HOLOCENE ENVIRONMENTAL CHANGE THROUGH NATURAL PROCESSES AND HUMAN INFLUENCE IN SALENTO, SOUTH-EAST ITALY: AN INTEGRATED GEOMORPHOLOGICAL AND PALYNOLOGICAL INVESTIGATION

(In two volumes)

by

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Volume 2

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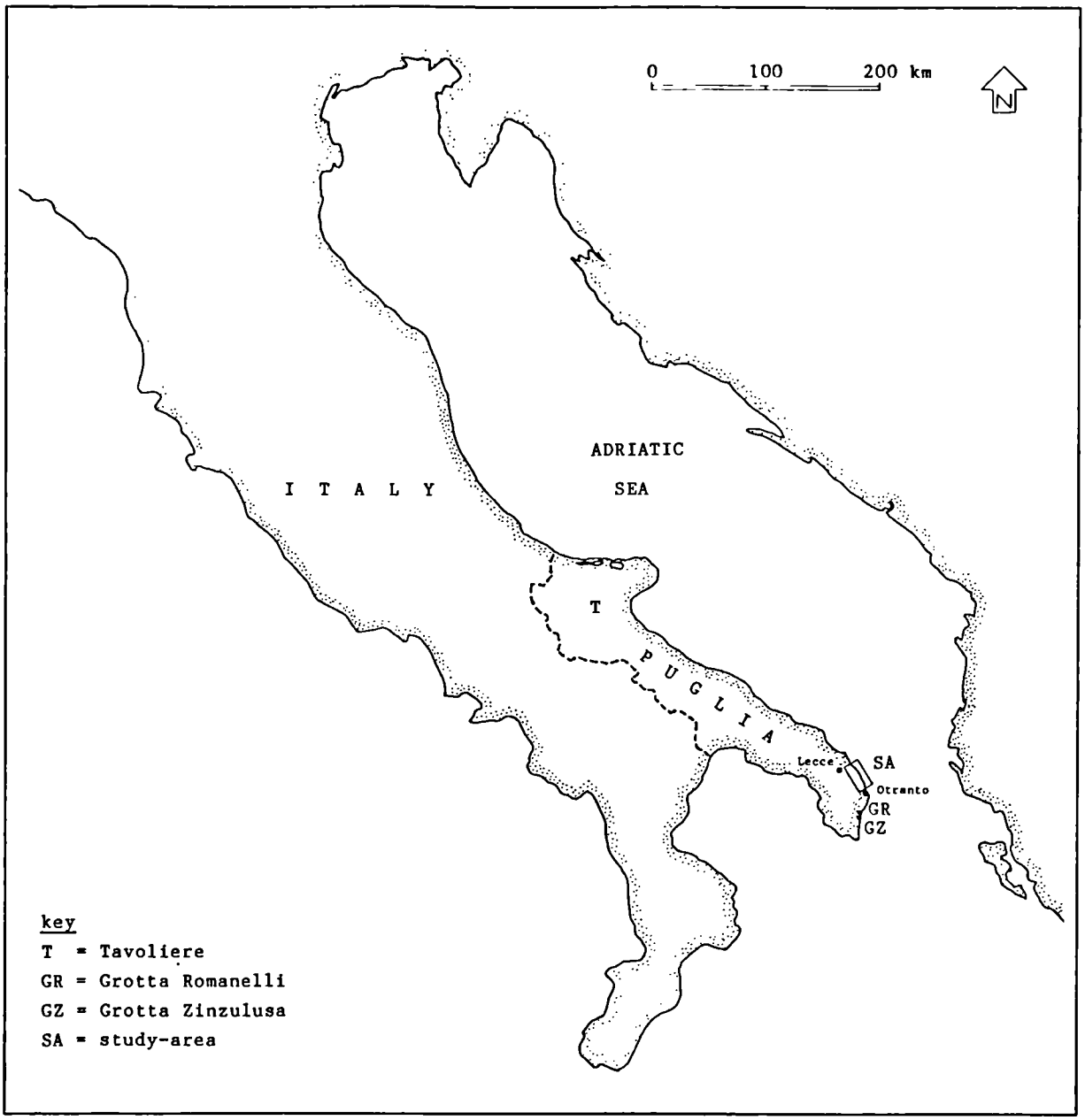

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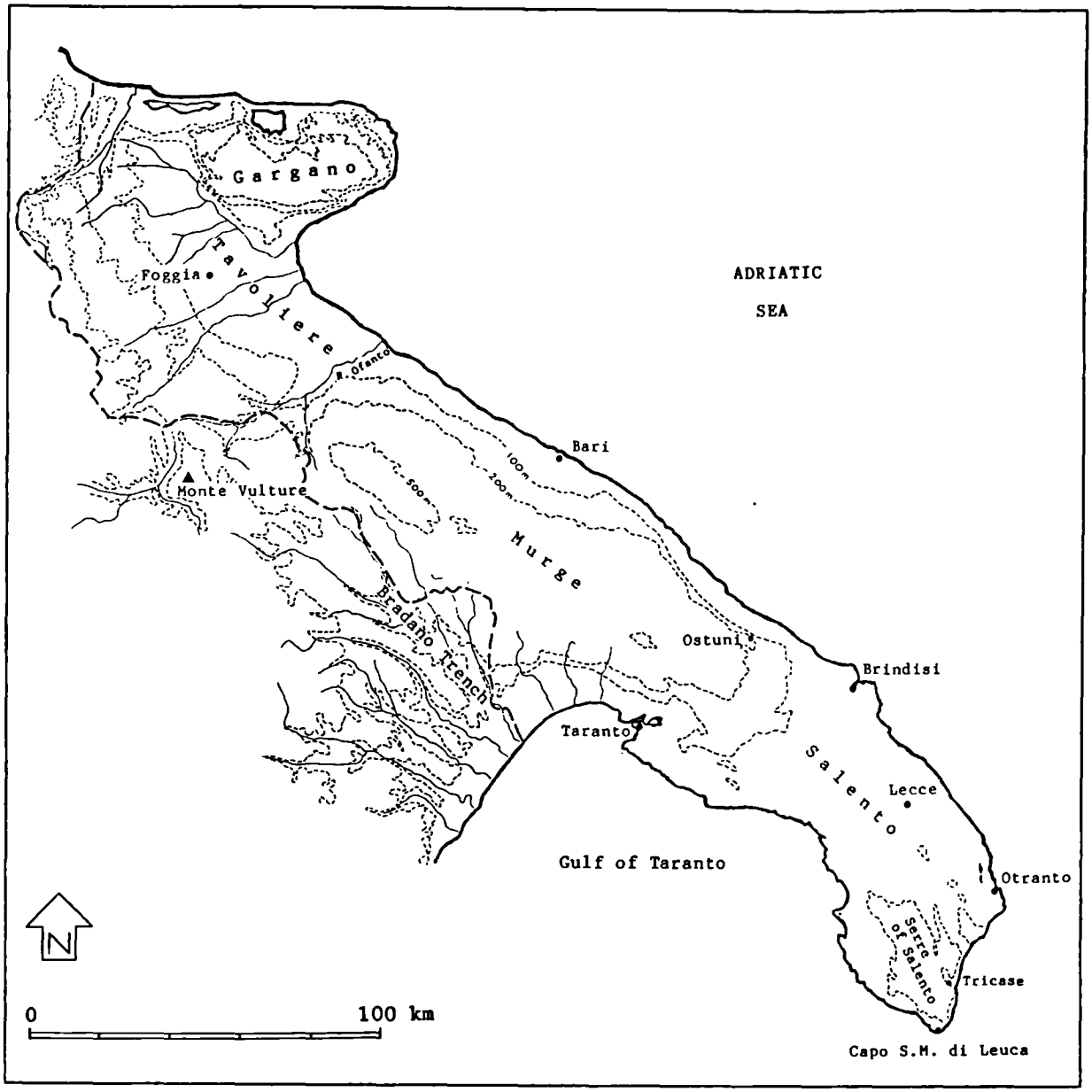

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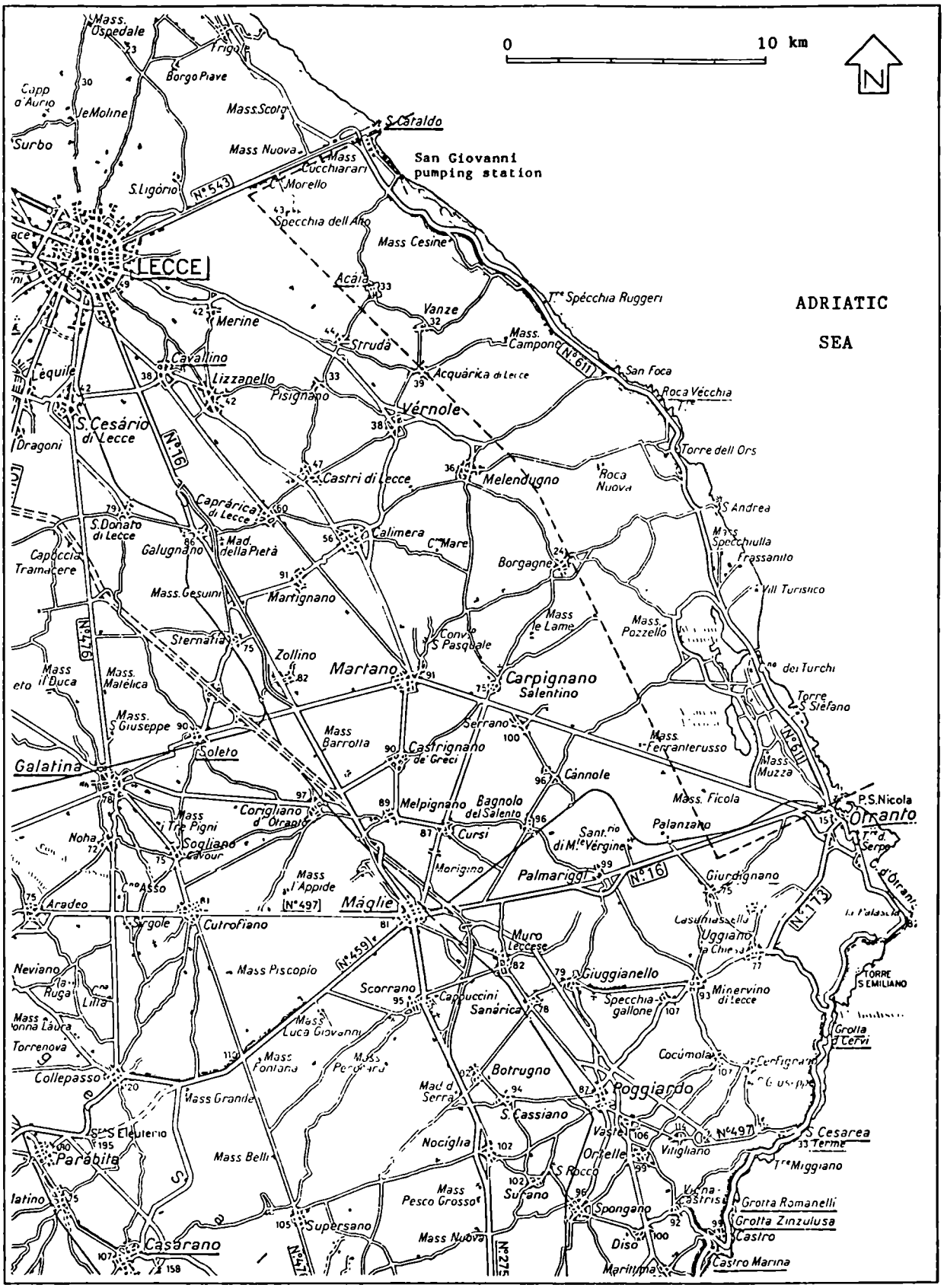

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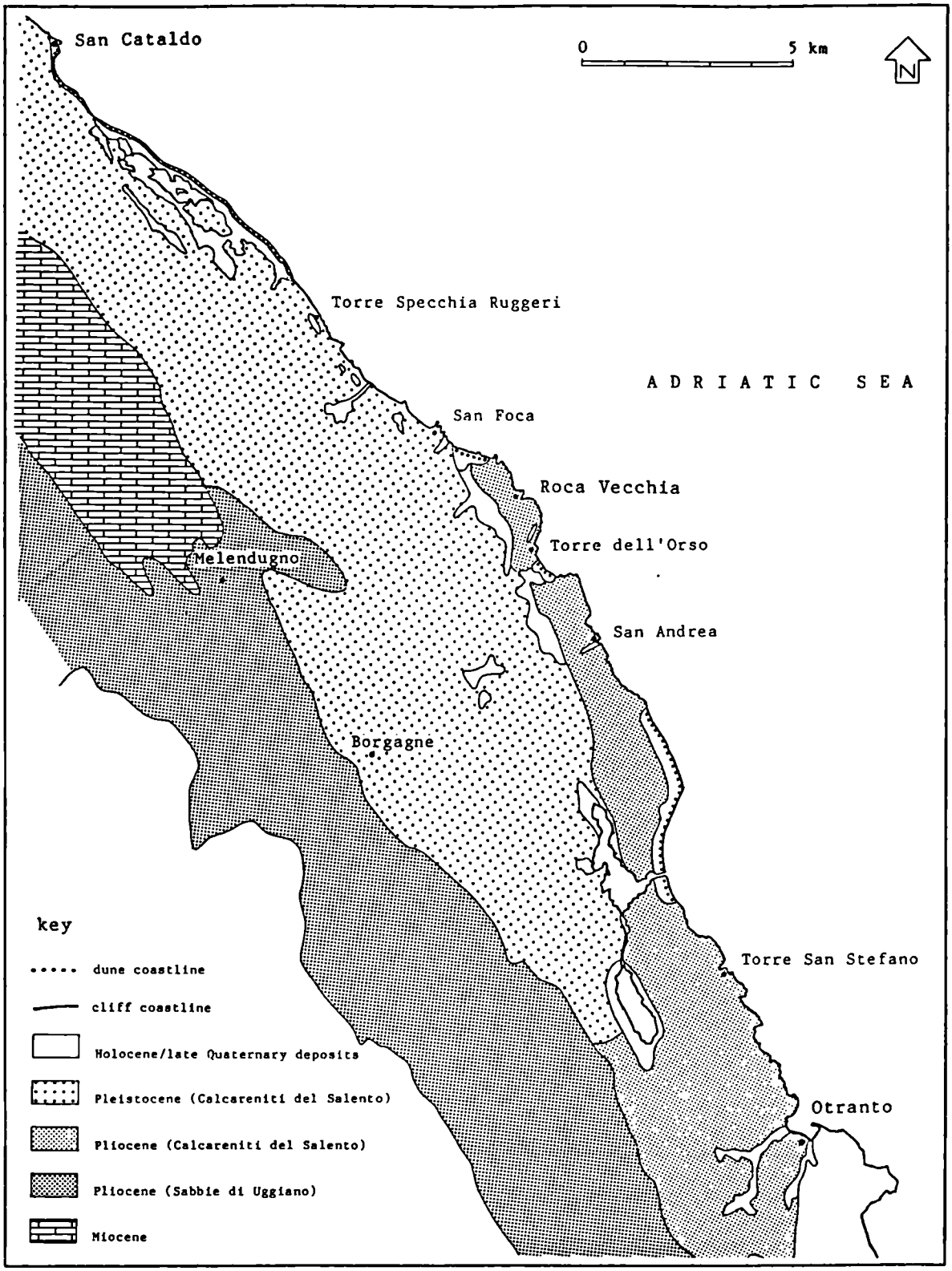

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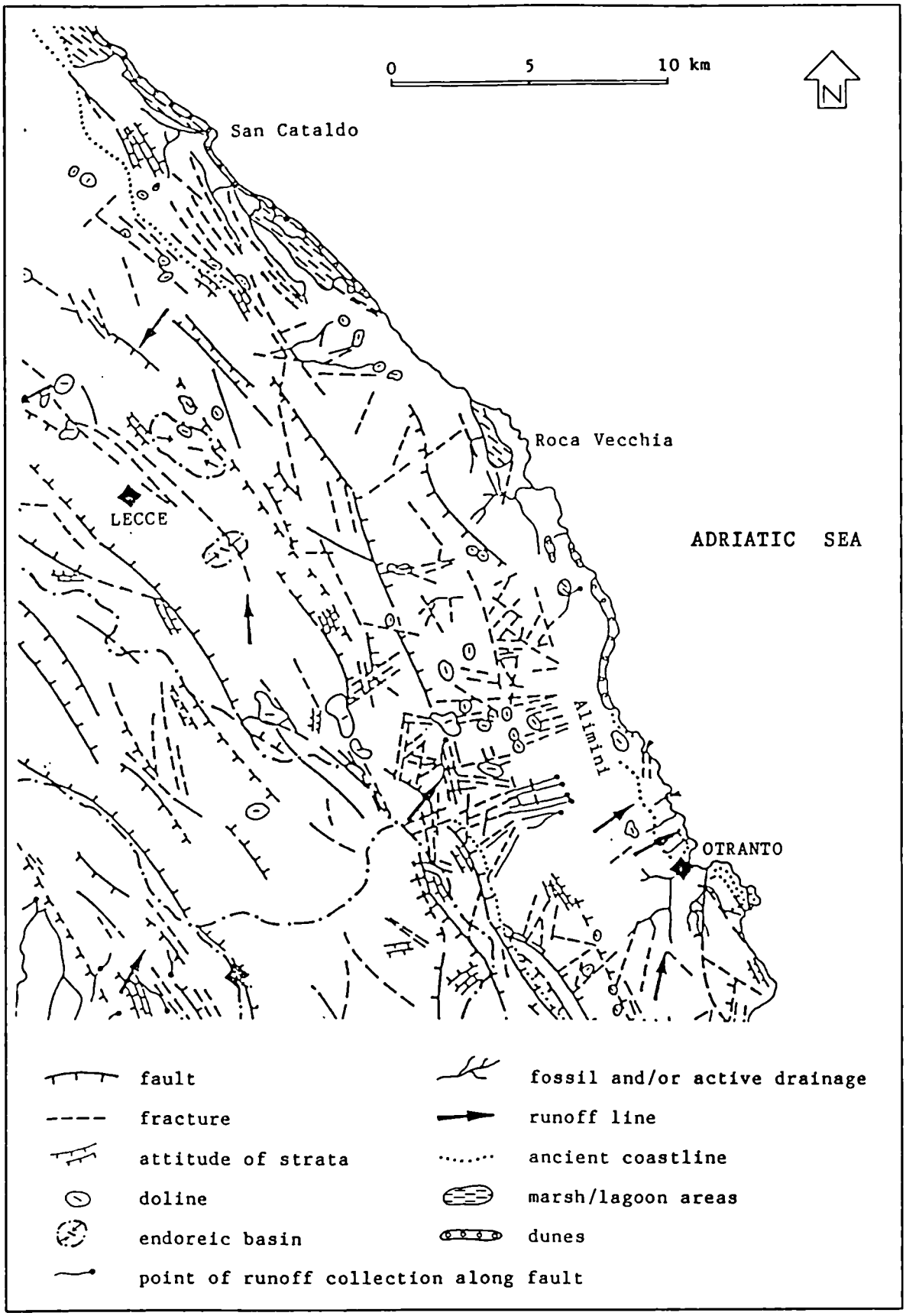

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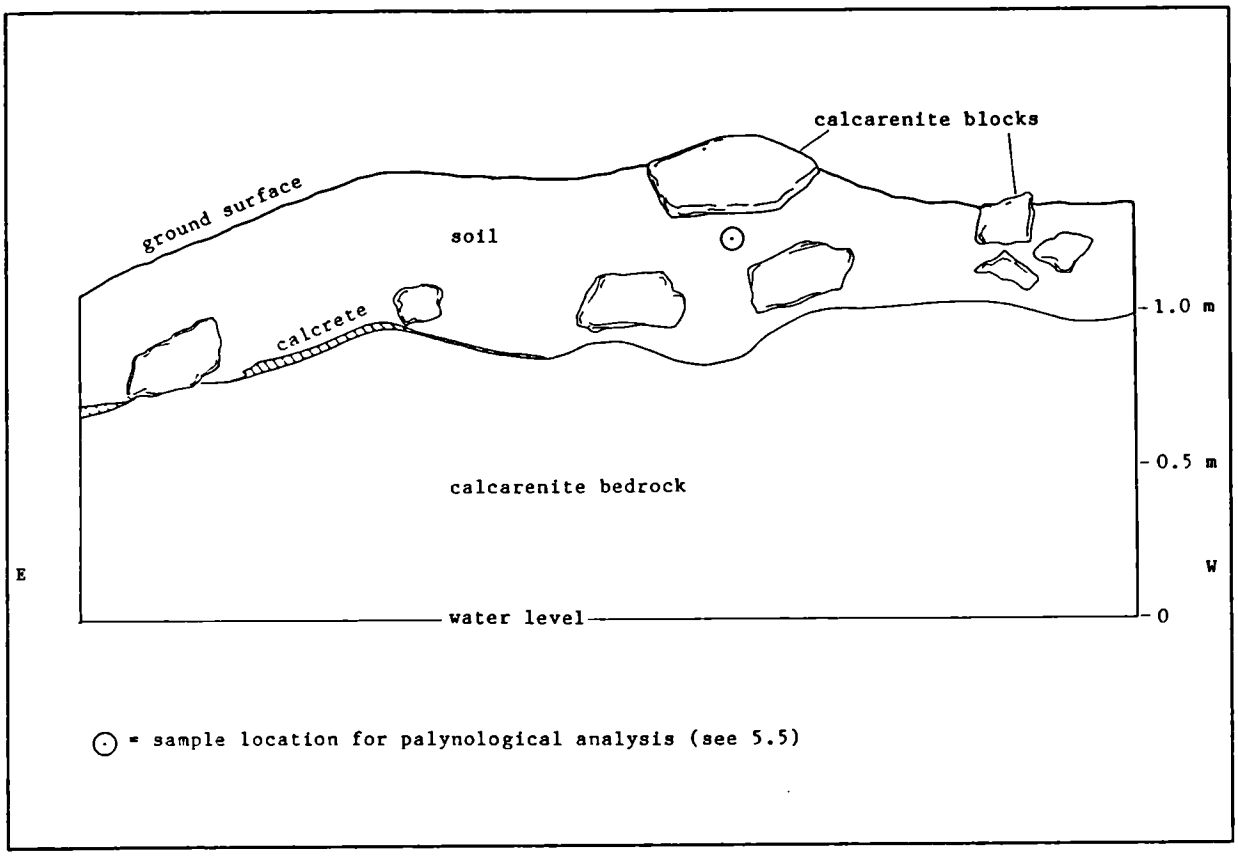

