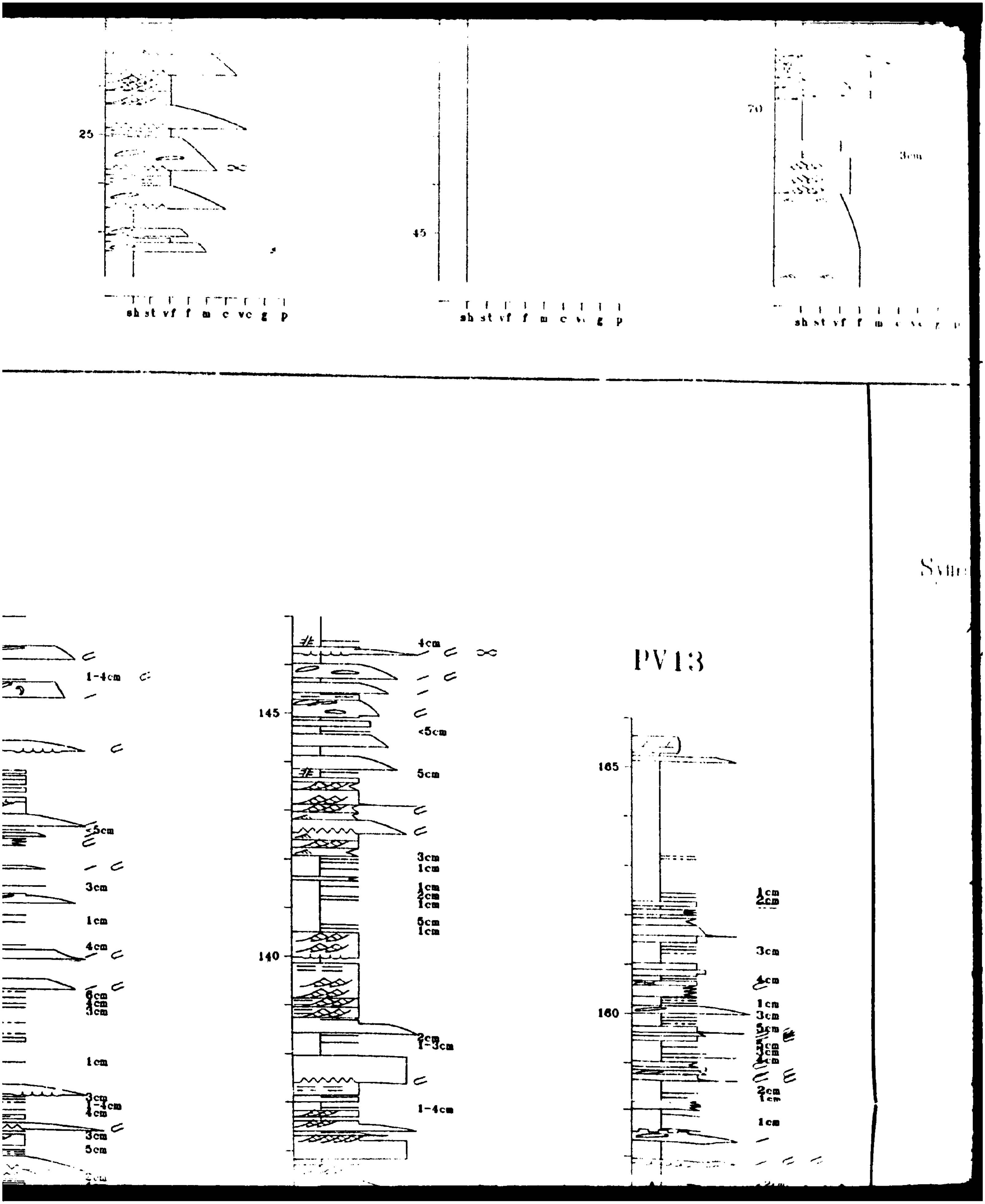

1-4cm
20
1cm
1-2cm
1cm
3cm
1-3cm
2cm
15
1cm
2cm
1cm
1cm
2cm
10
1cm
40
1cm
3-4cm
35
PY
2cm
60
55



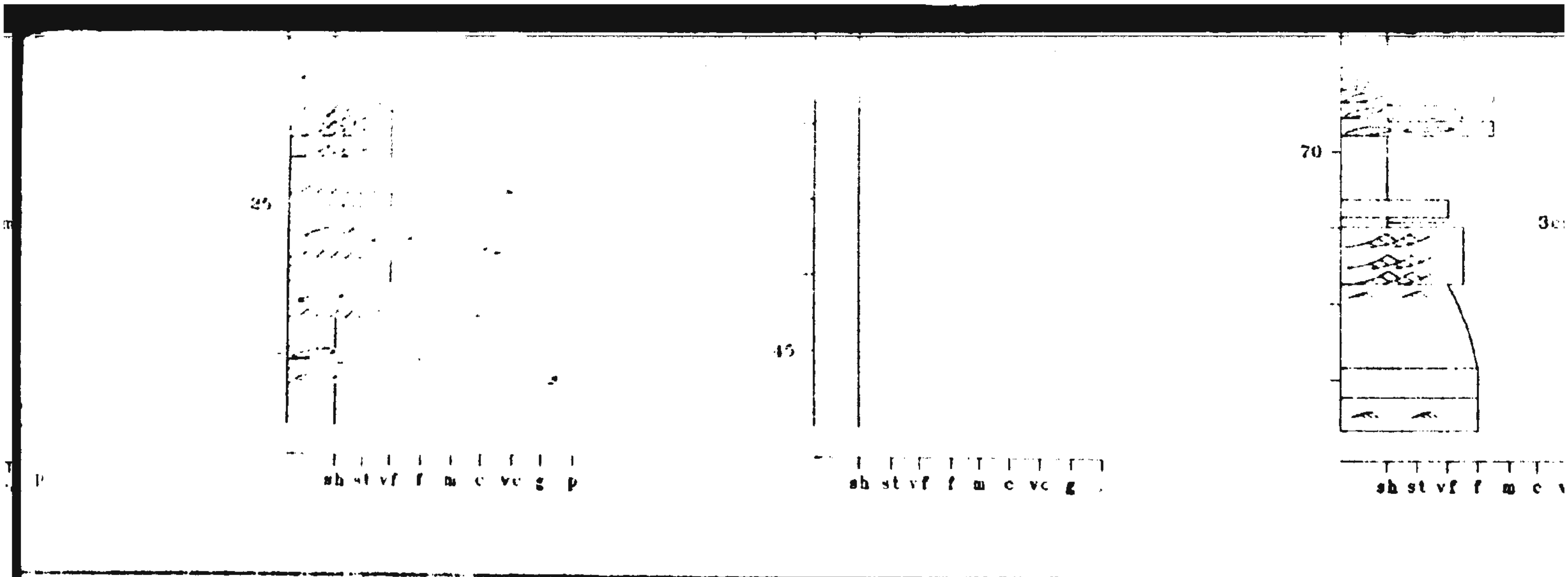
4cm
2cm
4cm
3cm
60
sh st vf f m c vc g p
sh st vf f m c vc g p
0
3cm
1-3cm
1-2cm
5cm
1-2cm
60
1cm
3cm
2cm
3cm
<2cm
2cm
55
<4cm
<2cm
1cm
3cm
1-3cm
3cm
80
1cm
4cm
2cm
75
105
5cm
3cm
5cm
3cm
100
2cm
3cm
1-2cm
5cm
2cm
1-2cm
2cm
2-3cm
5cm
95
2-3cm
2cm



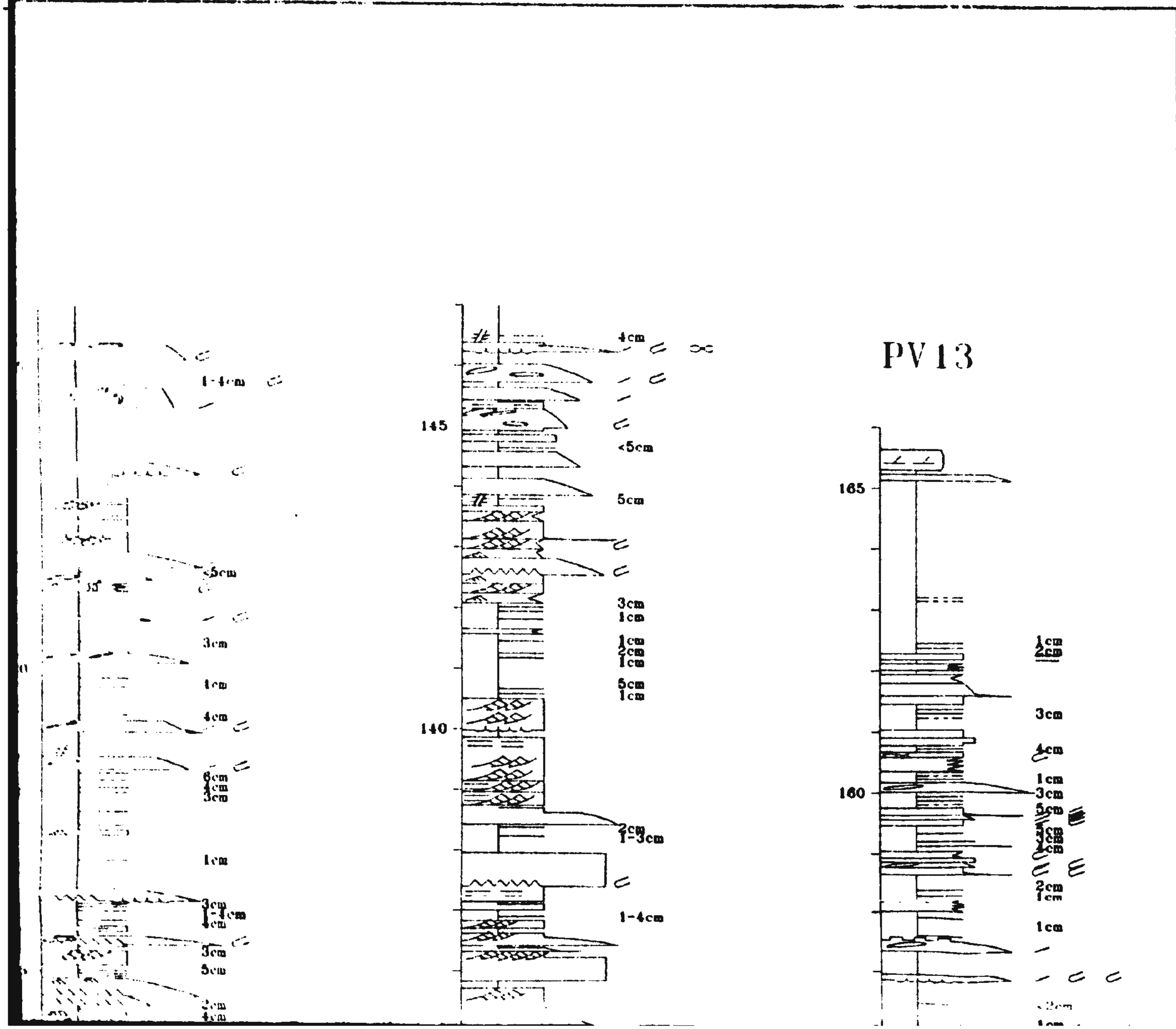
60
1cm
2cm
2cm
4cm
3cm
sh st vf f m c vc g p
0
4cm
5cm
<3cm
<3cm
sh st vf f m c vc g p
80
75
<2cm
1cm
3cm
1-3cm
3cm
1cm
4cm
2cm
105
100
95
5cm
<4cm
3cm
5cm
3cm
2cm
3cm
1-2cm
5cm
2cm
1-2cm
2cm
2-3cm
5cm
2-3cm
2cm
125
120
115



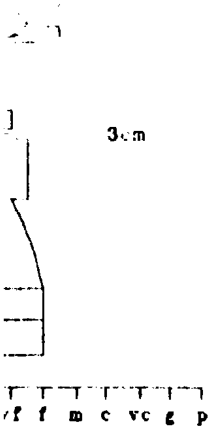
25
sh st vf f m c vc g p
45
sh st vf f m c vc g p
70
3cm
PV13
1-4cm
<5cm
3cm
1cm
4cm
6cm
4cm
3cm
1cm
3cm
1-4cm
4cm
3cm
5cm
4cm
145
<5cm
5cm
3cm
1cm
1cm
2cm
1cm
5cm
1cm
140
2cm
1-3cm
1-4cm
165
1cm
2cm
3cm
4cm
160
1cm
3cm
5cm
2cm
1cm
1cm

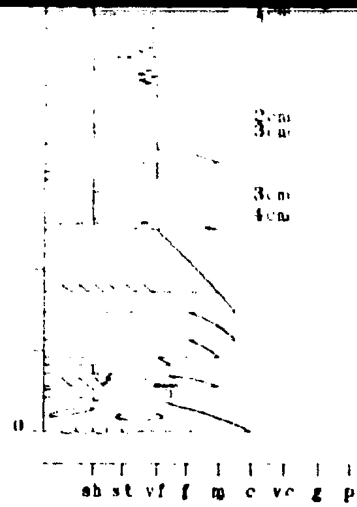


70
sh st vf f m c vc g p
sh st vf f m c vc g



PV13
145
140
165
160



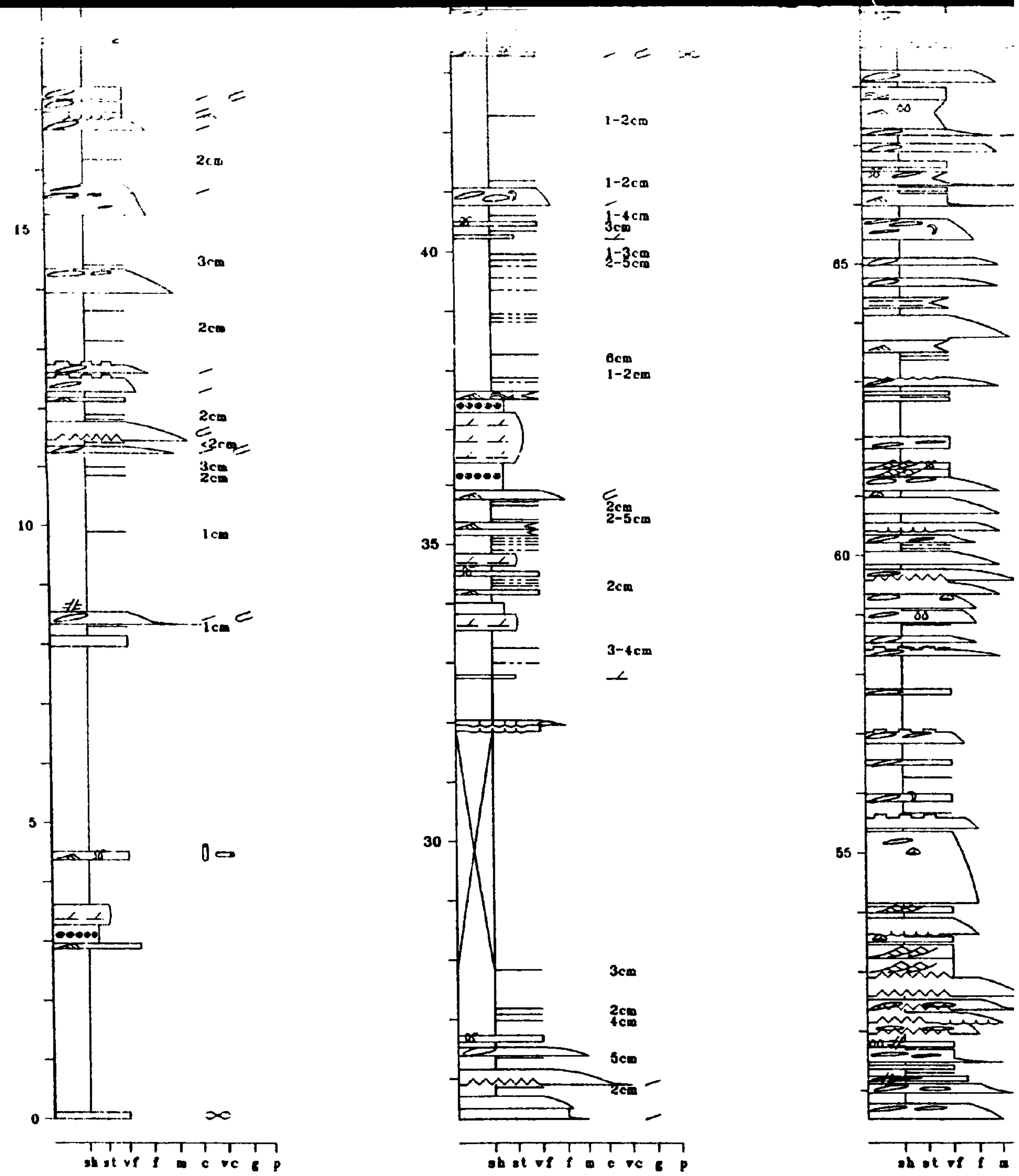


KEY

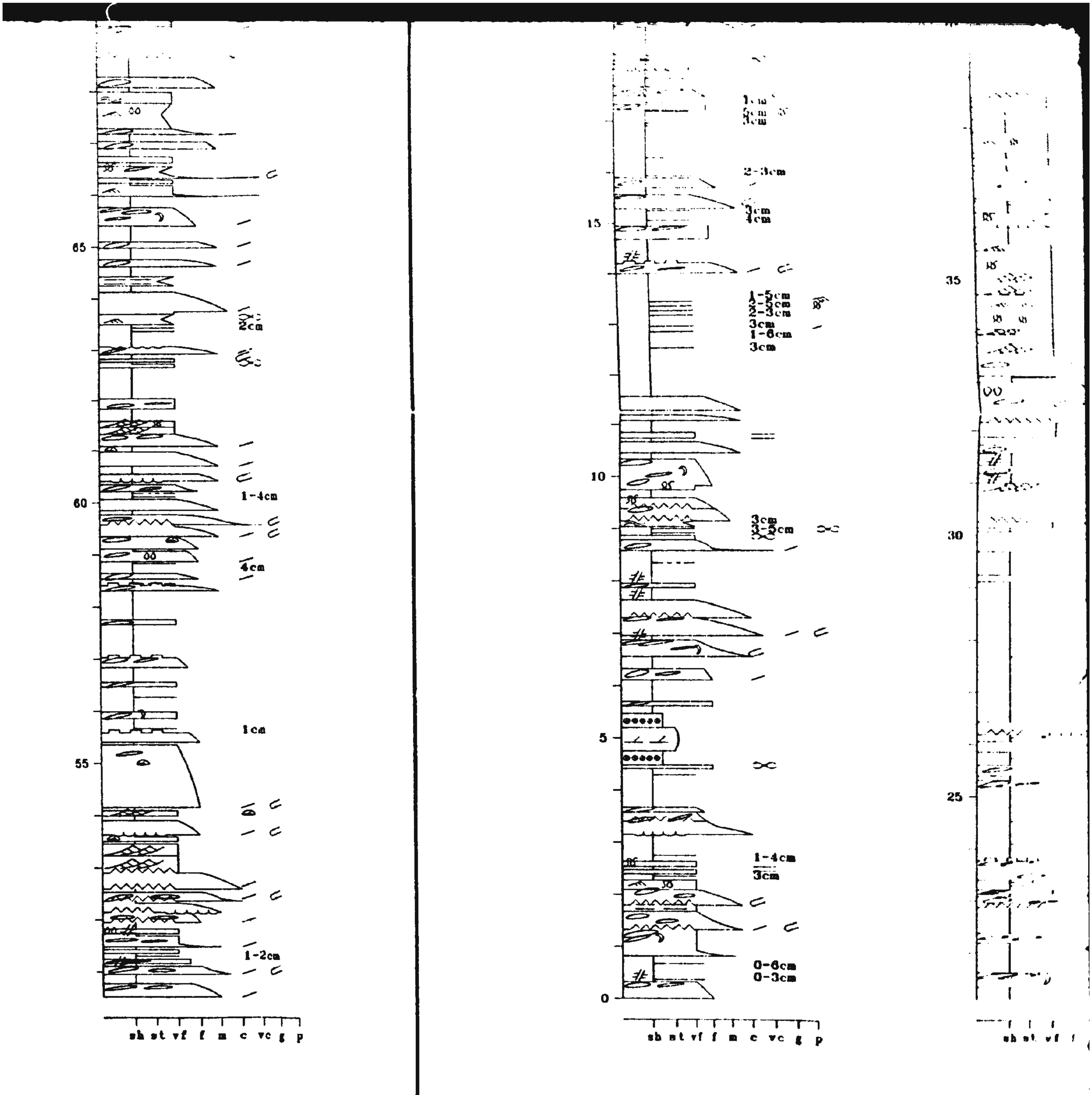
Symbols

- ripple
- convolute
- parallel lamination
- wavy lamination
- concretion
- load balls
- fluid escape
- lenticular
- burrows
- climbing ripple
- loaded base
- wavy top

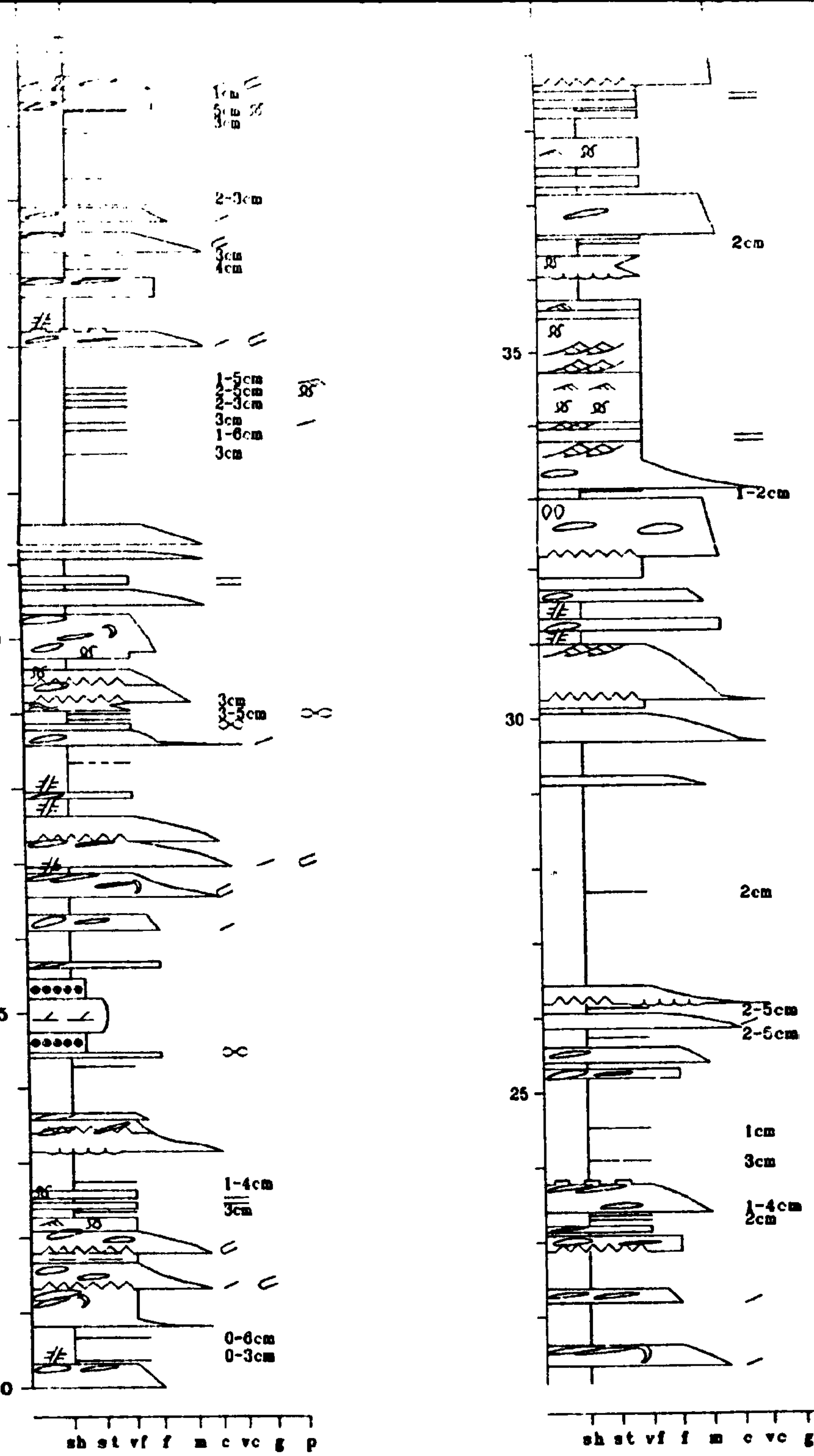
- folded clast
- shale clast
- dyke
- concretion clast
- flute
- groove
- loaded



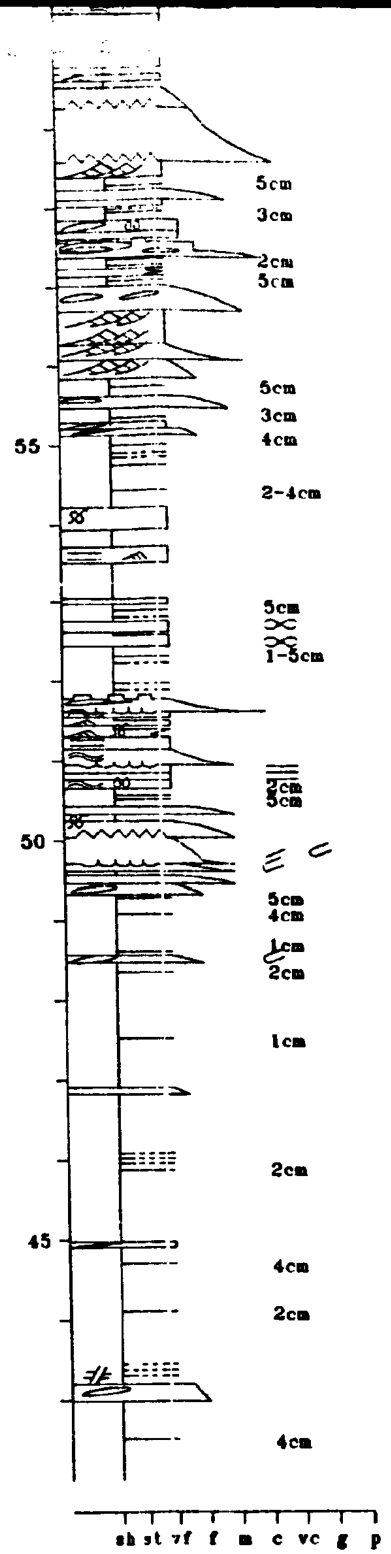
Appendix 1 (h-k) Bed-by-bed sections. H - Section PV7; I - Section



V7; I - Section PV8; J - Section PV9; K - Section PV10.



: J - Section PV9; K - Section PV10.



convolute

parallel lamination

wavy lamination

concretion

load balls

fluid escape

Grain size and others

sh -- shale

st -- silt

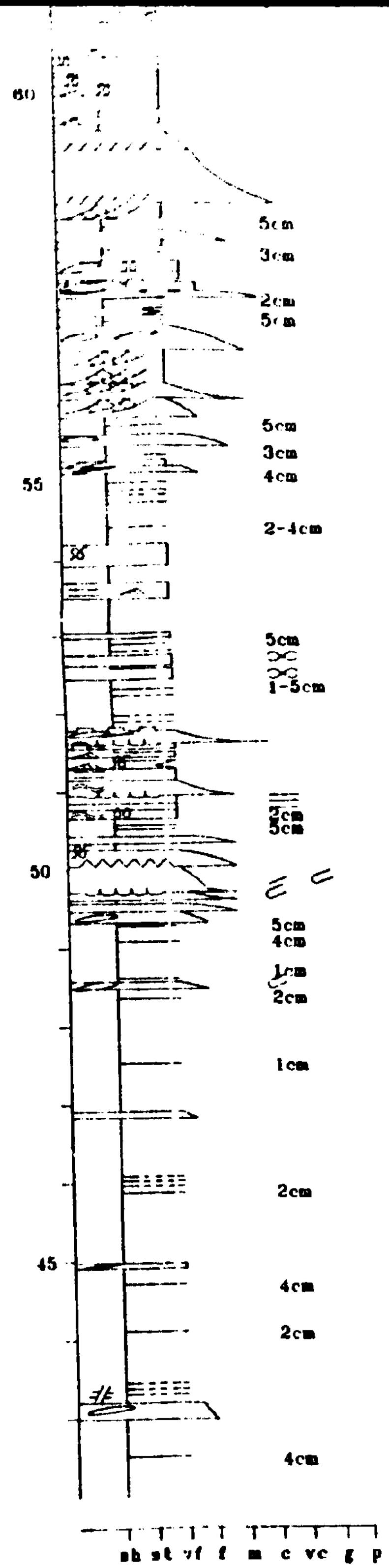
vf -- very fine sand

f -- fine sand

% -- sand component in a laminated

cm -- thickness of sand laminaes in a

B* -- a marker horizon for lateral



ꭥꭥ convolute

parallel lamination

wavy lamination

concretion

load balls

fluid escape

Grain size and others

sh -- shale

st -- silt

vf -- very fine sand

f -- fine sand

% -- sand component in a lamin

cm -- thickness of sand laminae

B* -- a marker horizon for late

	shale clast		burrows
	dyke		climbing ripple
	concretion clast		loaded base
	flute		wavy top
	groove		erosional base
	loaded		