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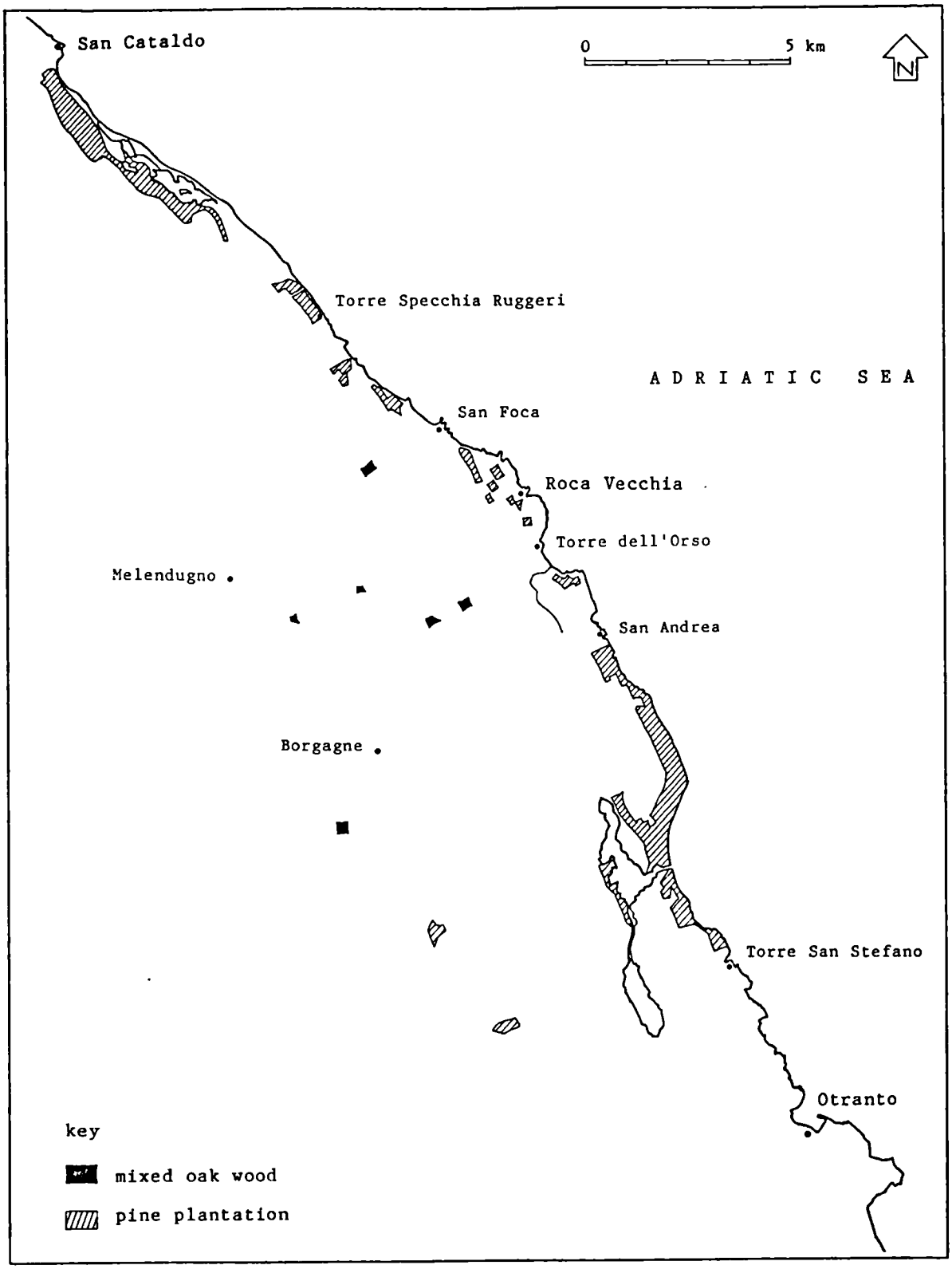

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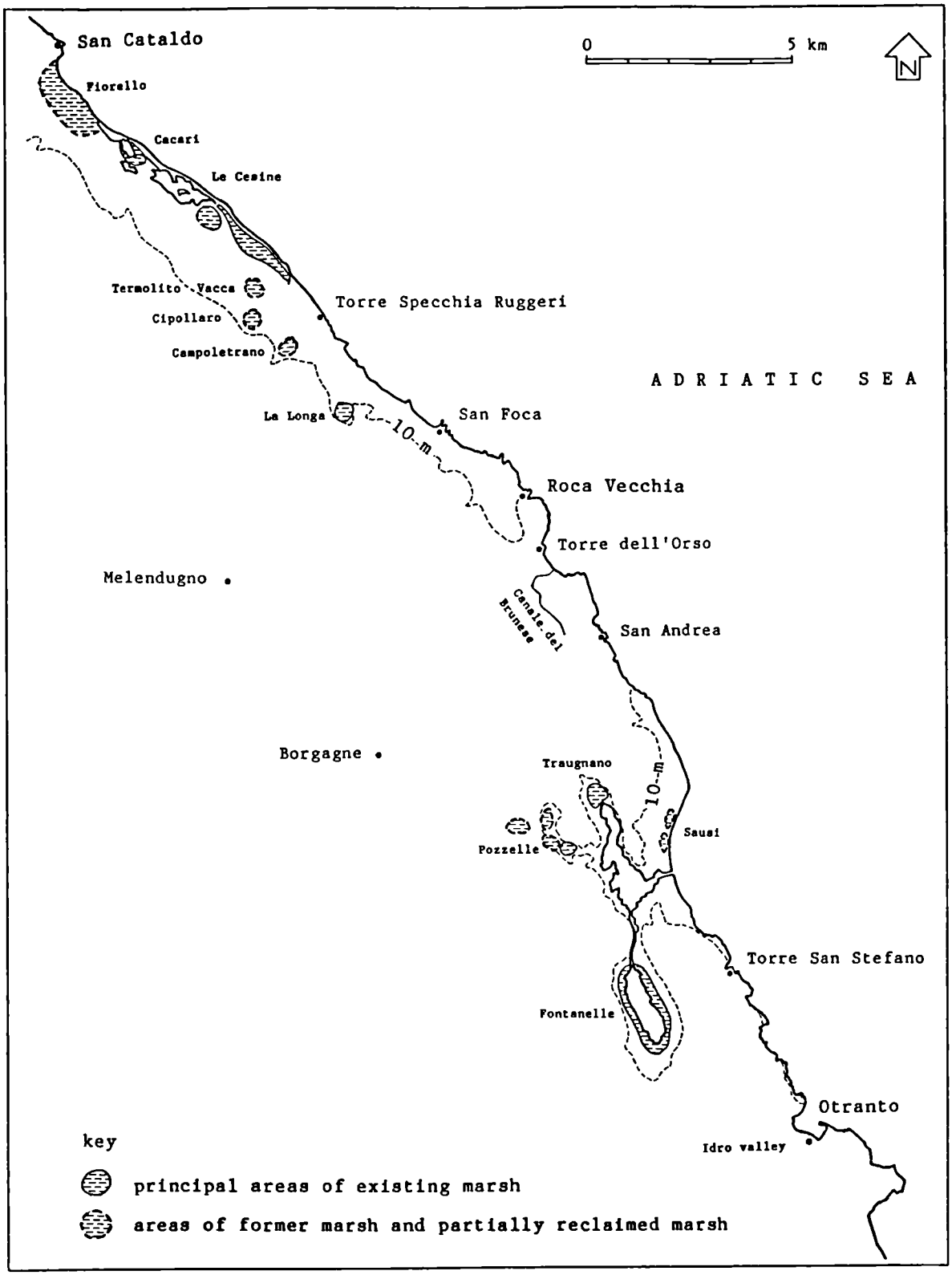

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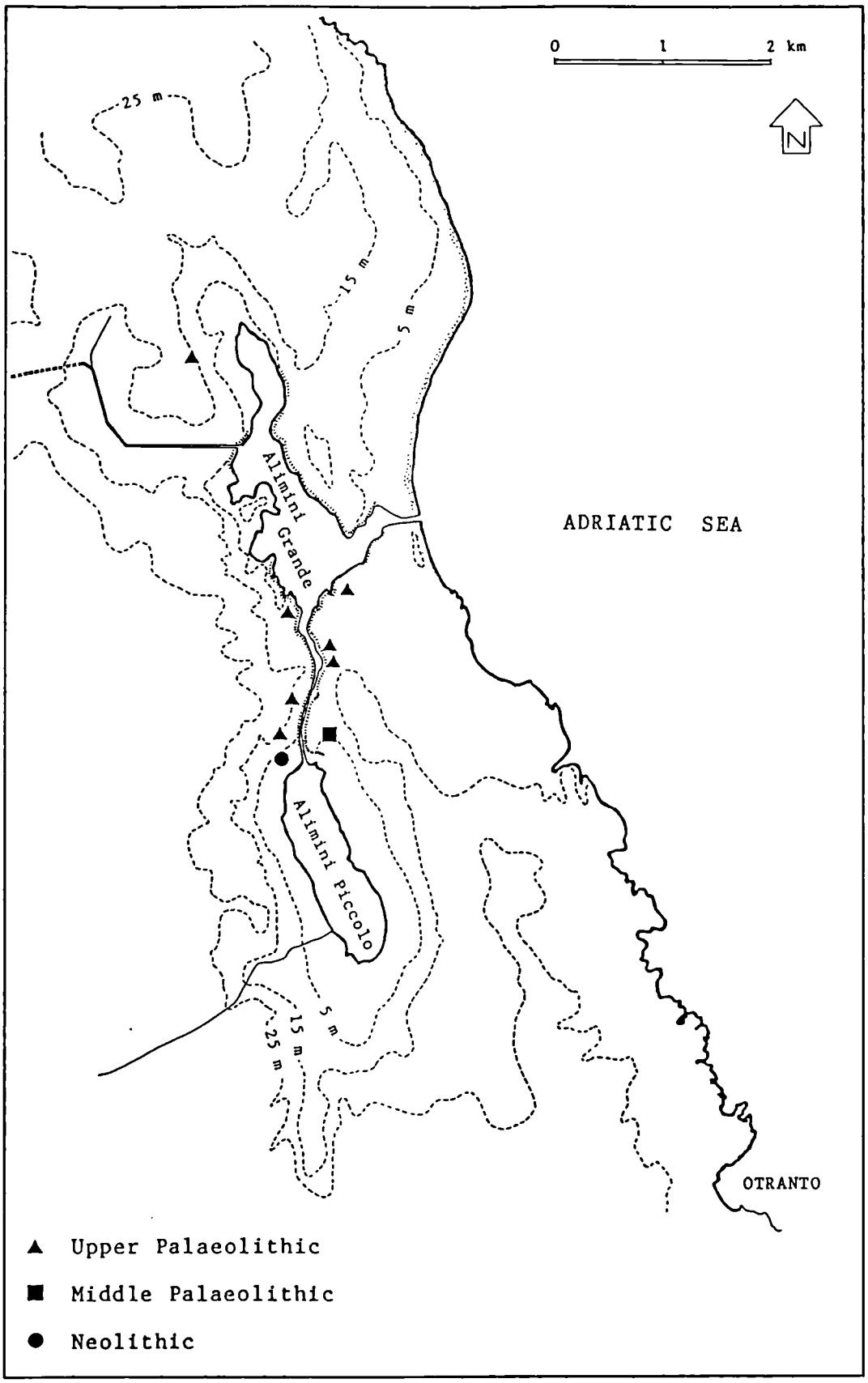

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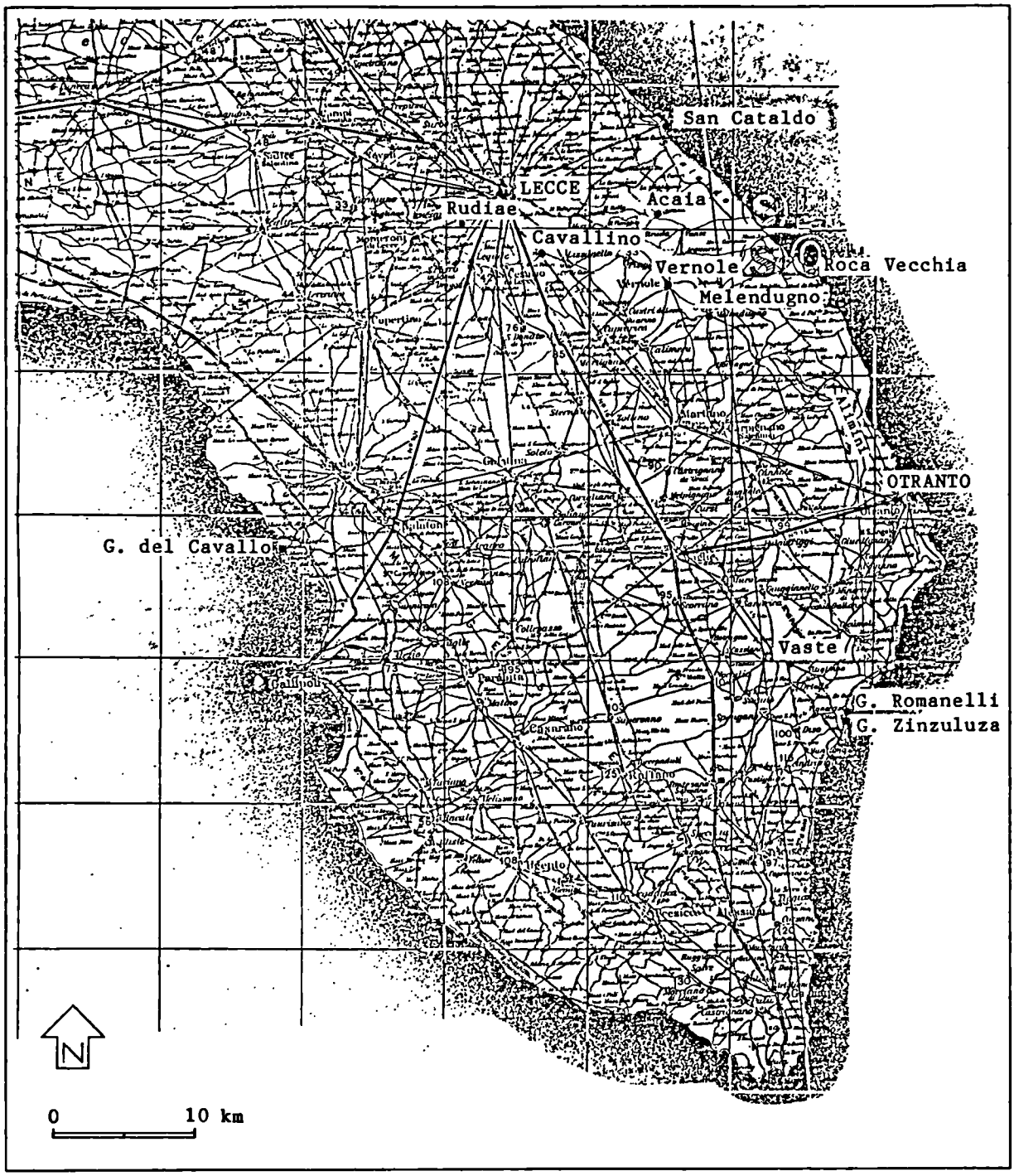

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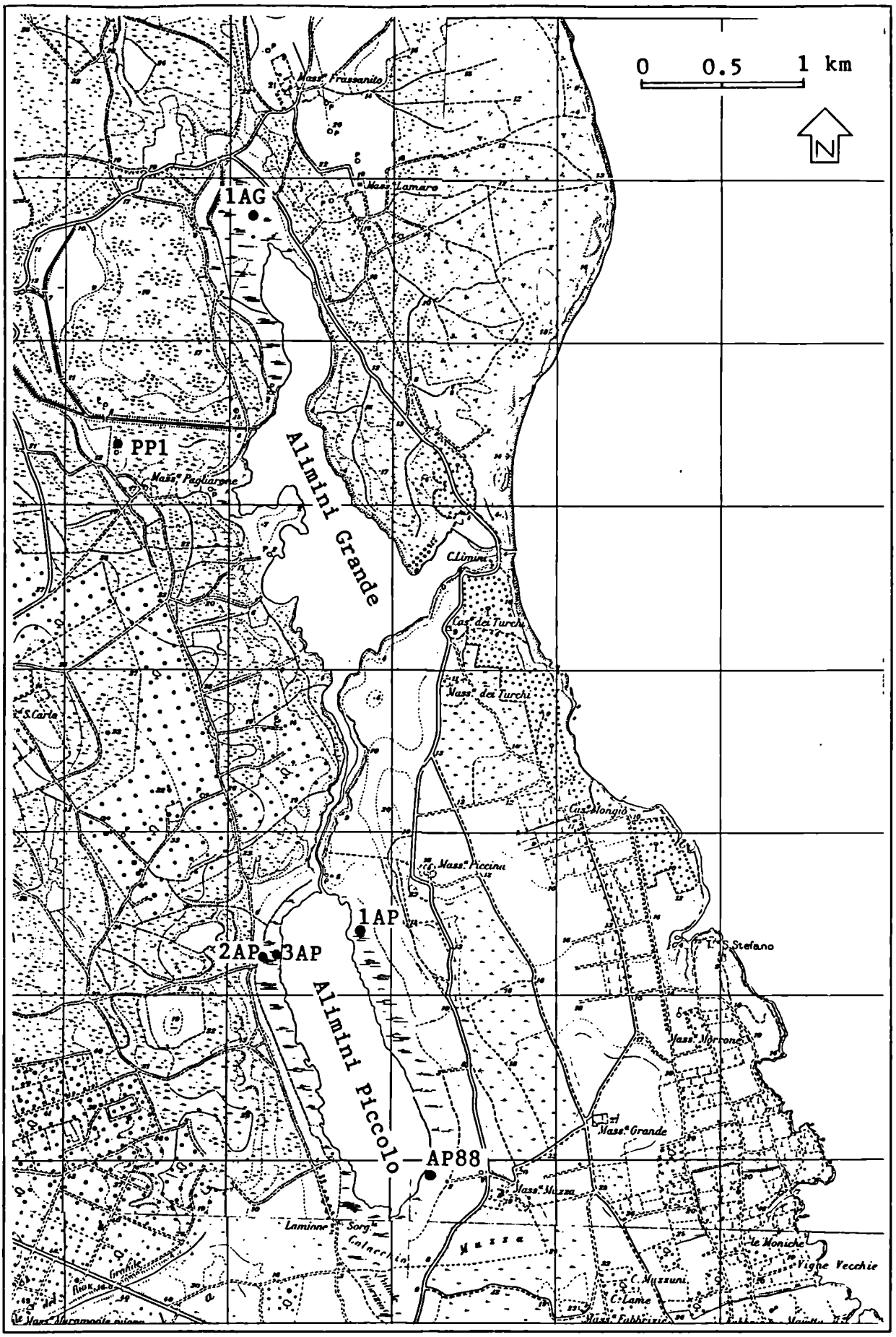

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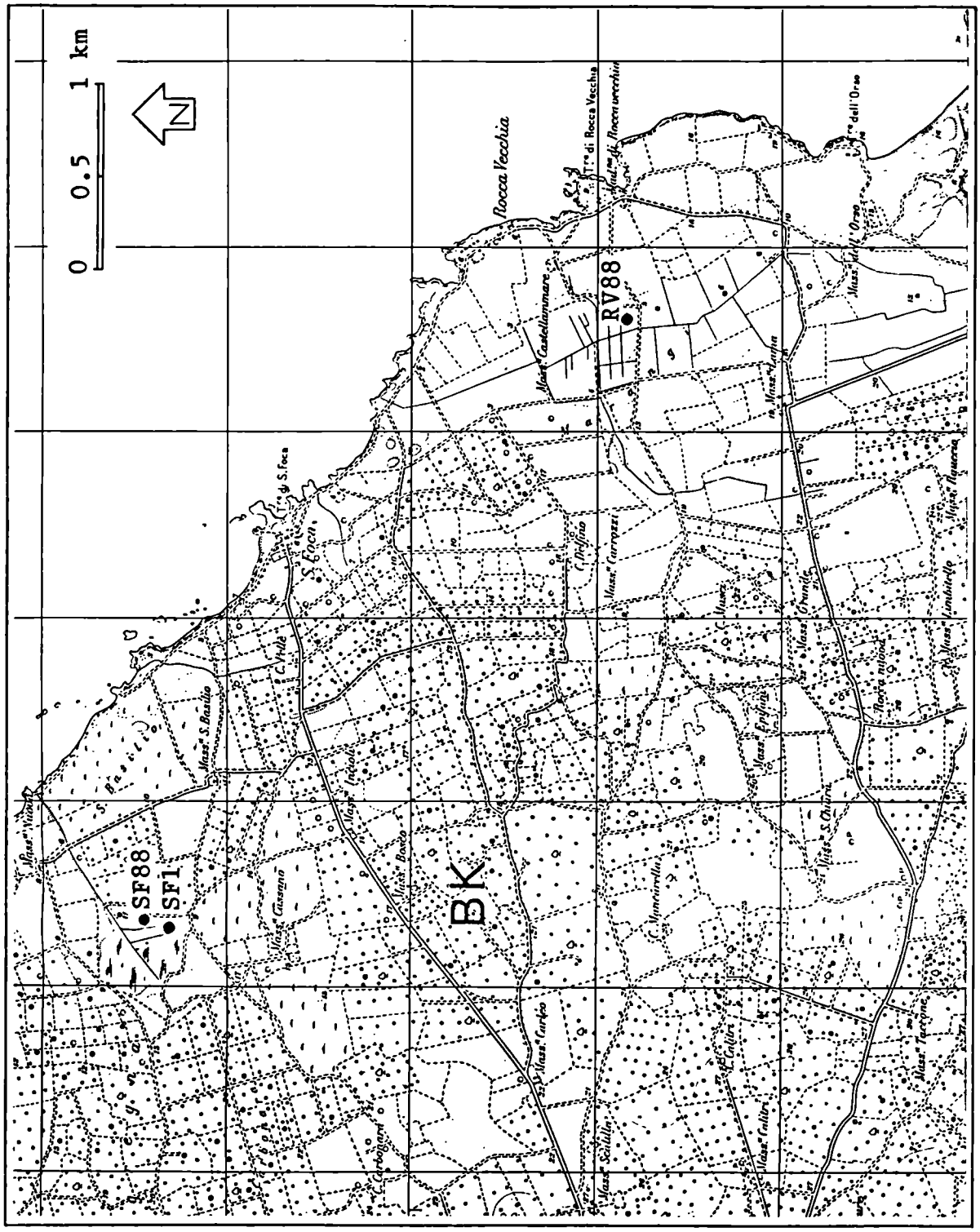

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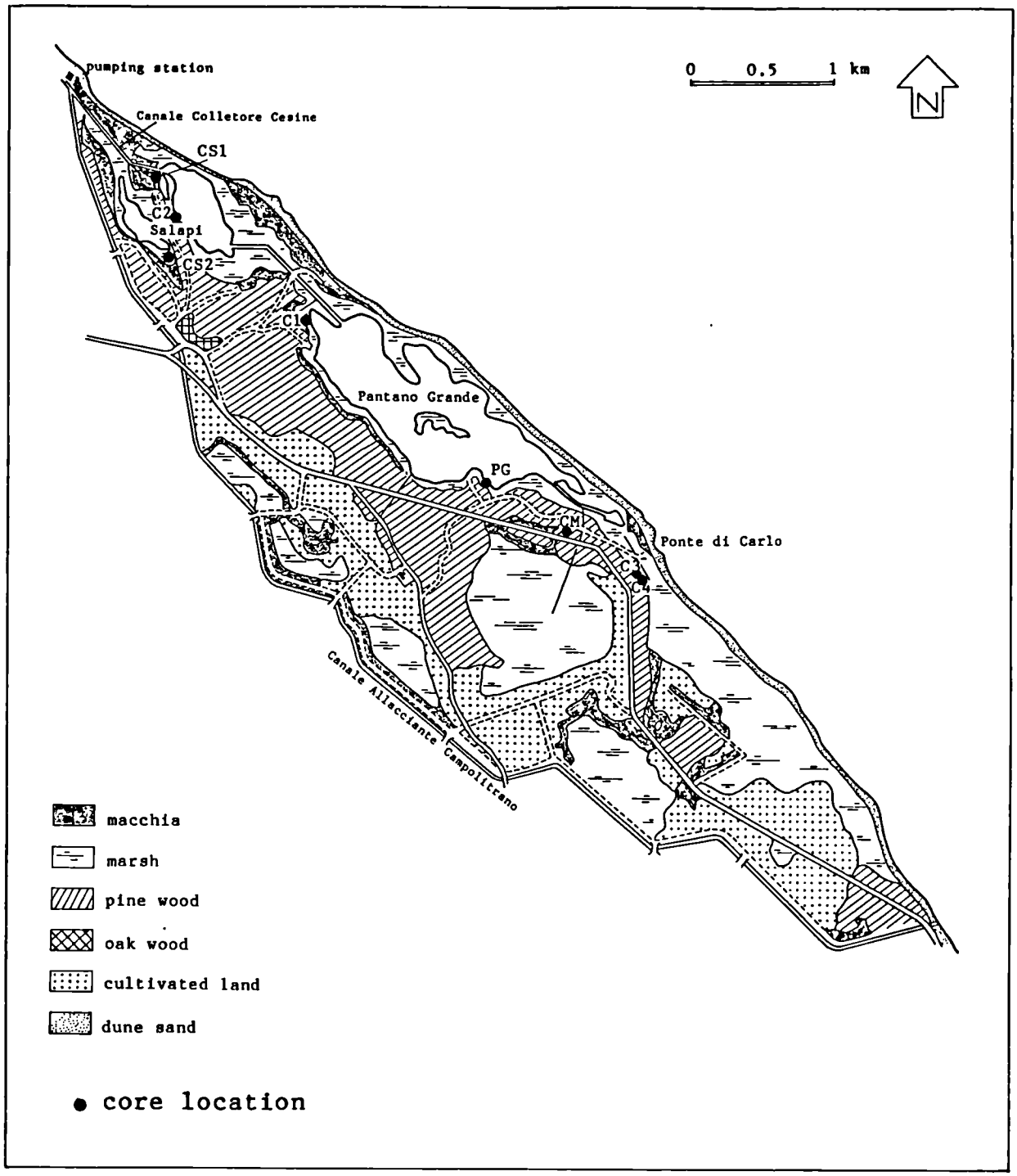

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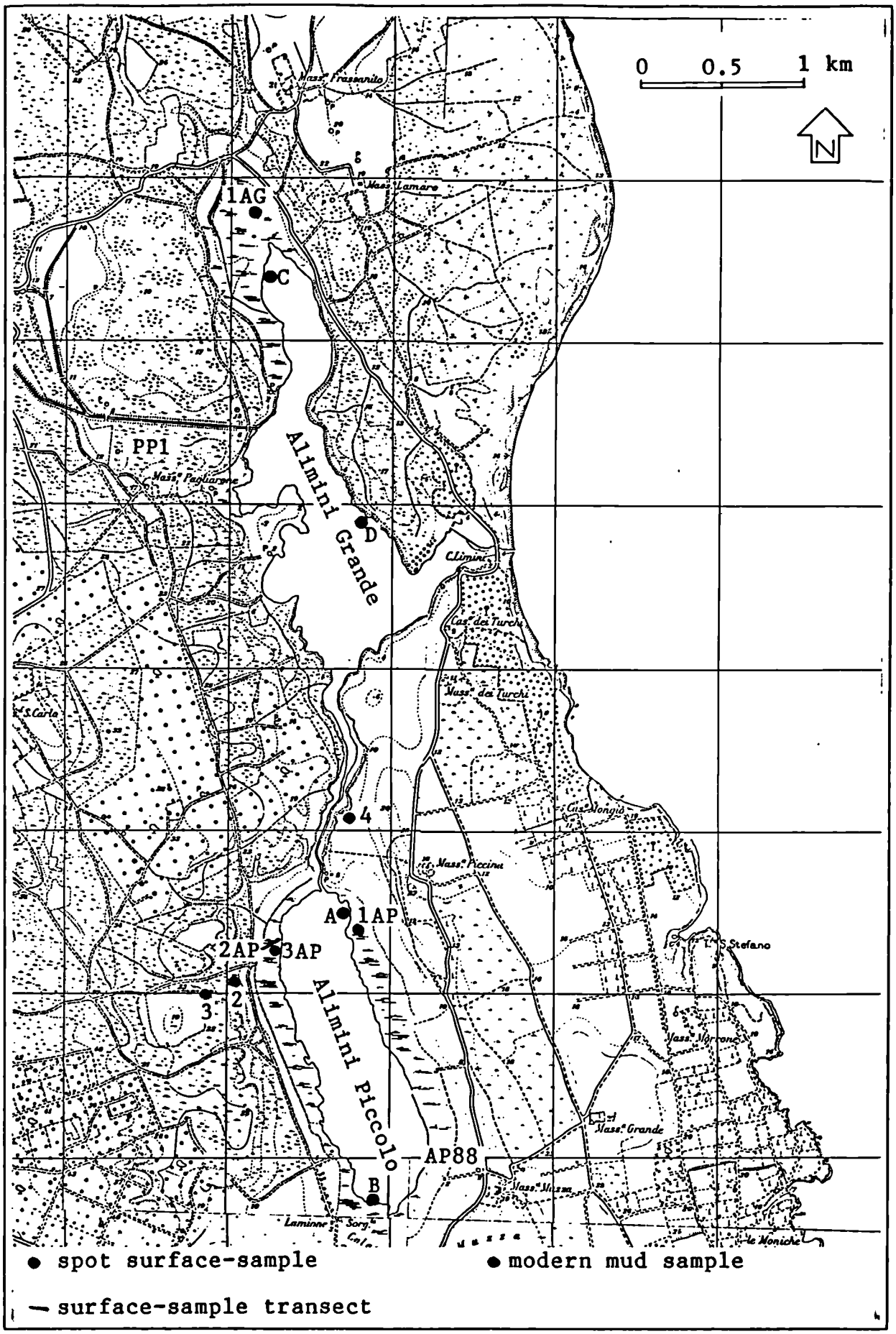

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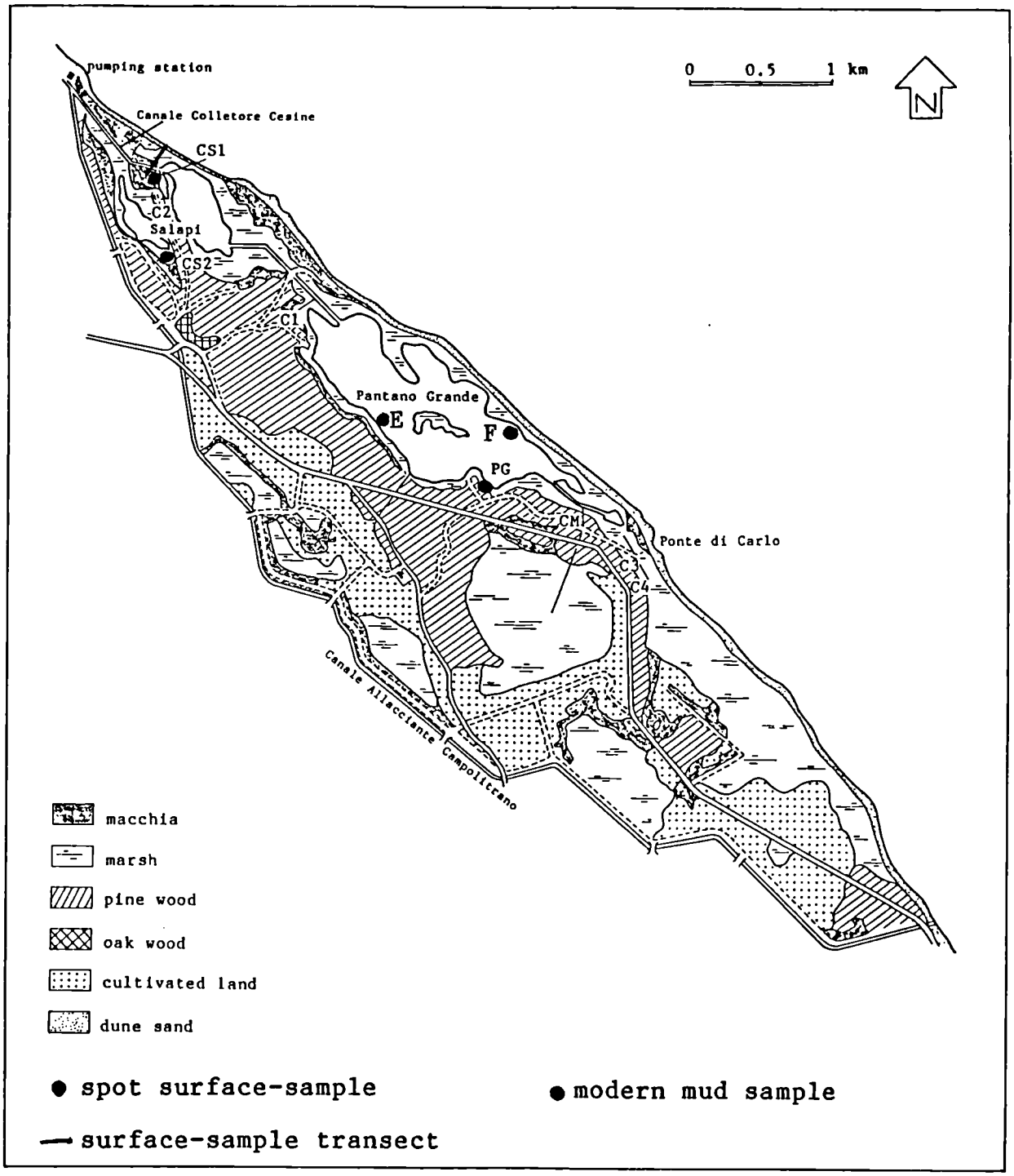

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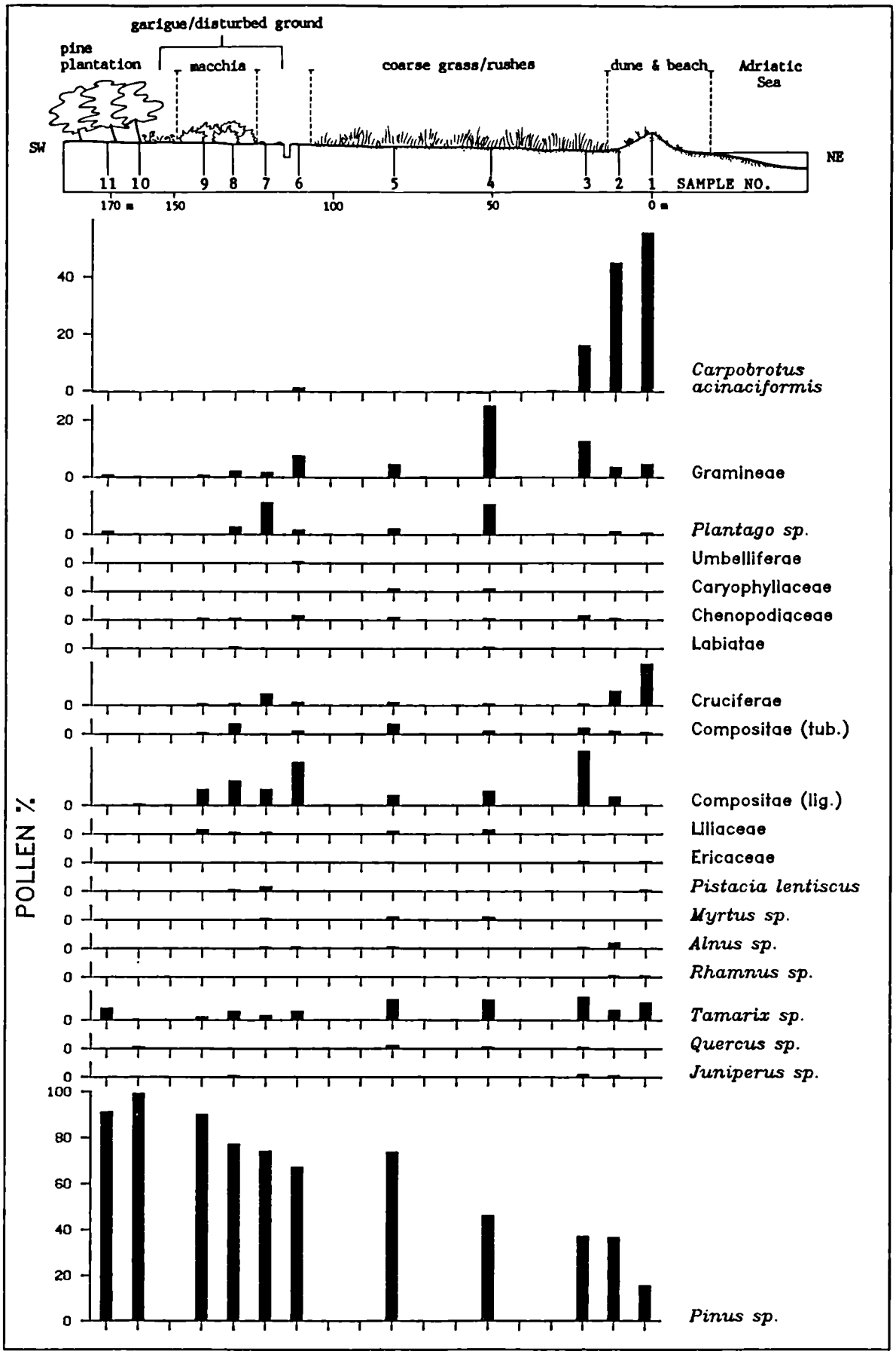
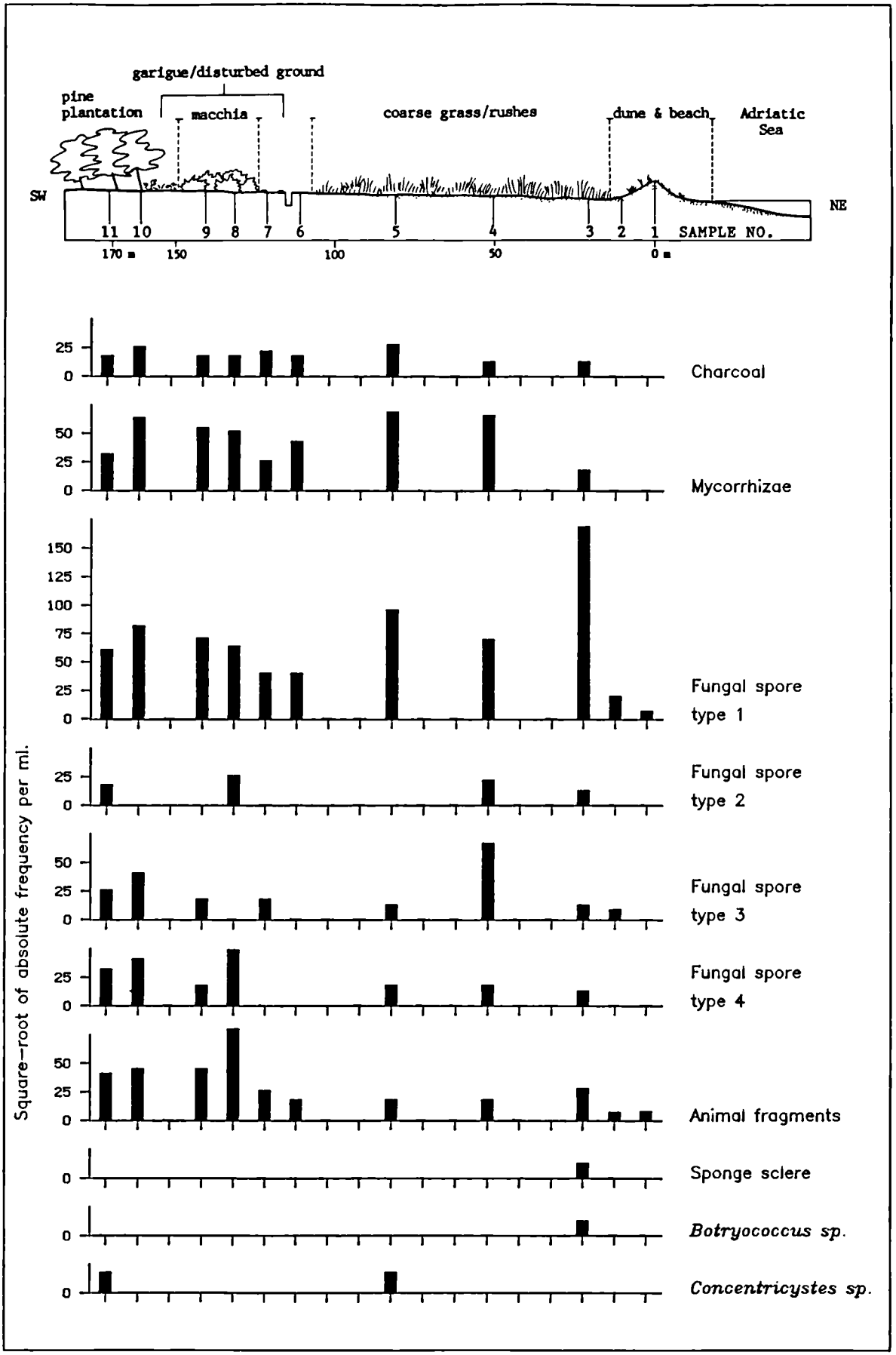