m -- medium sand

c -- coarse sand

vc -- very coarse sand

g -- gravel

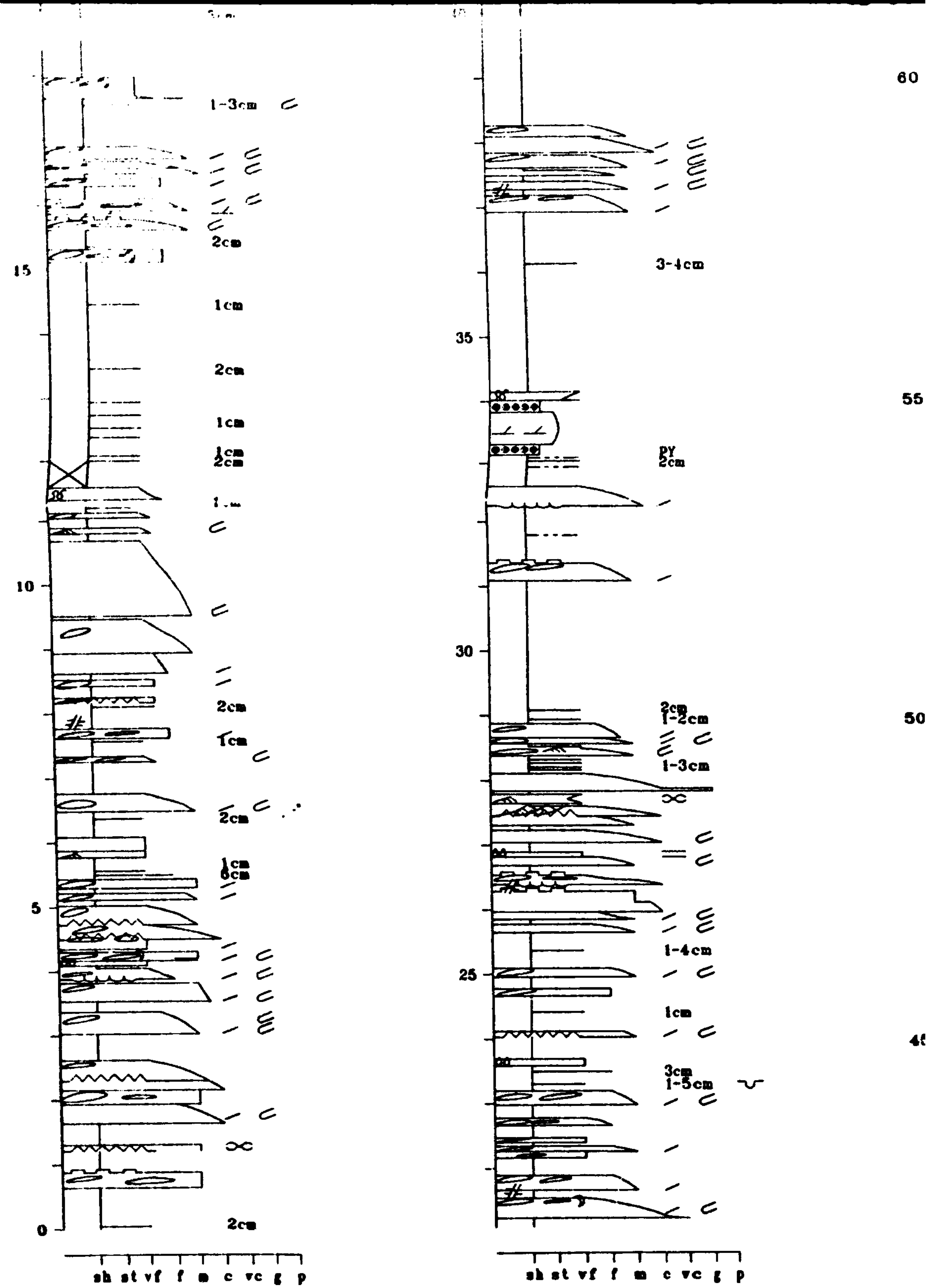
p -- pebble

py -- pyrite

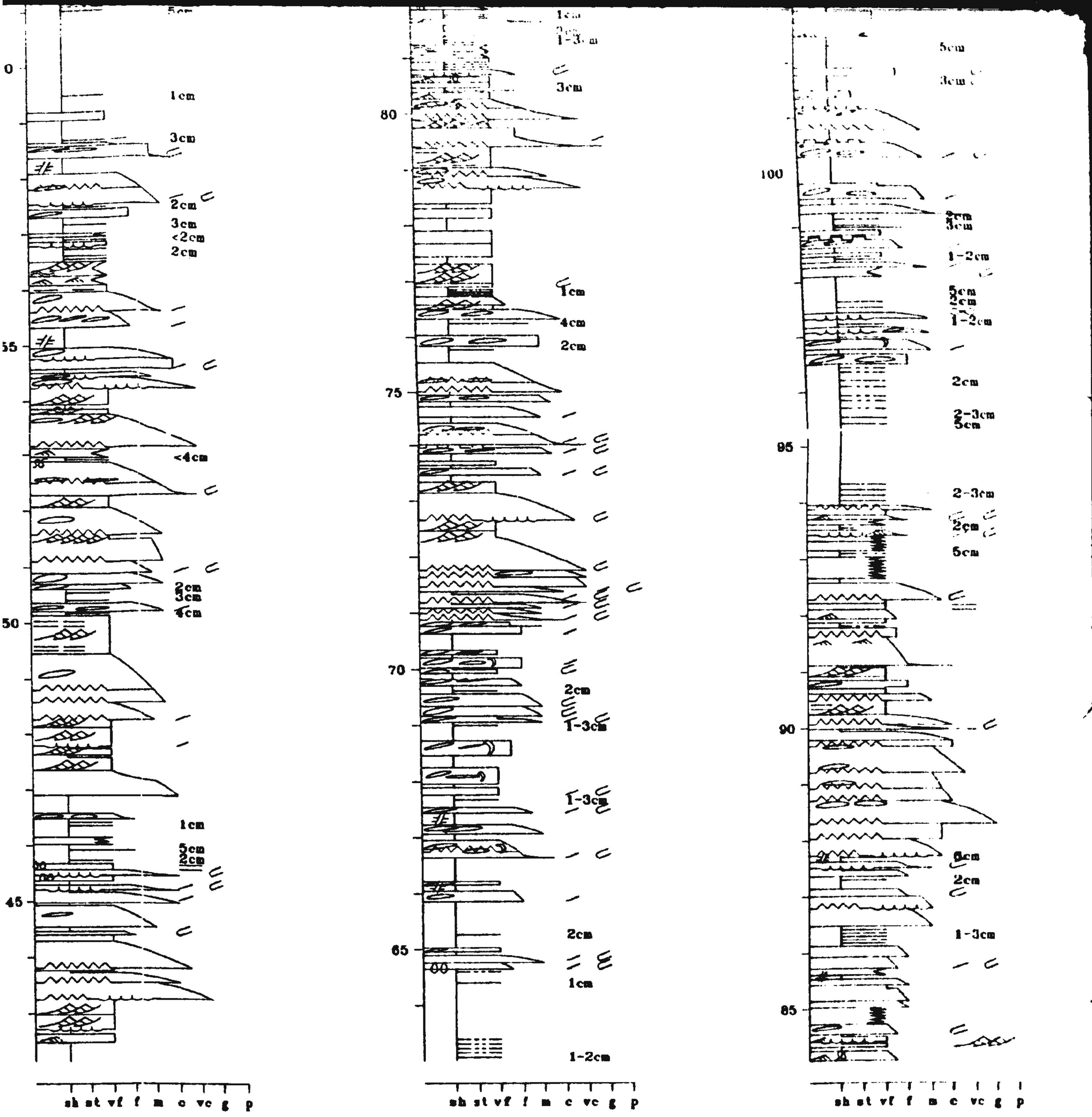
laminated shale package

minaes in a laminated shale package

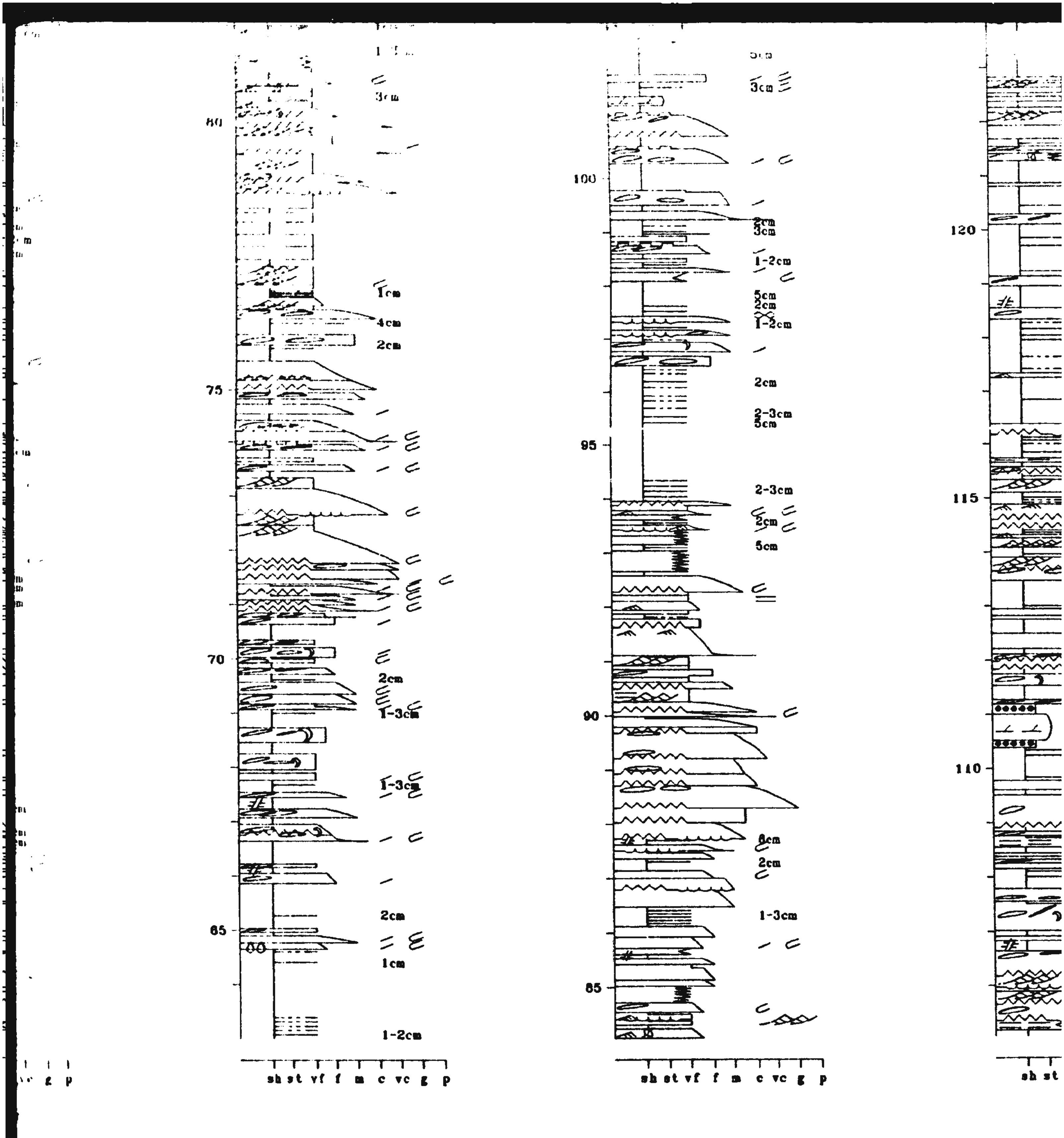
lateral correlation between sections PV1 and PV9



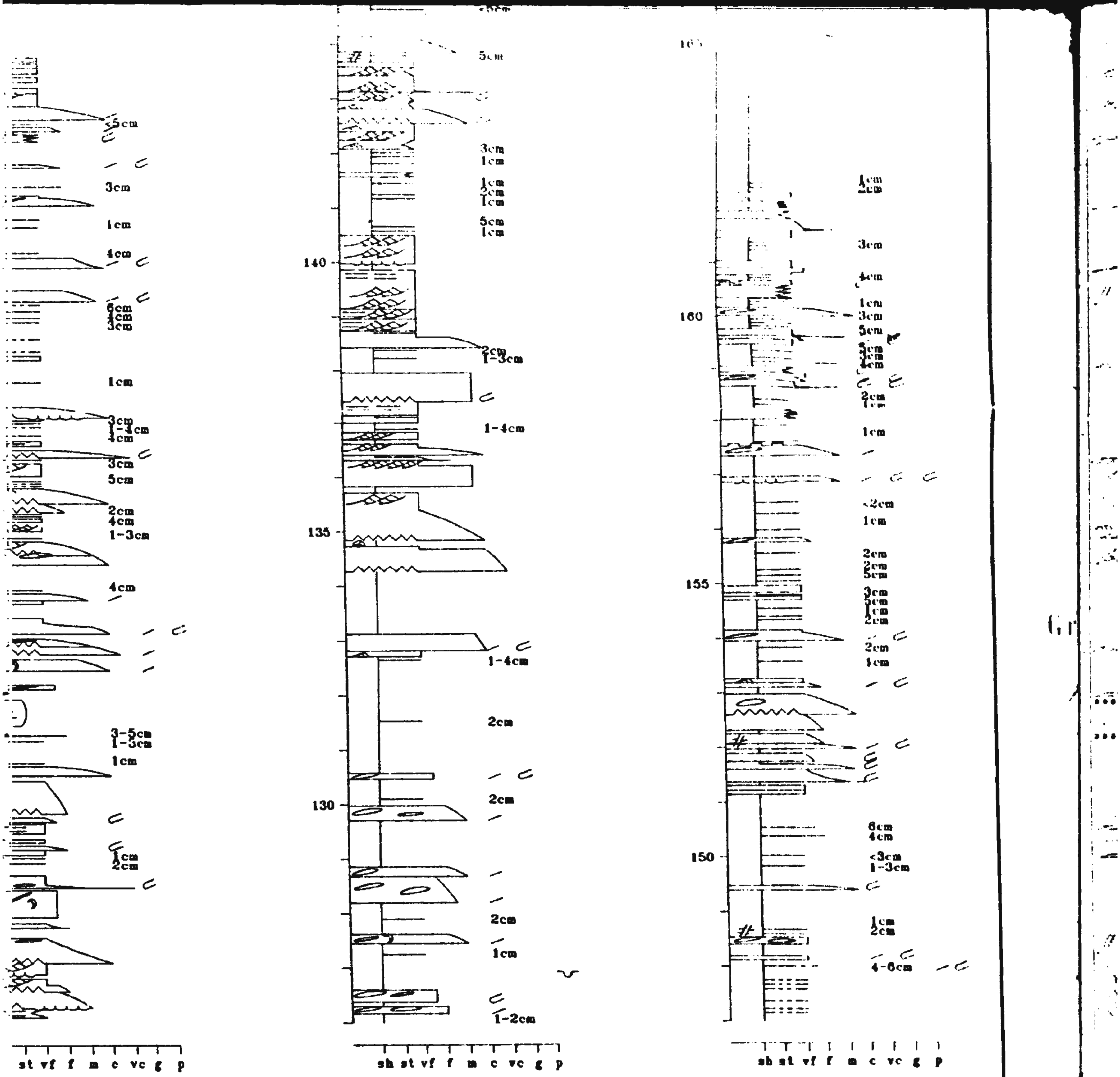
Appendix 1 (L-O) Bed-by-bed sections. L - Section PV11;

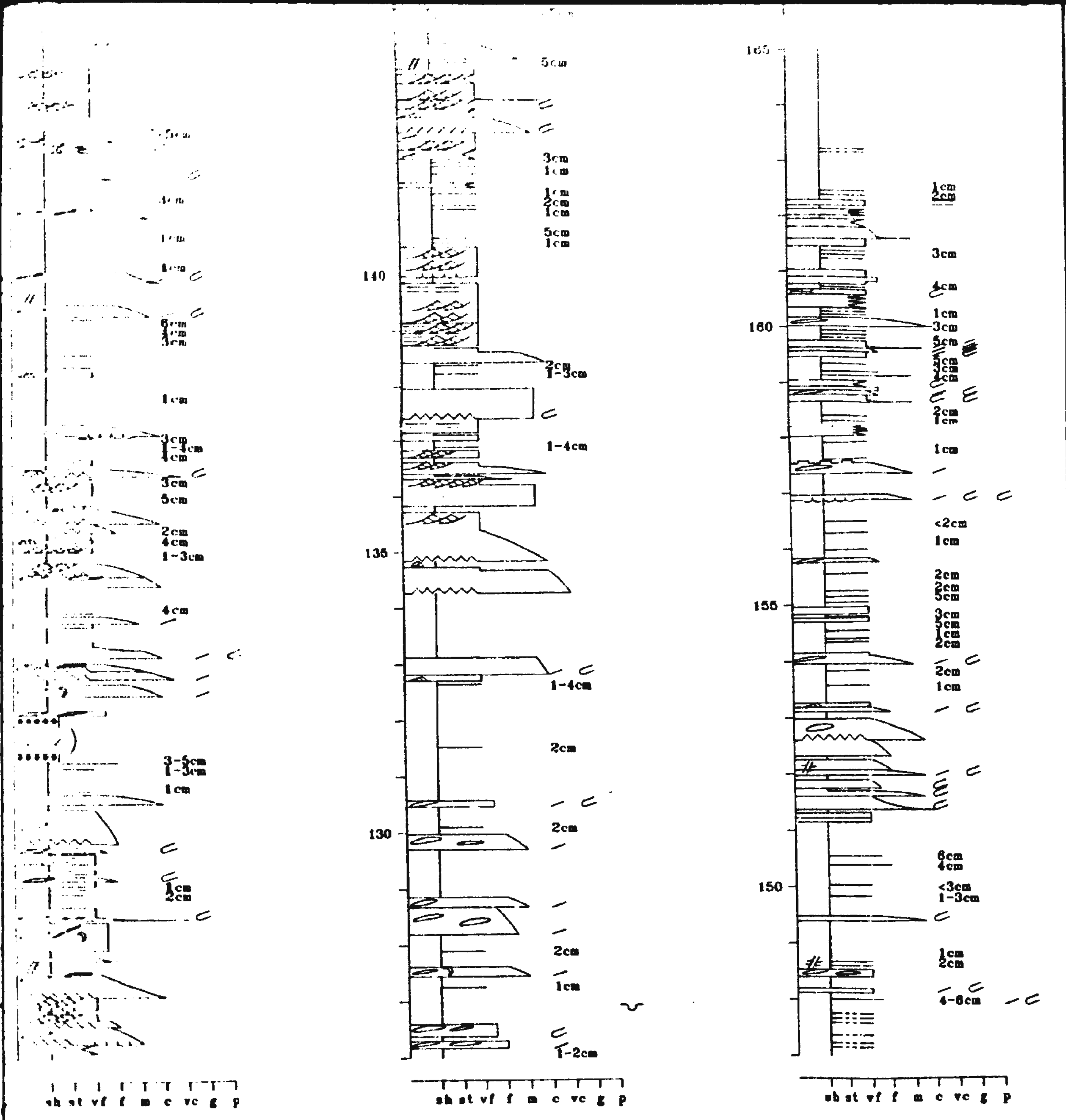


; M - Section PV12; N - Section PV13; O - Section PV13n.

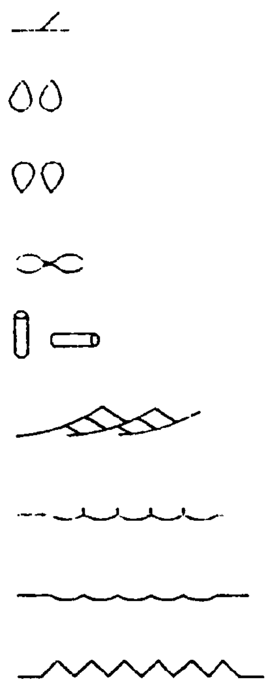


n PV12; N - Section PV13; O - Section PV13n.


140
135
130
st vf f m c vc g p
sh st vf f m c vc g p
160
155
150
sh st vf f m c vc g p



130
135
140
150
155
160
165
sh st vf f m c vc g p
sh st vf f m c vc g p
sh st vf f m c vc g p



concreti

load balls

fluid esc

lenticular

burrows

climbing ripple

loaded base

wavy top

erosional base

flute

groove

loaded

Grain size and others

sh -- shale

st -- silt

vf -- very fine sand

f -- fine sand

m -- medium sand

c -- coarse sand

vc -- very coarse sand

g -- gravel

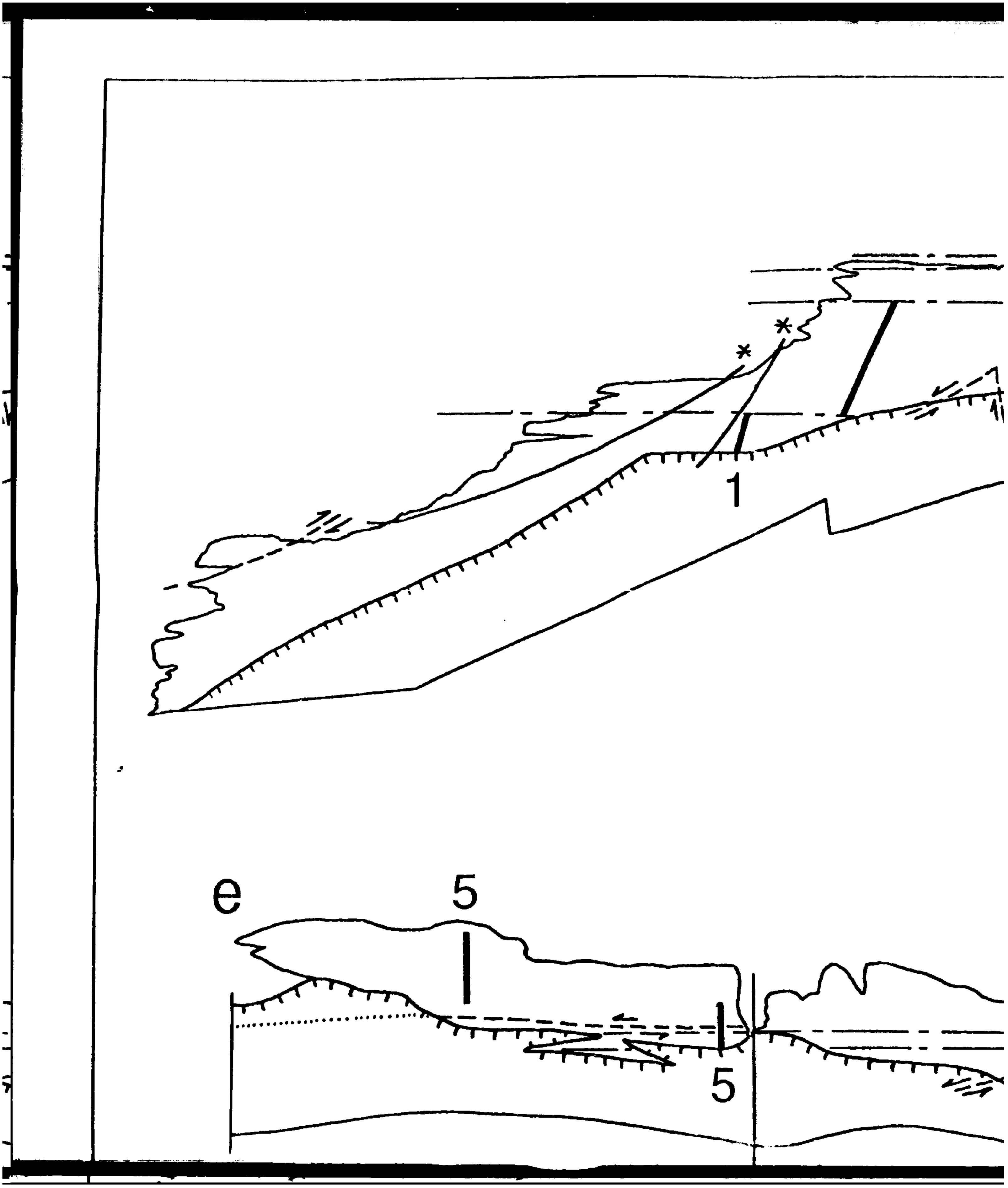
p -- pebble

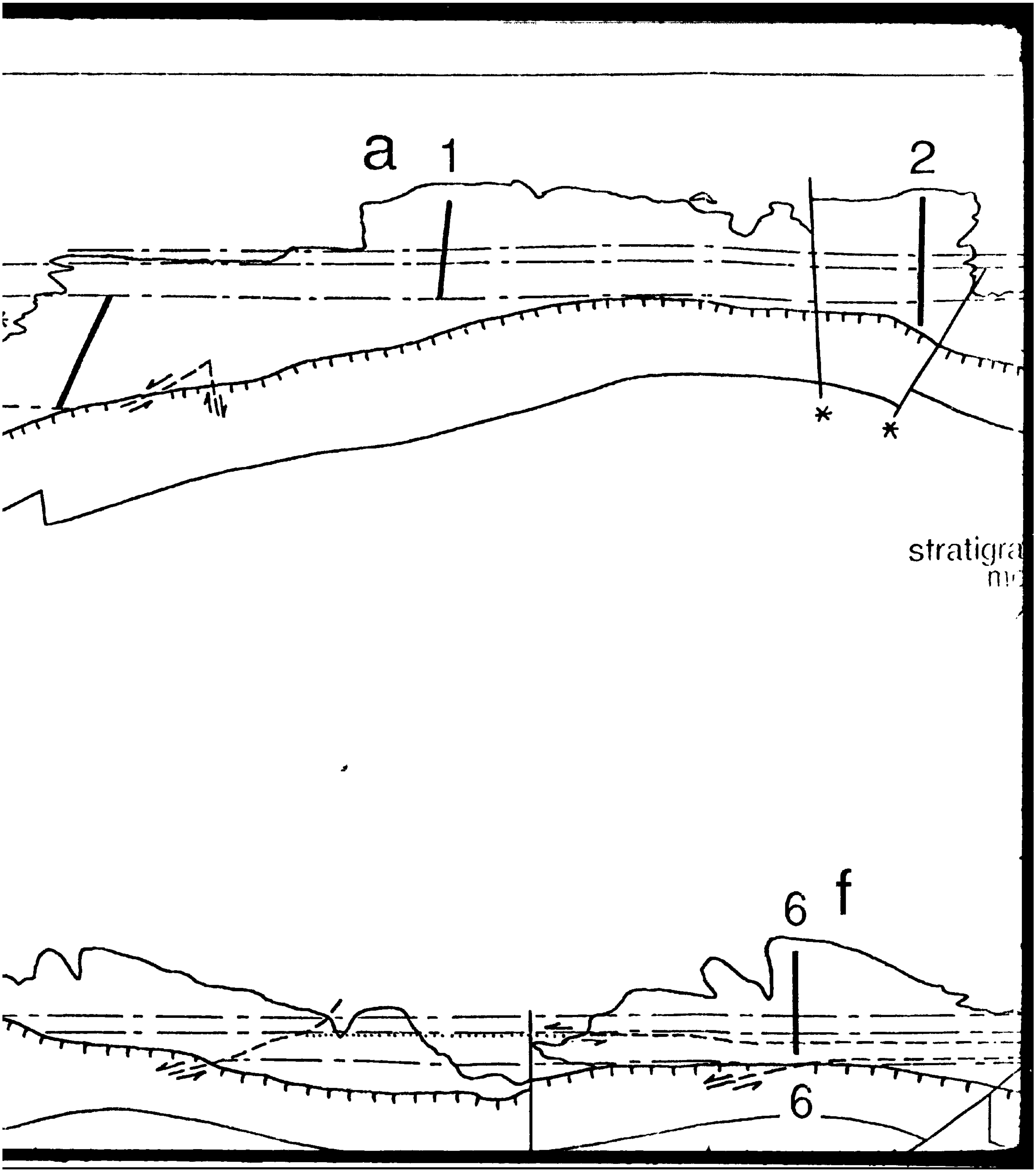
py -- pyrite

% -- sand component in a laminated shale package

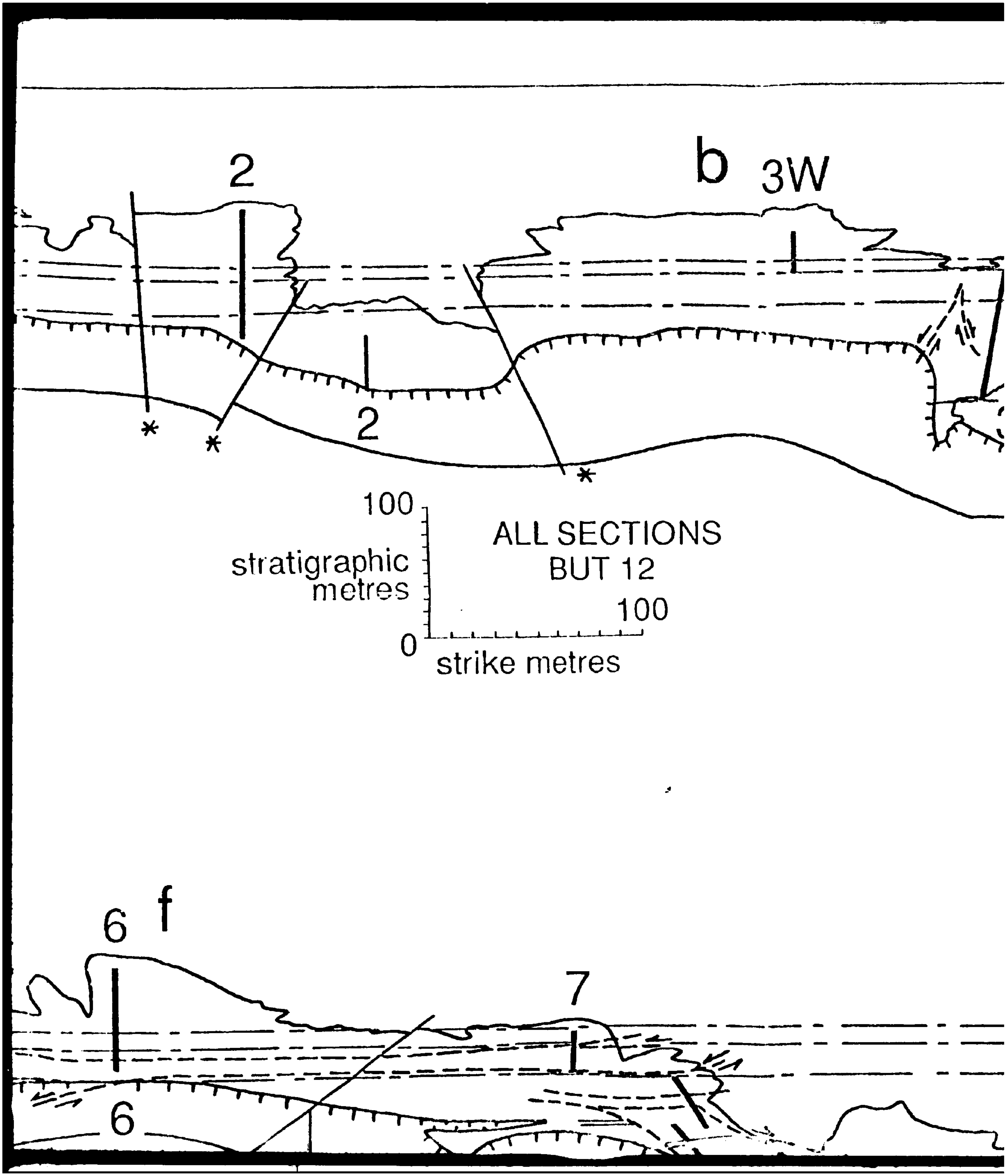
cm -- thickness of sand laminaes in a laminated shale package