Fig. 8.1: Pollen frequencies along the Cesine transect



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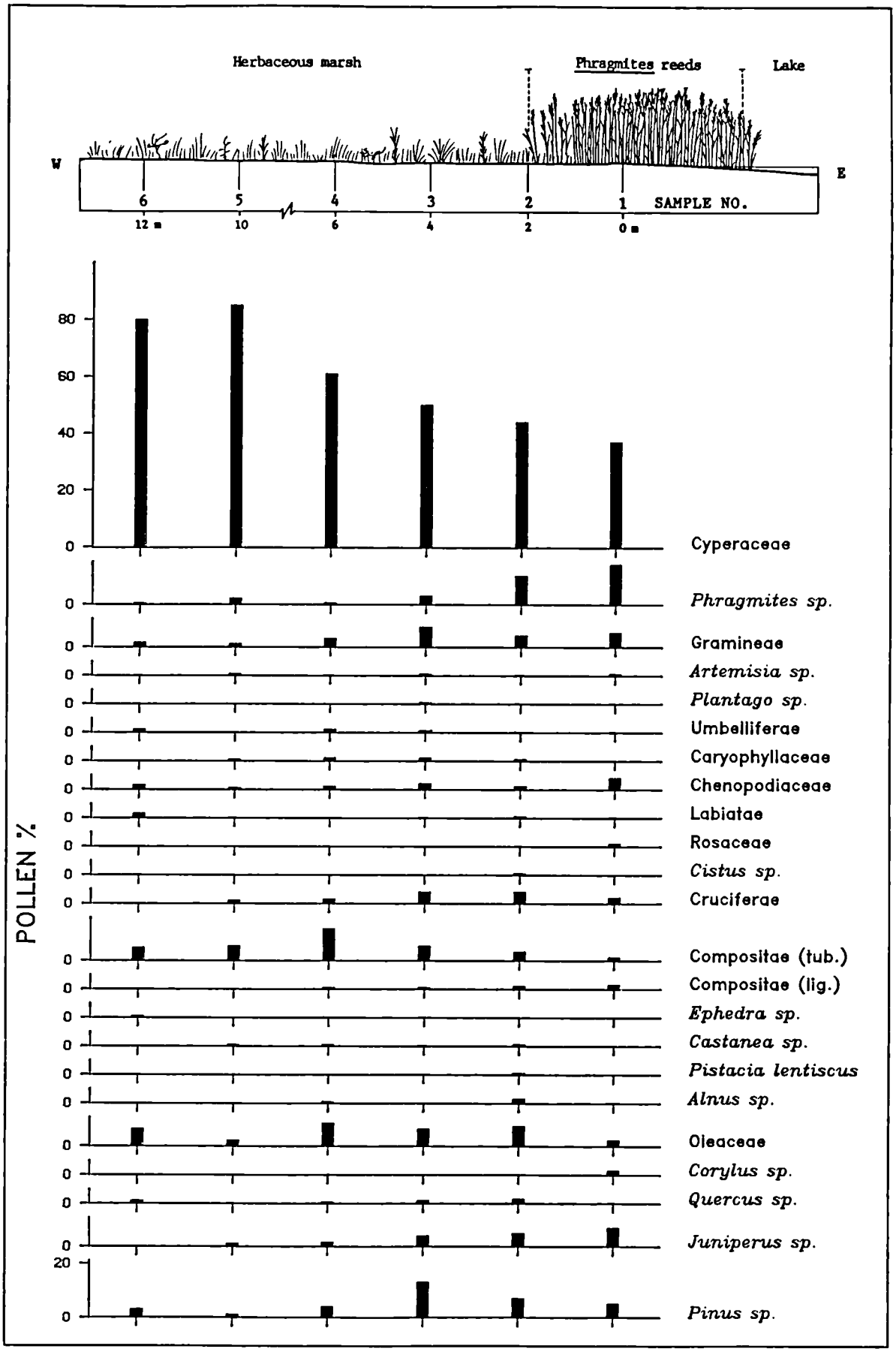

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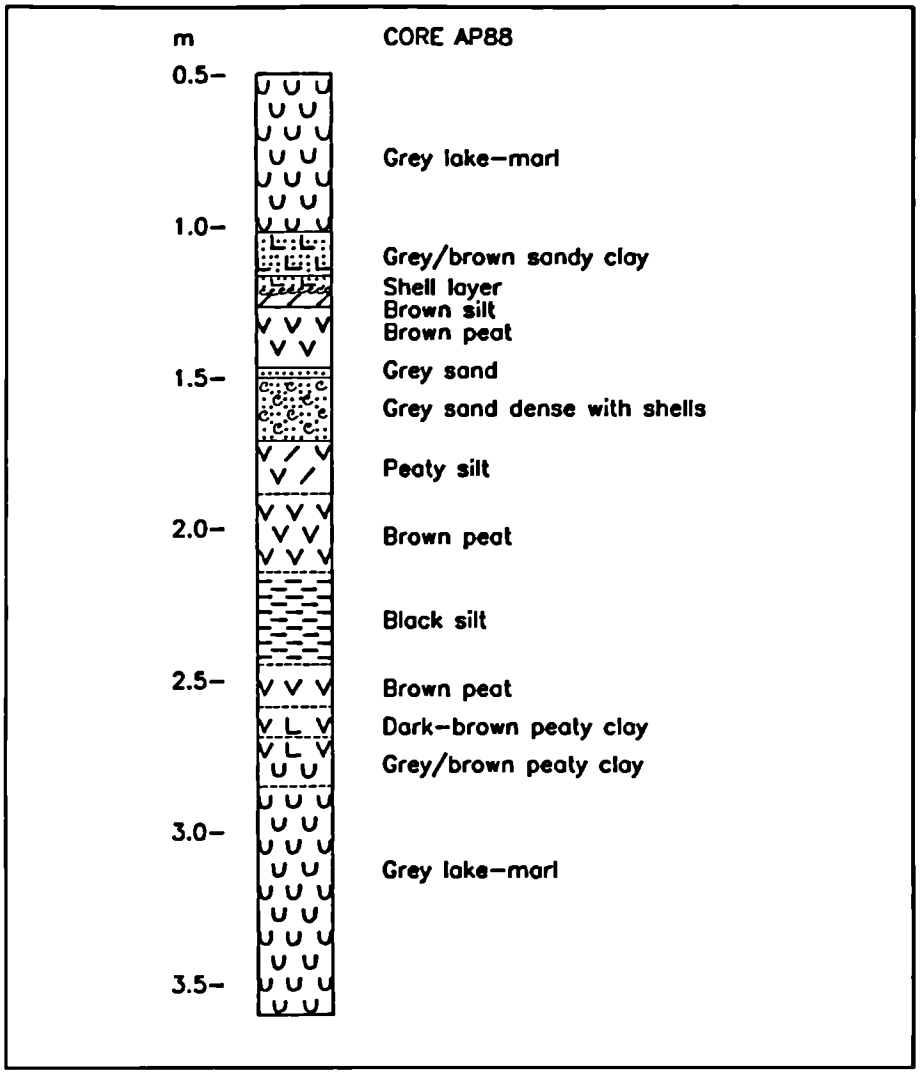


Fig. 9.1: Core AP88. sediment stratigraphy

Key to sediment symbols:

sand

lake marl

shells: Cerastoderma type
Planorbidae type

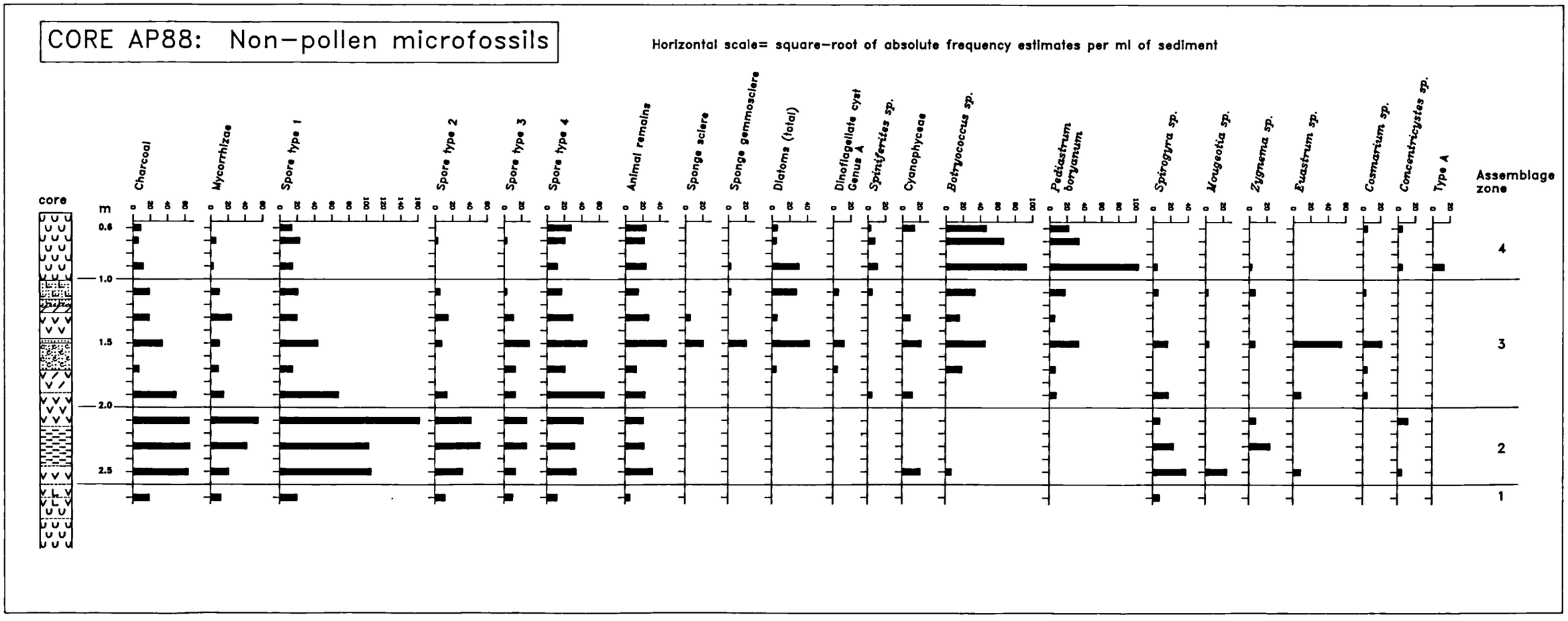
silt

peat

clay

black organic silt

Fig. 9.2


CORE AP88: Non–pollen microfossils
Horizontal scale= square–root of absolute frequency estimates per ml of sediment
core
m
0.5
1.0
1.5
2.0
2.5
Charcoal
Mycorrhizae
Spore type 1
Spore type 2
Spore type 3
Spore type 4
Animal remains
Sponge sclere
Sponge gemmosclere
Diatoms (total)
Dinoflagellate cyst Genus A
Spiniferites sp.
Cyanophyceae
Botryococcus sp.
Pediastrum boryanum
Spirogyra sp.
Mougeotia sp.
Zygnema sp.
Euastrum sp.
Cosmarium sp.
Concentricystes sp.
Type A
Assemblage zone
4
3
2
1

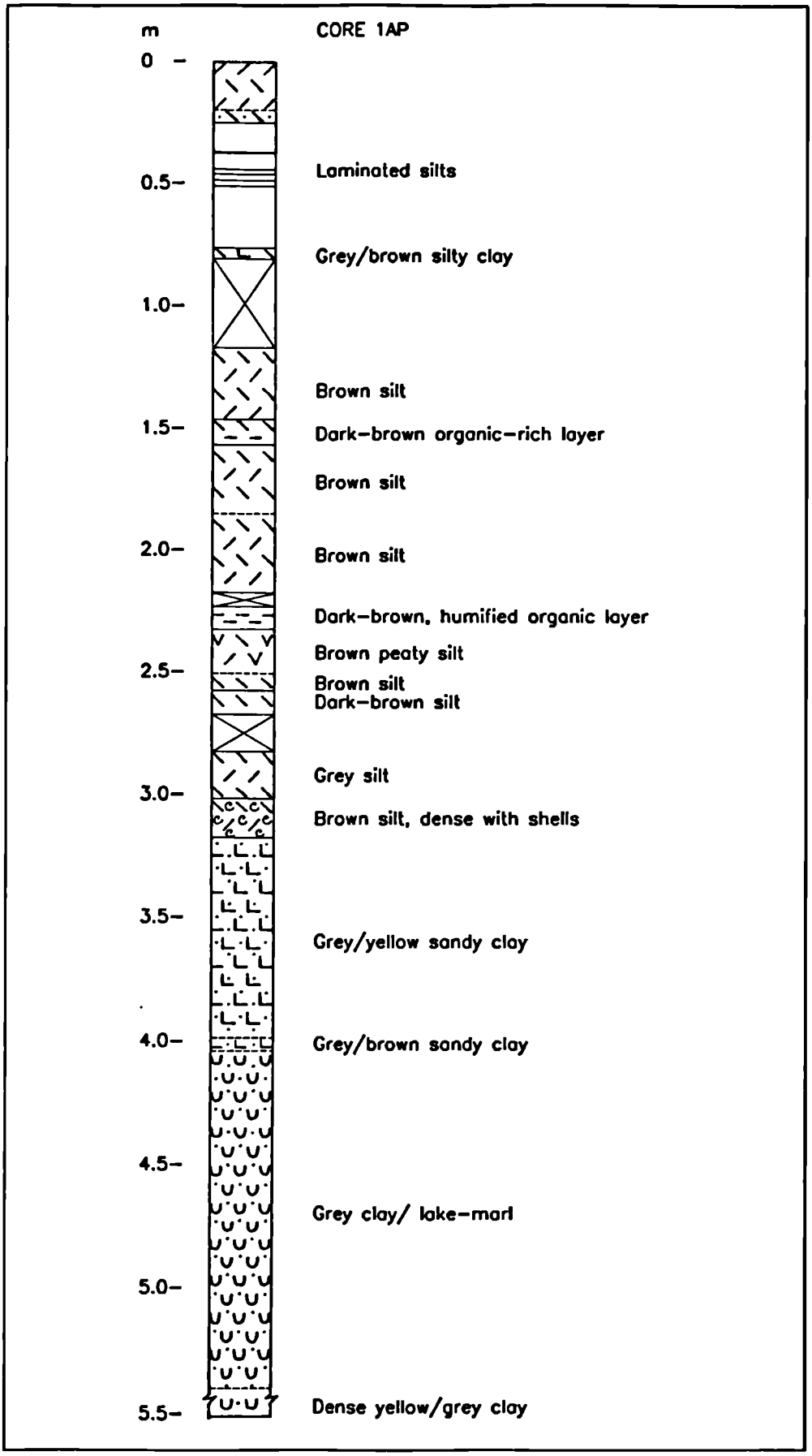


Fig. 9.5: Core 1AP. Sediment stratigraphy

Fig. 9.3

CORE AP88: Pollen diagram (%)

Horizontal scale= percentage of pollen sum

ARBOREAL

Pinus sp.
Juniperus sp.
Betula sp.
Quercus ilex + Quercus pubescens +
Fagus sp.
Ulmus sp.
Tilia sp.
Corylus sp.
Ostrya sp./ Carpinus orientalis
Oleaceae
Alnus sp.
Salix sp.
Castanea sp.
Juglans regia

SHRUB

Vitis sp.
Hedera helix
Rhamnus sp.
Pistacia sp.
Ericaceae
Helianthemum sp.
Rosaceae
Labiatae

HERBACEOUS

Limonium sp.
Umbelliferae
Lamium sp.
Verbenaceae
Cruciferae
Rumex sp.
Artemisia sp.
Centaurea sp.
Compositae (Liguliflorae)
Compositae (Tubuliflorae)
Chenopodiaceae
Caryophyllaceae
Plantago sp.
Melampyrum sp.
Liliaceae
Asphodelus sp.
Urtica sp.
Ranunculus sp.
Thalictrum sp.
Gramineae
Cereal type
Phragmites type

Assemblage zone

core

m

0.5
1.0
1.5
2.0
2.5

1785 ± 50
3675 ± 55

C
B2
B1
A

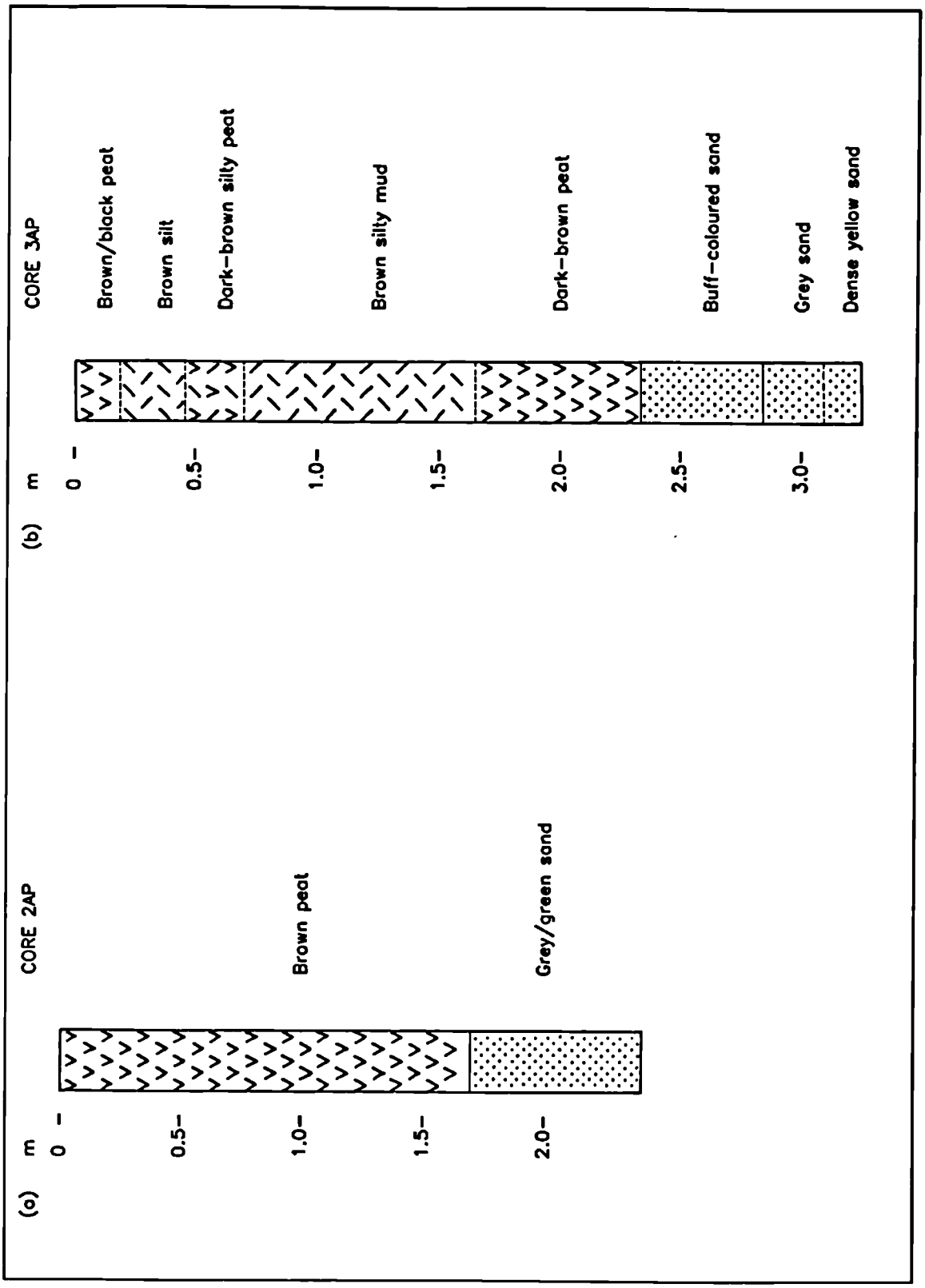
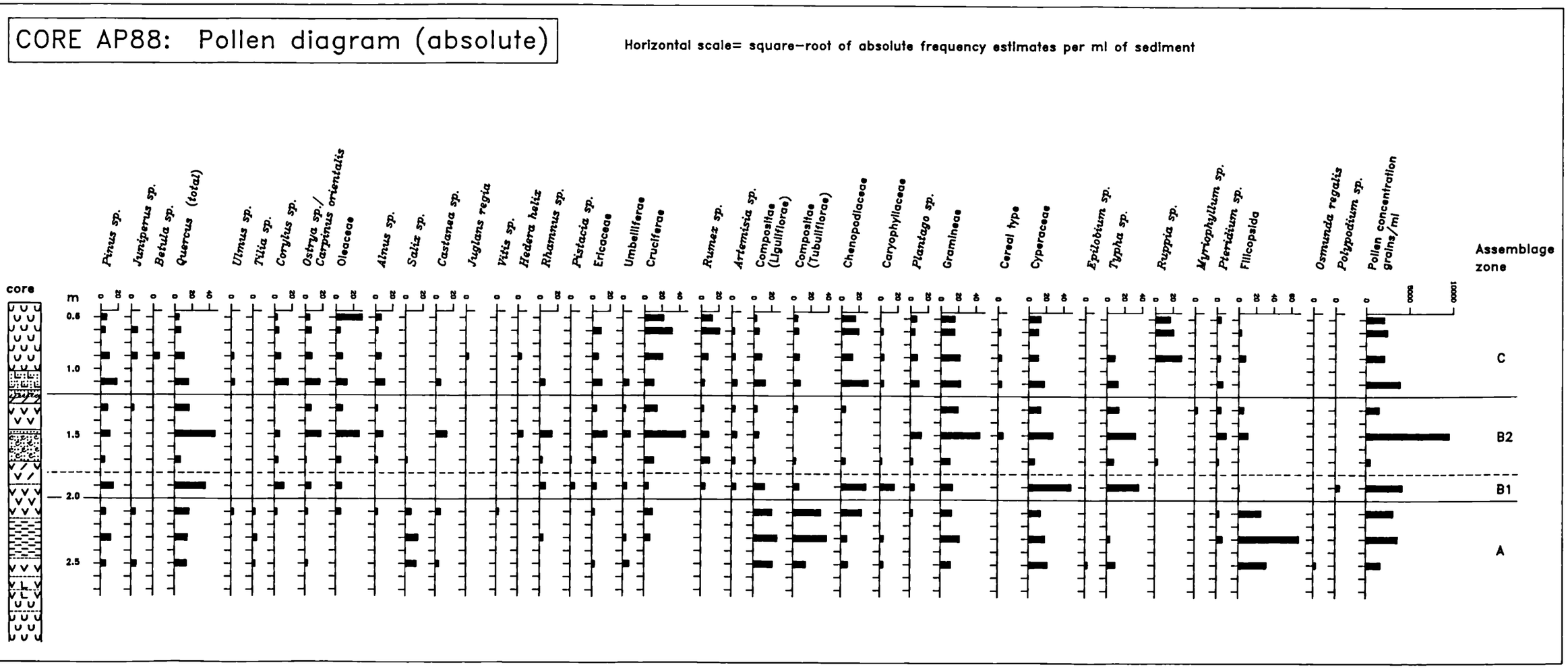