B* -- a marker horizon for lateral correlation between sections PV1 and PV9

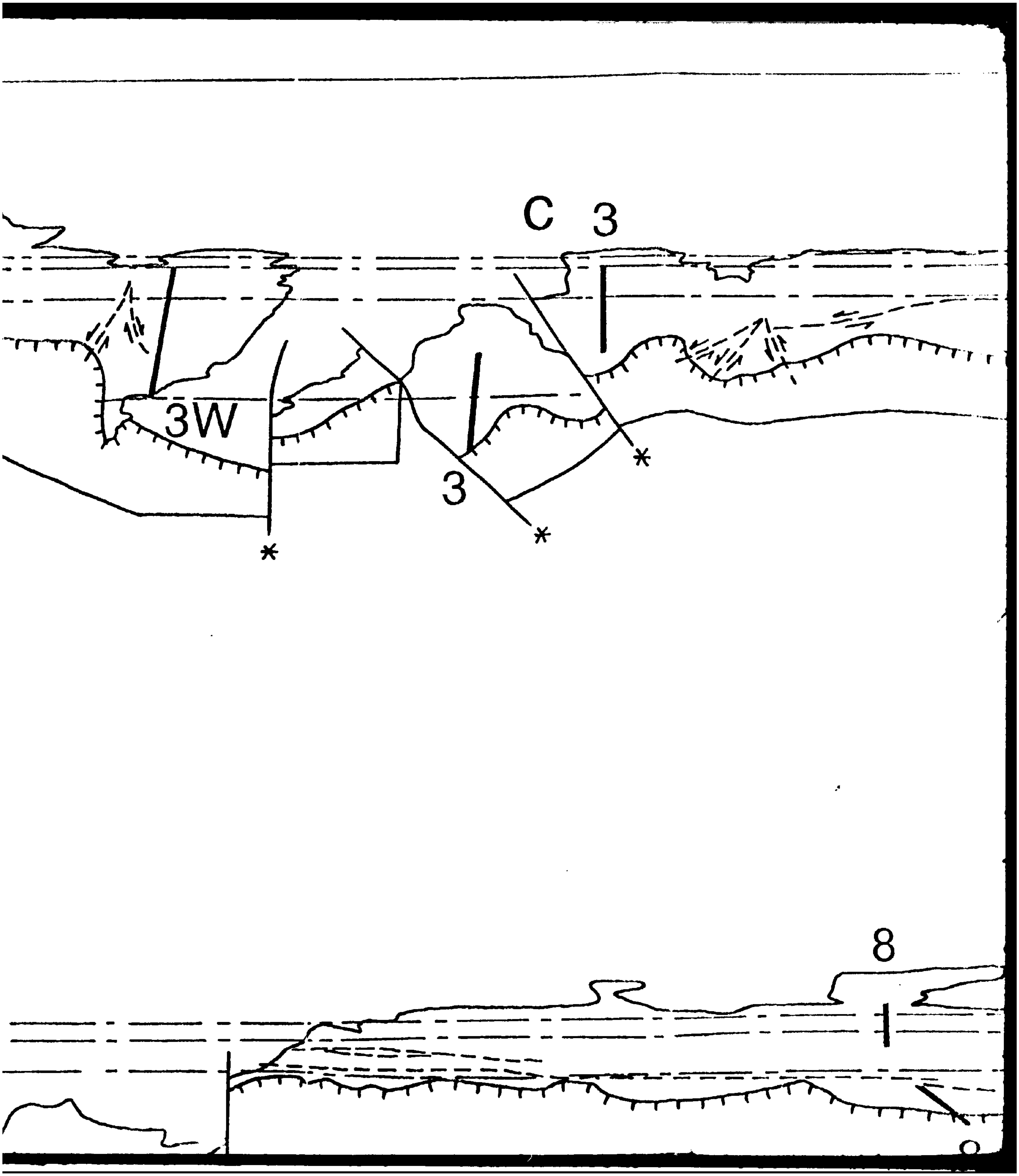

1
e
5
5

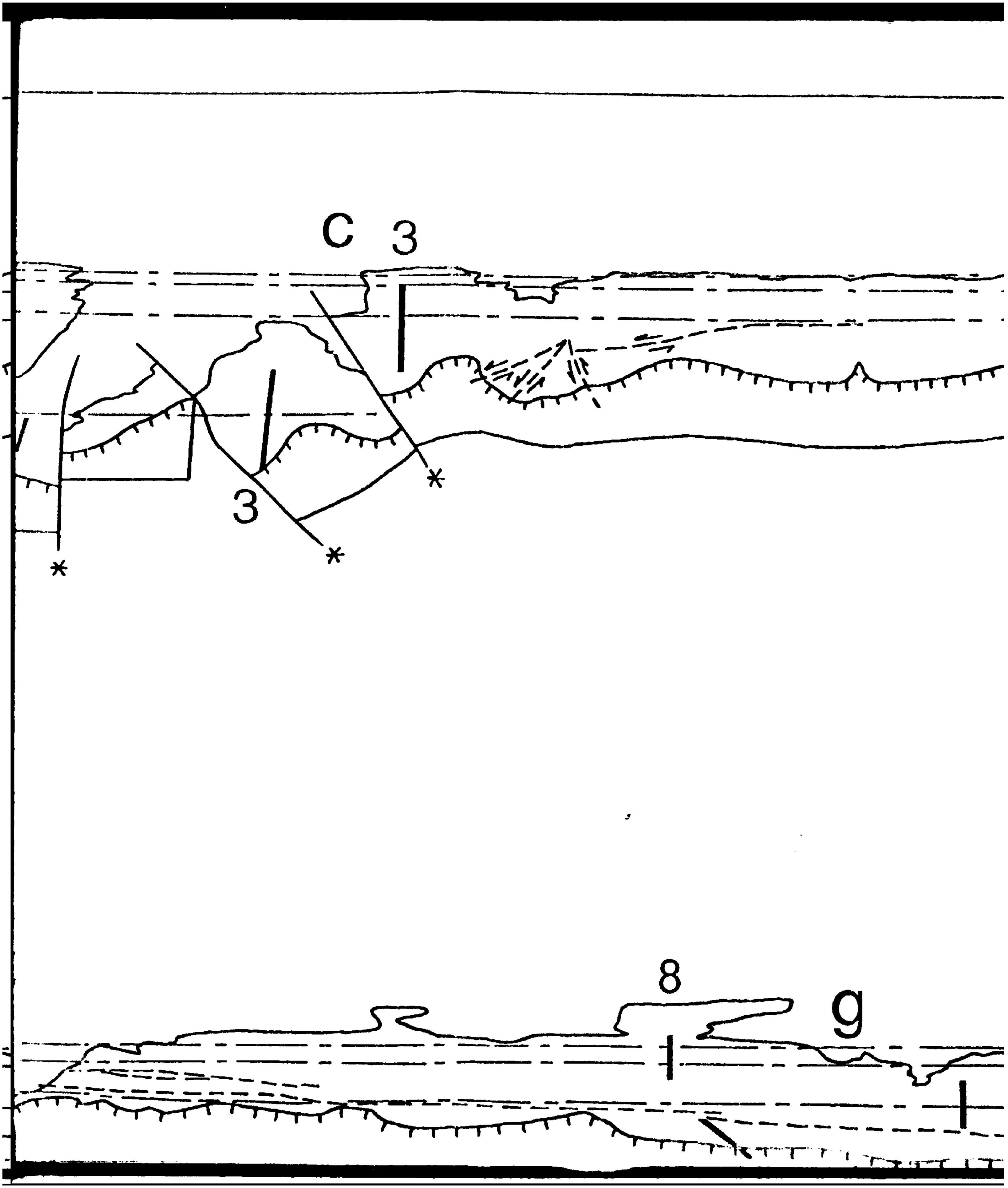


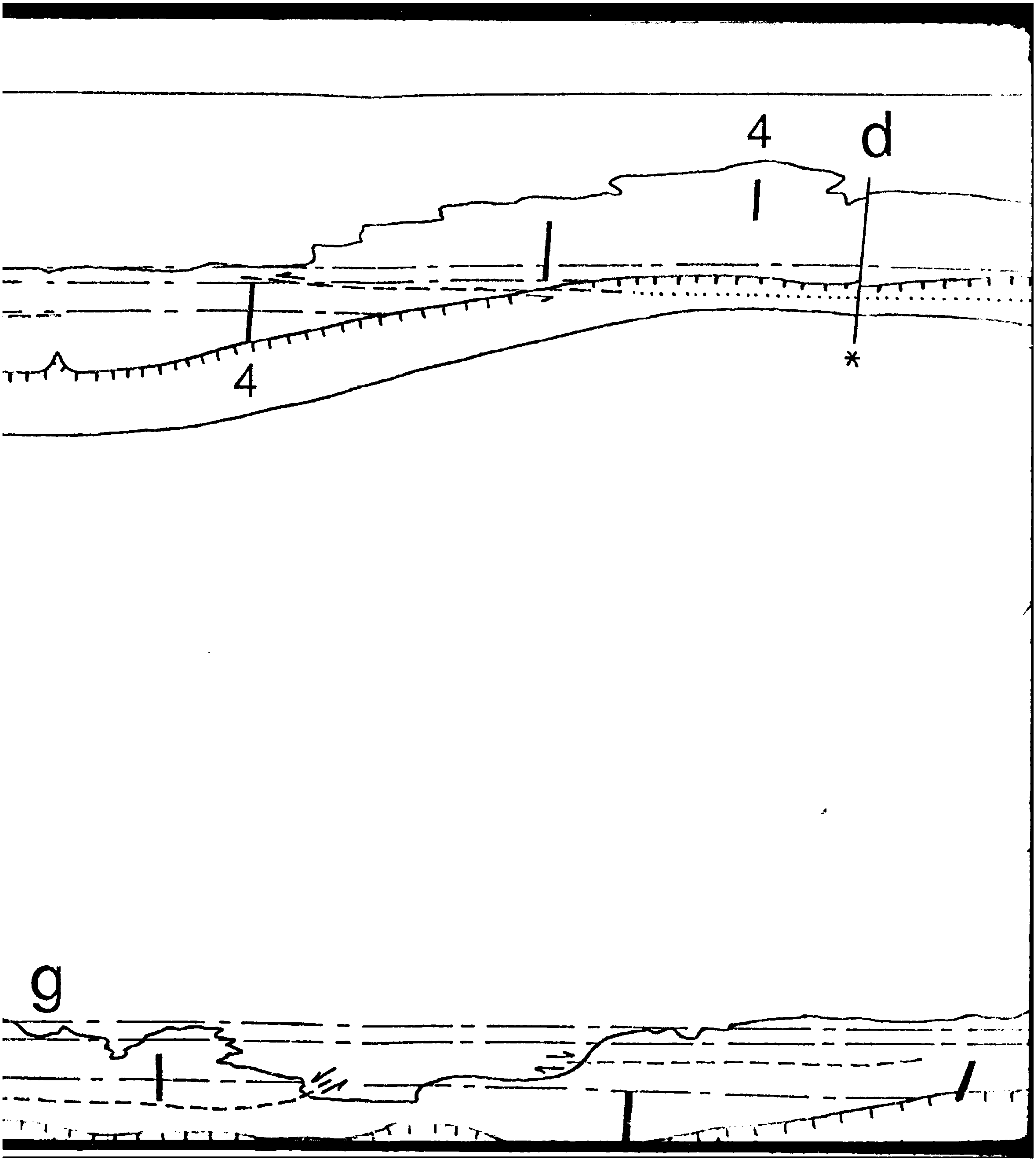
a
1
2
stratigra
6
f
6

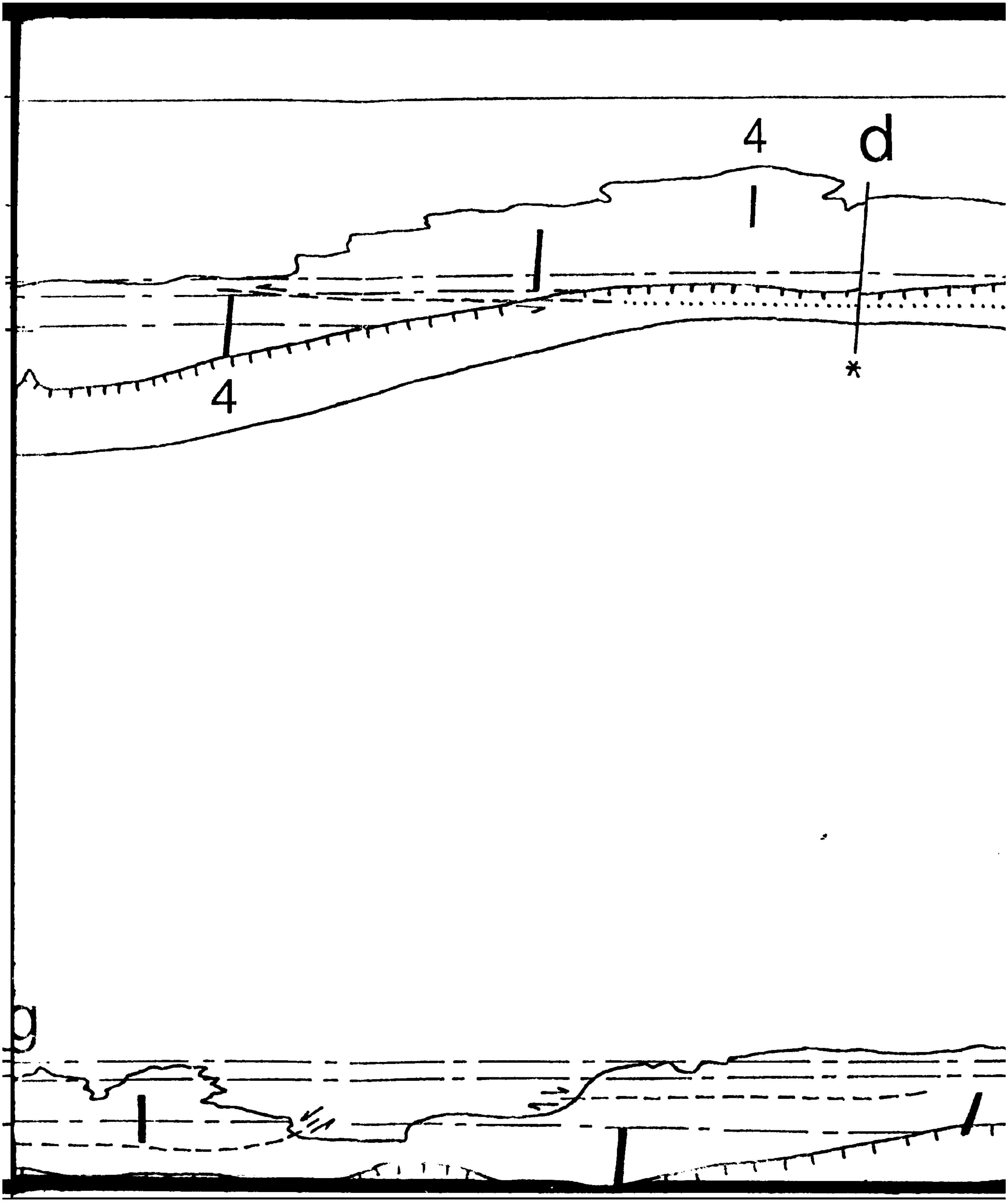


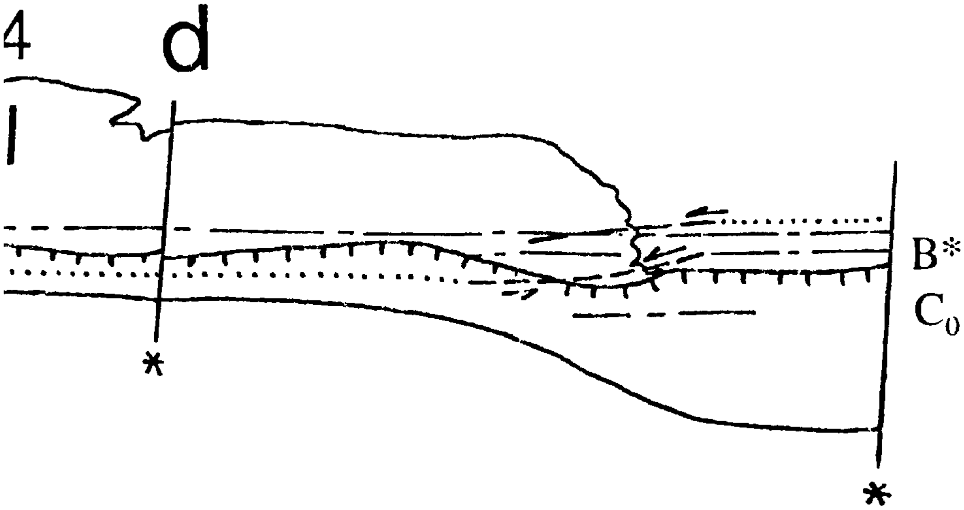
b
2
3W
2
100
stratigraphic
metres
0
ALL SECTIONS
BUT 12
100
strike metres
f
6
7
6

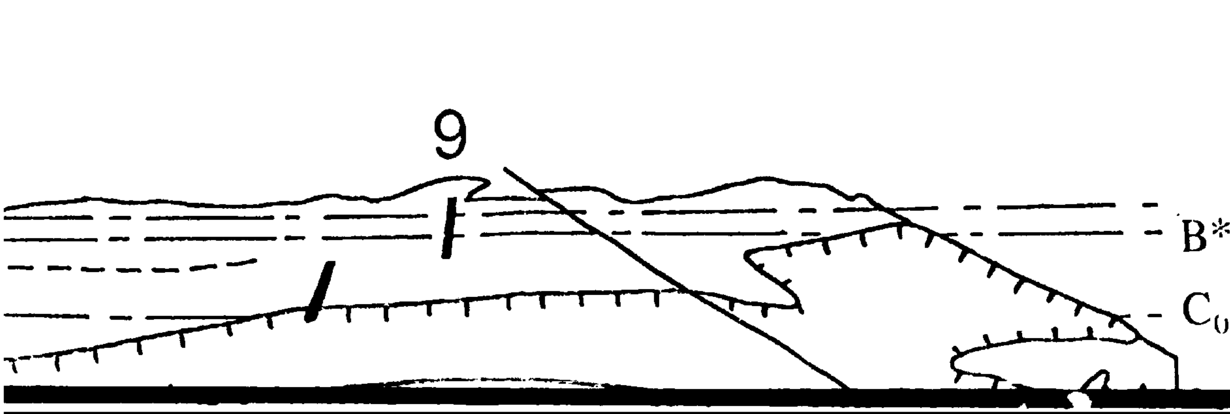

C
3
3W
3
*
*
*
8

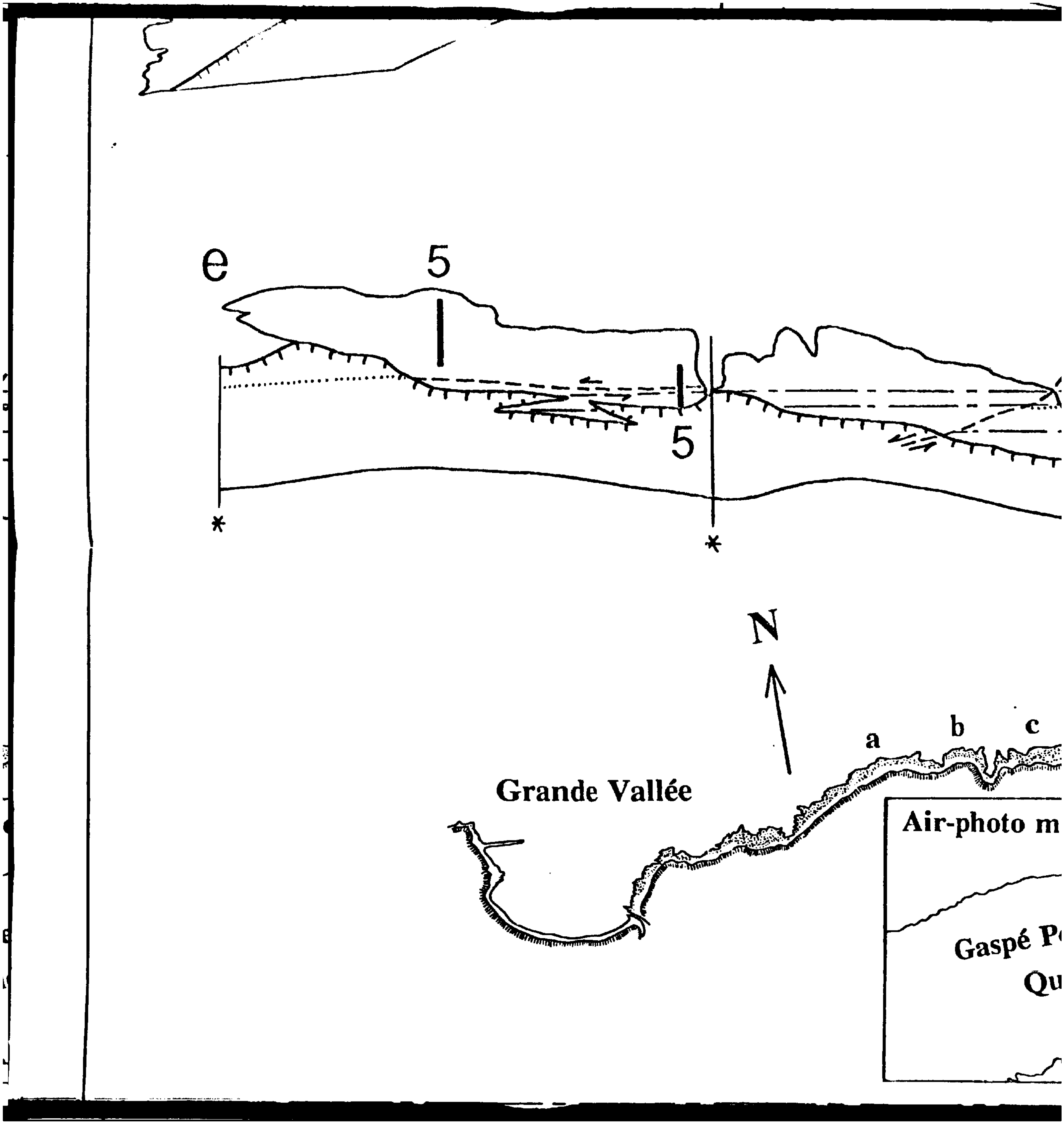

c
3
3
8
g

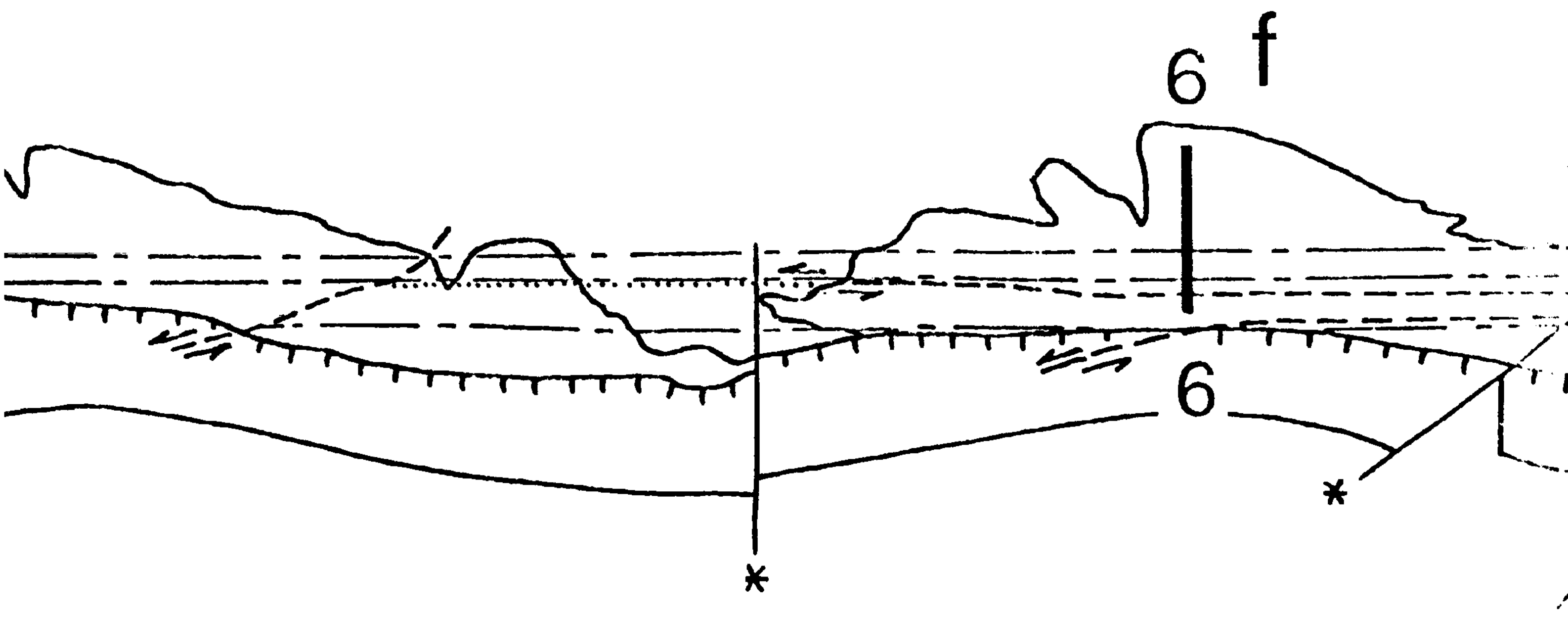

4
d
4
*
g

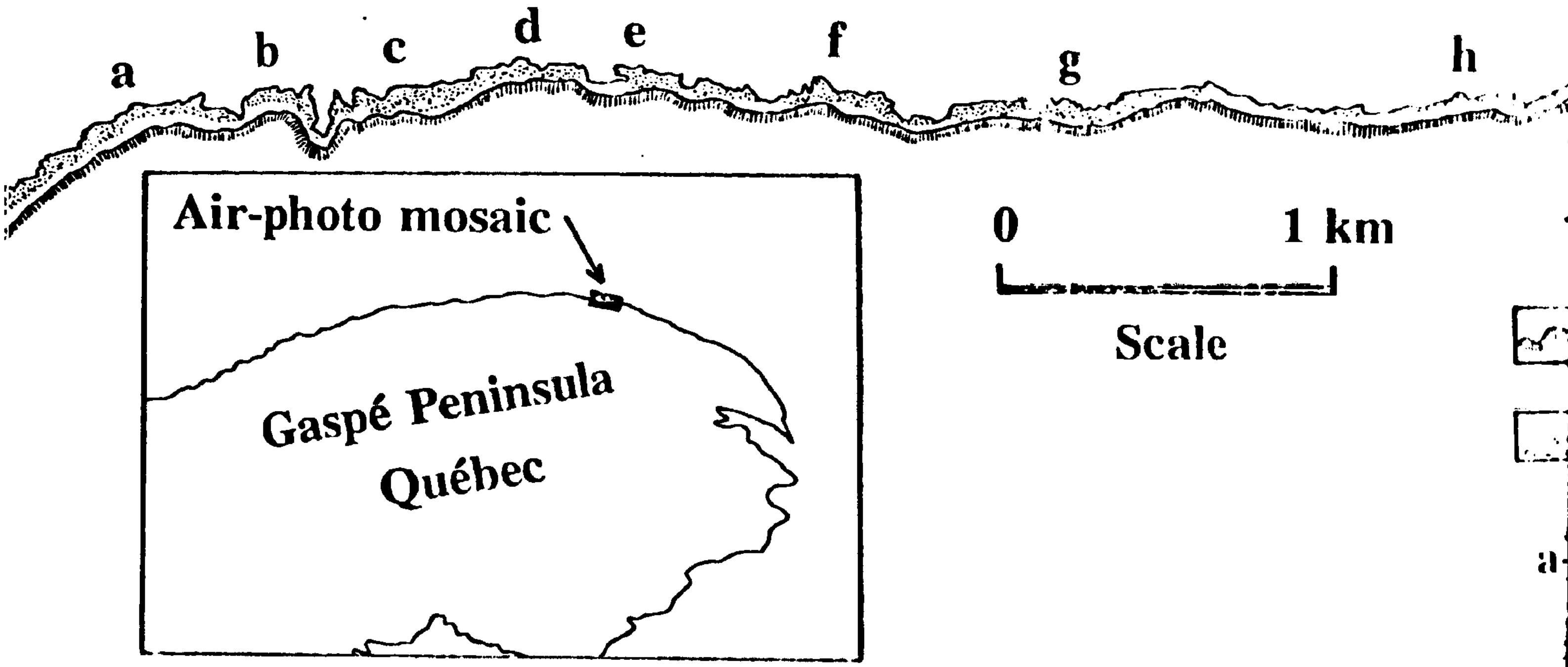

4
d
4
g

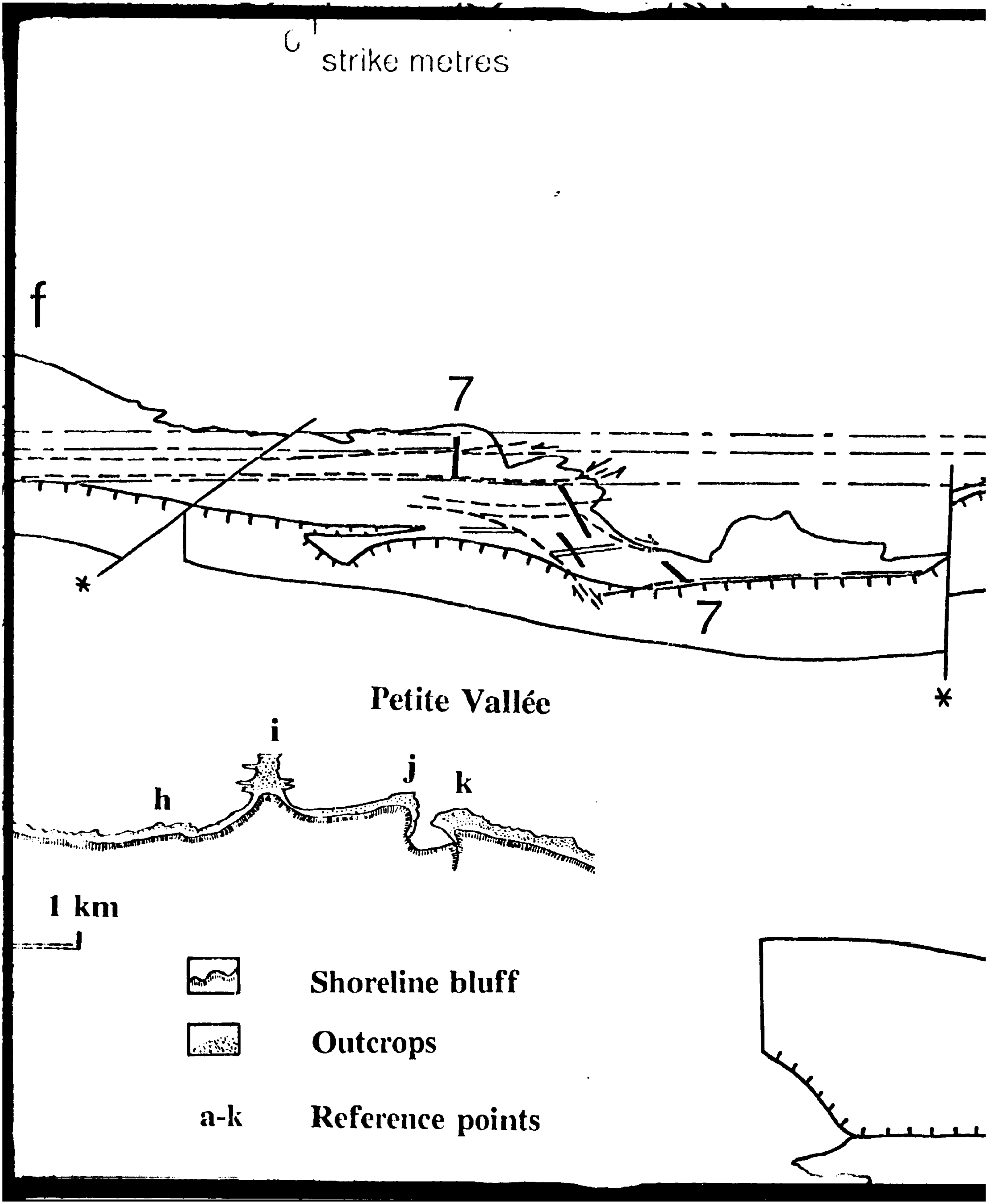

4
d
B*
C_0

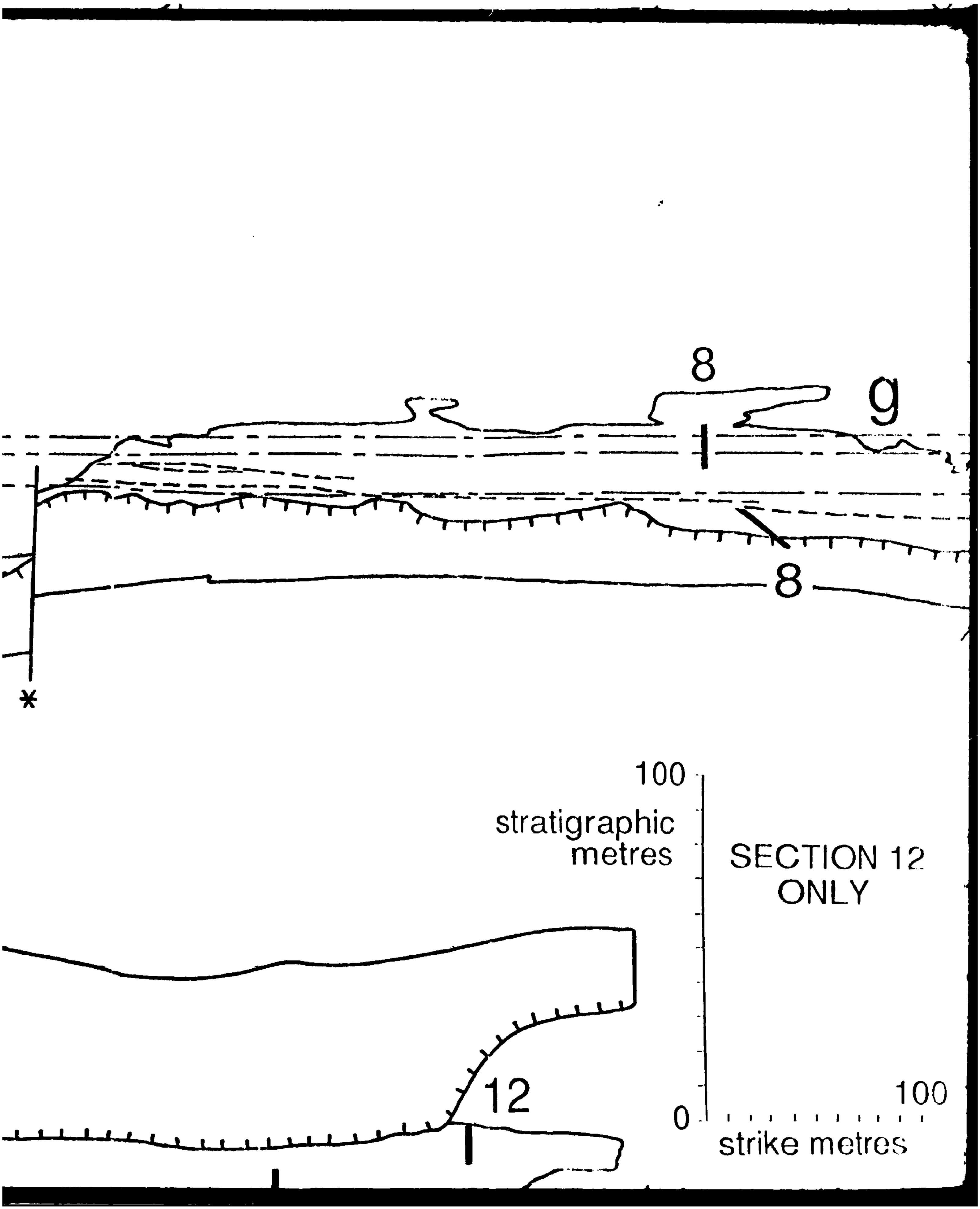

9
B*
C_0


e
5
5
N
a
b
c
Grande Vallée

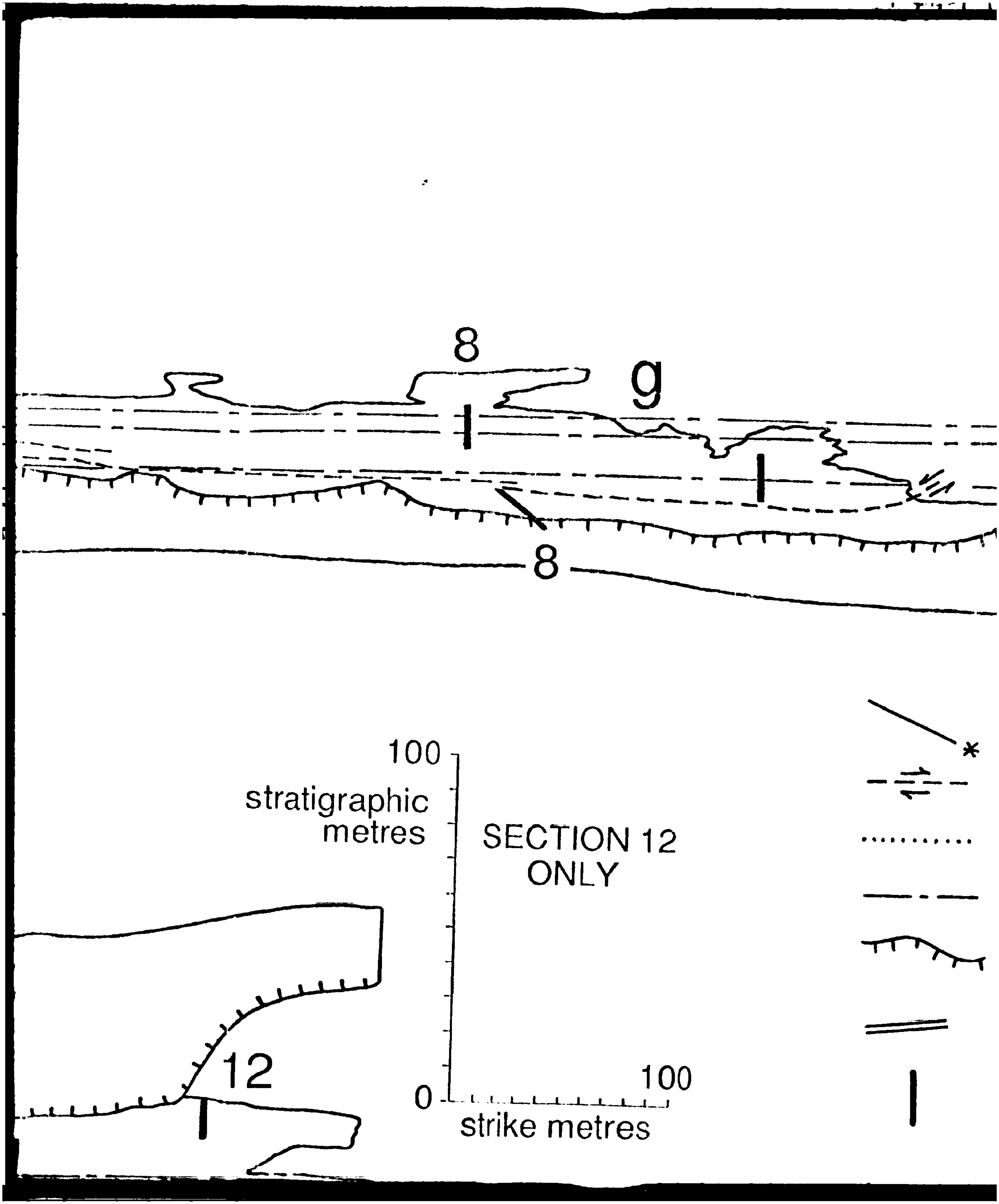

6
f
6

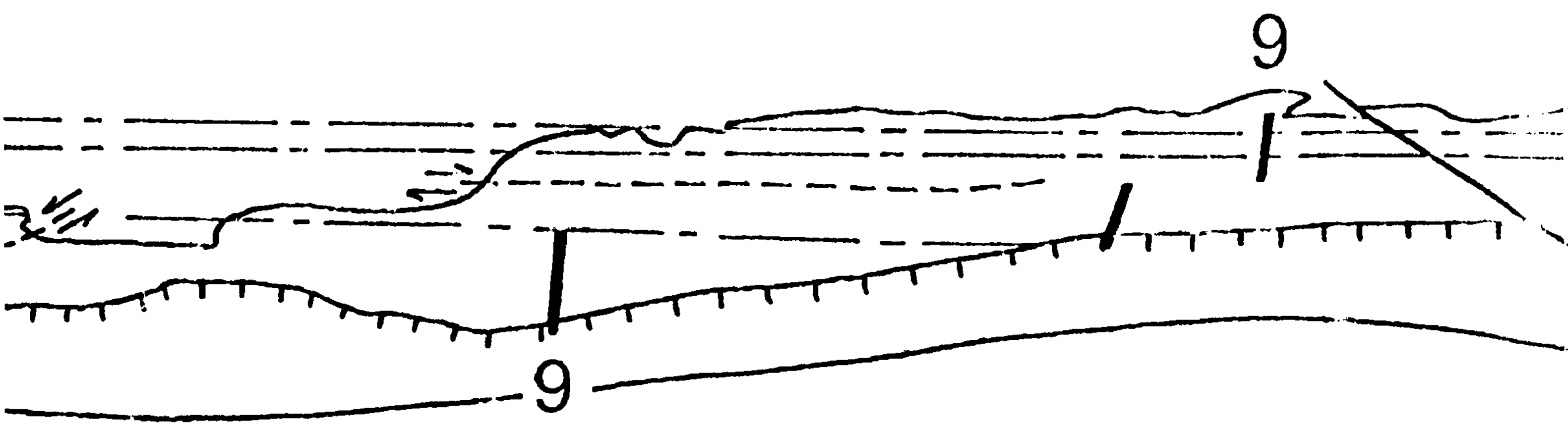

a
b
c
d
e
f
g
h
Air-photo mosaic
Gaspé Peninsula
Québec
0
1 km
Scale


strike metres
f
7
7
Petite Vallée
i
j
k
h
1 km
Shoreline bluff
Outcrops
a-k
Reference points