Fig. 9.9: Cores 2AP and 3AP. Sediment stratigraphy

Fig. 9.4

CORE AP88: Pollen diagram (absolute)

Horizontal scale= square-root of absolute frequency estimates per ml of sediment



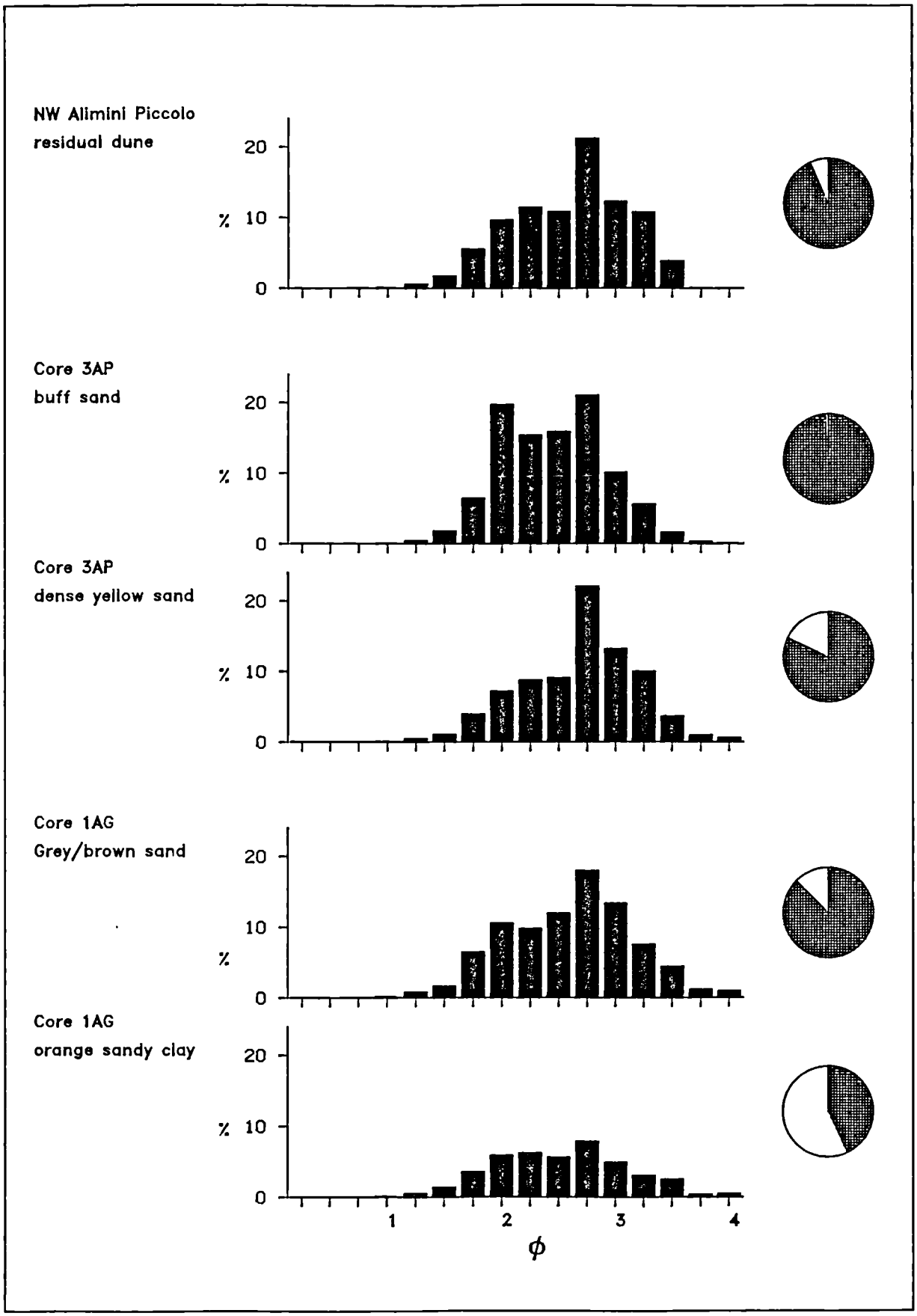


Fig. 9.10: Particle size distributions of sands from the north-west side of Alimini Piccolo, core 3AP and core 1AG
Pie-charts illustrate the ratio of sand (shaded) to silt and clay.

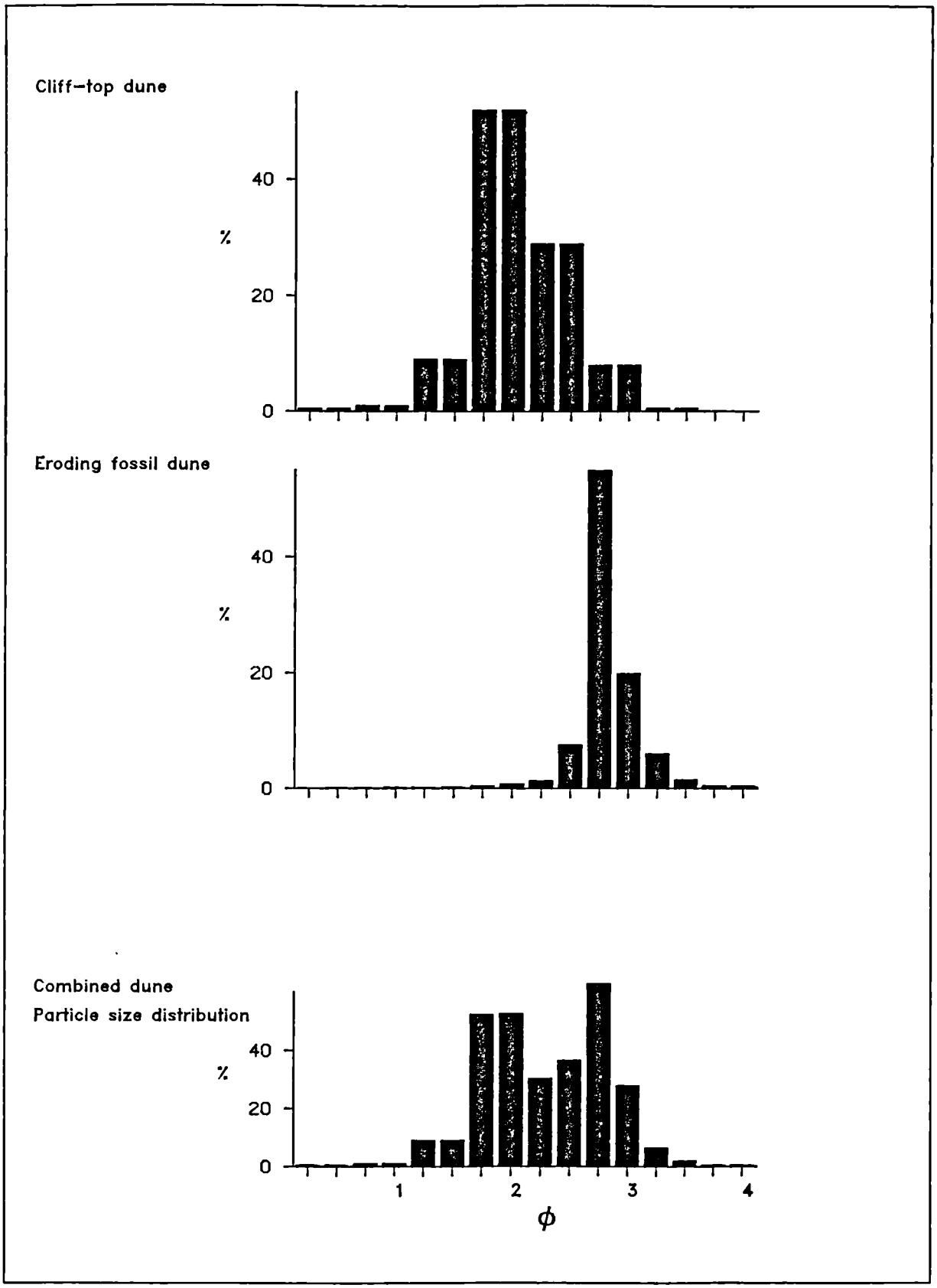
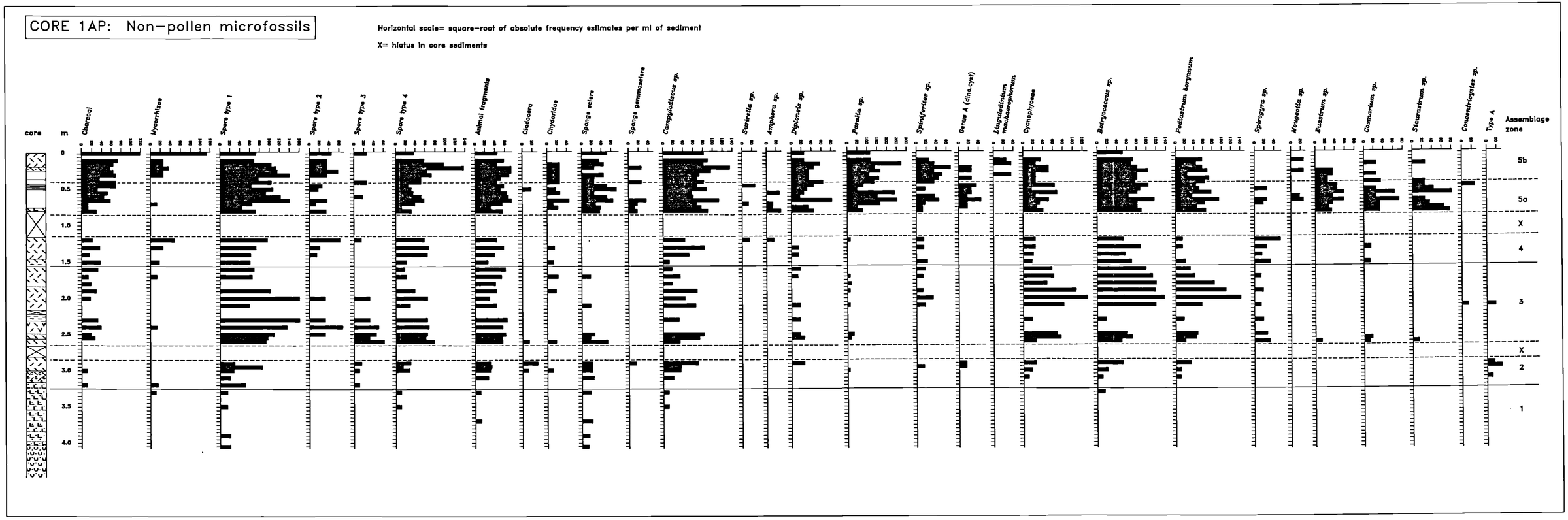


Fig. 9.11: Particle size distributions of dune sand samples from the study-area

Fig. 9.6


CORE 1AP: Non-pollen microfossils
Horizontal scale= square-root of absolute frequency estimates per ml of sediment
X= hiatus in core sediments
core
m
Charcoal
Mycorrhizae
Spore type 1
Spore type 2
Spore type 3
Spore type 4
Animal fragments
Cladocera
Chydoridae
Sponge sclere
Sponge gemmoscleres
Campylodiscus sp.
Surirella sp.
Amphora sp.
Diplomais sp.
Paralia sp.
Syrinxferidea sp.
Genus A (dino.cyst)
Lingulodinium machaerophorum
Cyanophyseae
Botryococcus sp.
Pediastrum boryanum
Spirogyra sp.
Mougeotia sp.
Zygnema sp.
Cosmarium sp.
Staurastrum sp.
Concentricystes sp.
Type A
Assemblage zone
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
5b
5a
X
4
3
X
2
1

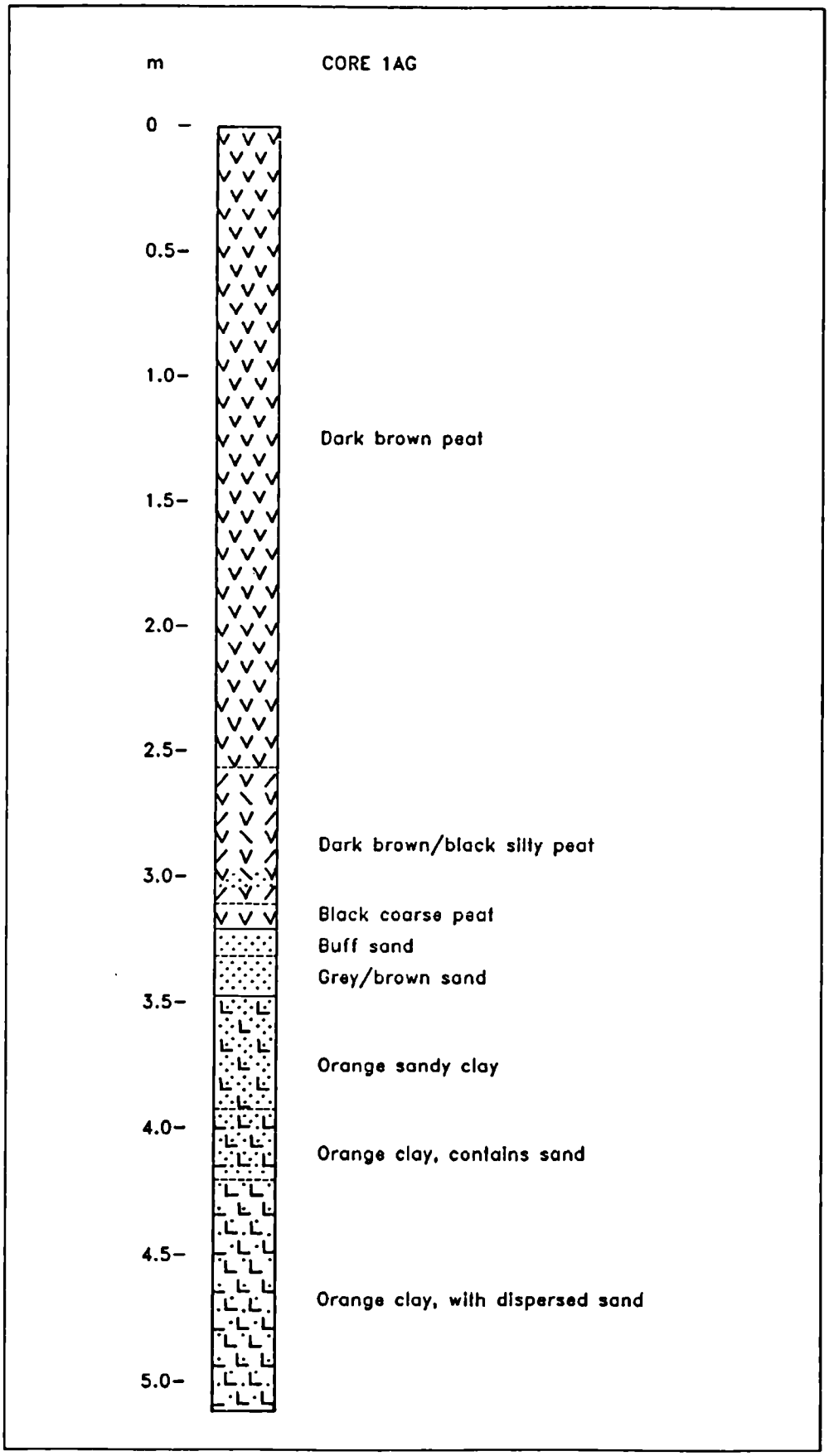
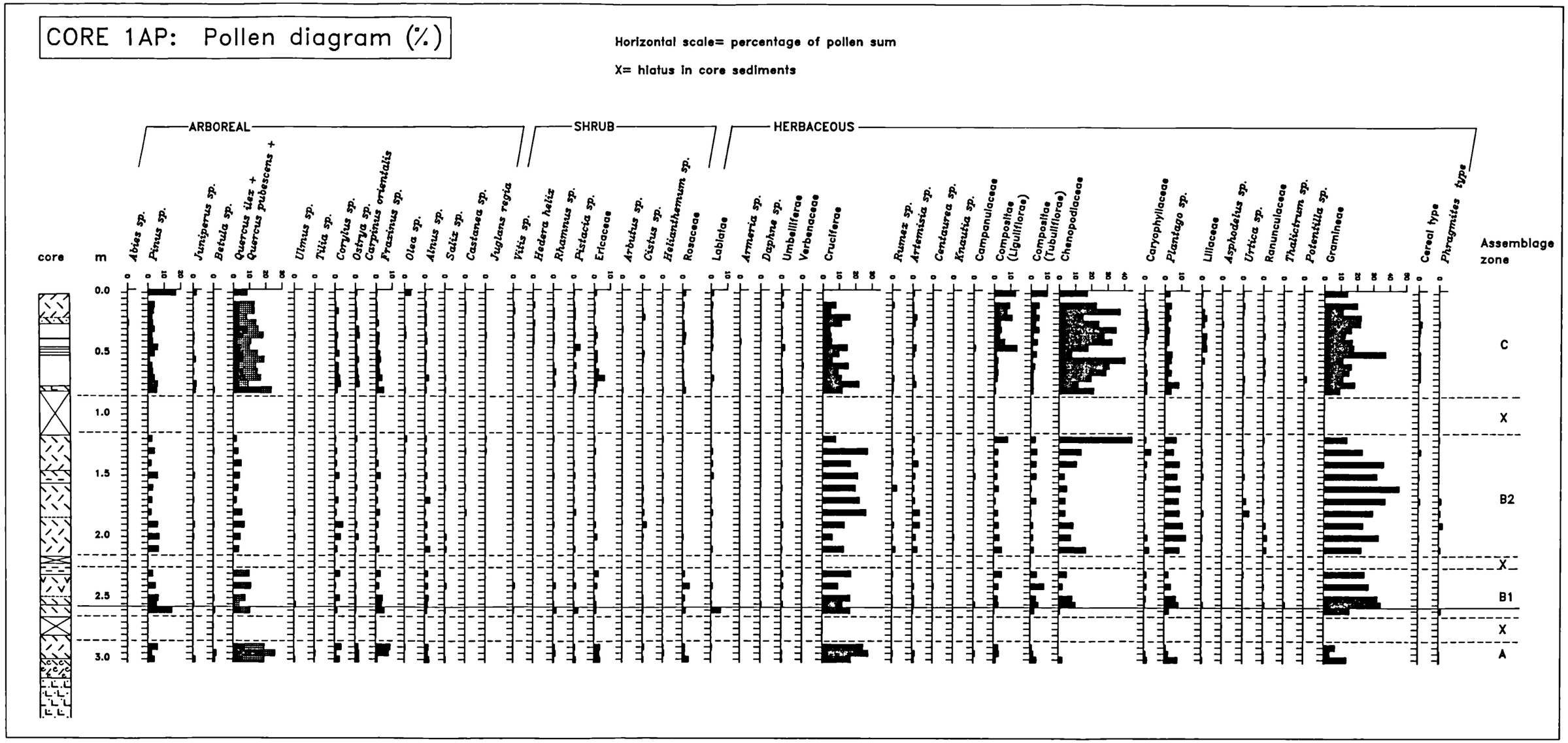


Fig. 9.12: Core 1AG. Sediment stratigraphy

Fig. 9.7


CORE 1AP: Pollen diagram (%)
Horizontal scale= percentage of pollen sum
X= hiatus in core sediments
ARBOREAL
SHRUB
HERBACEOUS
Abies sp.
Pinus sp.
Juniperus sp.
Betula sp.
Quercus ilex + Quercus pubescens +
Ulmus sp.
Tilia sp.
Corylus sp.
Ostrya sp. Carpinus orientalis
Fraxinus sp.
Olea sp.
Alnus sp.
Salix sp.
Castanea sp.
Juglans regia
Vitis sp.
Hedera helix
Rhamnus sp.
Pistacia sp.
Ericaceae
Arbutus sp.
Cistus sp.
Helianthemum sp.
Rosaceae
Labiatae
Armeria sp.
Daphne sp.
Umbelliferae
Verbenaceae
Cruciferae
Rumex sp.
Artemisia sp.
Centaurea sp.
Knautia sp.
Campanulaceae
Compositae (Liguliflorae)
Compositae (Tubuliflorae)
Chenopodiaceae
Caryophyllaceae
Plantago sp.
Liliaceae
Asphodelus sp.
Urtica sp.
Ranunculaceae
Thalictrum sp.
Potentilla sp.
Gramineae
Cereal type
Phragmites type
core
m
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Assemblage zone
C
X
B2
X
B1
X
A

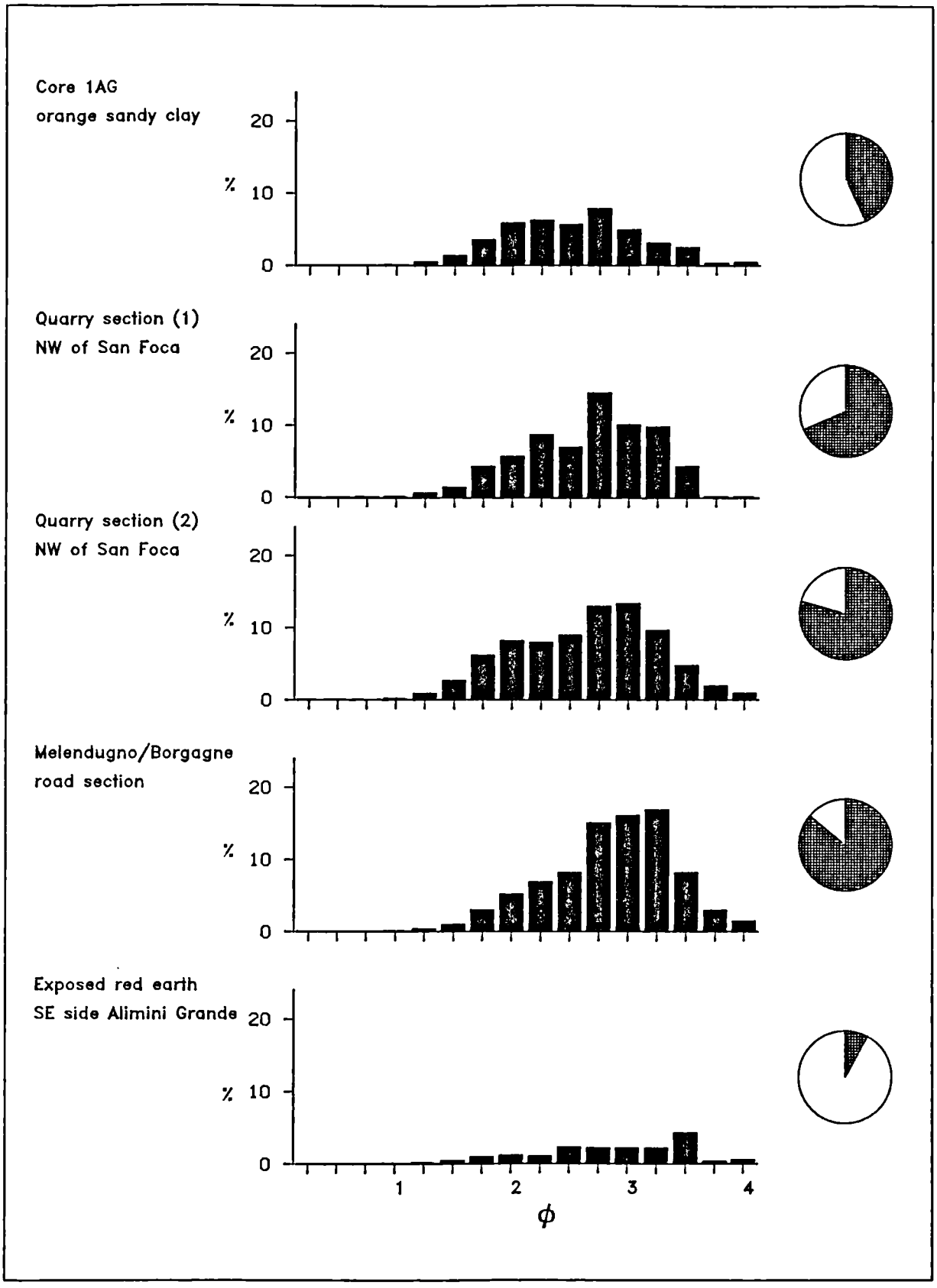


Fig. 9.16: Particle size distributions of the sand fraction of red-earth samples from the study-area
Pie-charts illustrate the ratio of sand (shaded) to silt and clay.