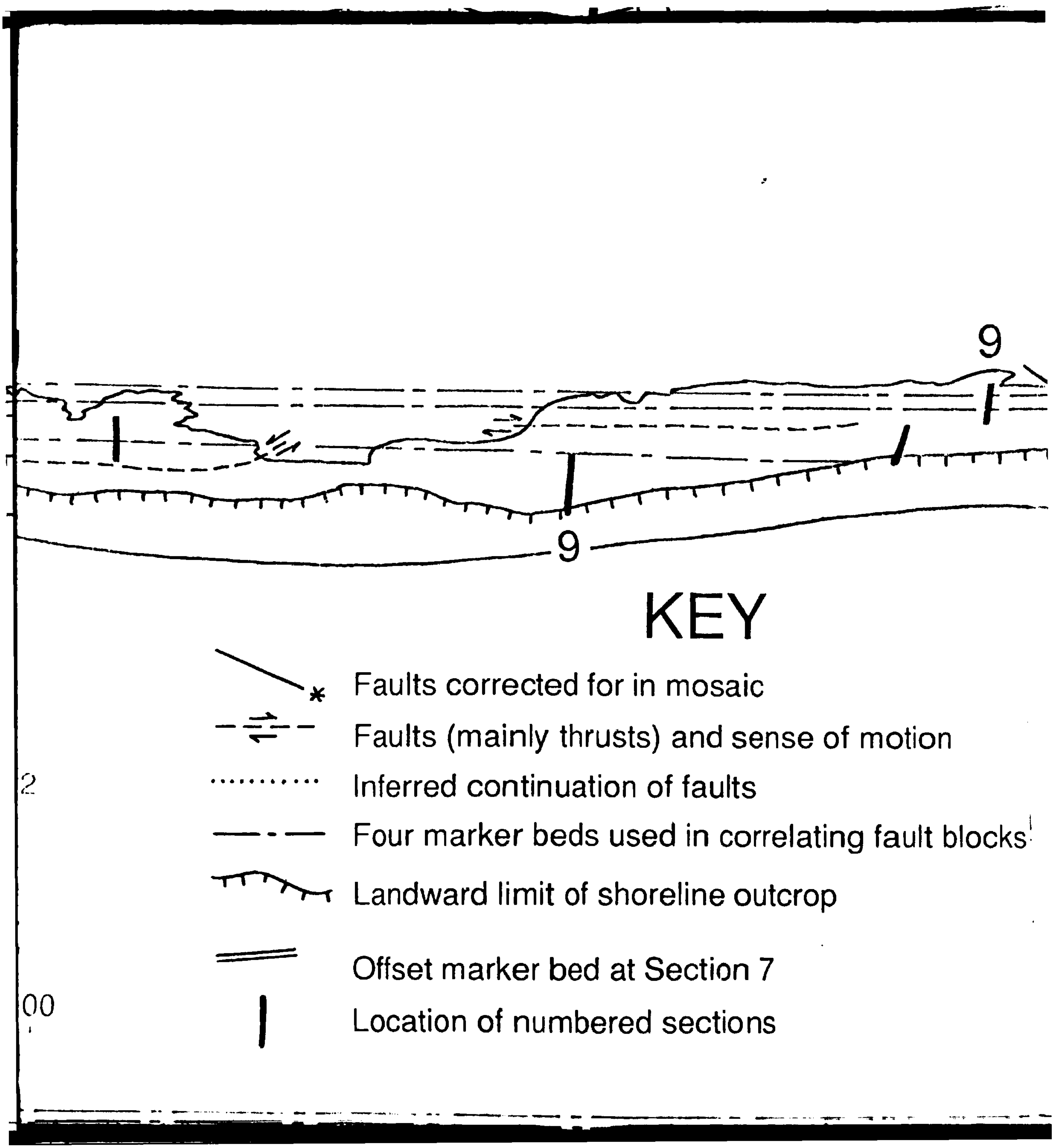
8
g
8
*
100
stratigraphic
metres
SECTION 12
ONLY
12
0
100
strike metres

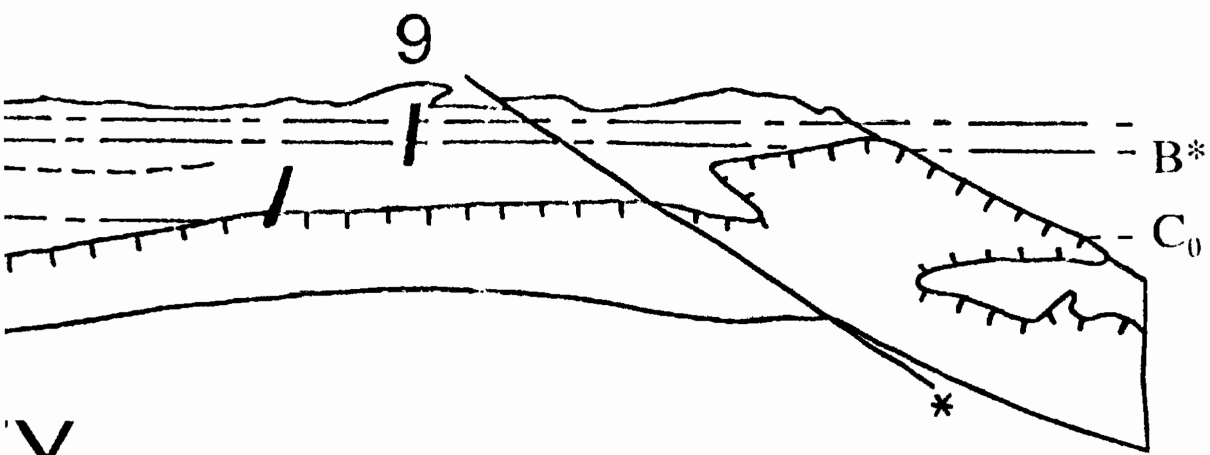

8
g
8
100
stratigraphic metres
SECTION 12 ONLY
12
0
100
strike metres
*



KEY

- Faults corrected for in mosaic
- Faults (mainly thrusts) and sense of motion
- Inferred continuation of faults
- Four marker beds used in correlating fault blocks
- Landward limit of shoreline outcrop
- Offset marker bed at Section 7
- Location of numbered sections


9
9
KEY
Faults corrected for in mosaic
Faults (mainly thrusts) and sense of motion
Inferred continuation of faults
Four marker beds used in correlating fault blocks
Landward limit of shoreline outcrop
Offset marker bed at Section 7
Location of numbered sections
2
00



:Y

:aic

sense of motion

ılts

correlating fault blocks

outcrop

ɔn 7

ions

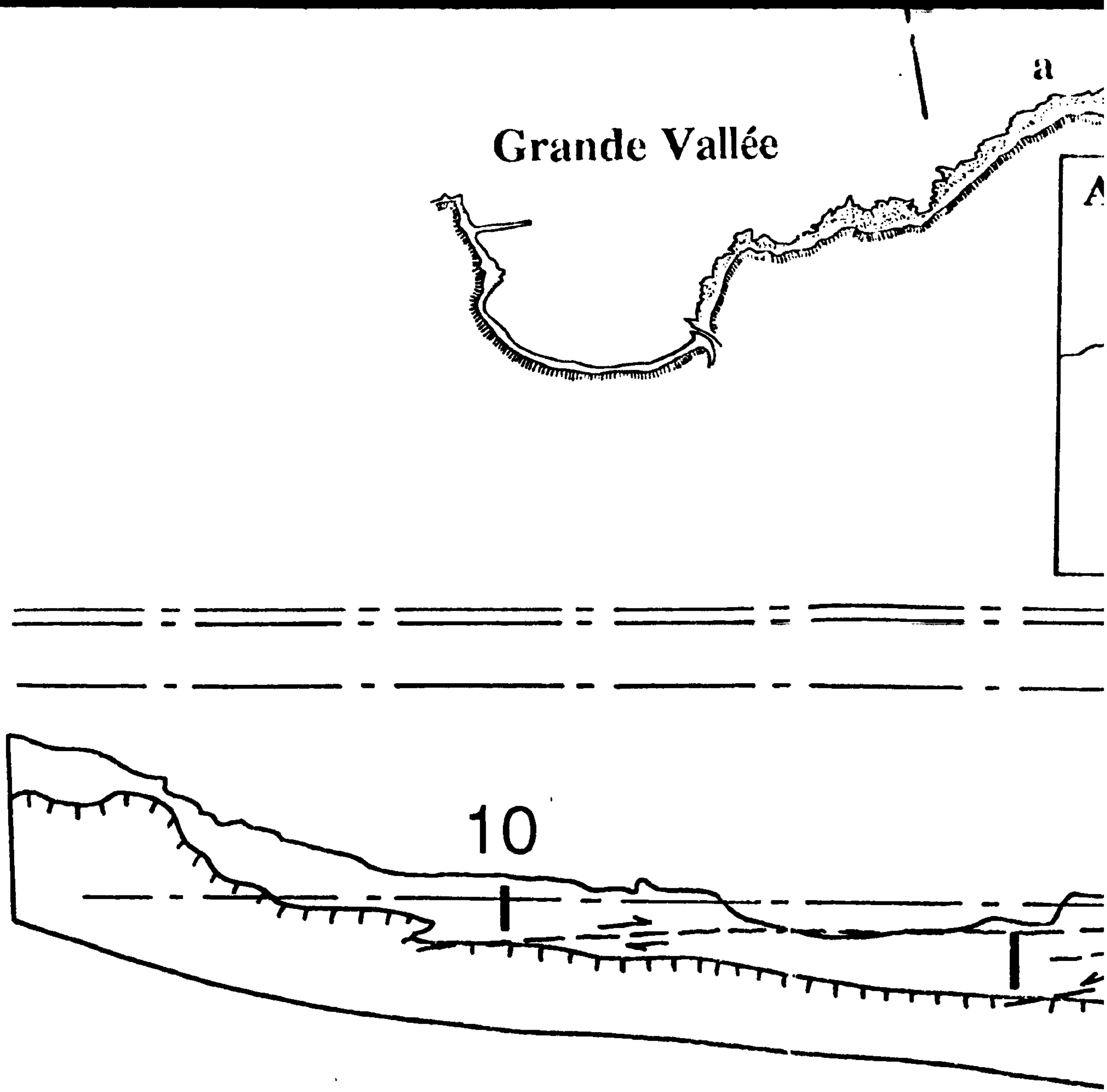
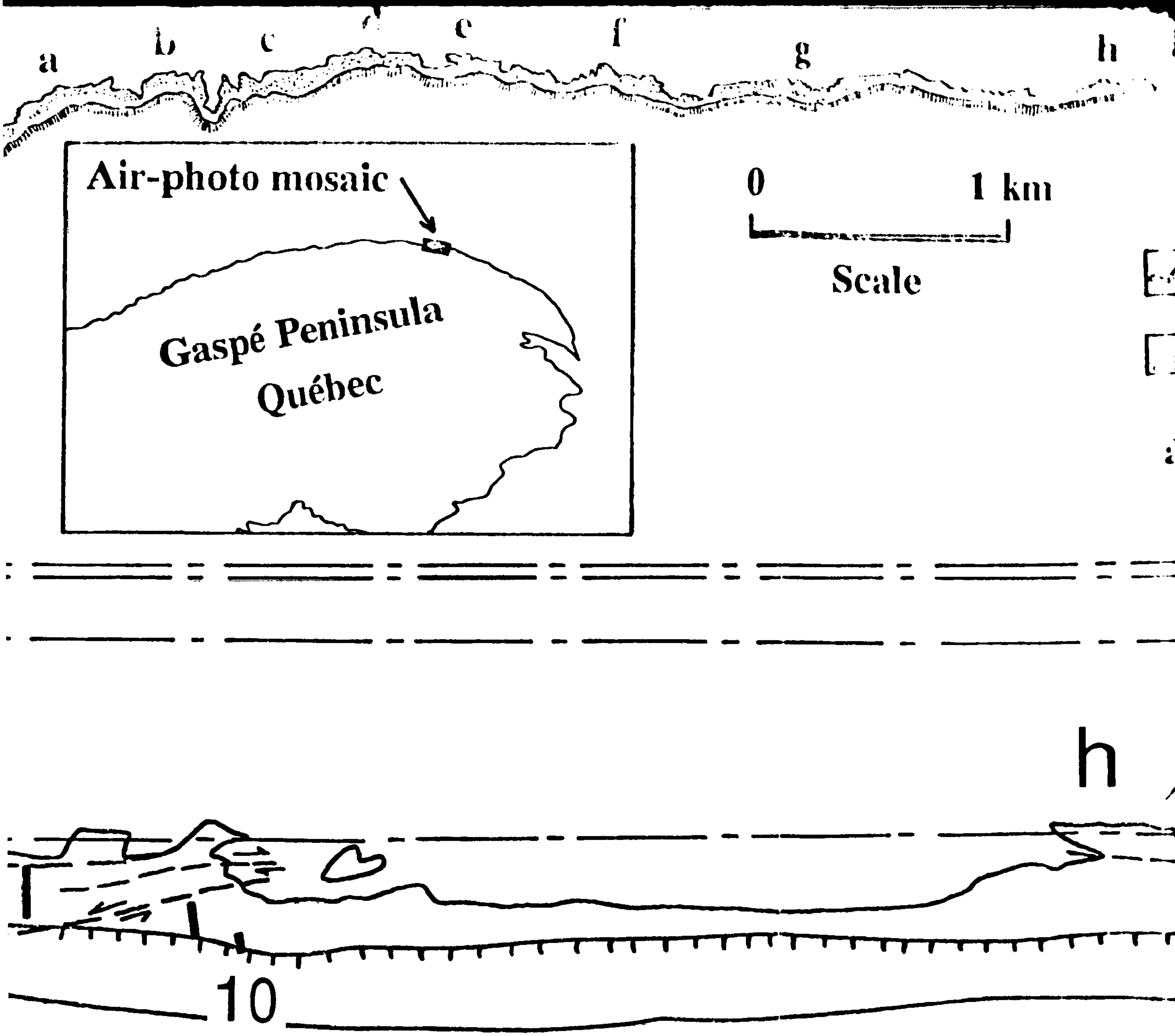
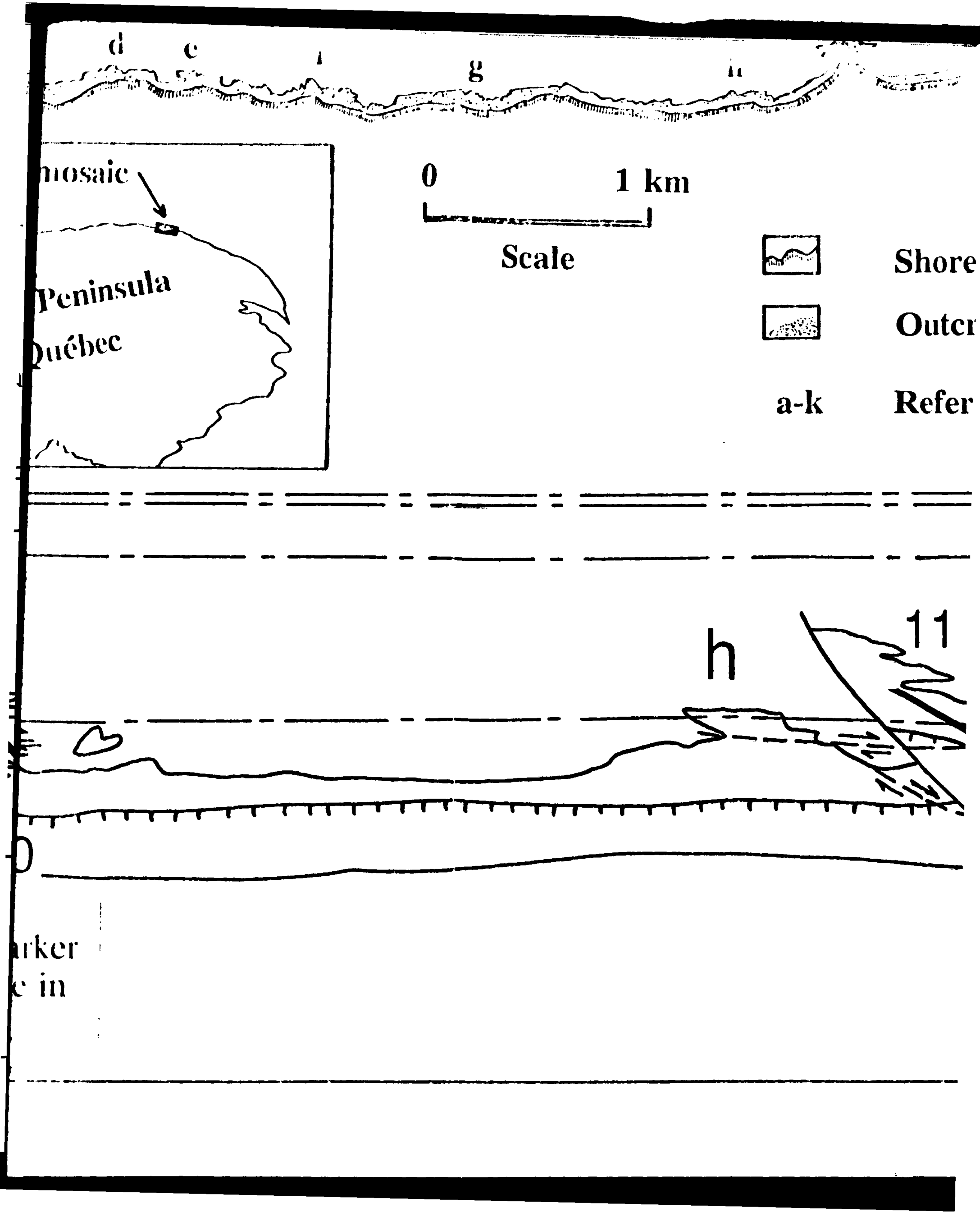


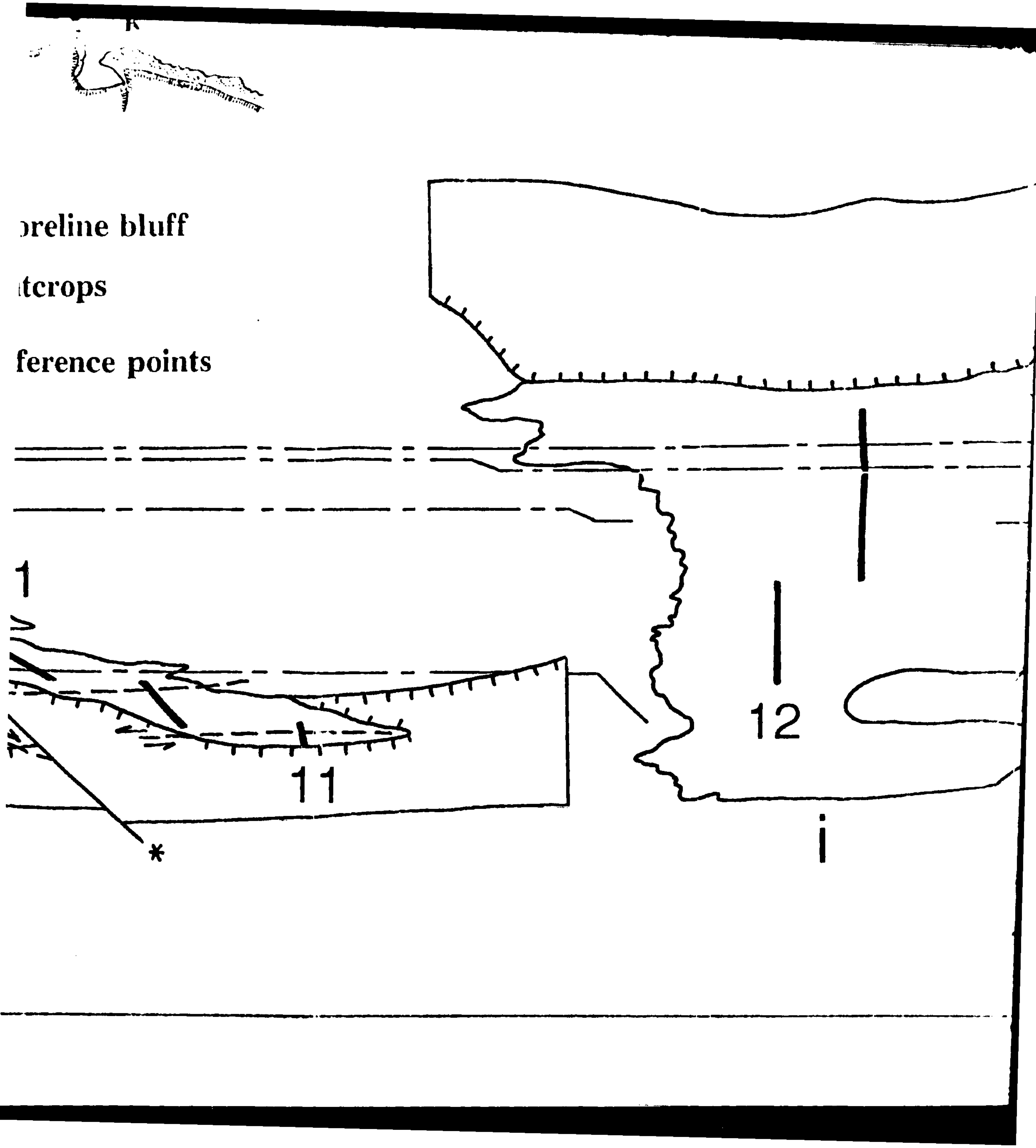
Figure 2.4 Simplified structural map of the study area.
horizons, including C_0 and B*, are the same
Figure 2.6.



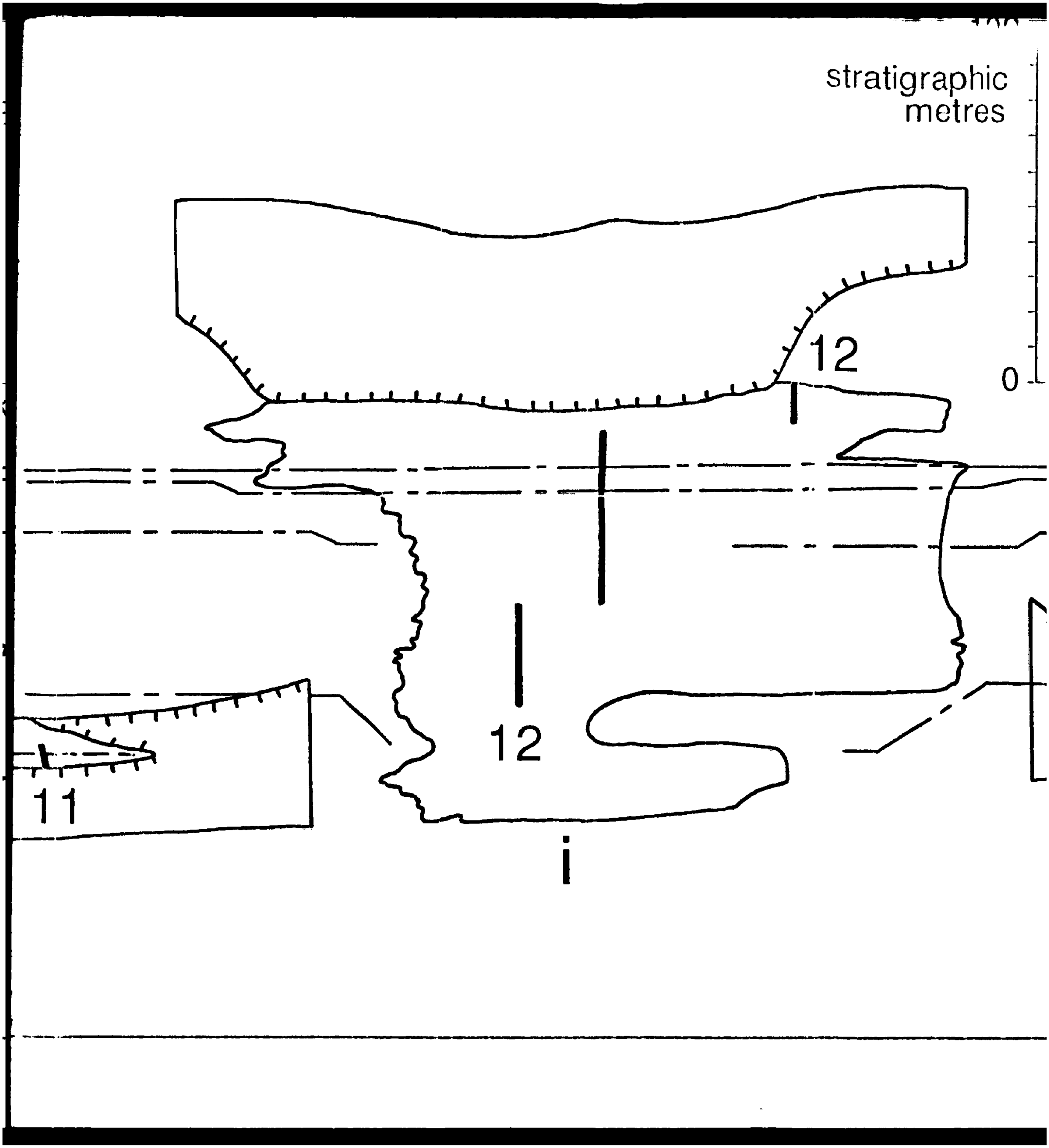
area. Four marker
e same as those in

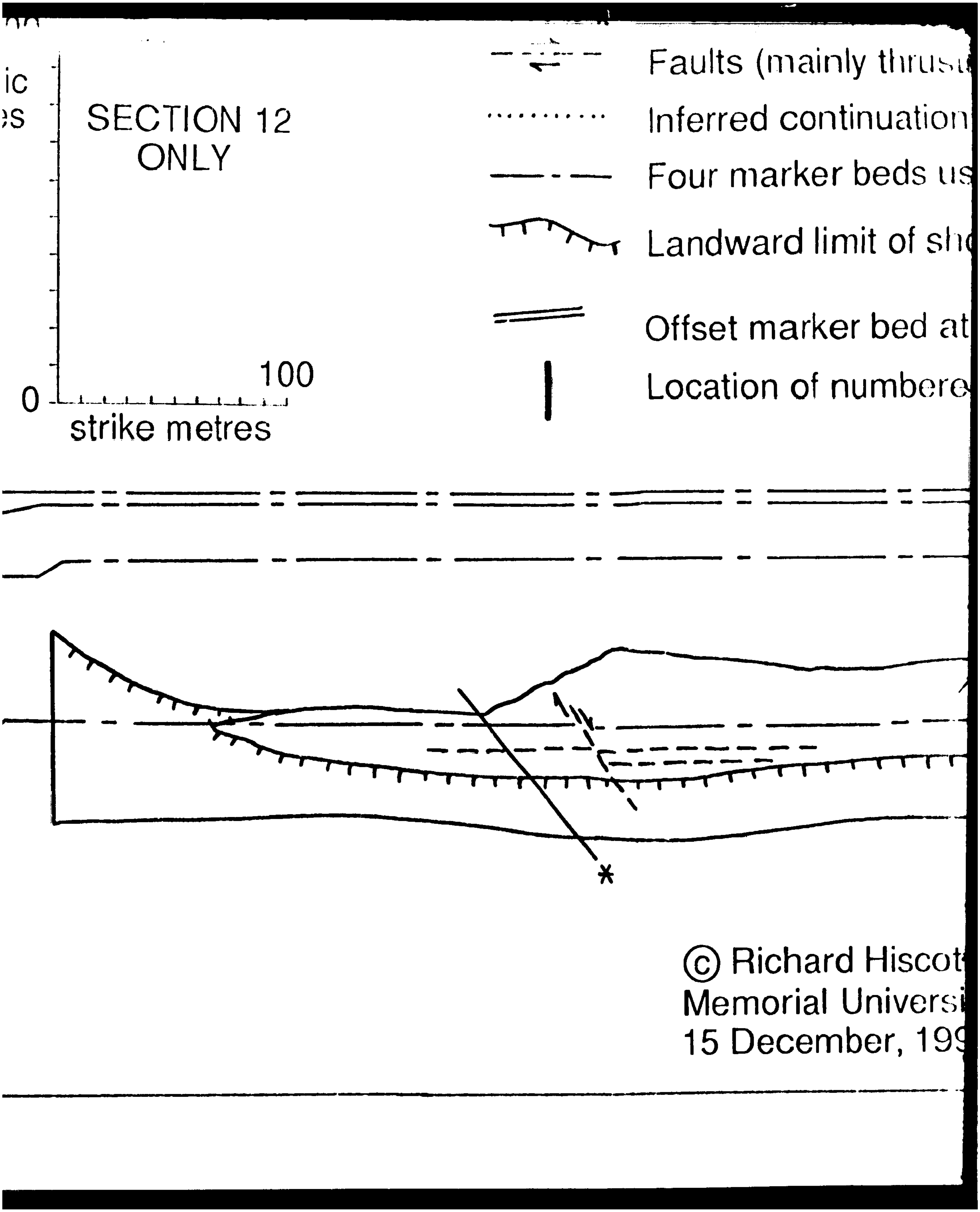


d
e
g
h
mosaic
Peninsula
uébec
0
1 km
Scale
Shore
Outcr
a-k
Refer
h
11
0
rker
e in

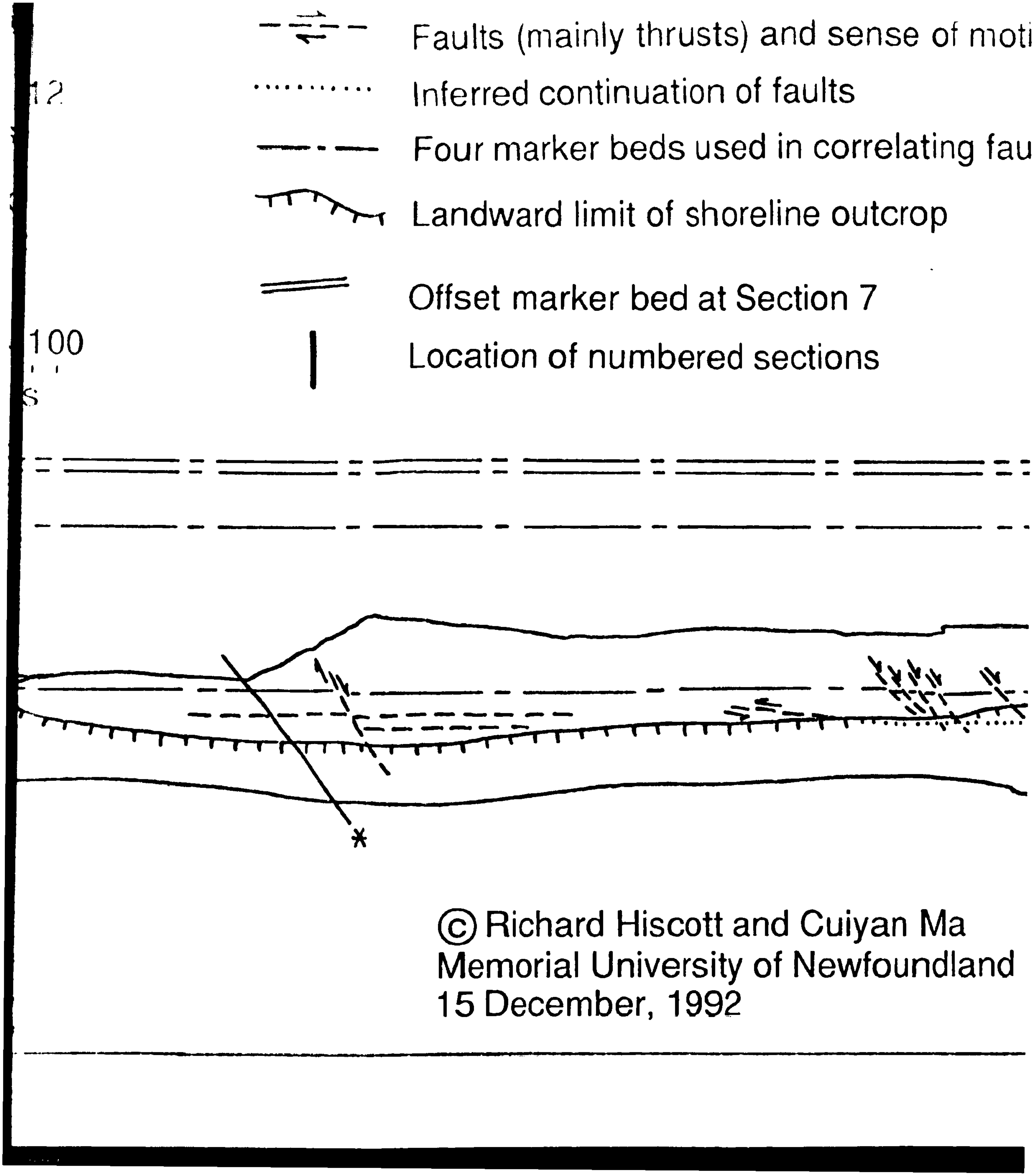


reline bluff
tcrops
ference points
1
12
11
i
*


stratigraphic metres
0
12
12
11
i

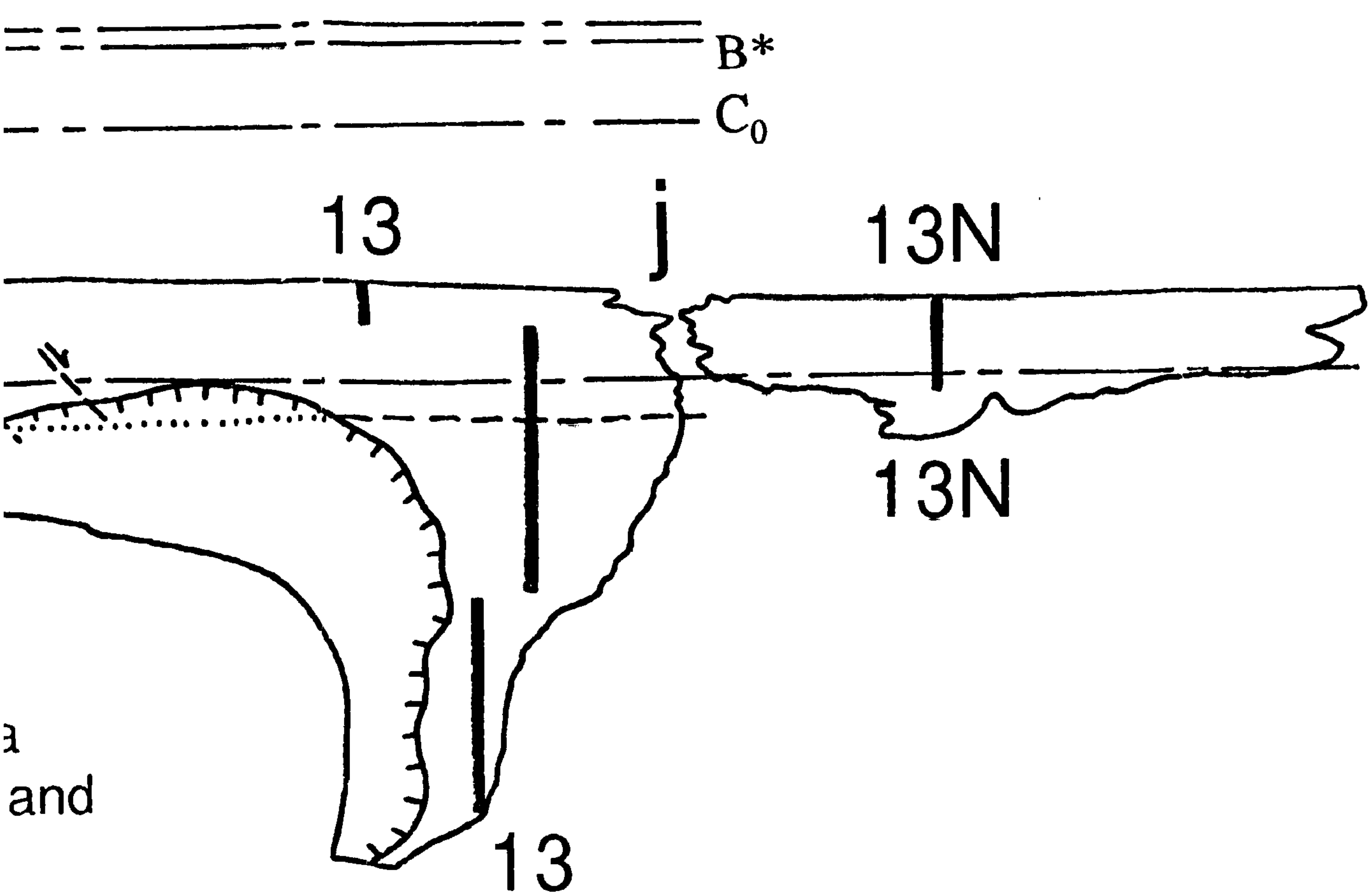


ic
es
SECTION 12
ONLY
100
0
strike metres
Faults (mainly thrus
Inferred continuation
Four marker beds us
Landward limit of sh
Offset marker bed at
Location of numbere
© Richard Hiscot
Memorial Universi
15 December, 19


12
Faults (mainly thrusts) and sense of moti
Inferred continuation of faults
Four marker beds used in correlating fau
Landward limit of shoreline outcrop
Offset marker bed at Section 7
100
Location of numbered sections
s
*
© Richard Hiscott and Cuiyan Ma
Memorial University of Newfoundland
15 December, 1992

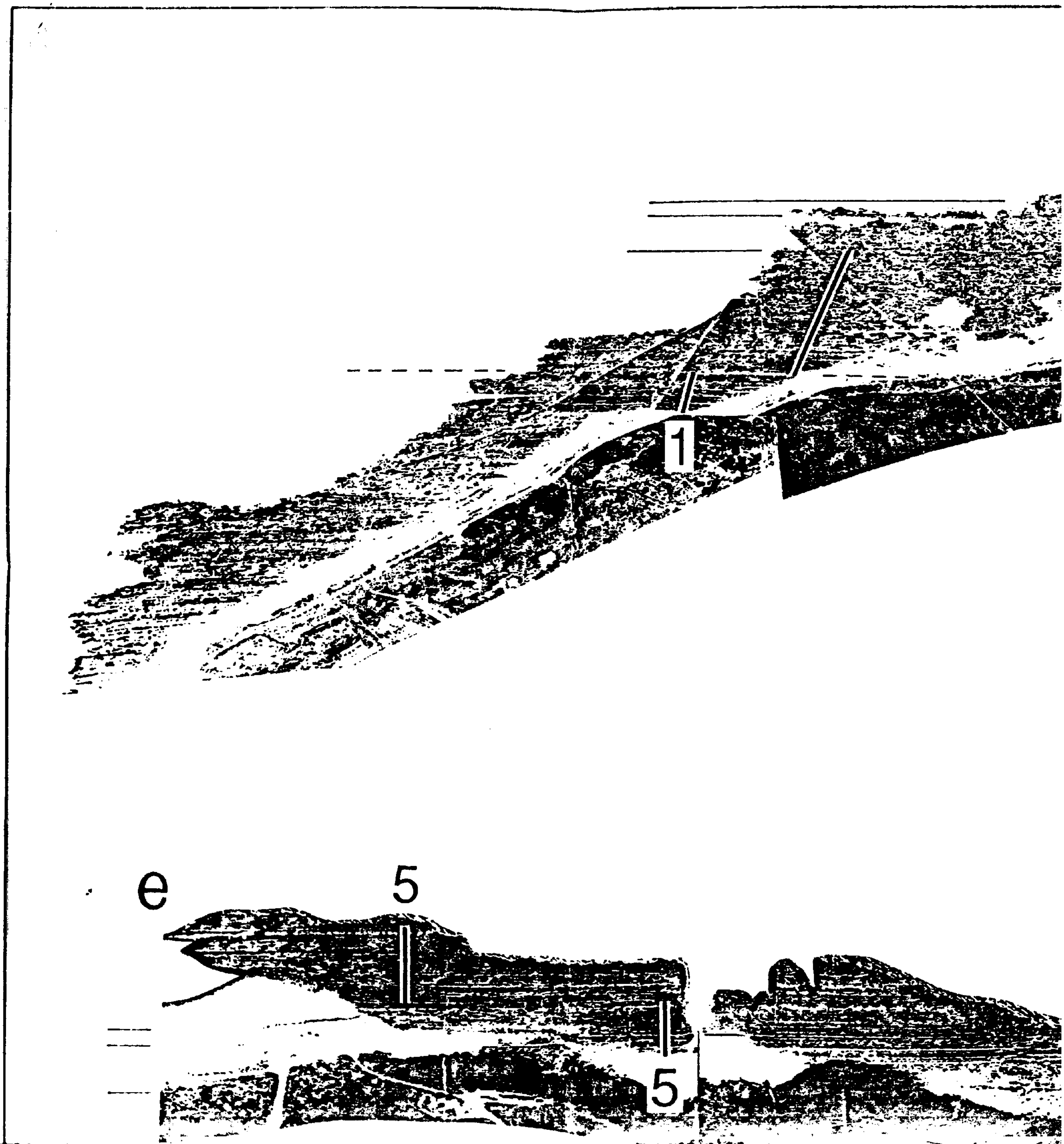
motion

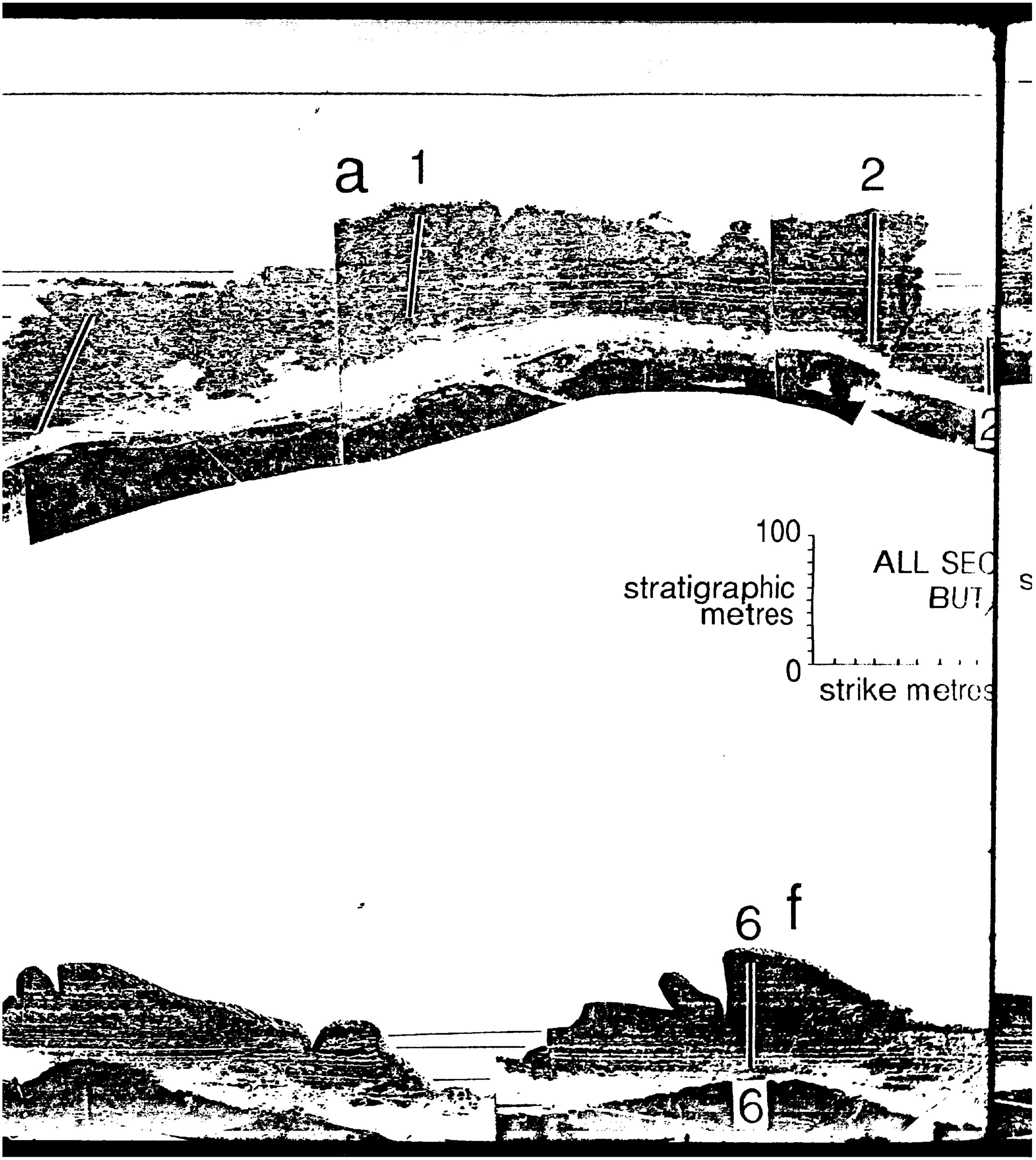
g fault blocks

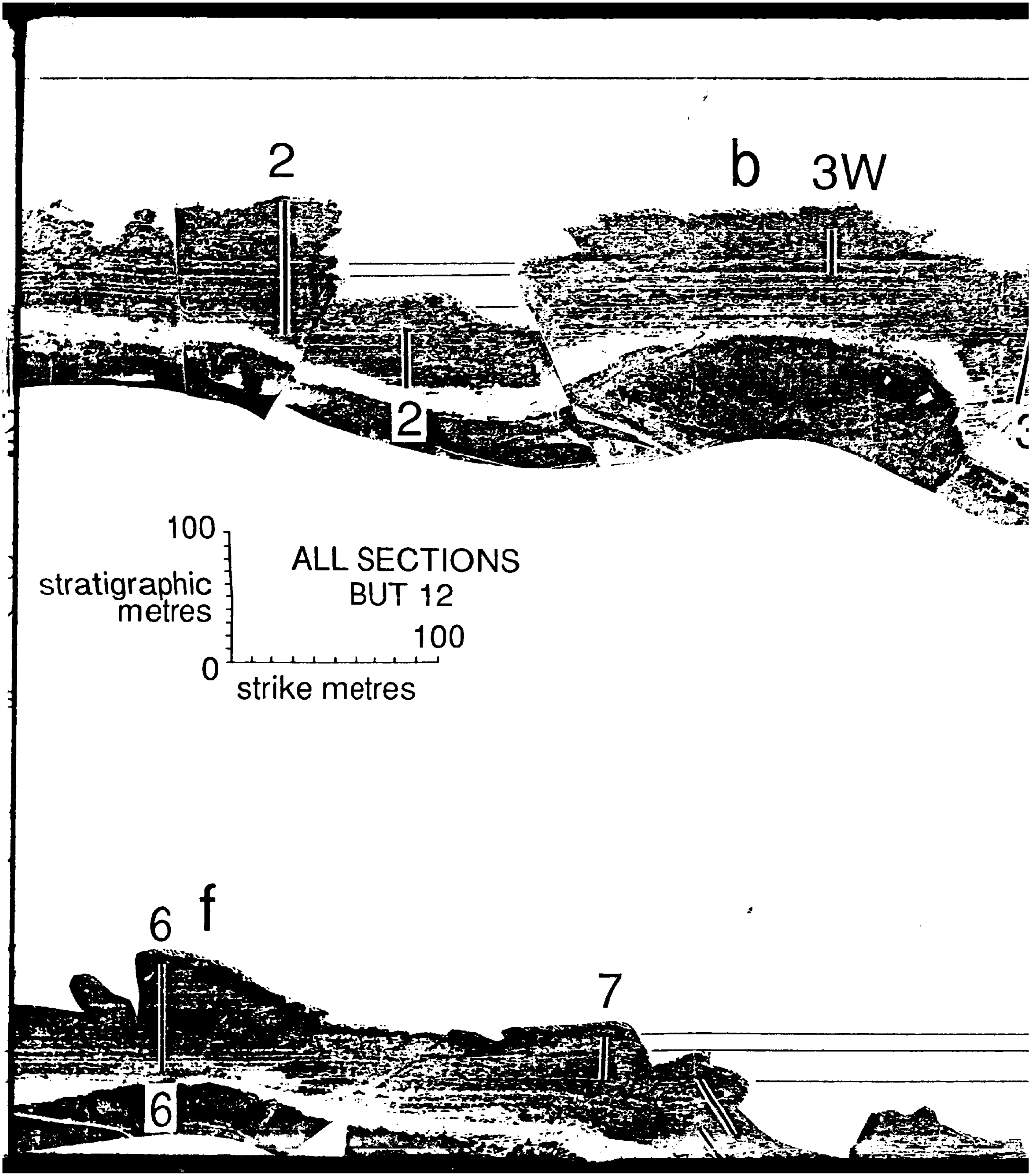


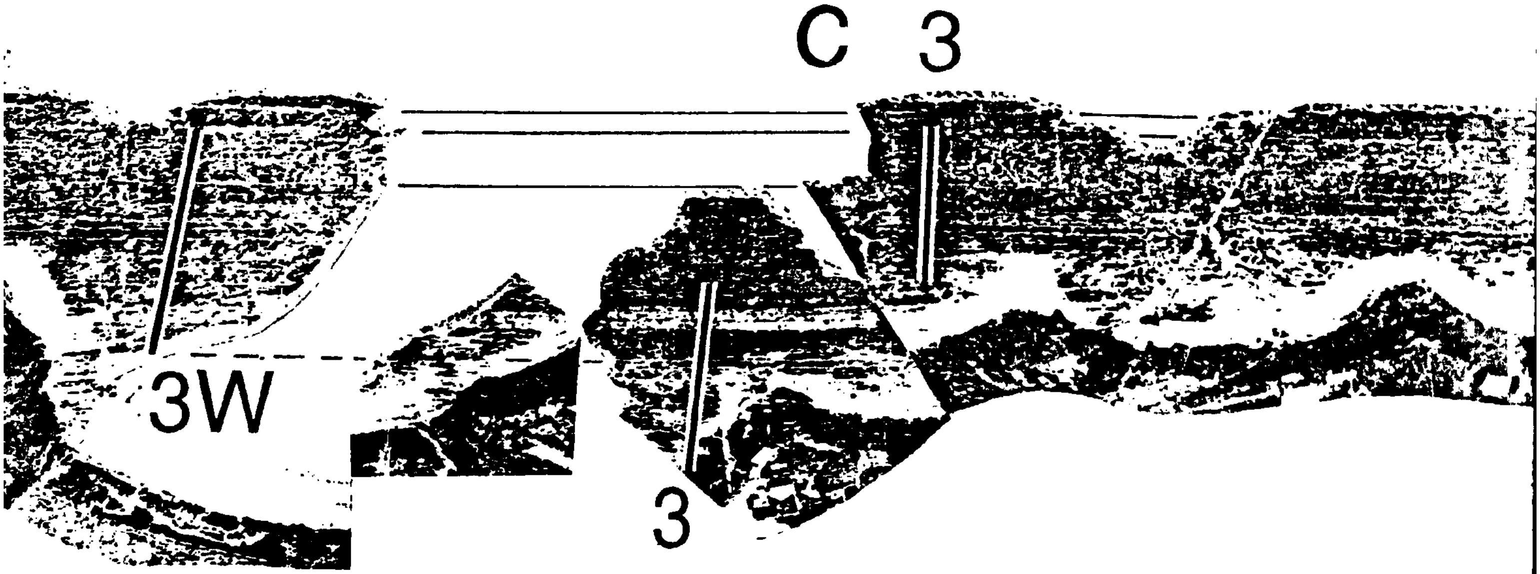
a

and

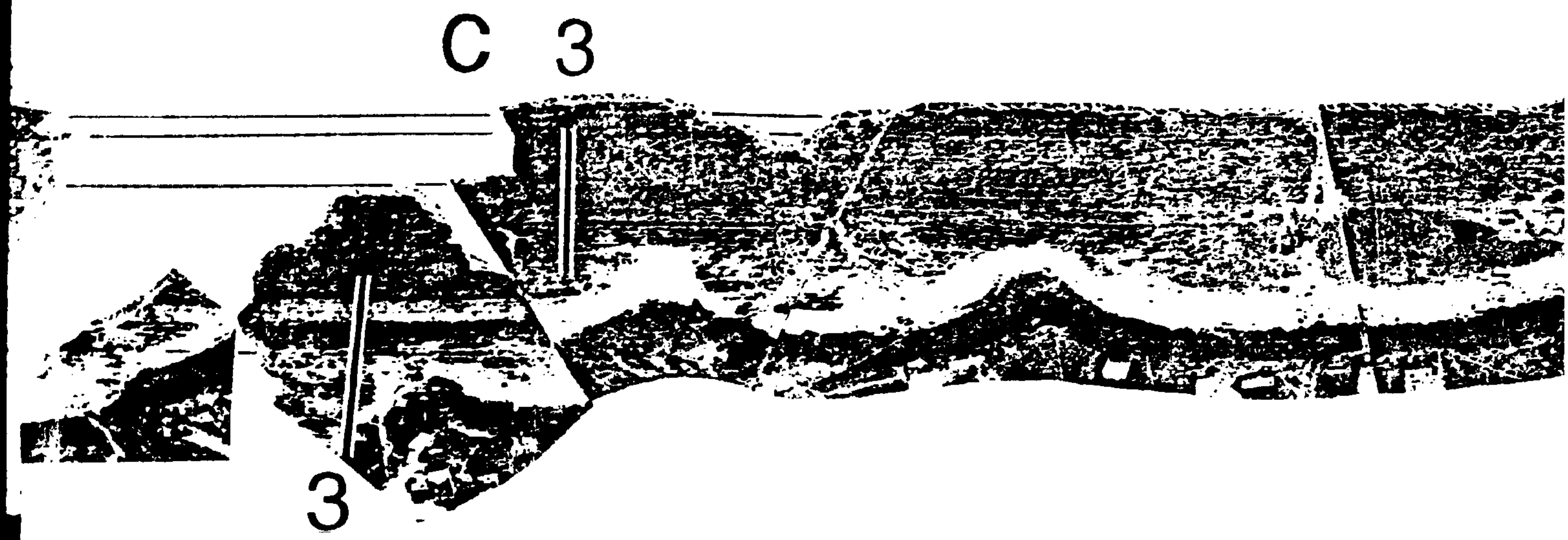

1
e
5
5

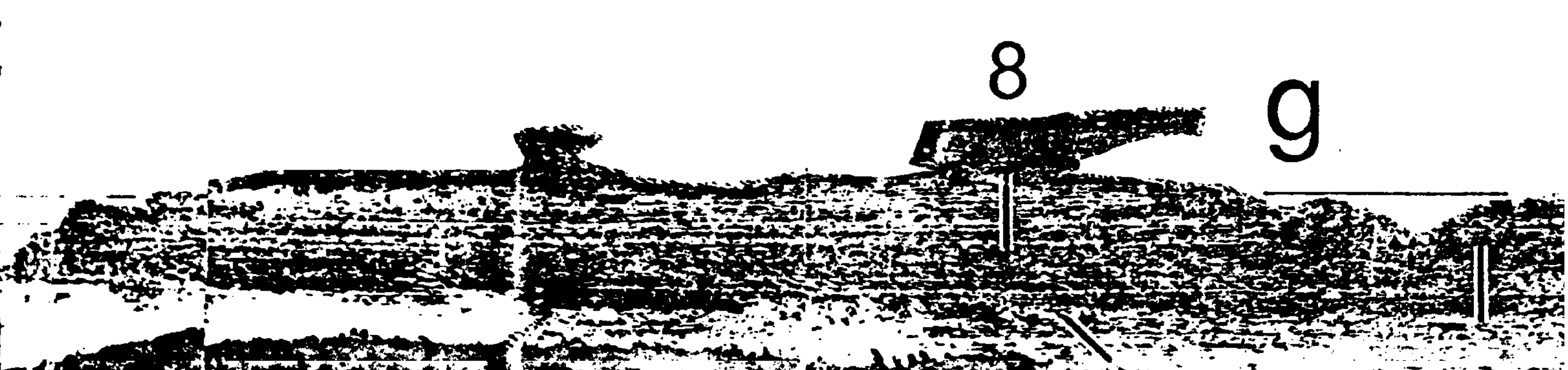

a
1
2
2
100
stratigraphic
metres
0
strike metres
ALL SEC
BUT
6
f
6

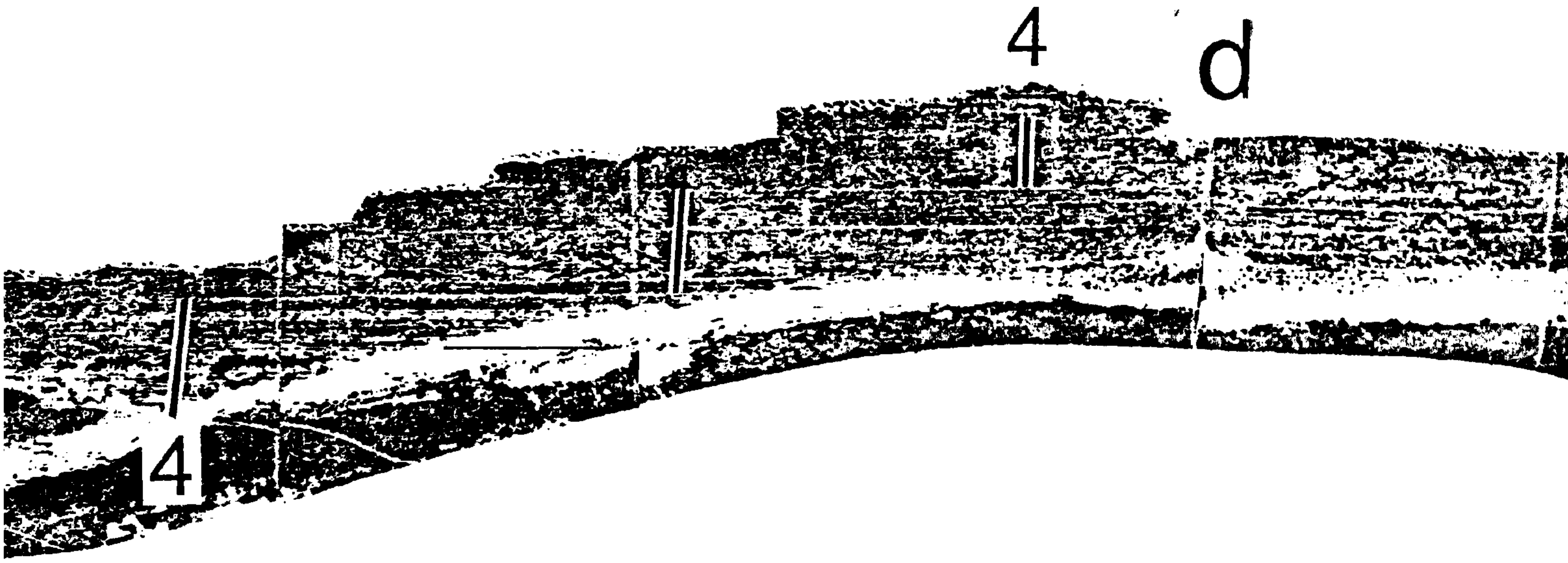

2
b
3W
2
100
stratigraphic metres
ALL SECTIONS BUT 12
100
0
strike metres
6
f
7
6