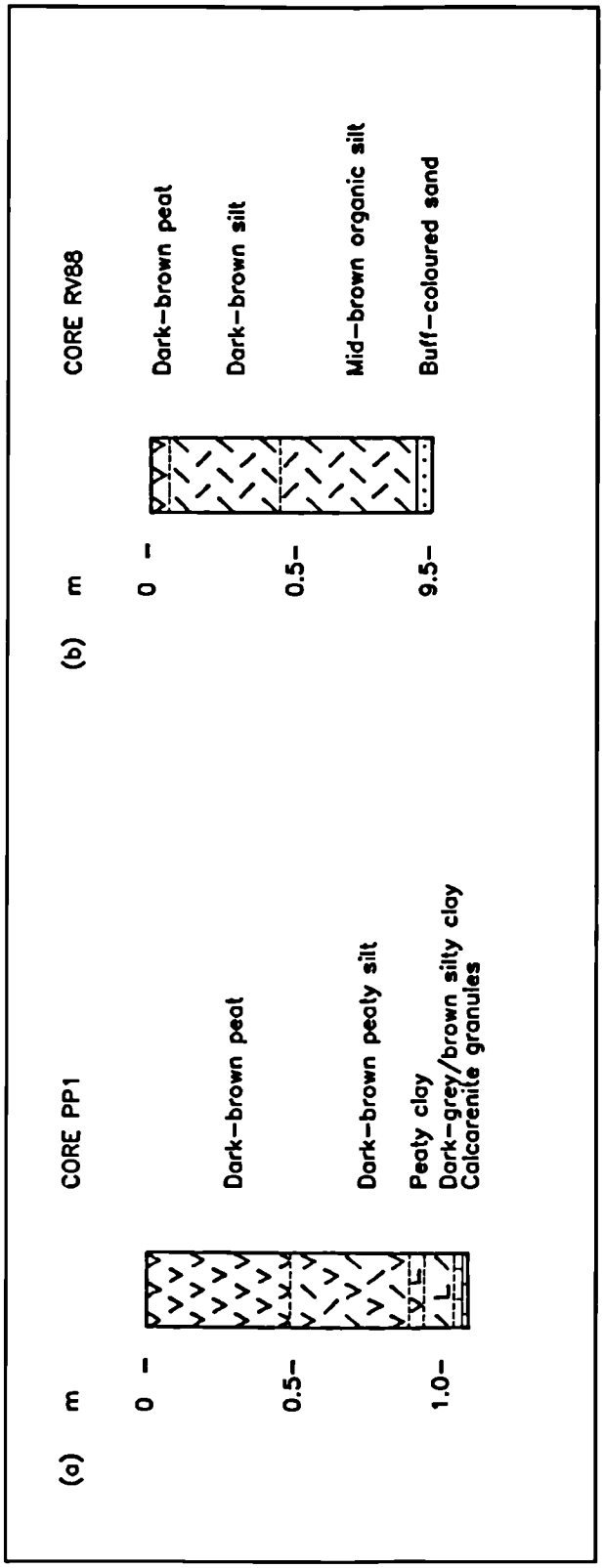
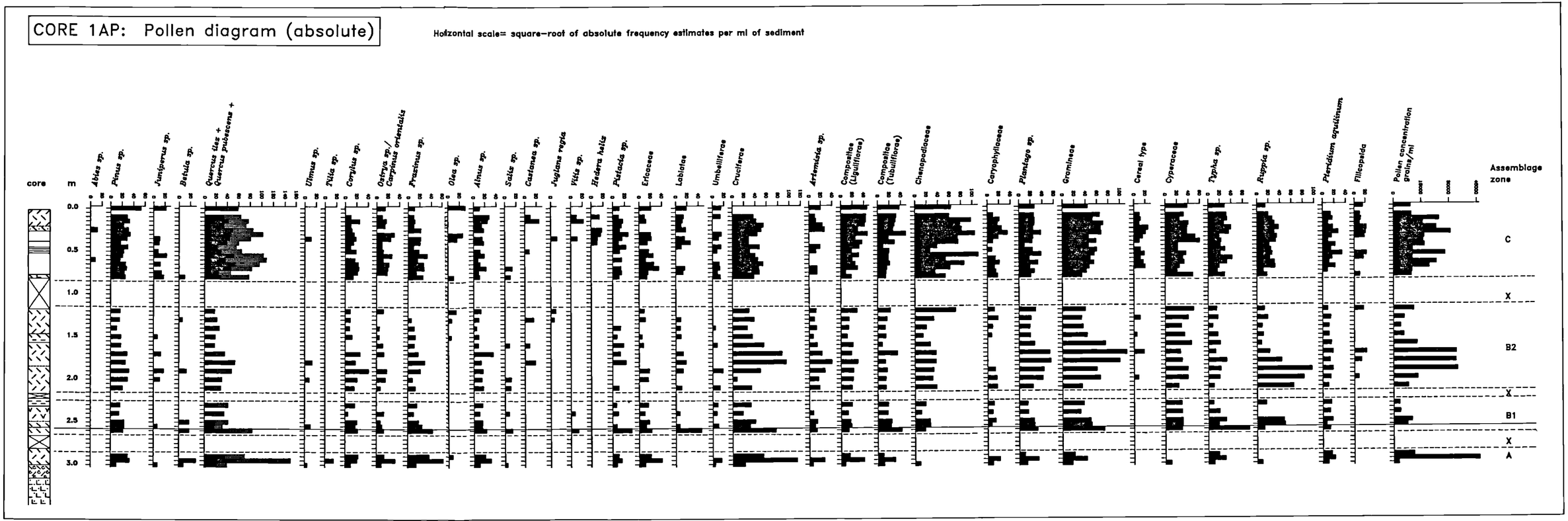


Fig. 9.17: Cores PP1 and RV88. Sediment stratigraphy

Fig. 9.8


CORE 1AP: Pollen diagram (absolute)
Horizontal scale= square-root of absolute frequency estimates per ml of sediment
core
m
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Abies sp.
Pinus sp.
Juniperus sp.
Betula sp.
Quercus ilex + Quercus pubescens +
Ulmus sp.
Pistacia sp.
Corylus sp.
Ostrya sp./ Carpinus orientalis
Fraxinus sp.
Olea sp.
Alnus sp.
Salix sp.
Castanea sp.
Juglans regia
Vitis sp.
Hedera helix
Pistacia sp.
Ericaceae
Labiatae
Umbelliferae
Cruciferae
Artemisia sp.
Compositae (Liguliflorae)
Compositae (Tubuliflorae)
Chenopodiaceae
Caryophyllaceae
Plantago sp.
Gramineae
Cereal type
Cyperaceae
Typha sp.
Ruppia sp.
Pteridium aquilinum
Filicopsida
Pollen concentration grains/ml
Assemblage zone
C
X
B2
X
B1
X
A

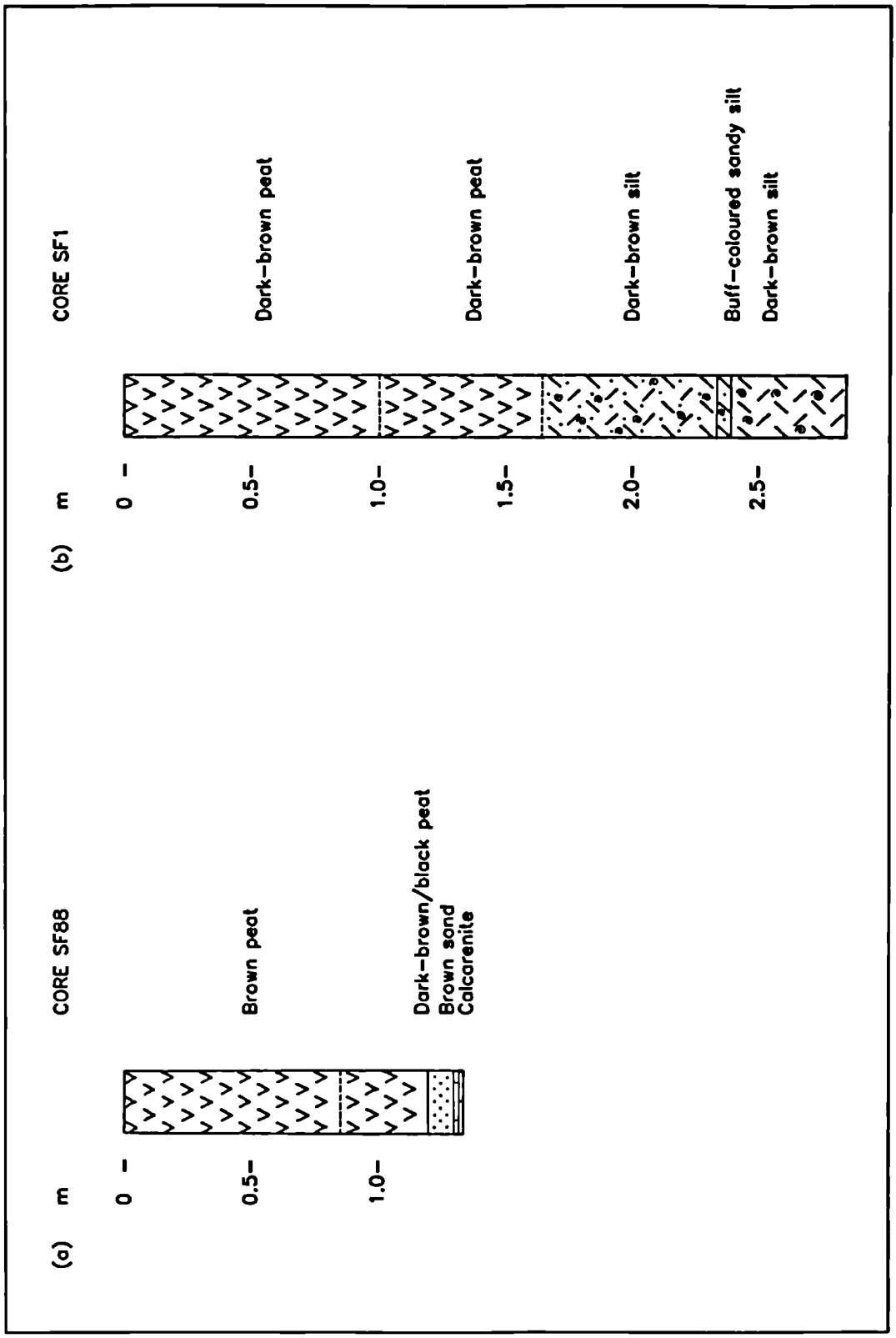


Fig. 9.18: Cores SF88 and SF1. Sediment stratigraphy

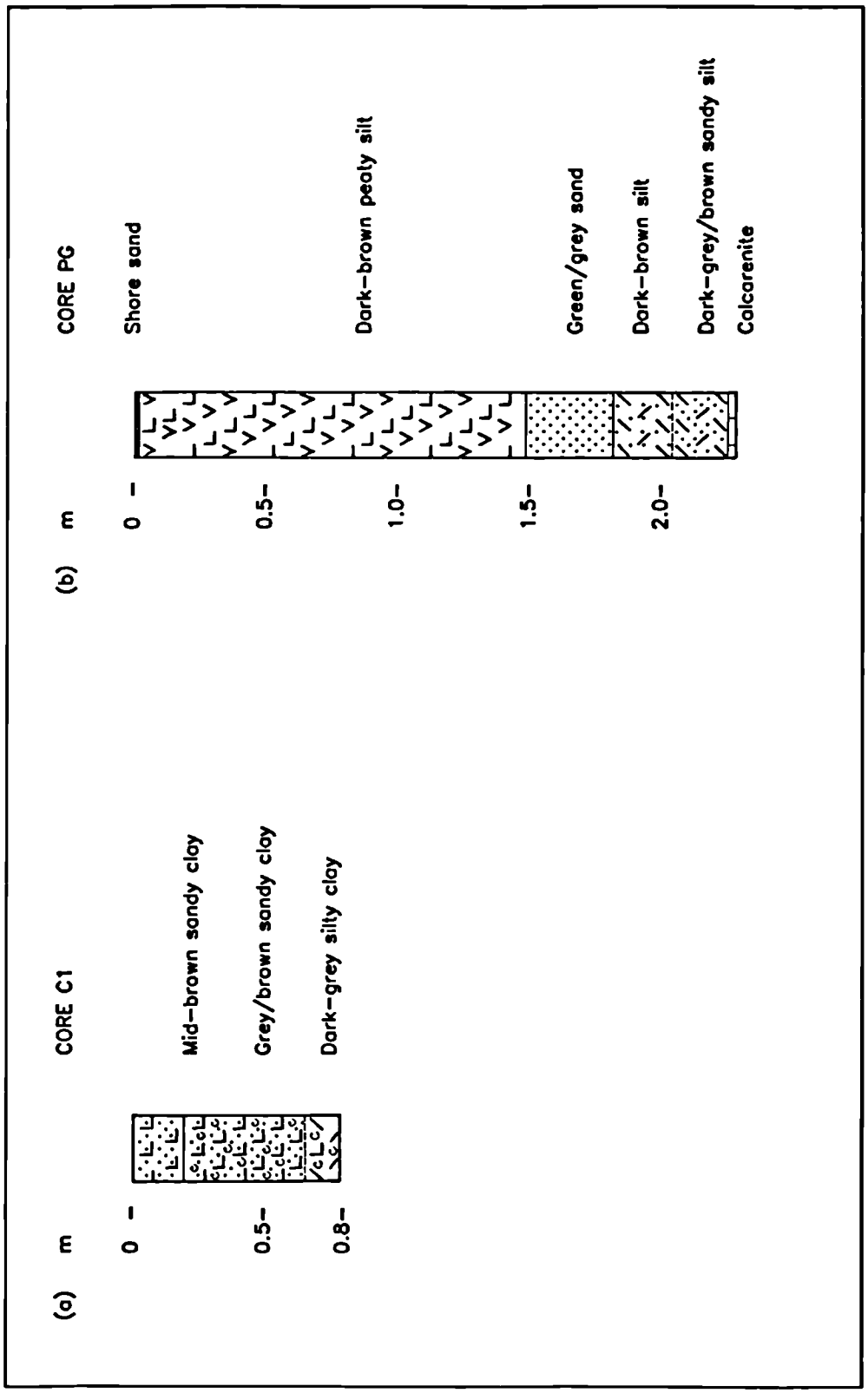


Fig. 9.21: Cores C1 and PG. Sediment stratigraphy

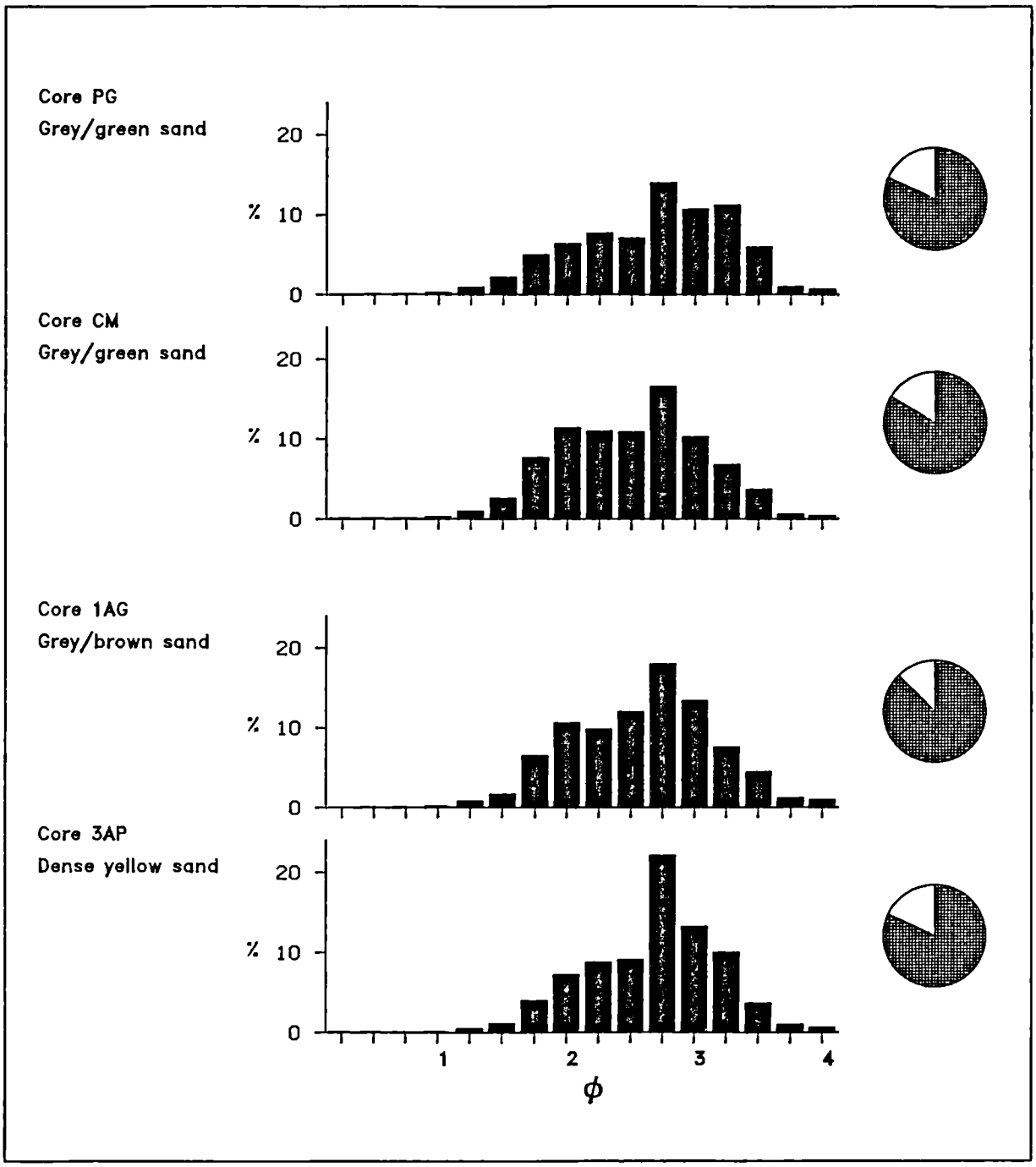


Fig. 9.22: **Particle size distributions of sands from cores PG and CM from the Cesine, and cores 1AG and 3AP near the Alimini**
Pie-charts illustrate the ratio of sand (shaded) to silt and clay.

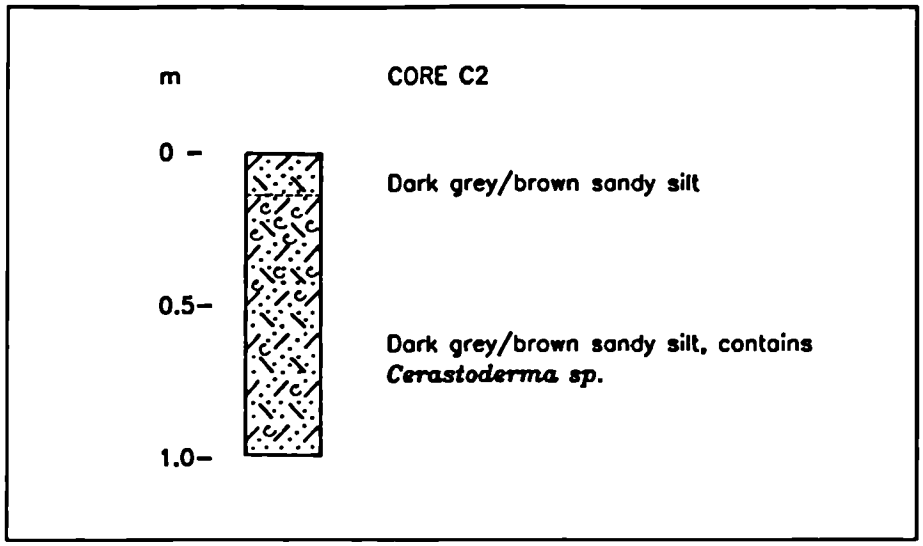


Fig. 9.24: Core C2. Sediment stratigraphy

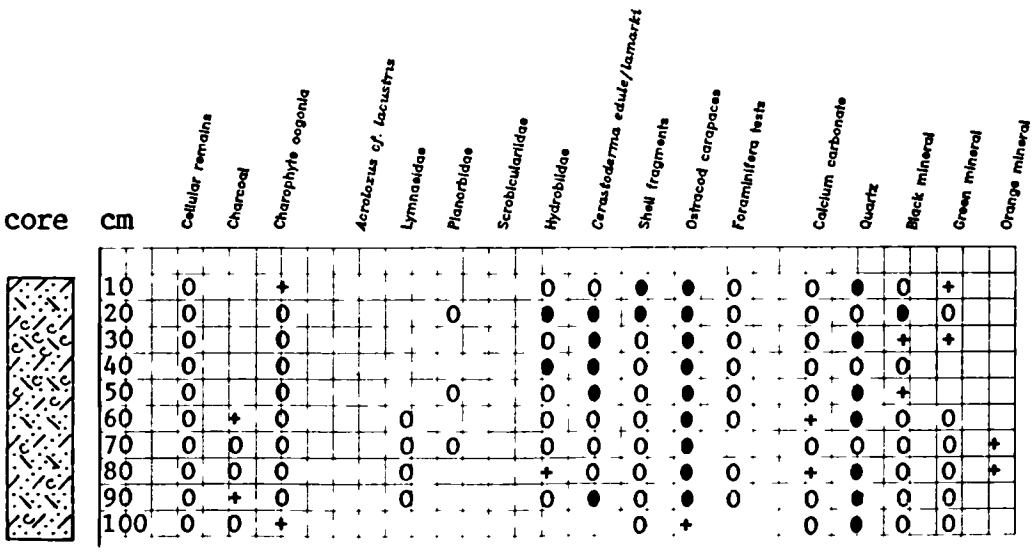
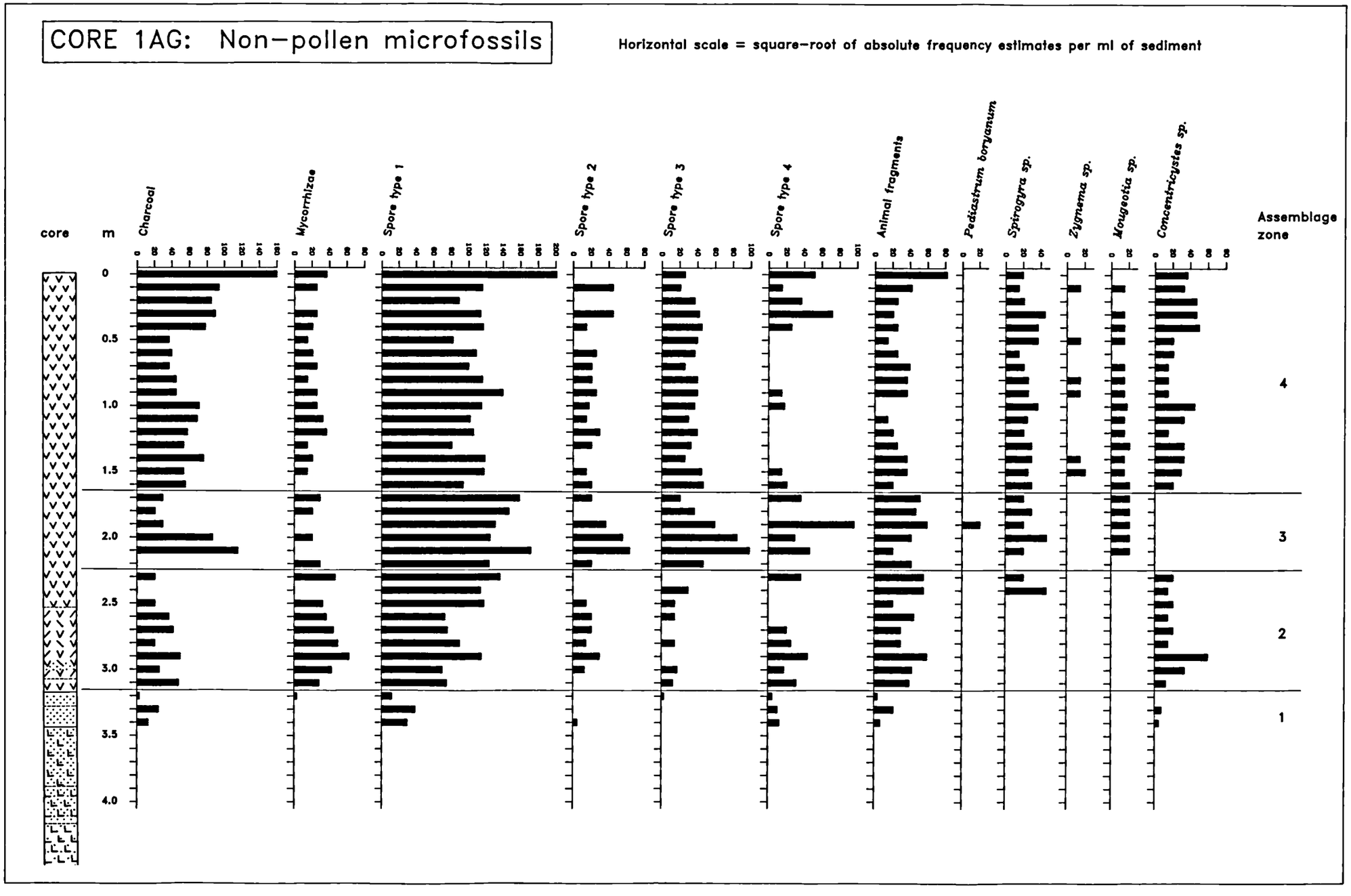


Table 9.7: Macrofossil and mineral distribution in core C2

key: 0 = abundant
0 = present (frequent)
+ = present (scarce)

Fig. 9.13


CORE 1AG: Non–pollen microfossils
Horizontal scale = square–root of absolute frequency estimates per ml of sediment
core
m
Charcoal
Mycorrhizae
Spore type 1
Spore type 2
Spore type 3
Spore type 4
Animal fragments
Pediastrum boryanum
Spirogyra sp.
Zygnema sp.
Mougeotia sp.
Concentricystes sp.
Assemblage zone
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4
3
2
1

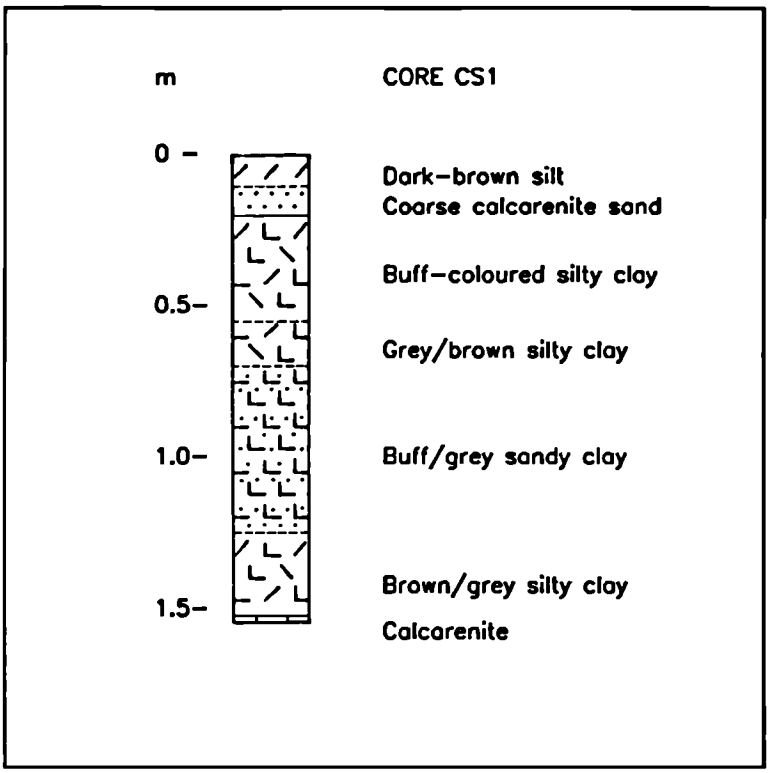
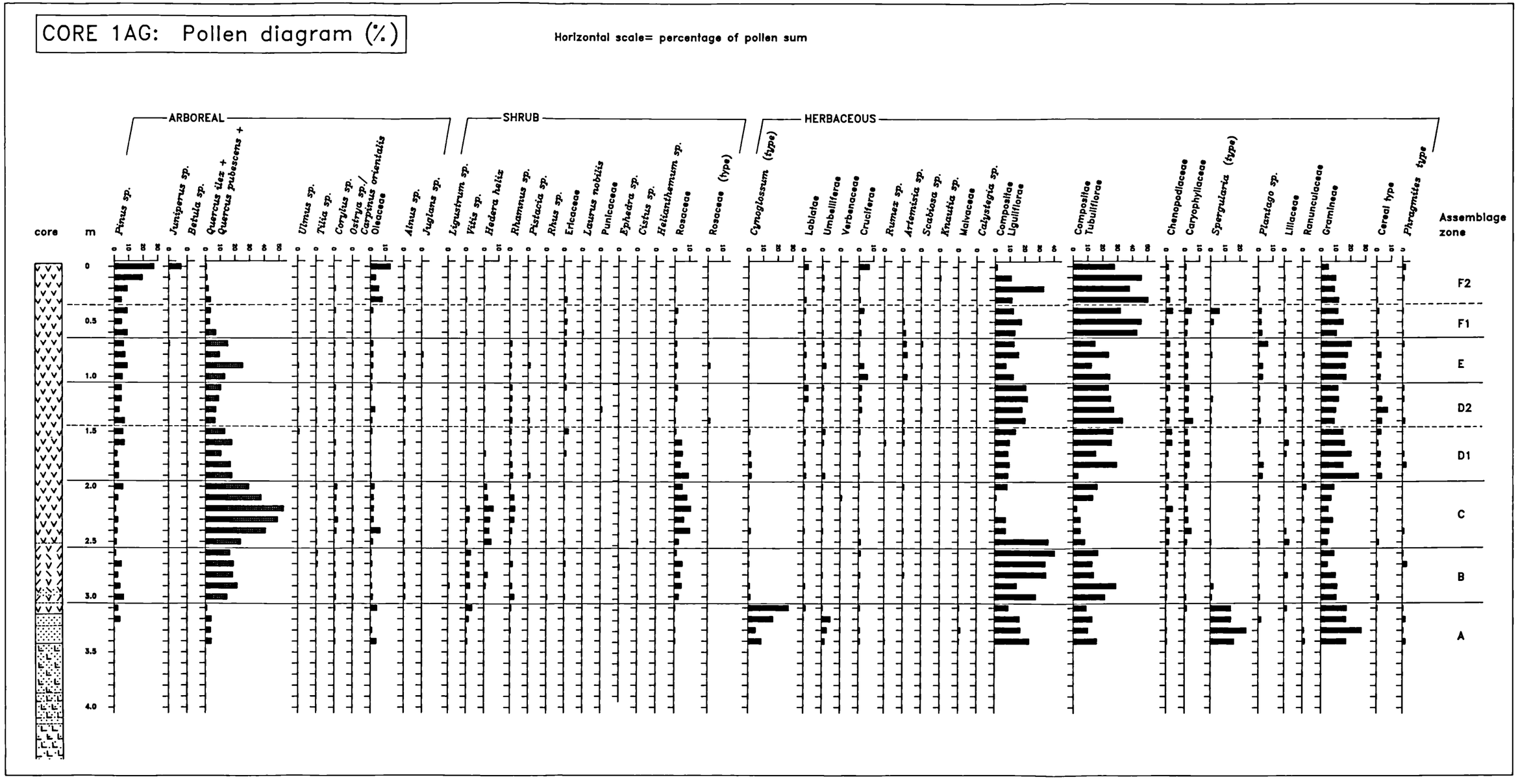


Fig. 9.28: Core CS1. Sediment stratigraphy

Fig. 9.14


CORE 1AG: Pollen diagram (%)
Horizontal scale= percentage of pollen sum
ARBOREAL
SHRUB
HERBACEOUS
core
m
Pinus sp.
Juniperus sp.
Betula sp.
Quercus ilex + Quercus pubescens +
Ulmus sp.
Tilia sp.
Corylus sp.
Ostrya sp./ Carpinus orientalis
Oleaceae
Alnus sp.
Juglans sp.
Ligustrum sp.
Vitis sp.
Hedera helix
Rhamnus sp.
Pistacia sp.
Rhus sp.
Ericaceae
Laurus nobilis
Punicaceae
Ephedra sp.
Cistus sp.
Helianthemum sp.
Rosaceae
Rosaceae (type)
Cynoglossum (type)
Labiatae
Umbelliferae
Verbenaceae
Cruciferae
Rumex sp.
Artemisia sp.
Scabiosa sp.
Knautia sp.
Malvaceae
Calystegia sp.
Compositae Liguliflorae
Compositae Tubuliflorae
Chenopodiaceae
Caryophyllaceae
Spergularia (type)
Plantago sp.
Liliaceae
Ranunculaceae
Gramineae
Cereal type
Phragmites type
Assemblage zone
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
F2
F1
E
D2
D1
C
B
A

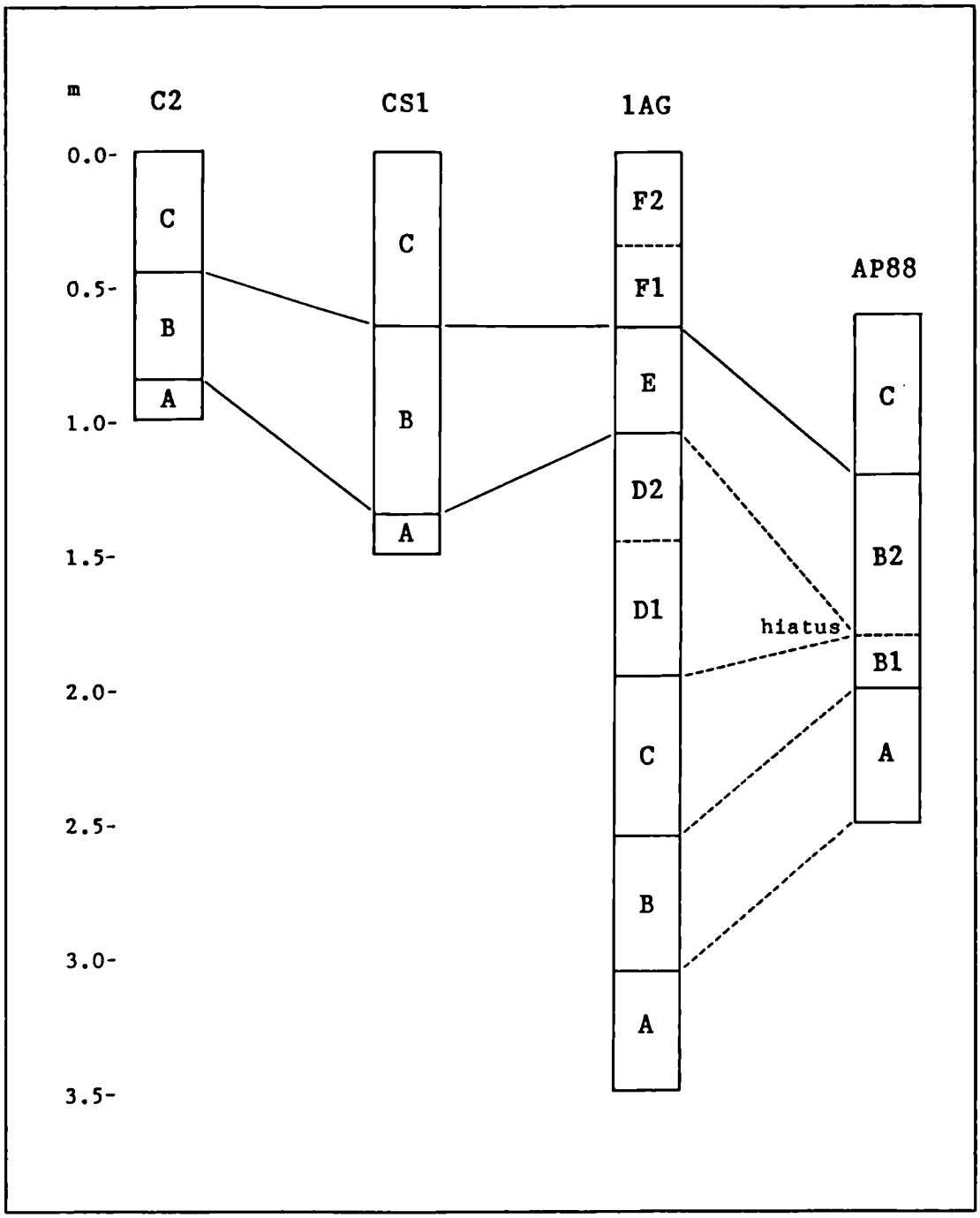
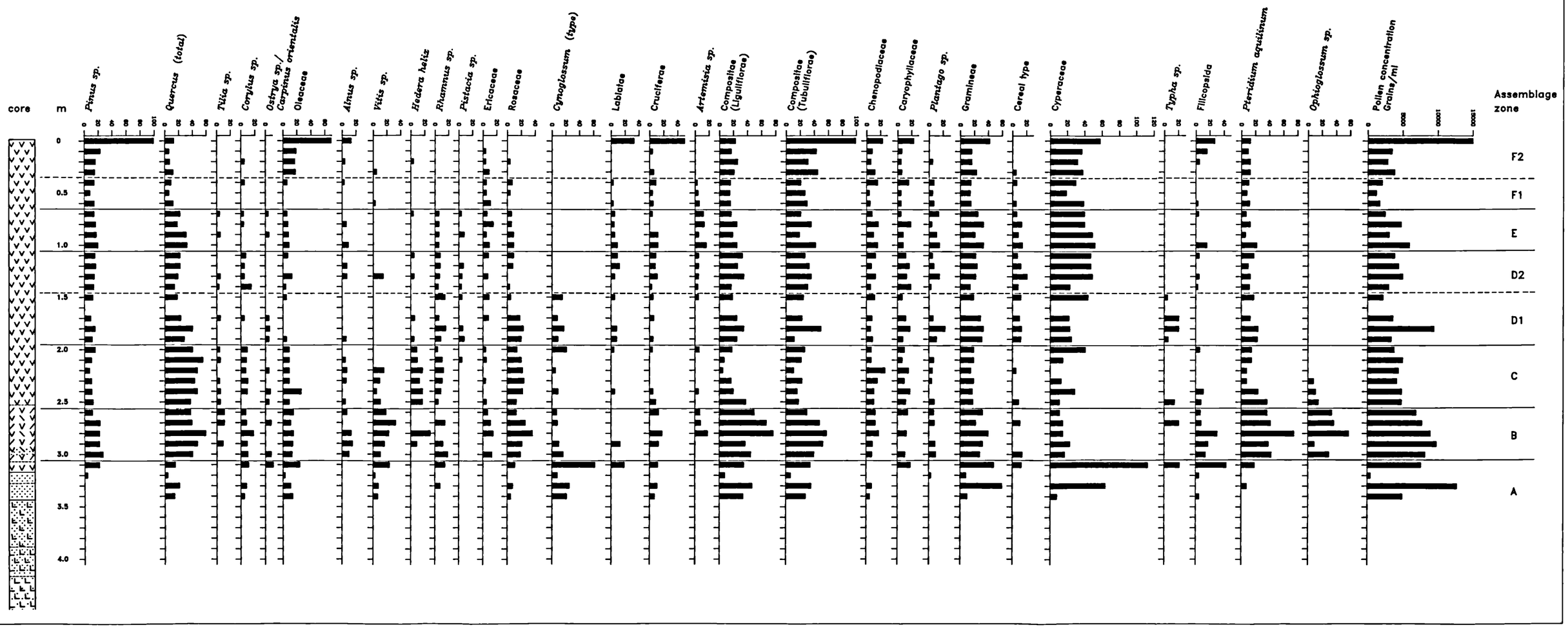


Fig. 9.32: Diagram showing the suggested correlation between pollen assemblage-zones in cores C2, CS1, 1AG and AP88

Fig. 9.15

CORE 1AG: Pollen diagram (absolute)