C
3
3W
3

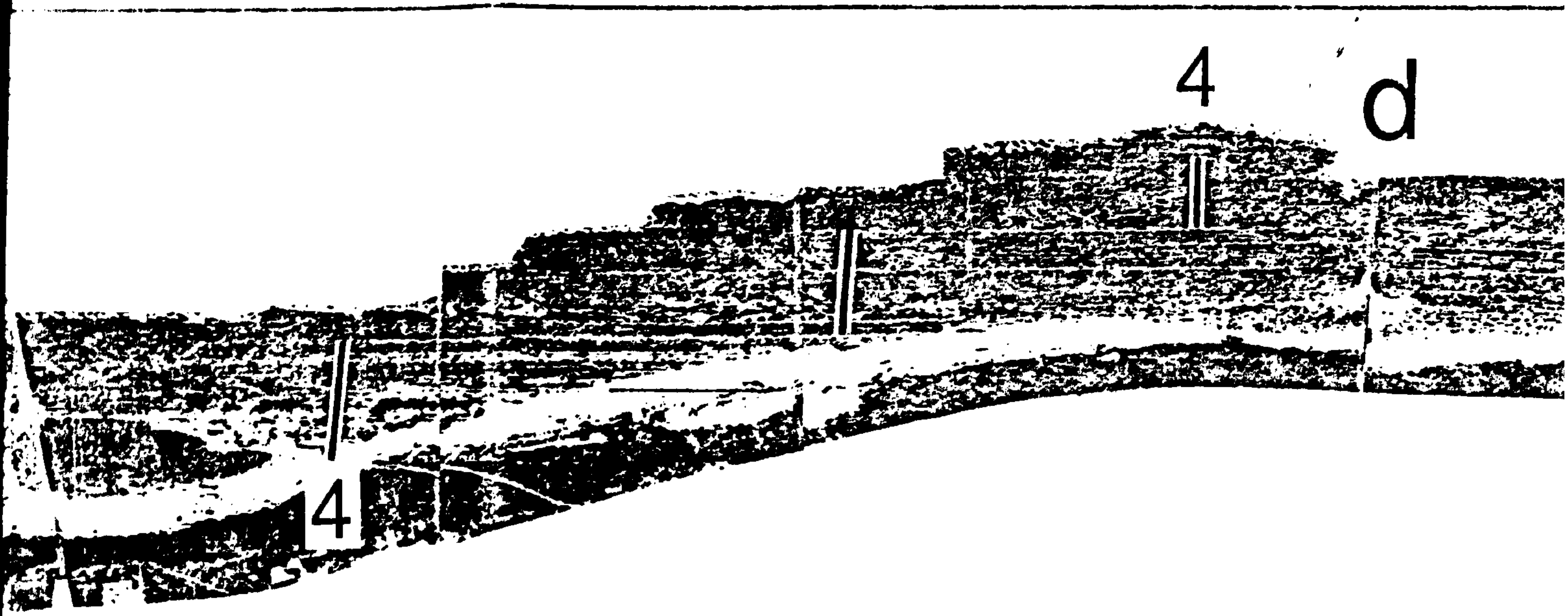

8

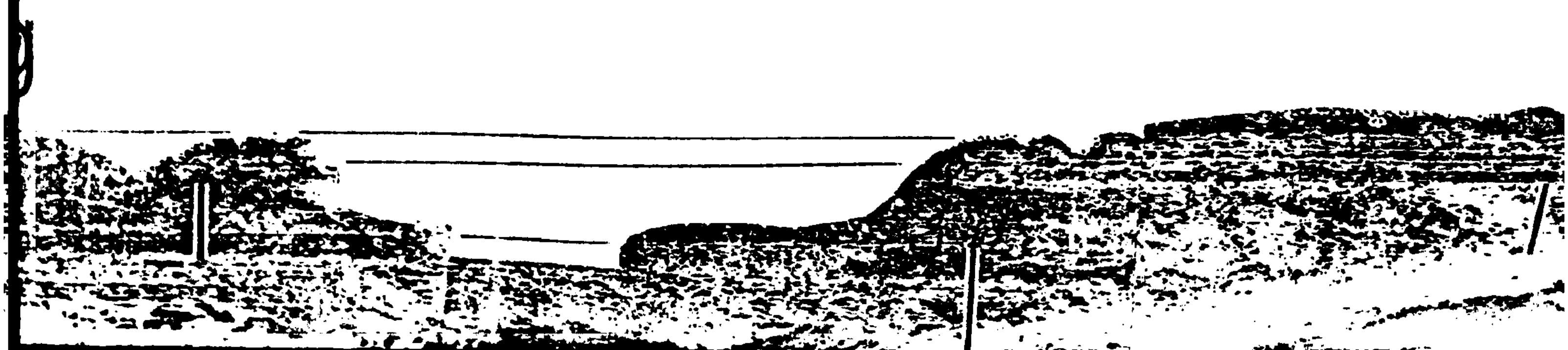

c
3
3

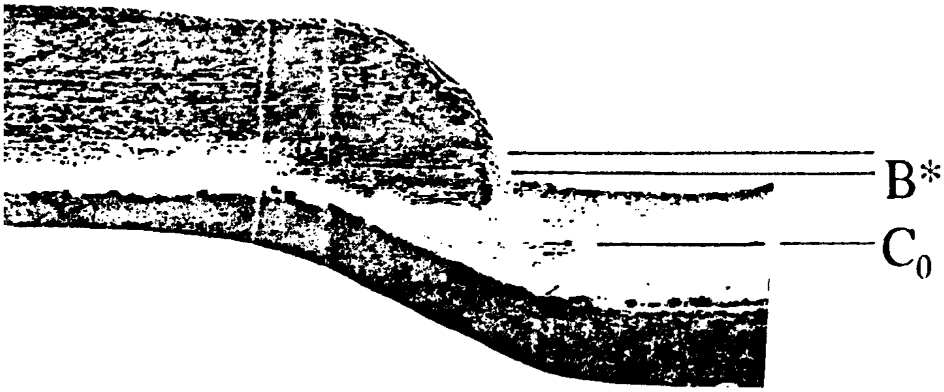

8
g


4
d
4

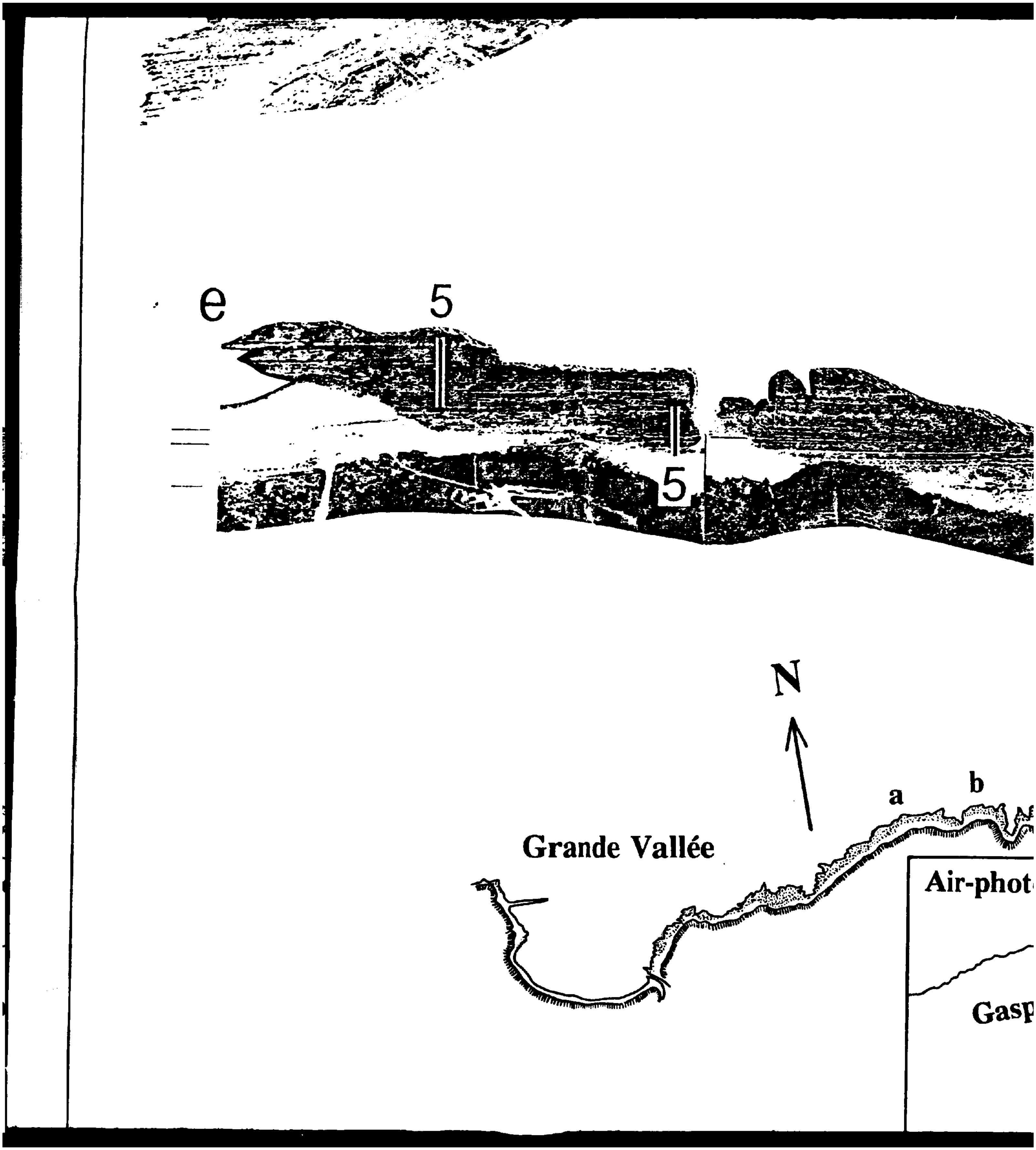

9

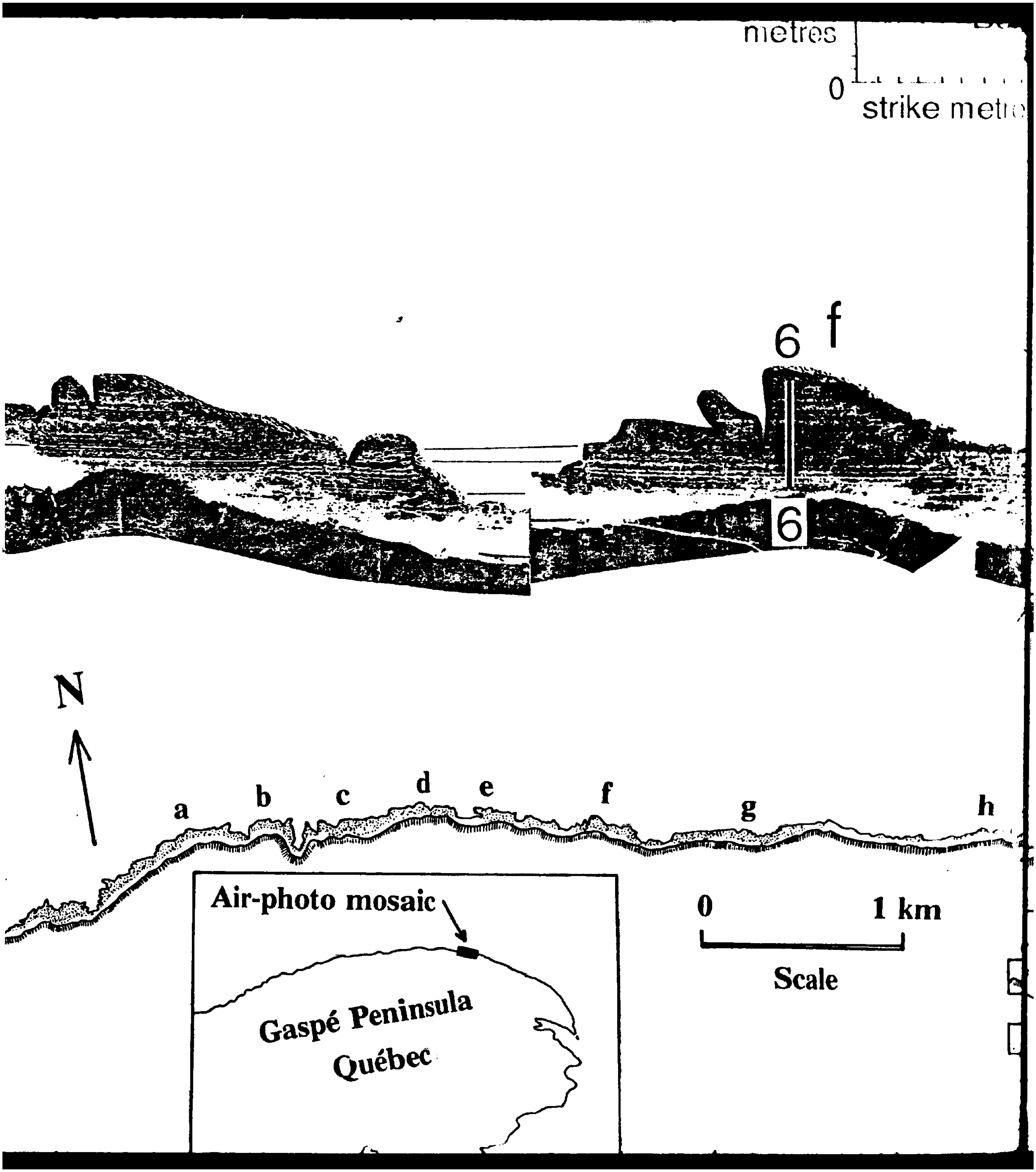

4
d
4



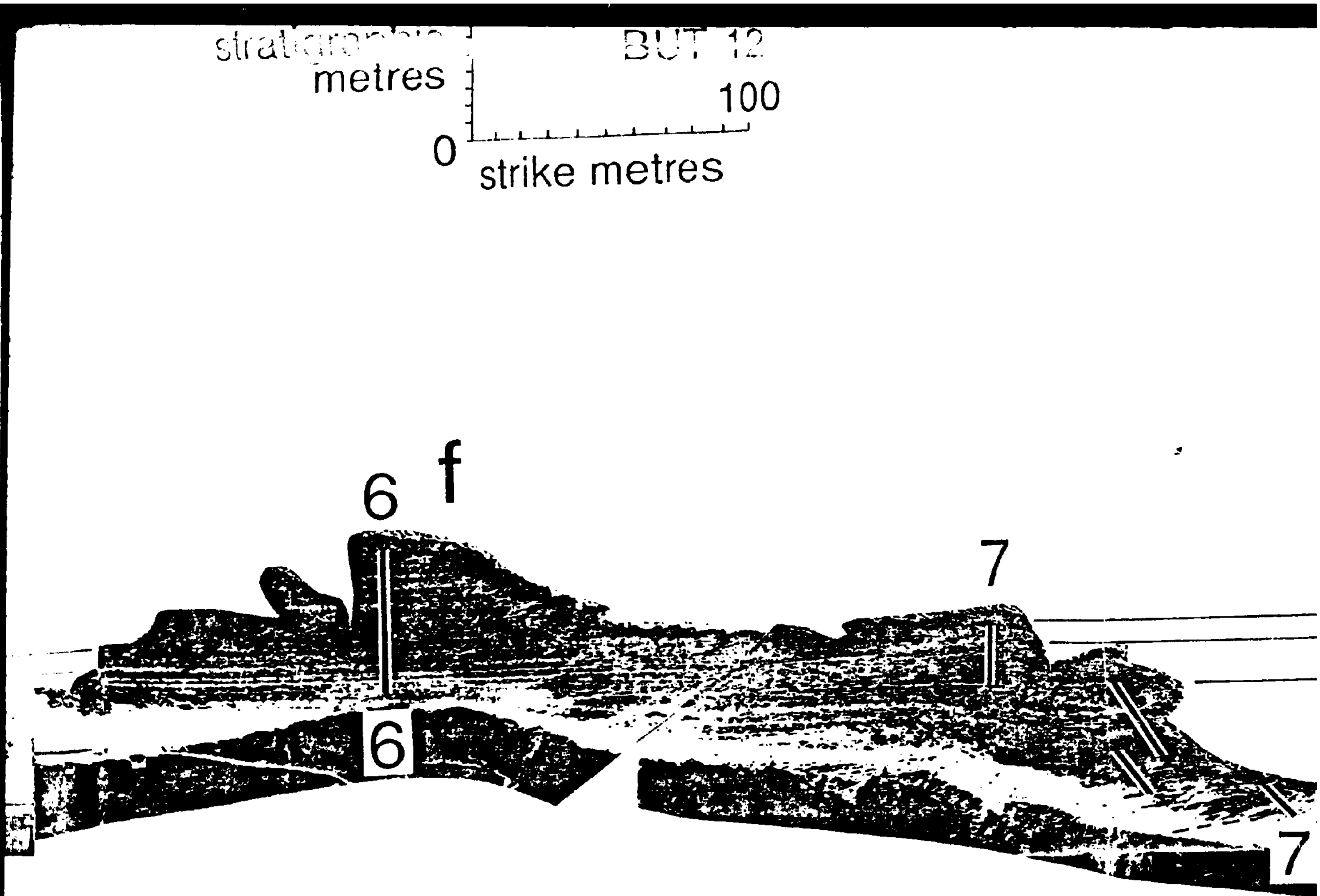

B*
C_0

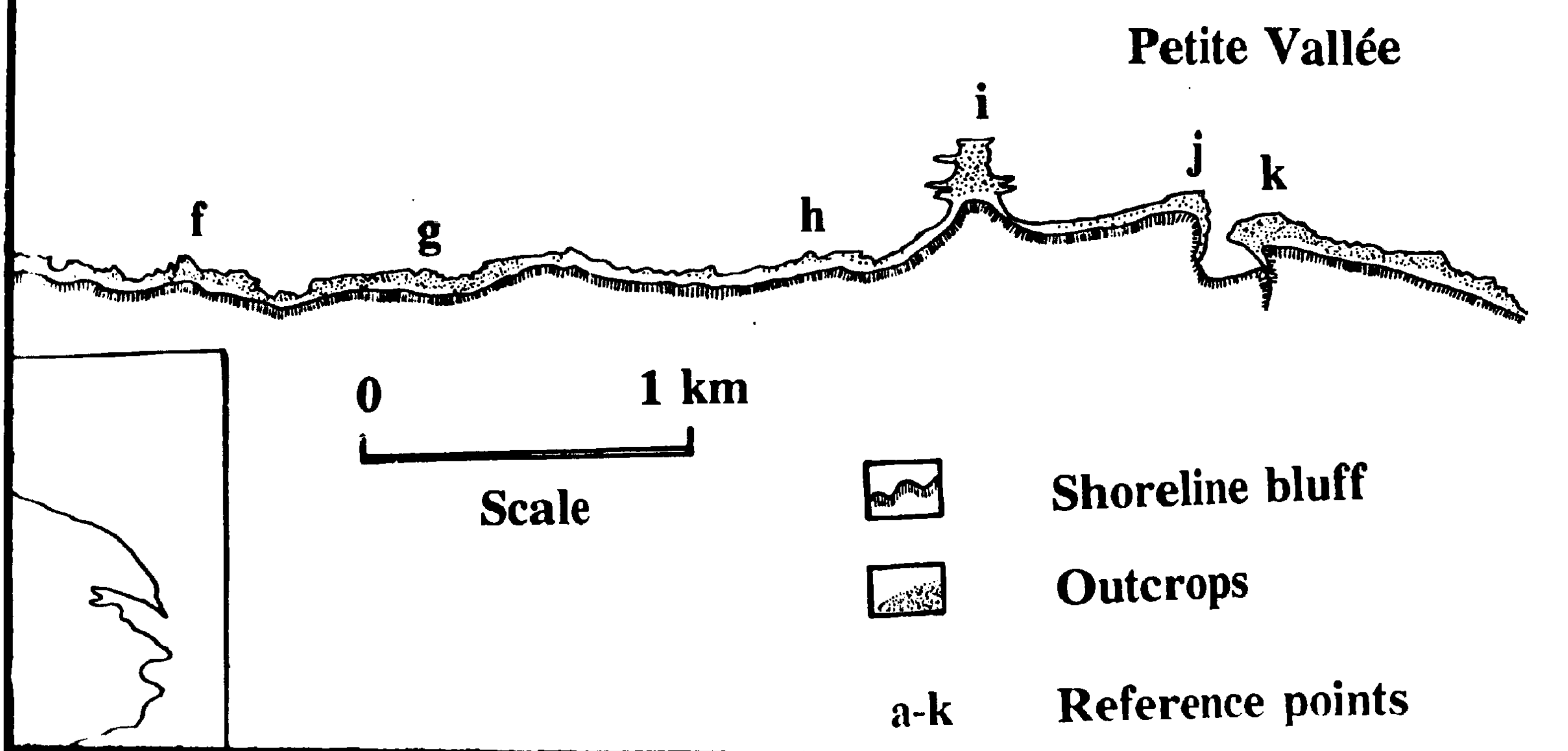

9
B*
C_0

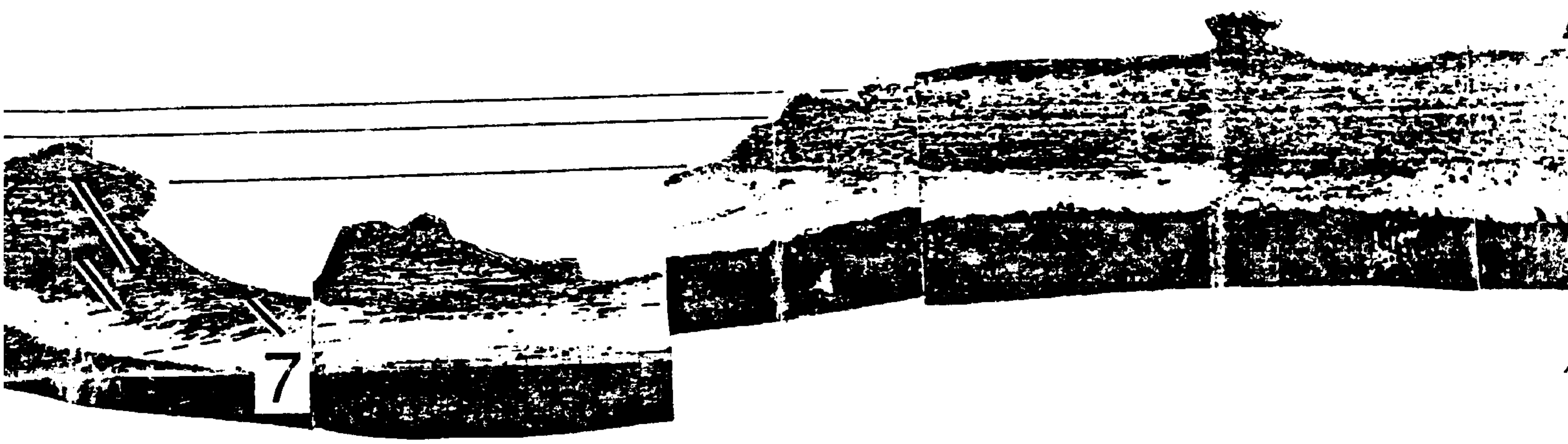

e
5
5
N
a
b
Grande Vallée



metres
0
strike metre
6
f
6
N
a
b
c
d
e
f
g
h
Air-photo mosaic
Gaspé Peninsula
Québec
0
1 km
Scale

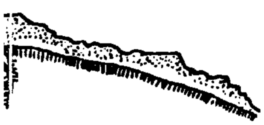

BUT 12
metres
100
0
strike metres
6
f
7
6
7


Petite Vallée
i
j
k
f
g
h
0
1 km
Scale
Shoreline bluff
Outcrops
a-k
Reference points



Vallée

k

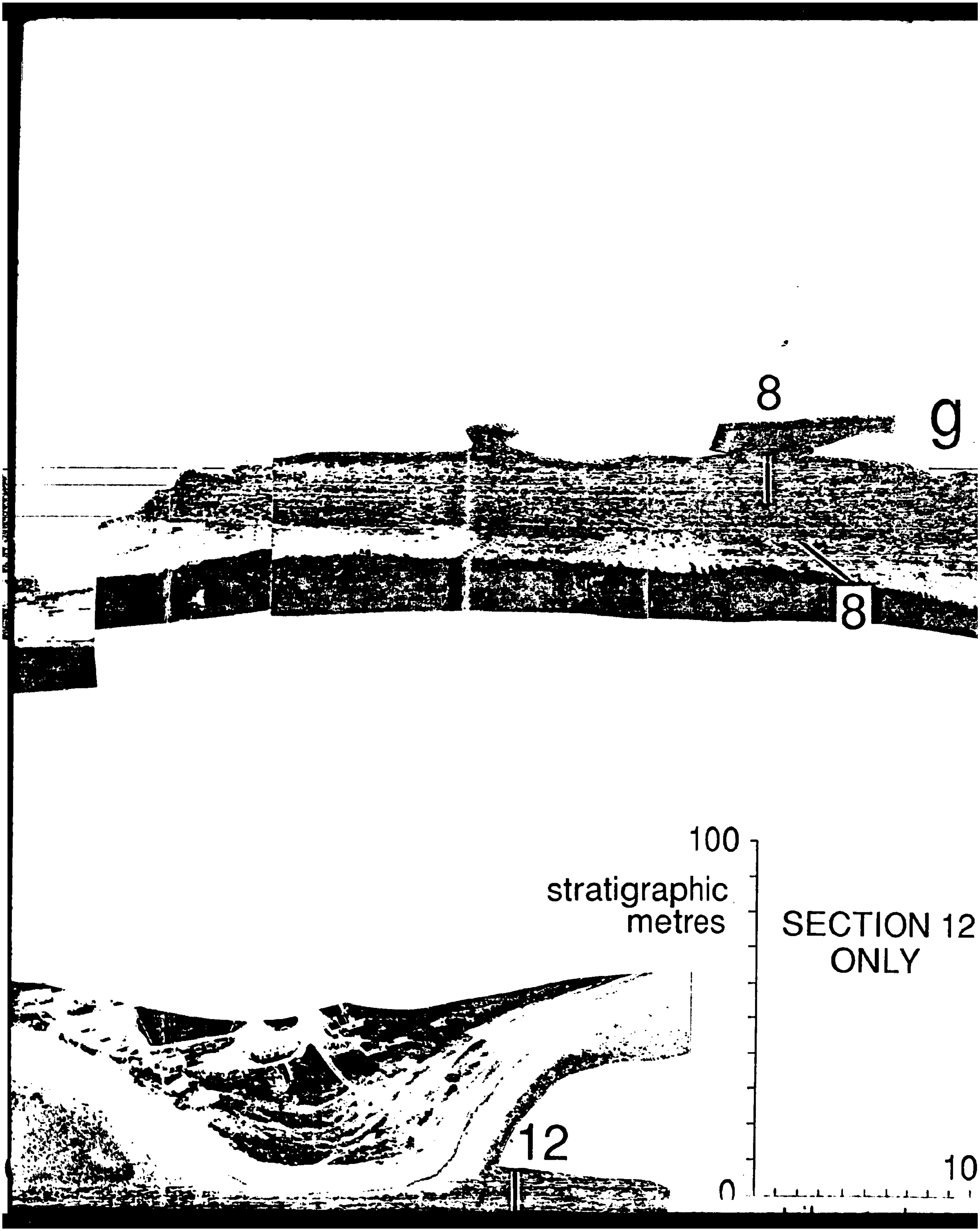


1

stratigraph
metre

bluff

points


8
g
8
100
stratigraphic
metres
SECTION 12
ONLY
12
10
0

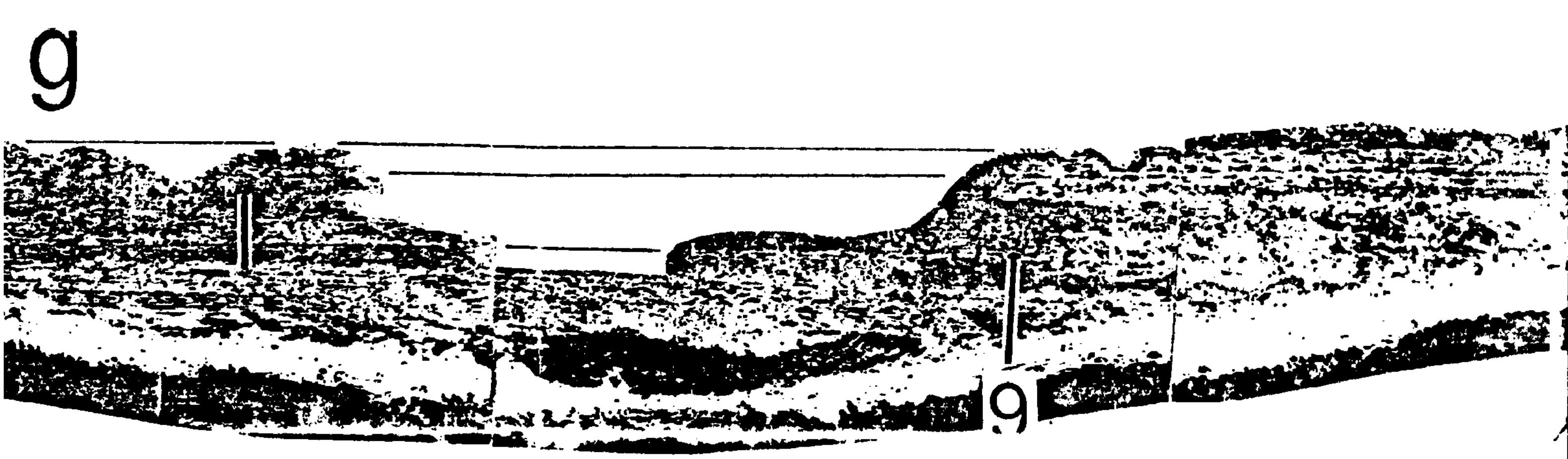


Figure 2.6 Aerial photograph mosaic which ali horizons across a set of fault blocks between Grande Vallée and Petite V horizons were selected because they traced on the photomosaic. Two of correspond to levels recognized in s (Fig. 2.7).

N 12

100

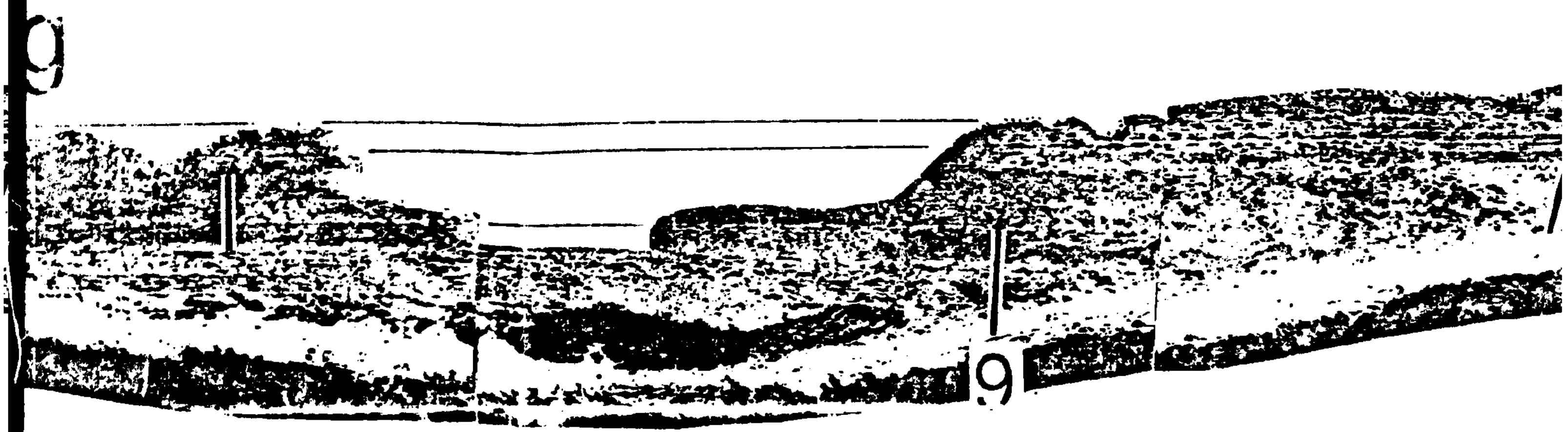


Figure 2.6 Aerial photograph mosaic which alig
horizons across a set of fault blocks
between Grande Vallée and Petite V
horizons were selected because they
traced on the photomosaic. Two of t
correspond to levels recognized in s
(Fig. 2.7).

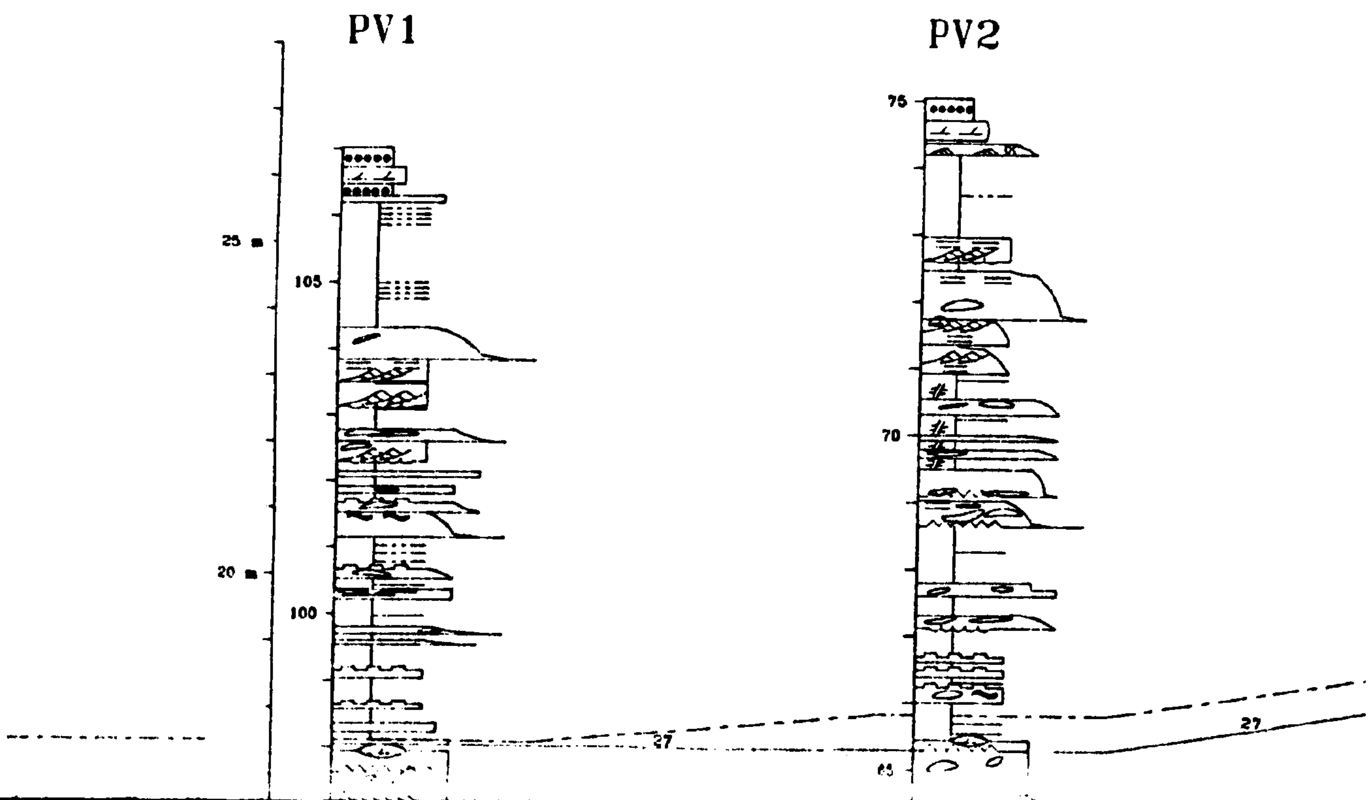
12

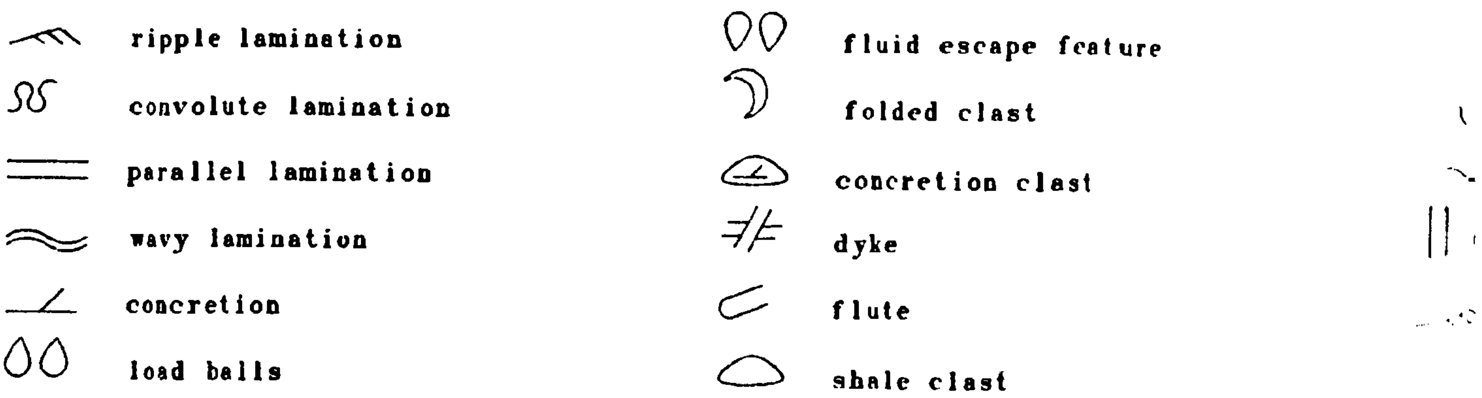
100

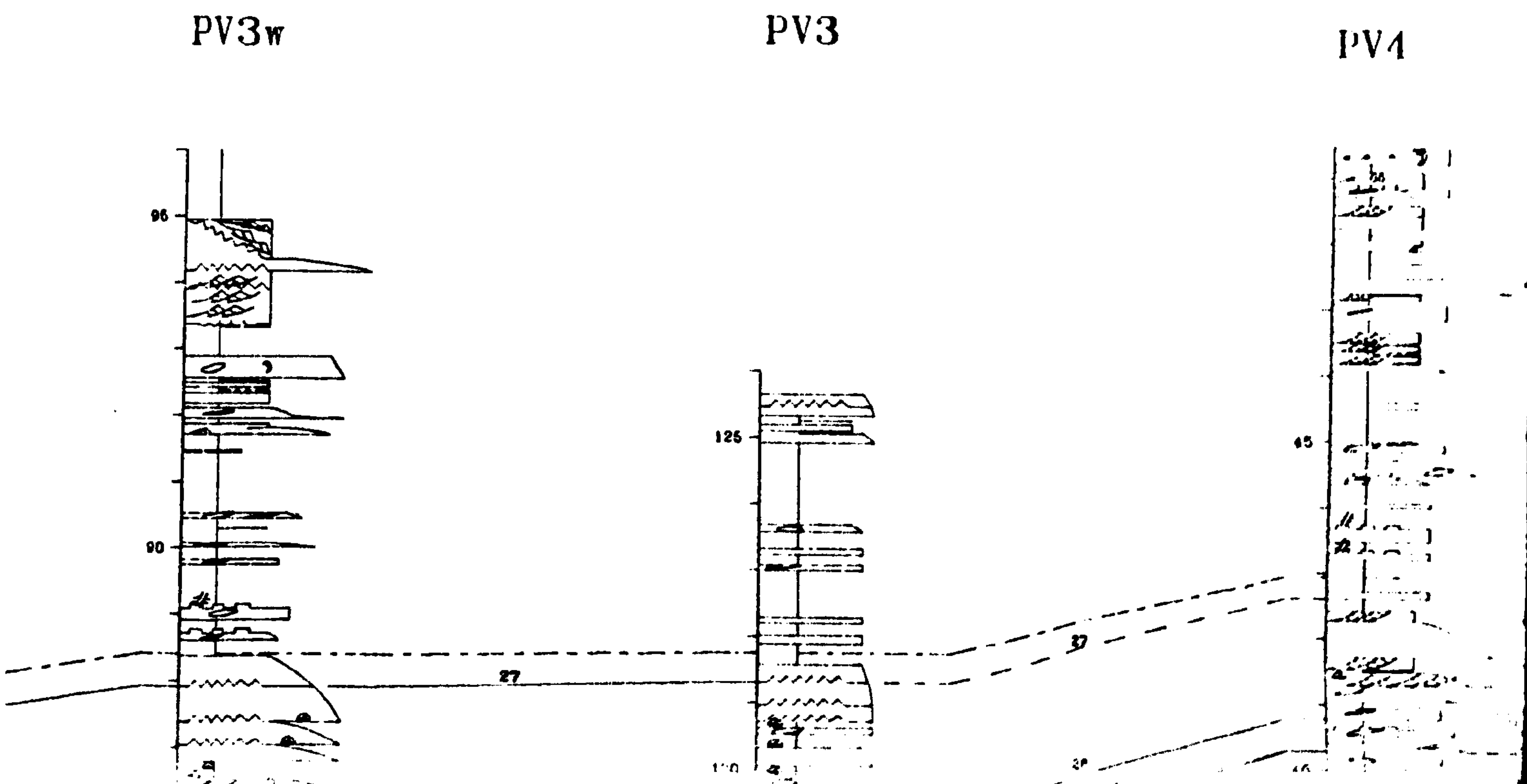
ı aligns four marker
ocks along the coast
ite Vallée. The marker
they could be easily
ɔ of these (C_0 and B*)
in sedimentary sections

Symbols

- —·—·—·— group boundary
- ———— correlated bed
- – – – – correlated bed (suspected)

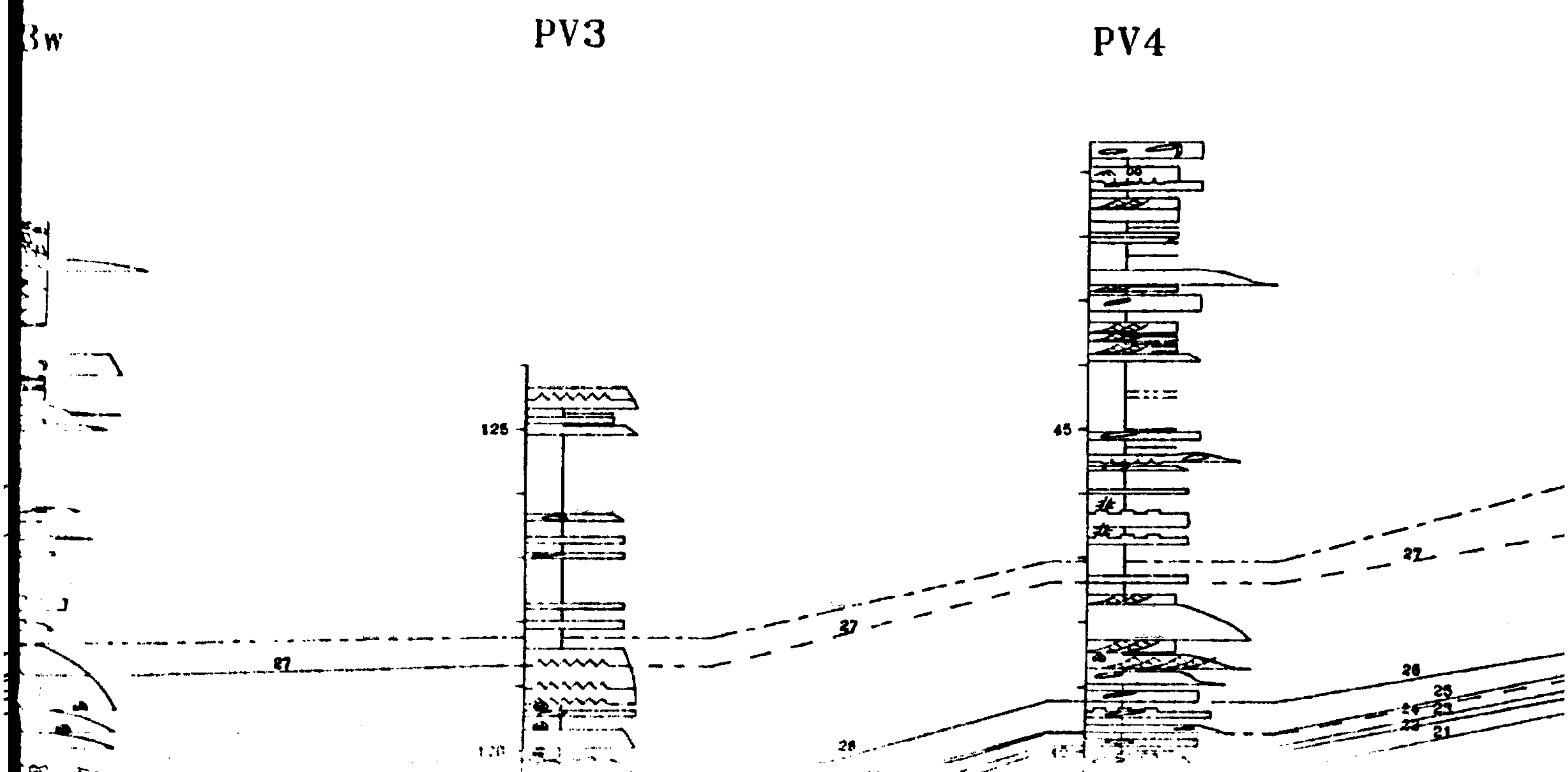



ripple lamination
convolute lamination
parallel lamination
wavy lamination
concretion
load balls
fluid escape feature
folded clast
concretion clast
dyke
flute
shale clast


PV3w
PV3
PV4
95
90
125
45
27
37

KEY

c lamination	fluid escape feature	groove
lute lamination	folded clast	load cast
lel lamination	concretion clast	lenticular bed
lamination	dyke	burrows
etion	flute	climbing rippl
balls	shale clast	



st

ar bed

; ripple

loaded base

wavy top

erosional base

irregular top

Grain size

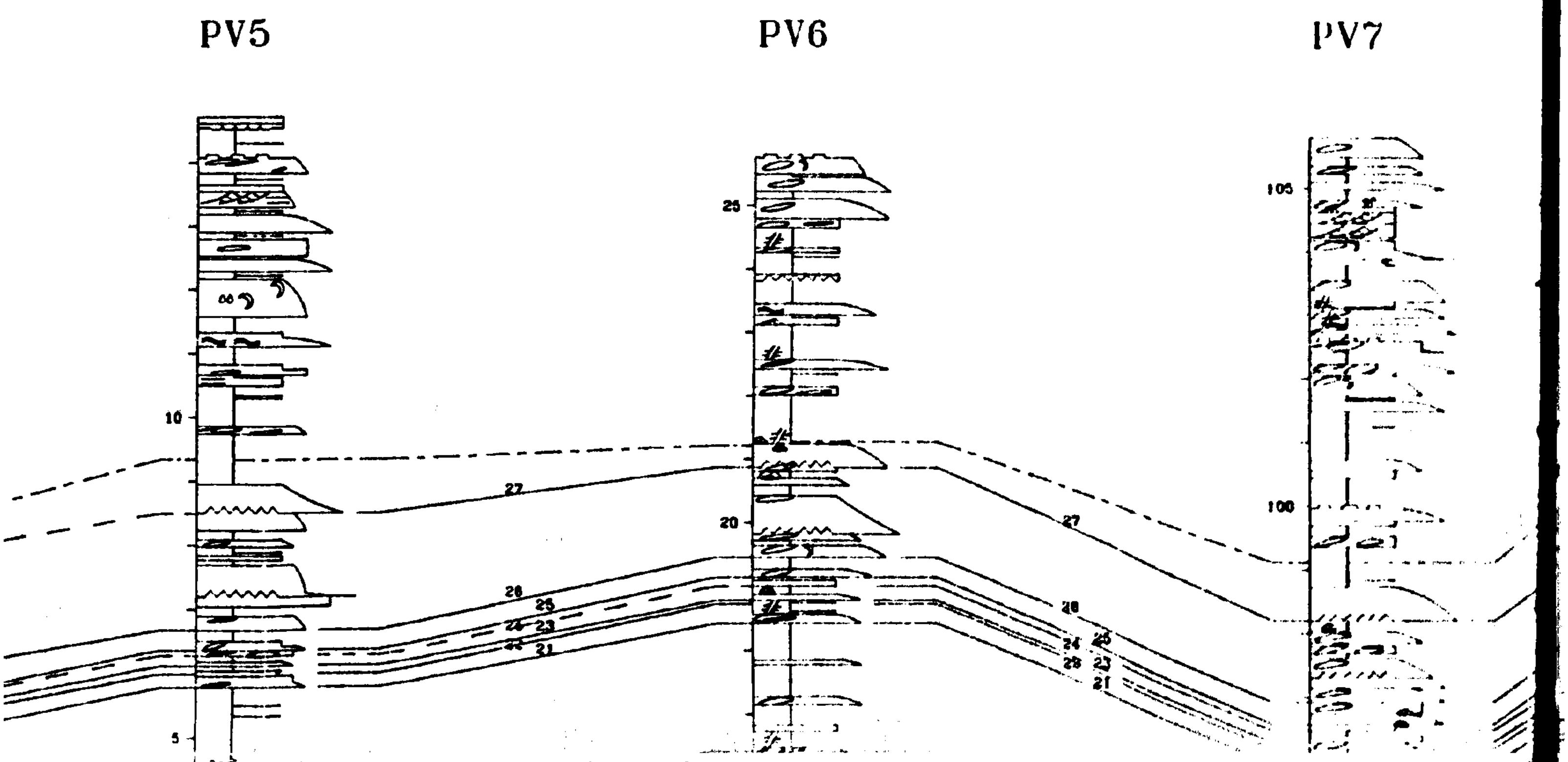
sh -- shale

st -- silt

vf -- very fine san

f -- fine sand

m -- medium sand



KEY

roove		loaded base	
oad cast		wavy top	
enticular bed		erosional base	
urrows		irregular top	
limbing ripple			

Grain size

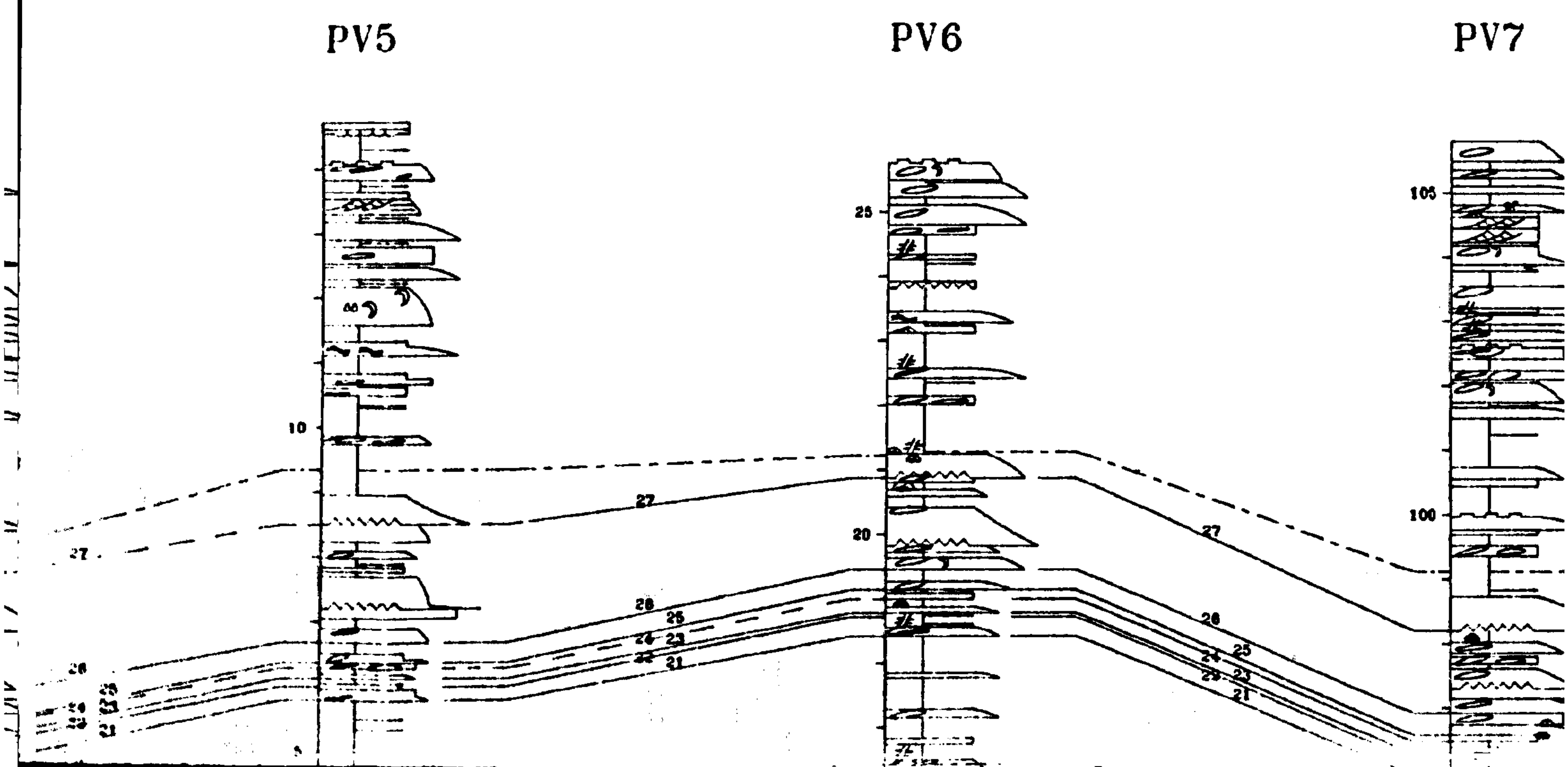
sh -- shale

st -- silt

vf -- very

f -- fine

m -- mediu



in size

sh -- shale

st -- silt

vf -- very fine sand

f -- fine sand

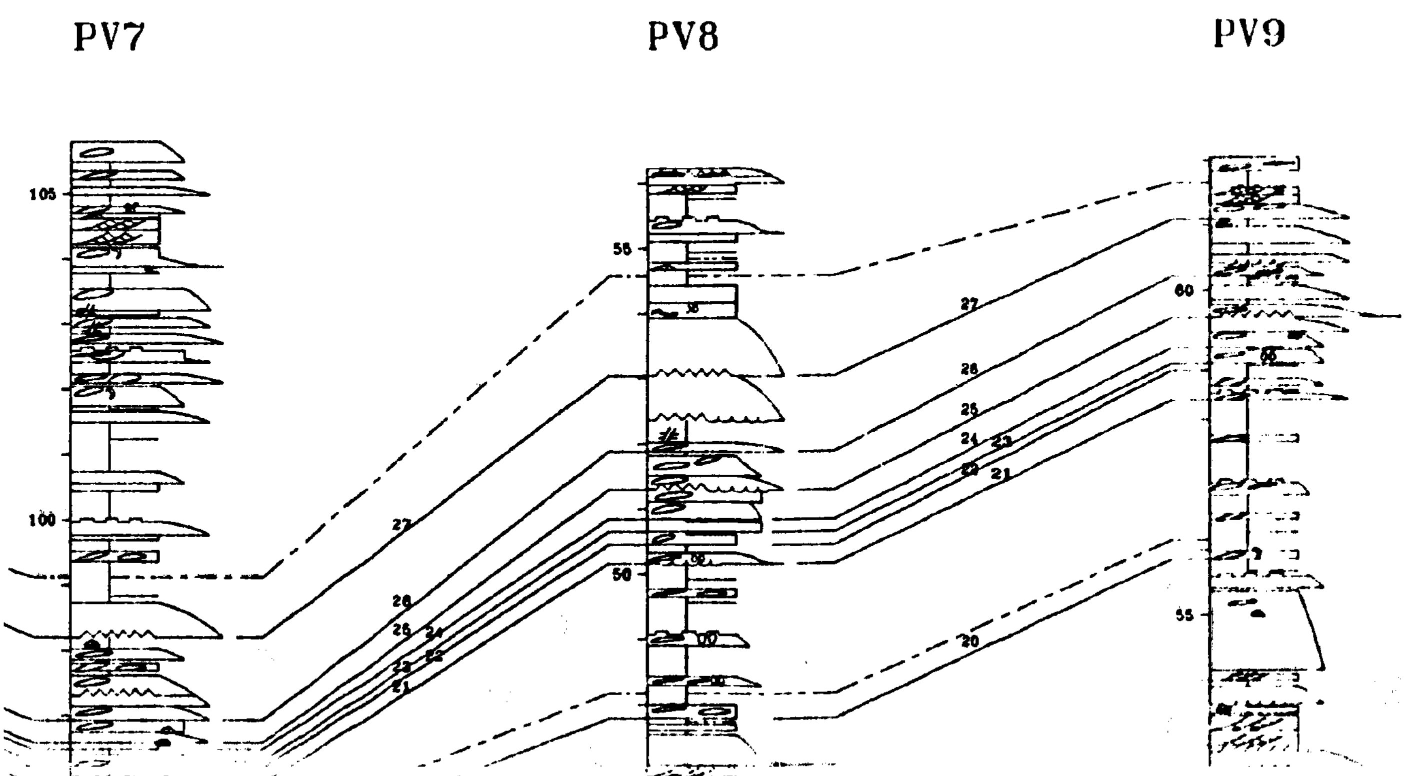
m -- medium sand

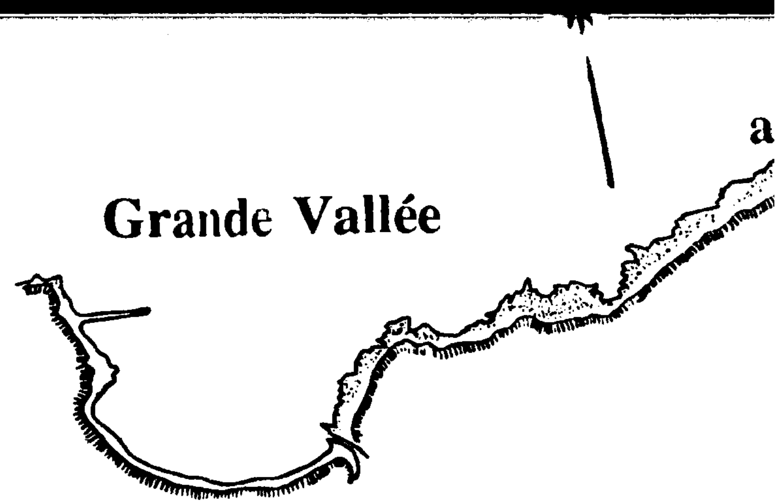
c -- coarse sand

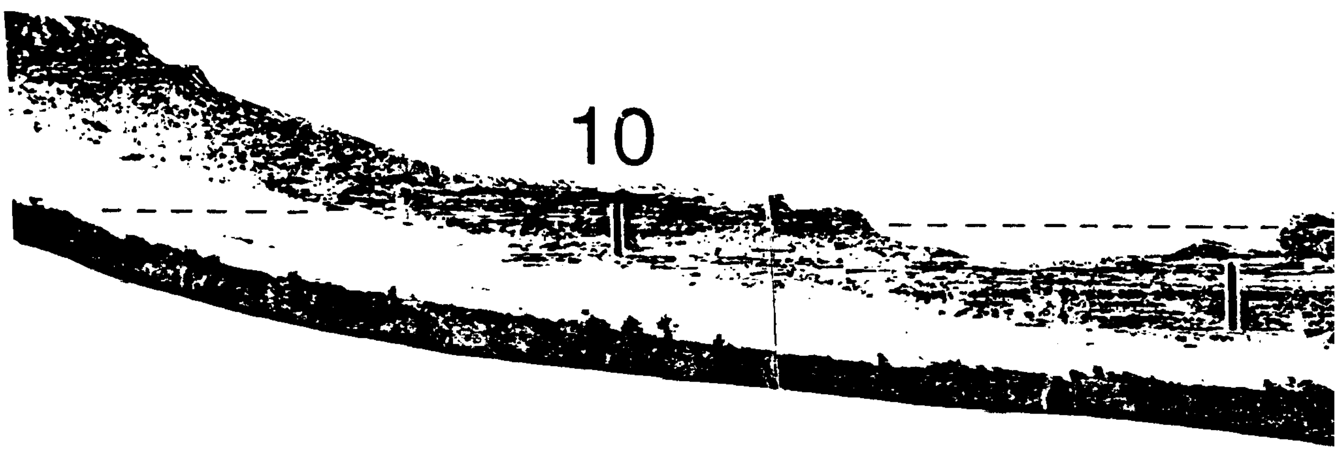
vc -- very coarse sand

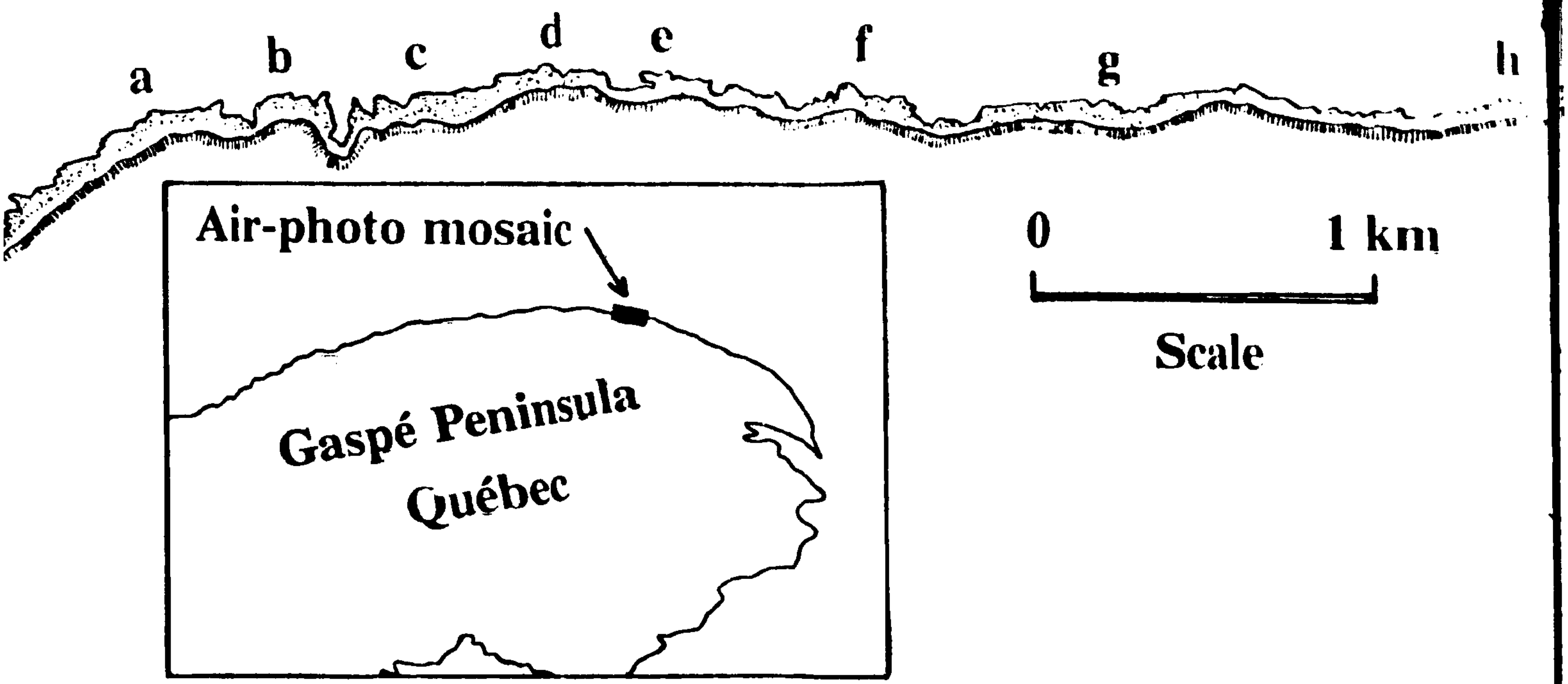
g -- granule

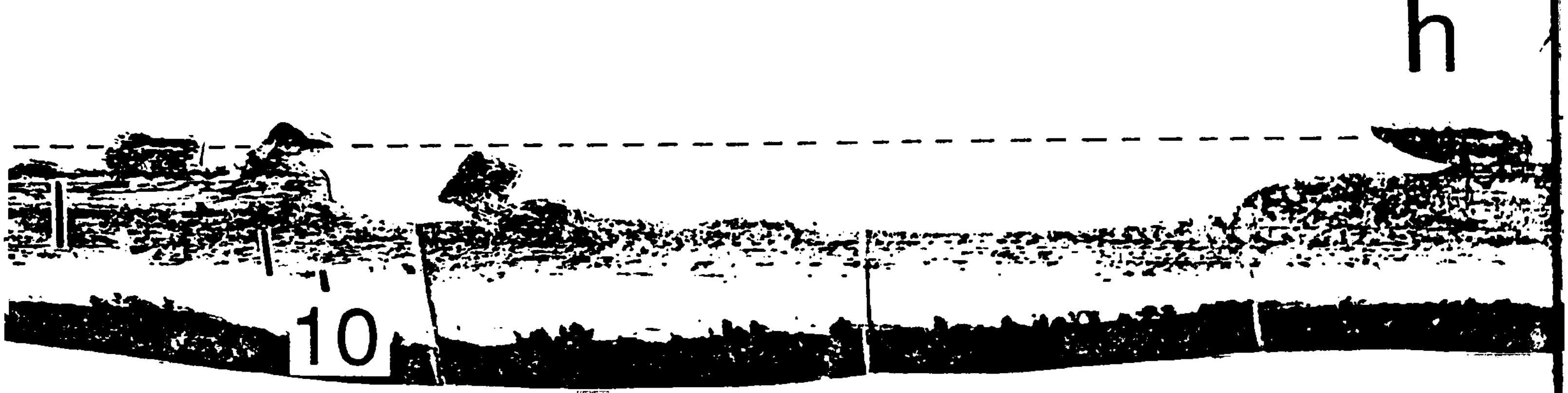
p -- pebble

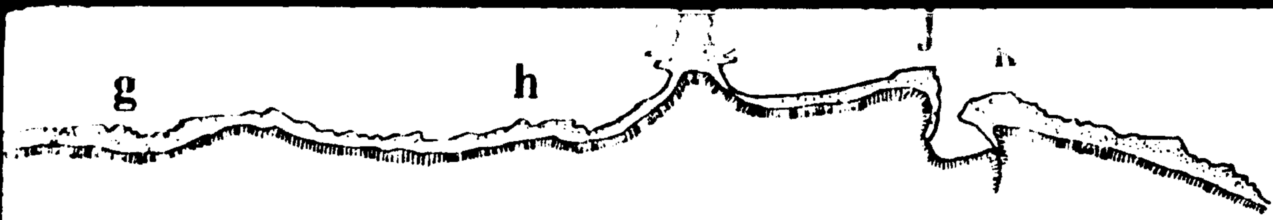



Grande Vallée
a


10


a
b
c
d
e
f
g
h
Air-photo mosaic
Gaspé Peninsula
Québec
0
1 km
Scale


h
10



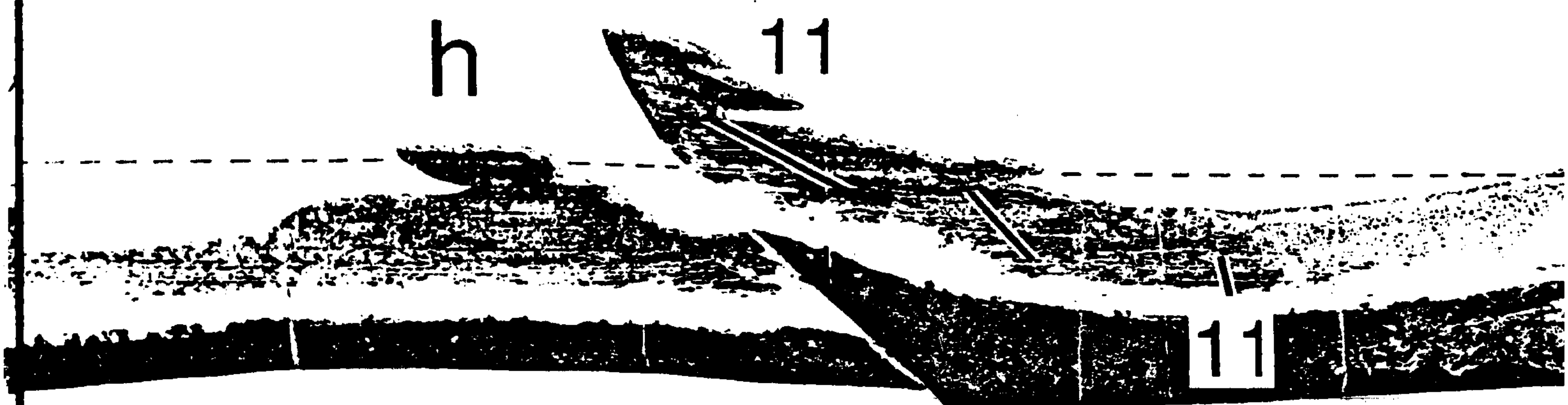
0 1 km

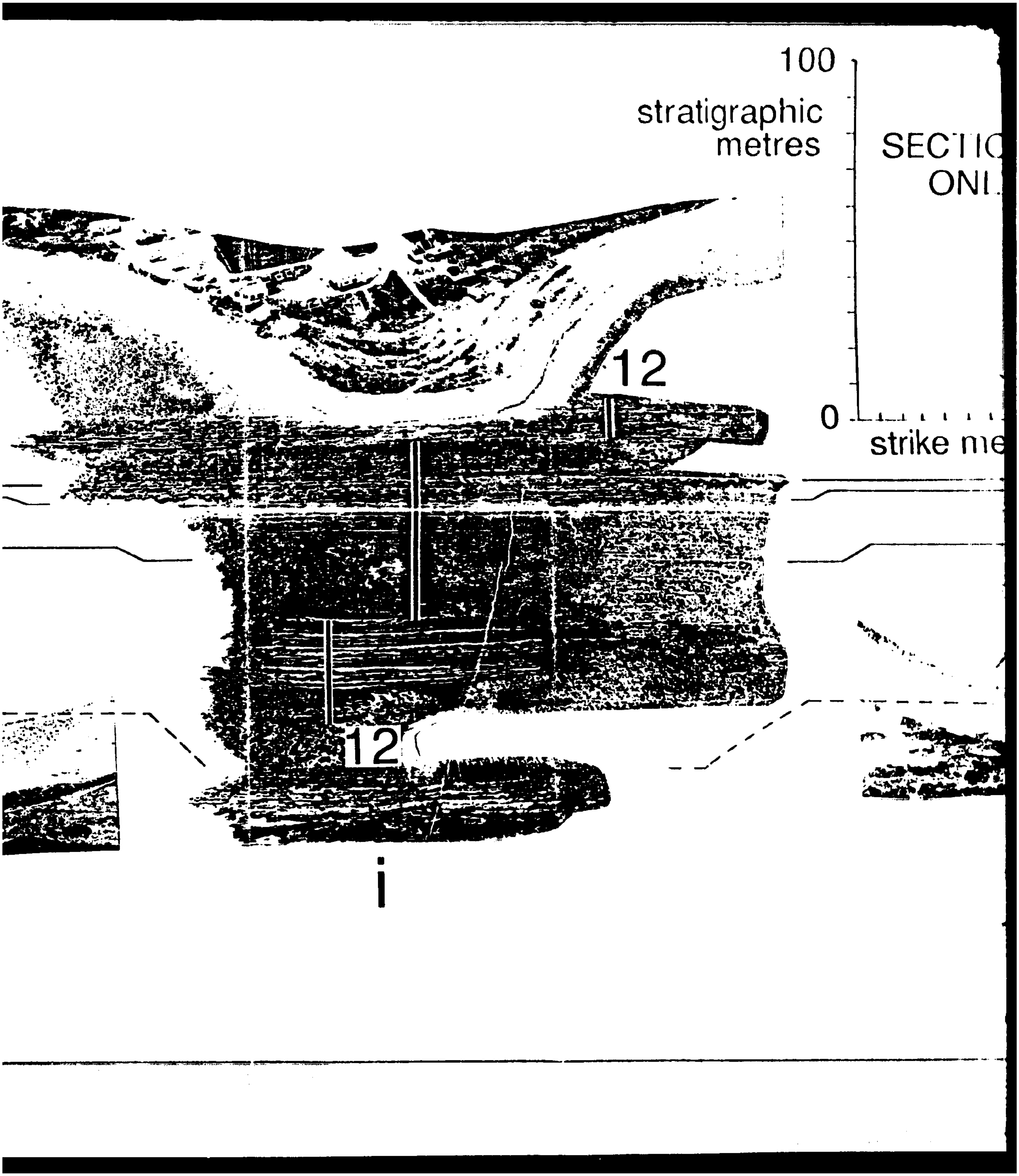
Scale

Shoreline bluff

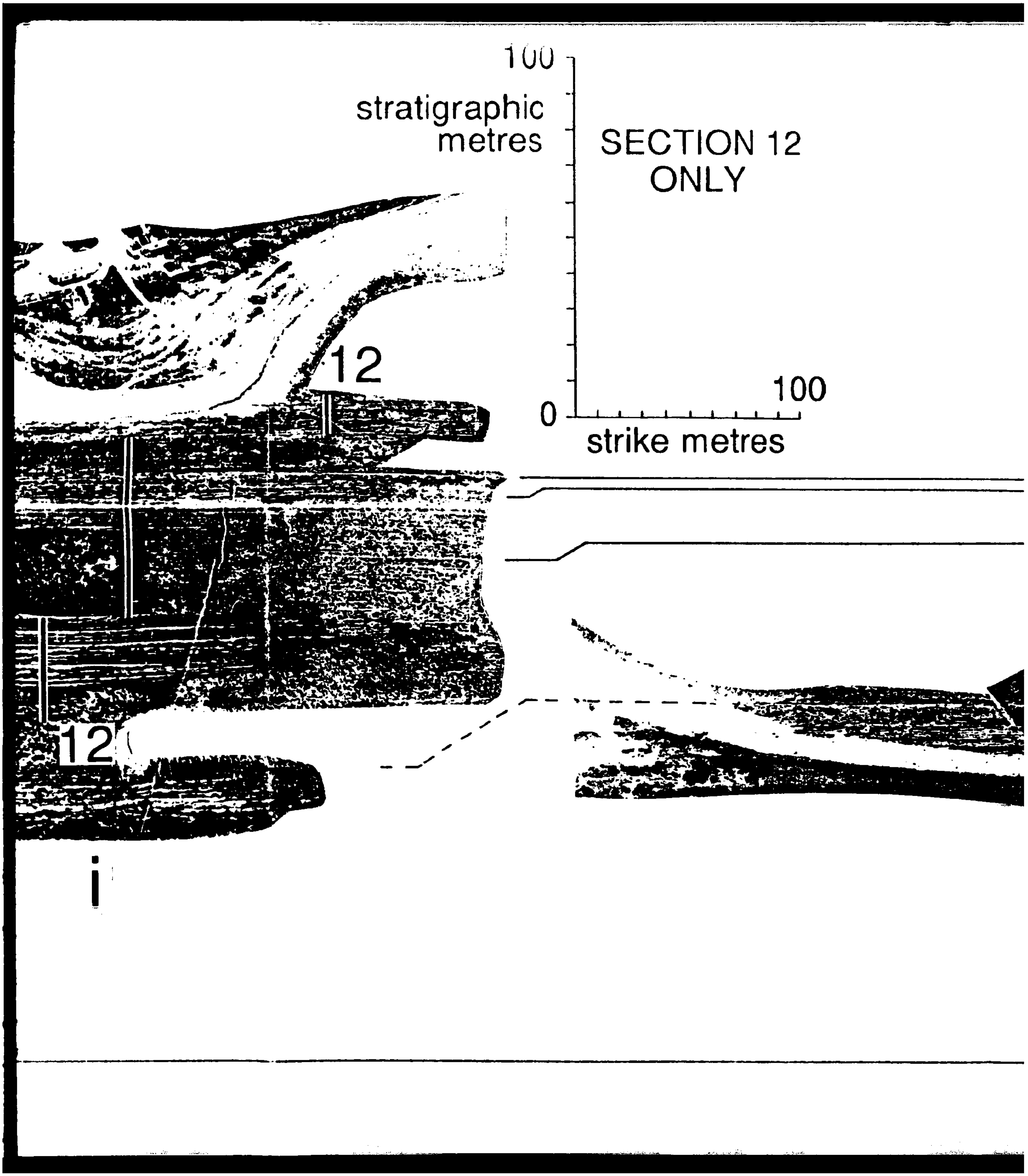
Outcrops

a-k Reference points





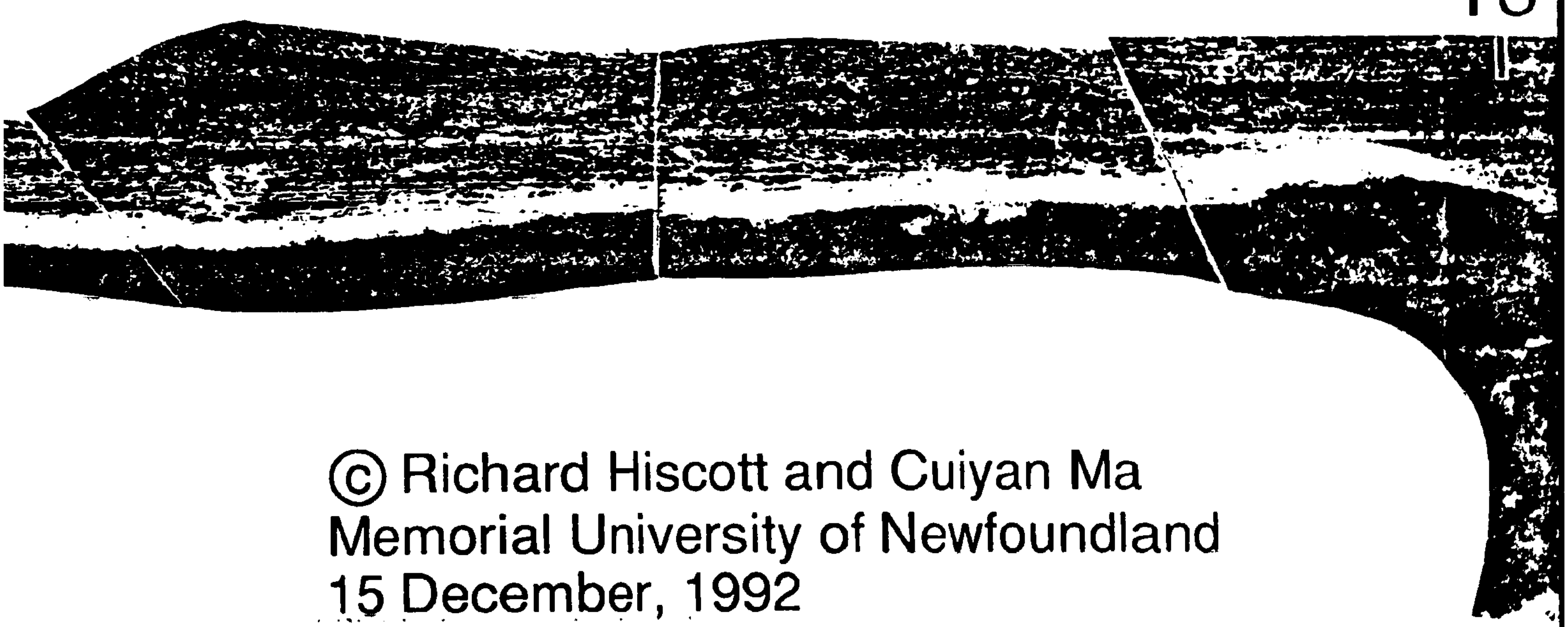
100
stratigraphic
metres
SECTIO
ONL
12
0
strike me
12
i



100
stratigraphic metres
SECTION 12 ONLY
12
100
0
strike metres
12
i

2.6 Aerial photograph mosaic which aligns four mar horizons across a set of fault blocks along the coas between Grande Vallée and Petite Vallée. The mar horizons were selected because they could be easil traced on the photomosaic. Two of these (C_0 and B correspond to levels recognized in sedimentary sec (Fig. 2.7).

13



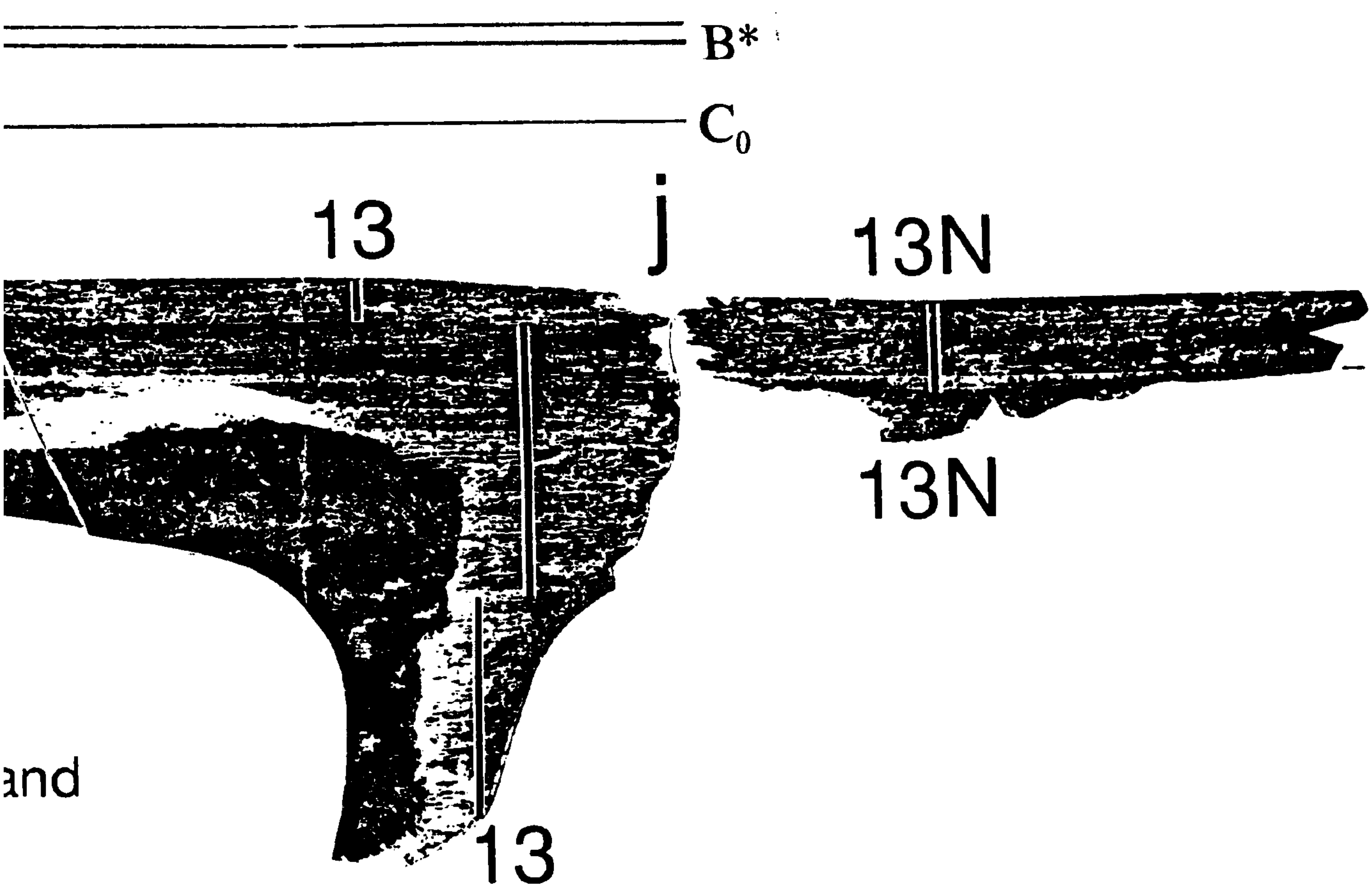
12

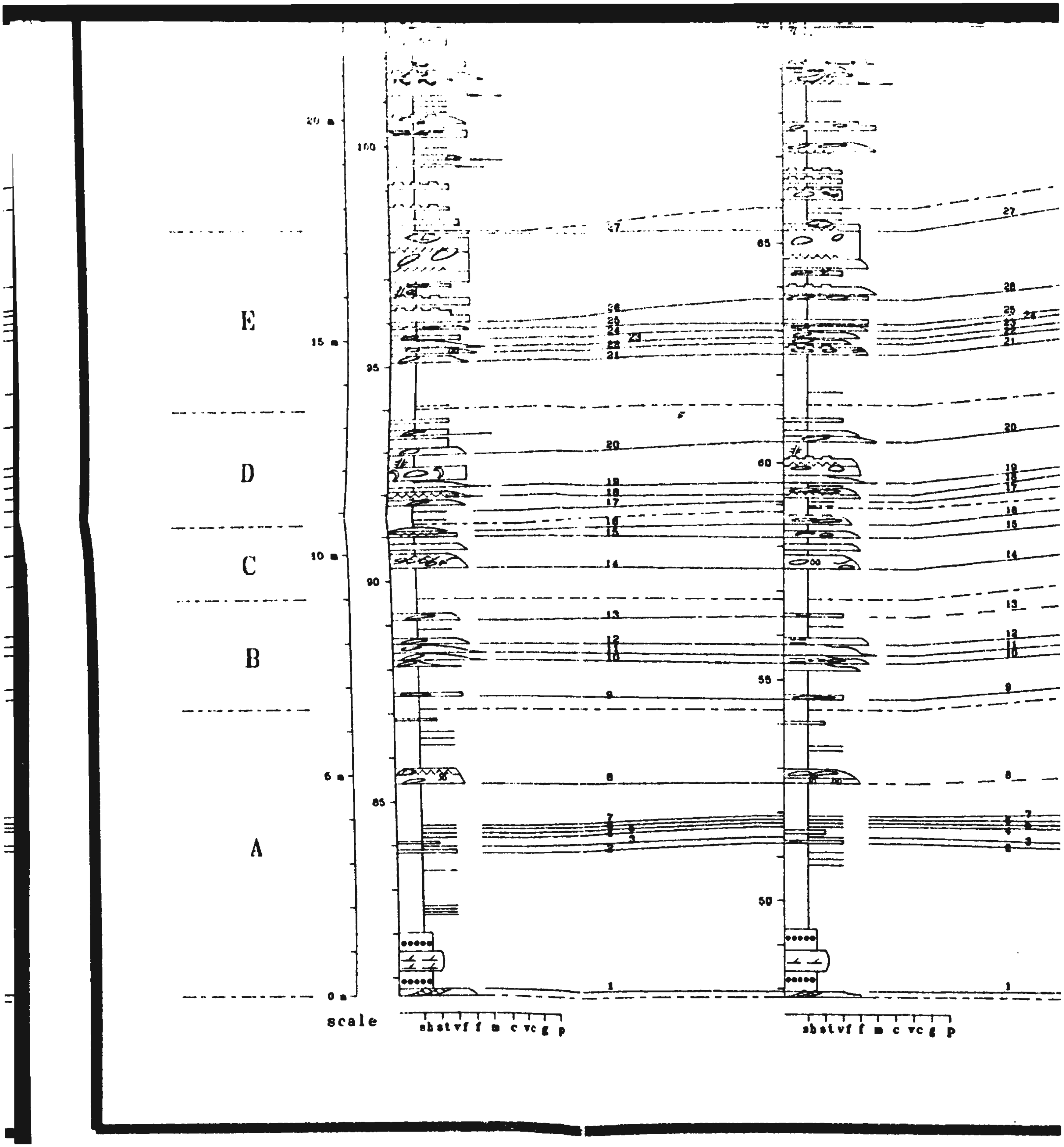
Figure 2.6 Aerial photograph mosaic which alig
horizons across a set of fault blocks
between Grande Vallée and Petite V
horizons were selected because they
traced on the photomosaic. Two of t
correspond to levels recognized in s
(Fig. 2.7).

100

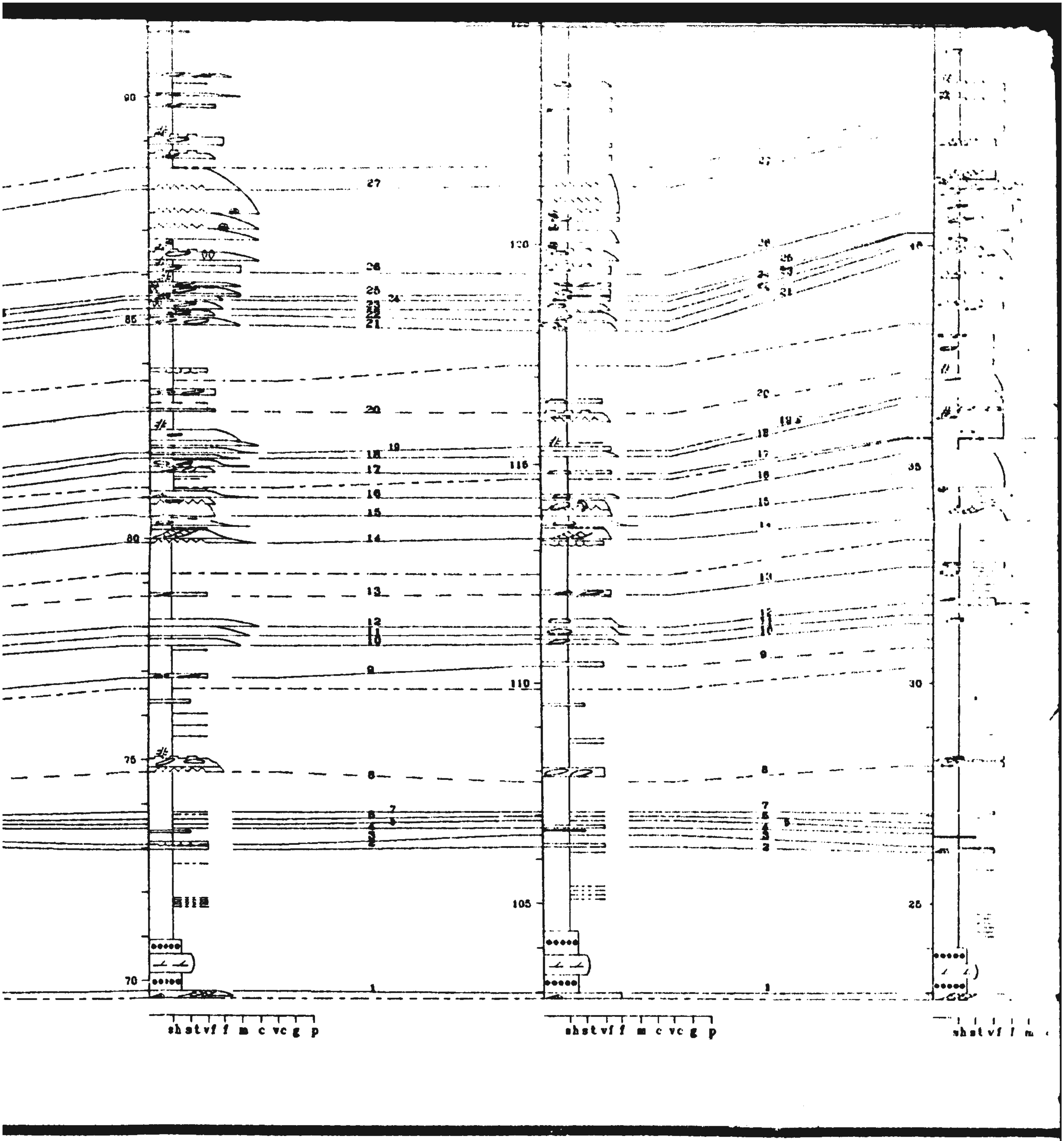
es

ights four marker
:ks along the coast
: Vallée. The marker
ey could be easily
of these (C_0 and B*)
n sedimentary sections





E
D
C
B
A
20 m
15 m
10 m
6 m
0 m
scale
100
95
90
85
65
60
55
50
sh st vf f m c vc g p
sh st vf f m c vc g p



90
85
80
75
70
27
26
25
24
23
22
21
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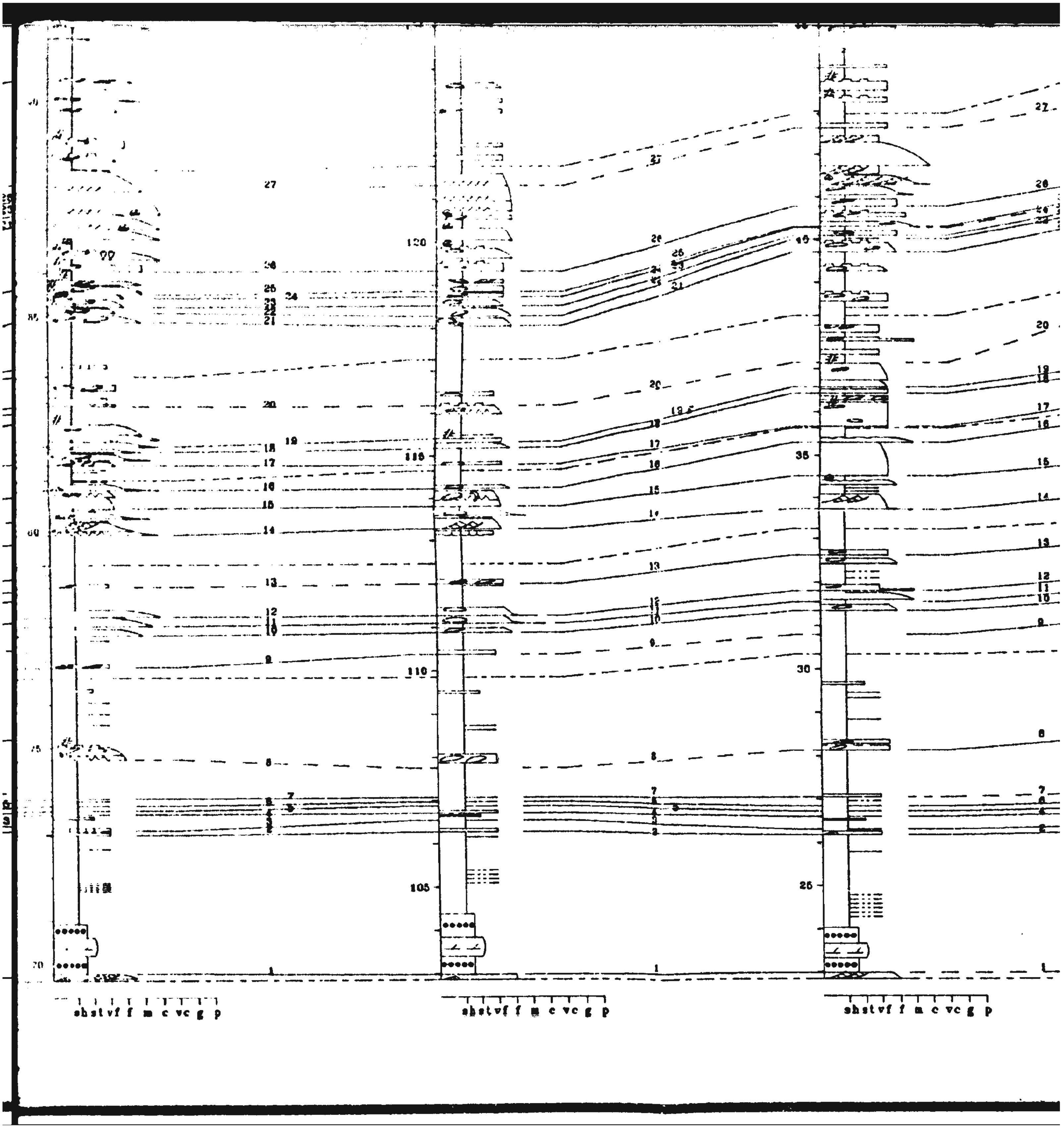
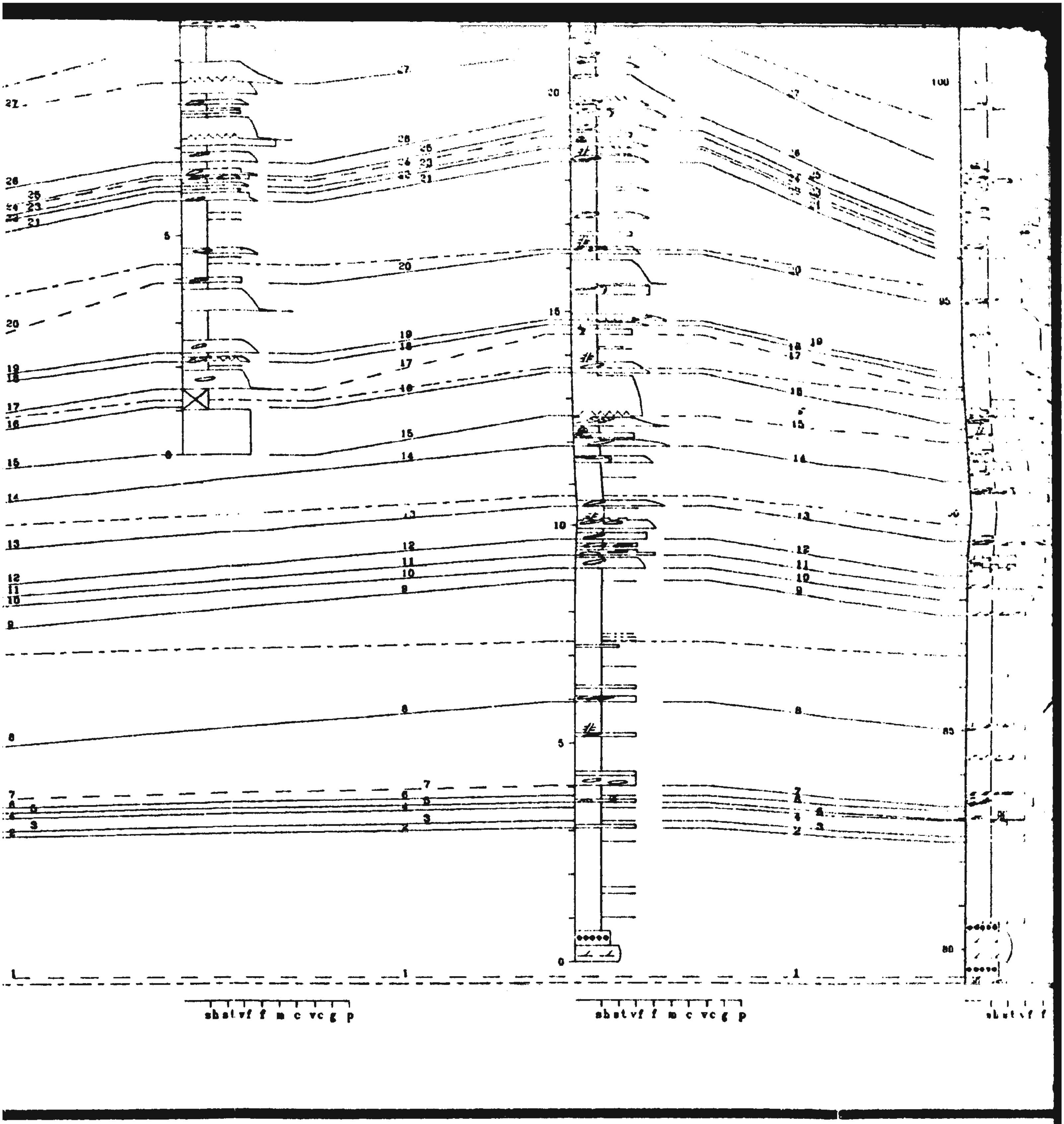
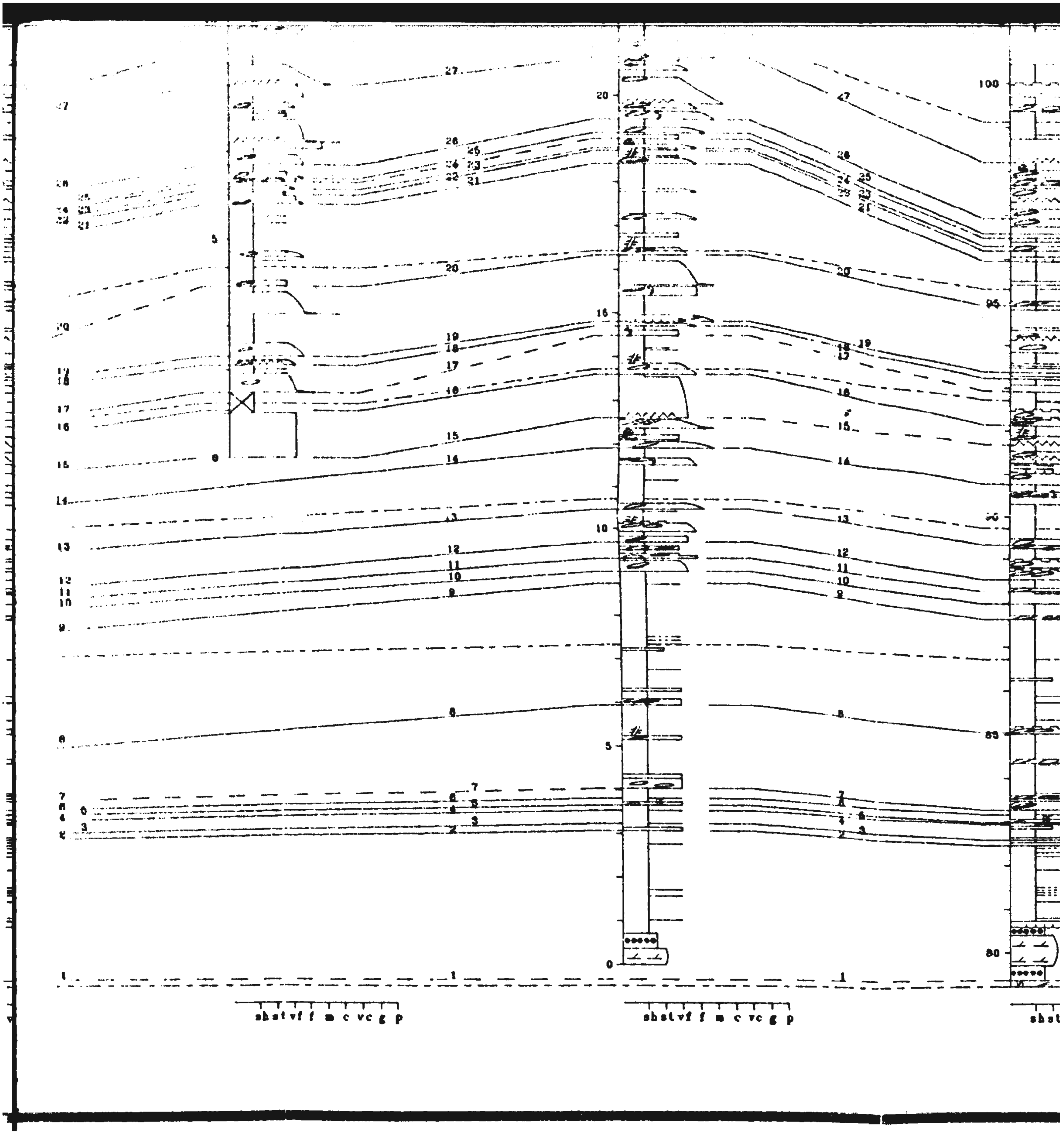
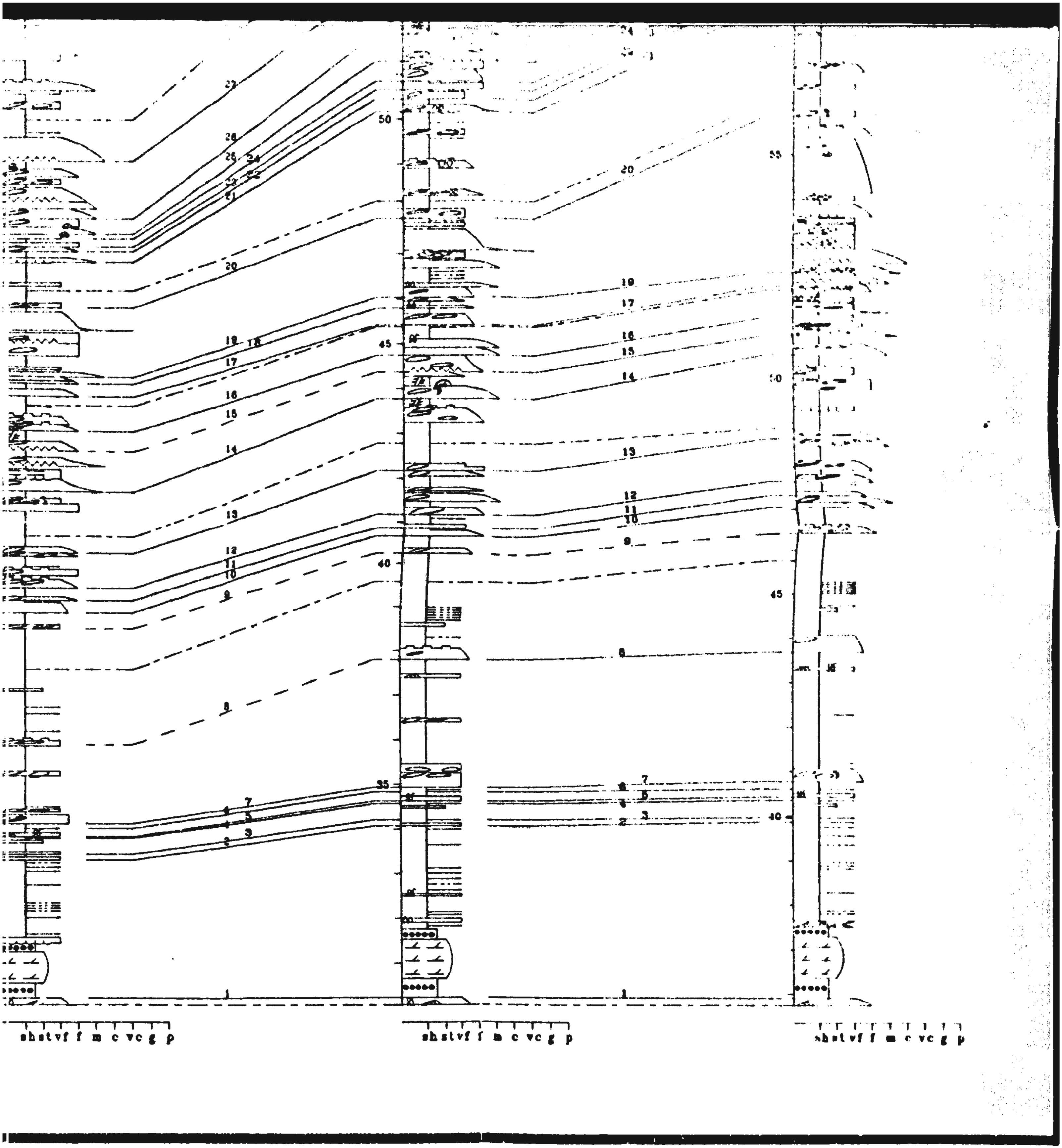
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
120
115
110
105
35
30
25
sh st vf f m c vc g p
sh st vf f m c vc g p




sh s t vf f m c vc g p
sh s t vf f m c vc g p
sh s t vf f



sh st vf f m c vc g p
sh st vf f m c vc g p


50
45
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15
16
17
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19
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21
22
24
26
28
27
sh st vf f m c vc g p
sh st vf f m c vc g p
sh st vf f m c vc g p