Horizontal scale= square-root of absolute frequency estimates per ml of sediment



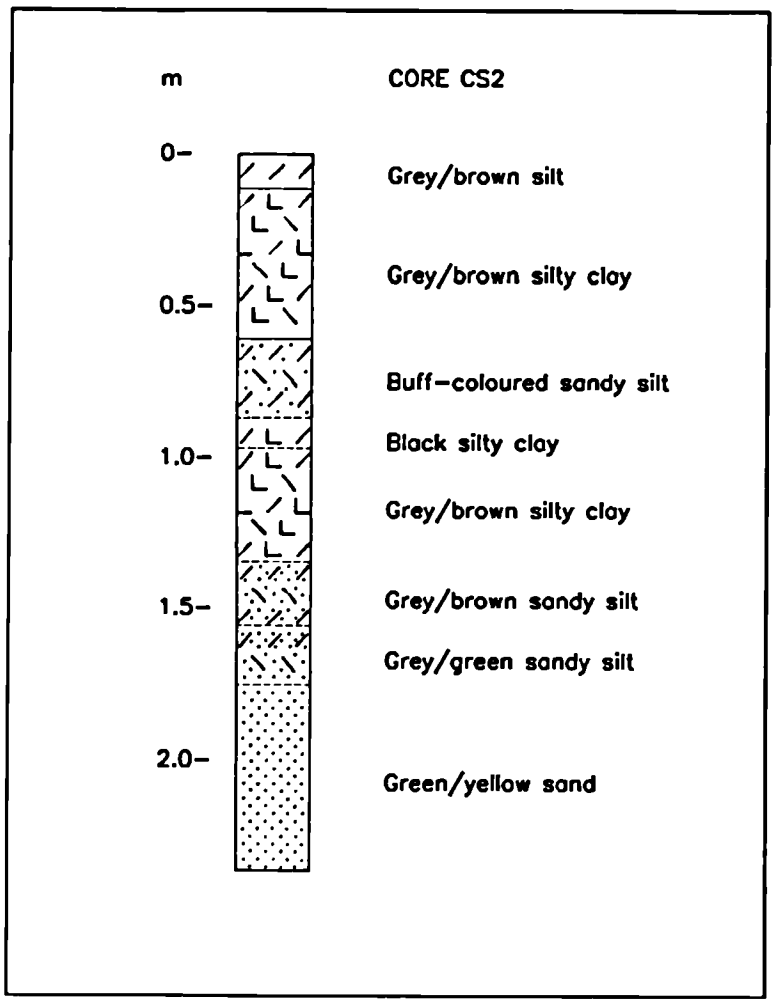


Fig. 9.33: Core CS2. Sediment stratigraphy

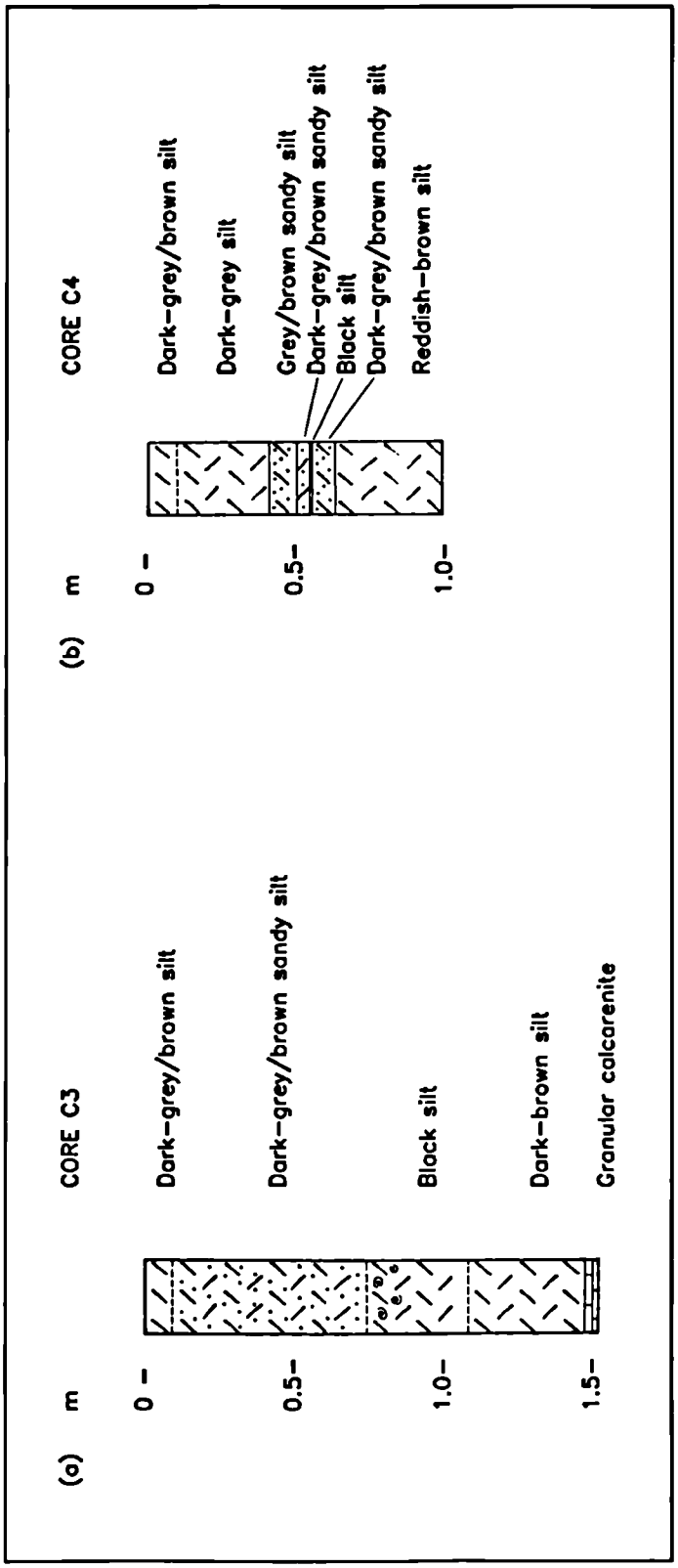


Fig. 9.35: Cores C3 and C4. Sediment stratigraphy

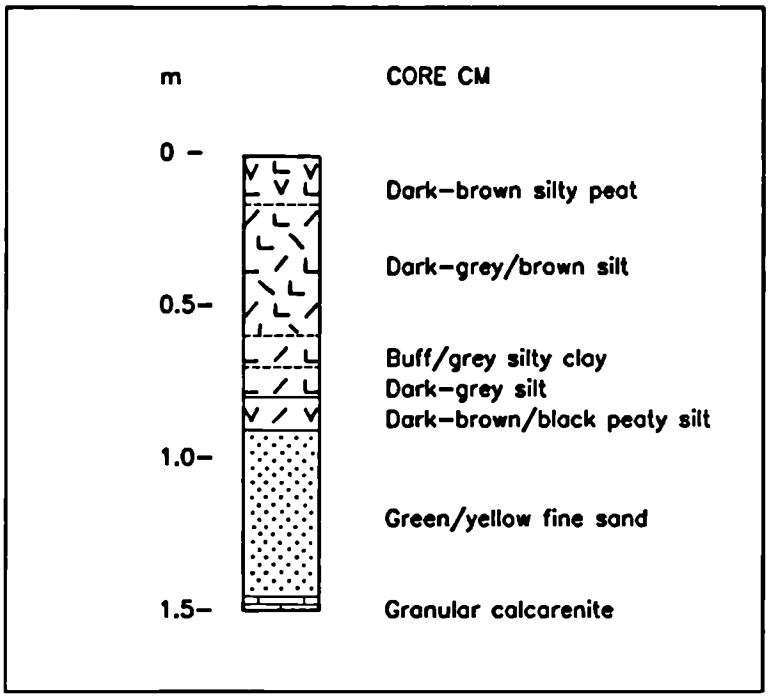


Fig. 9.36: Core CM. Sediment stratigraphy

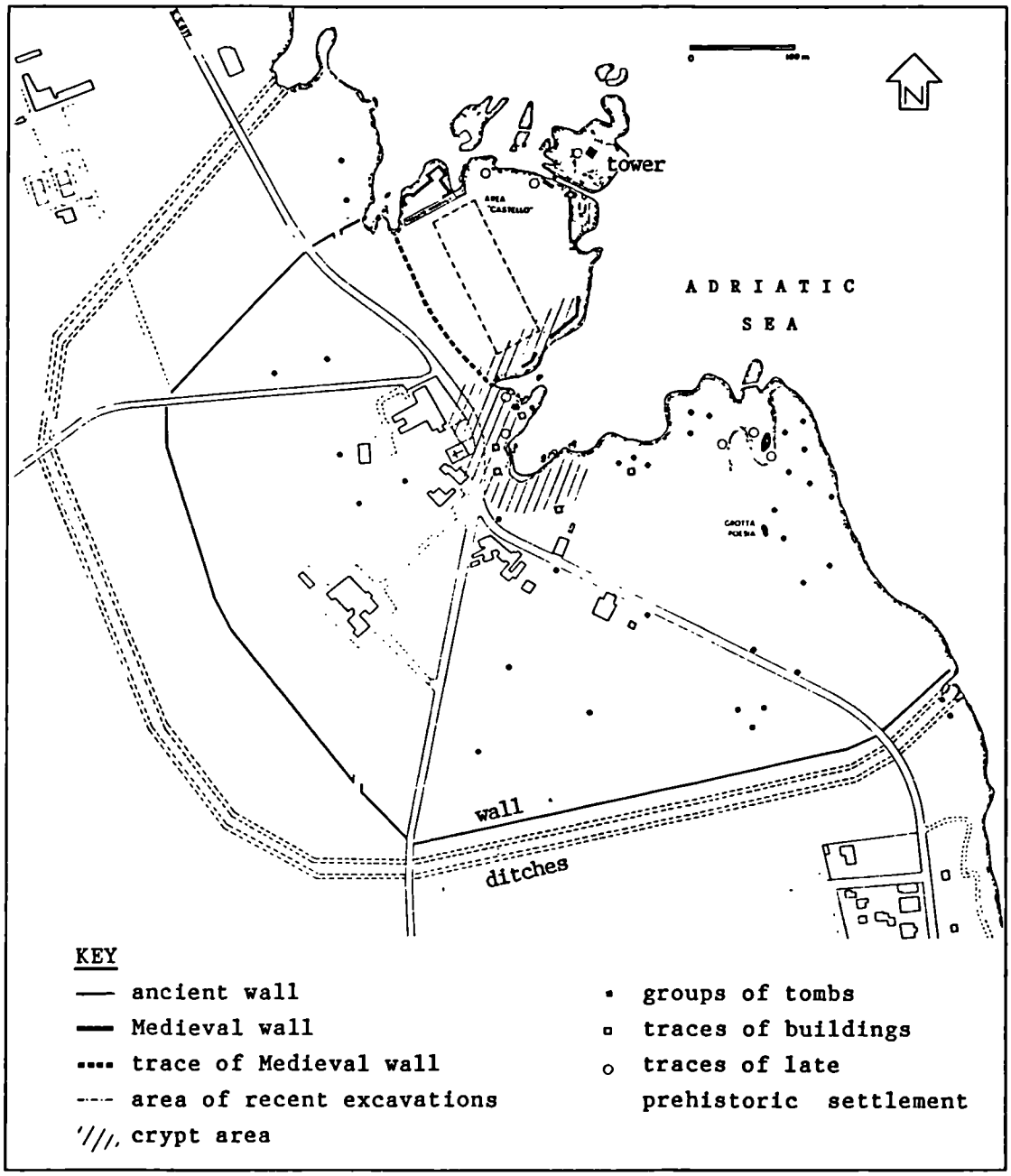
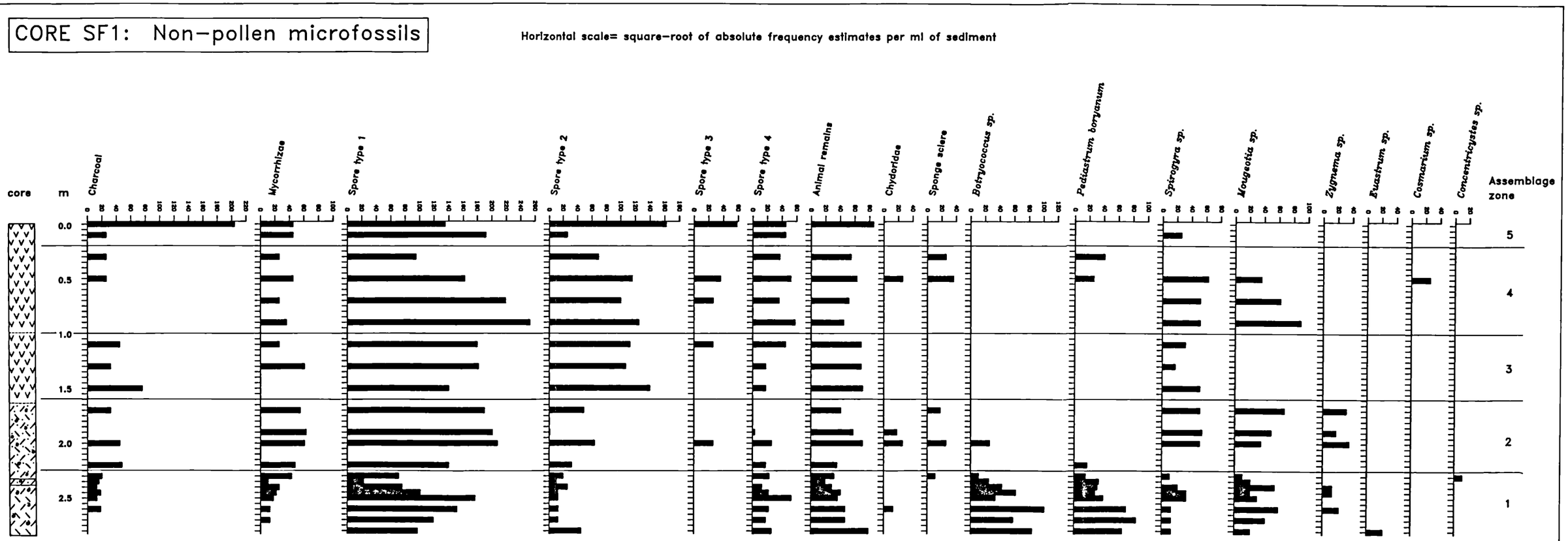


Fig. 10.1: The archaeological site of Roca Vecchia (after Pagliara 1987: Tav. XXI)

Fig. 9.19

CORE SF1: Non-pollen microfossils

Horizontal scale= square-root of absolute frequency estimates per ml of sediment



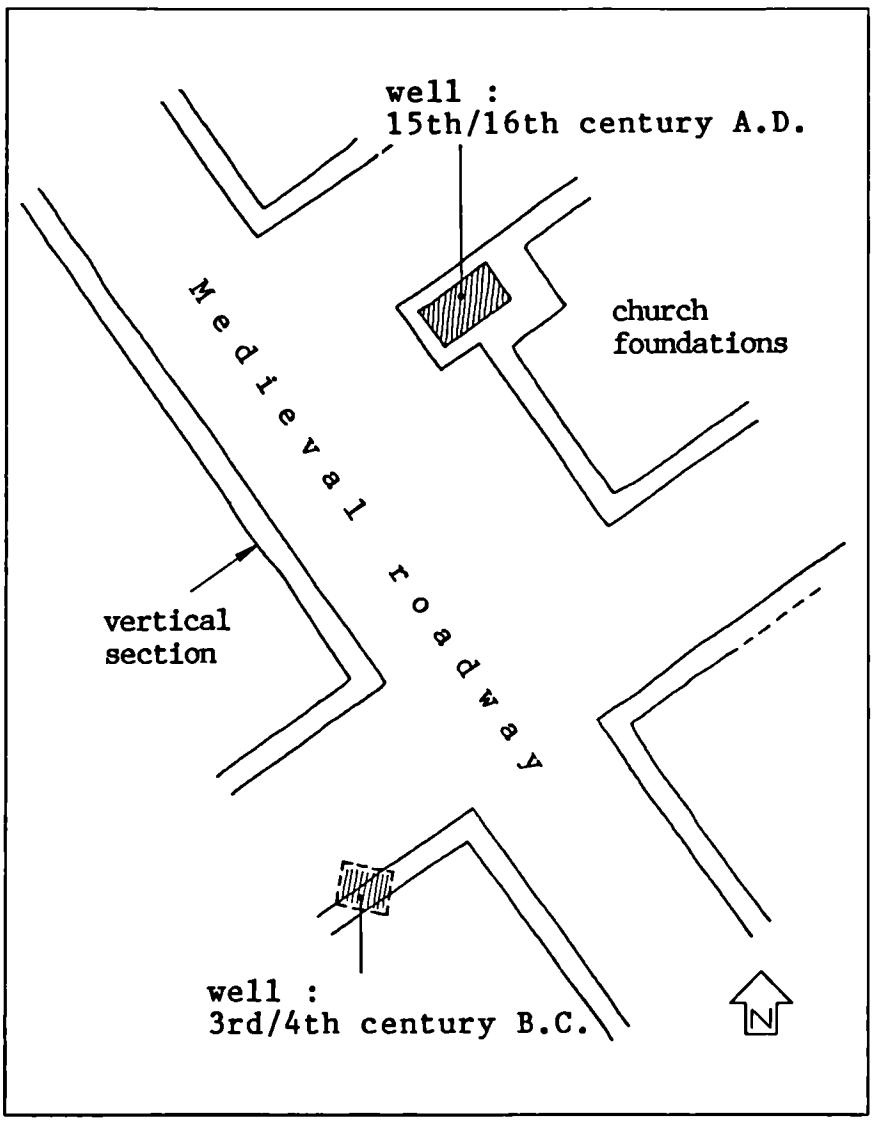
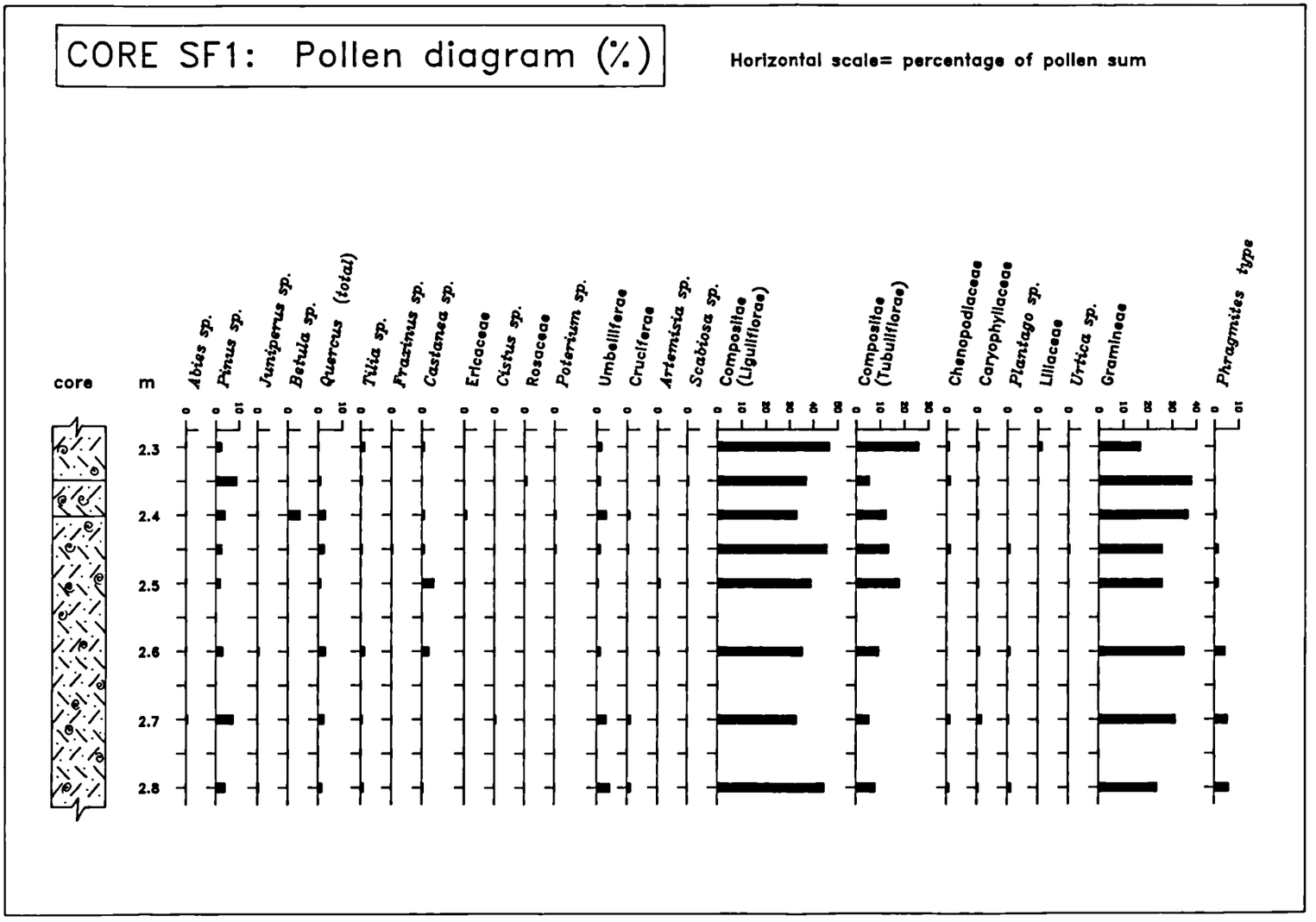


Fig. 10.2: **Sketch plan of the sampling area within the excavated area at Roca Vecchia (Fig. 10.1)** Not to scale. Source-author.

Fig. 9.20


CORE SF1: Pollen diagram (%)
Horizontal scale= percentage of pollen sum
core
m
2.3
2.4
2.5
2.6
2.7
2.8
Abies sp.
Pinus sp.
Juniperus sp.
Betula sp.
Quercus (total)
Tilia sp.
Fraxinus sp.
Castanea sp.
Ericaceae
Cistus sp.
Rosaceae
Poterium sp.
Umbelliferae
Cruciferae
Artemisia sp.
Scabiosa sp.
Compositae (Liguliflorae)
Compositae (Tubuliflorae)
Chenopodiaceae
Caryophyllaceae
Plantago sp.
Liliaceae
Urtica sp.
Gramineae
Phragmites type

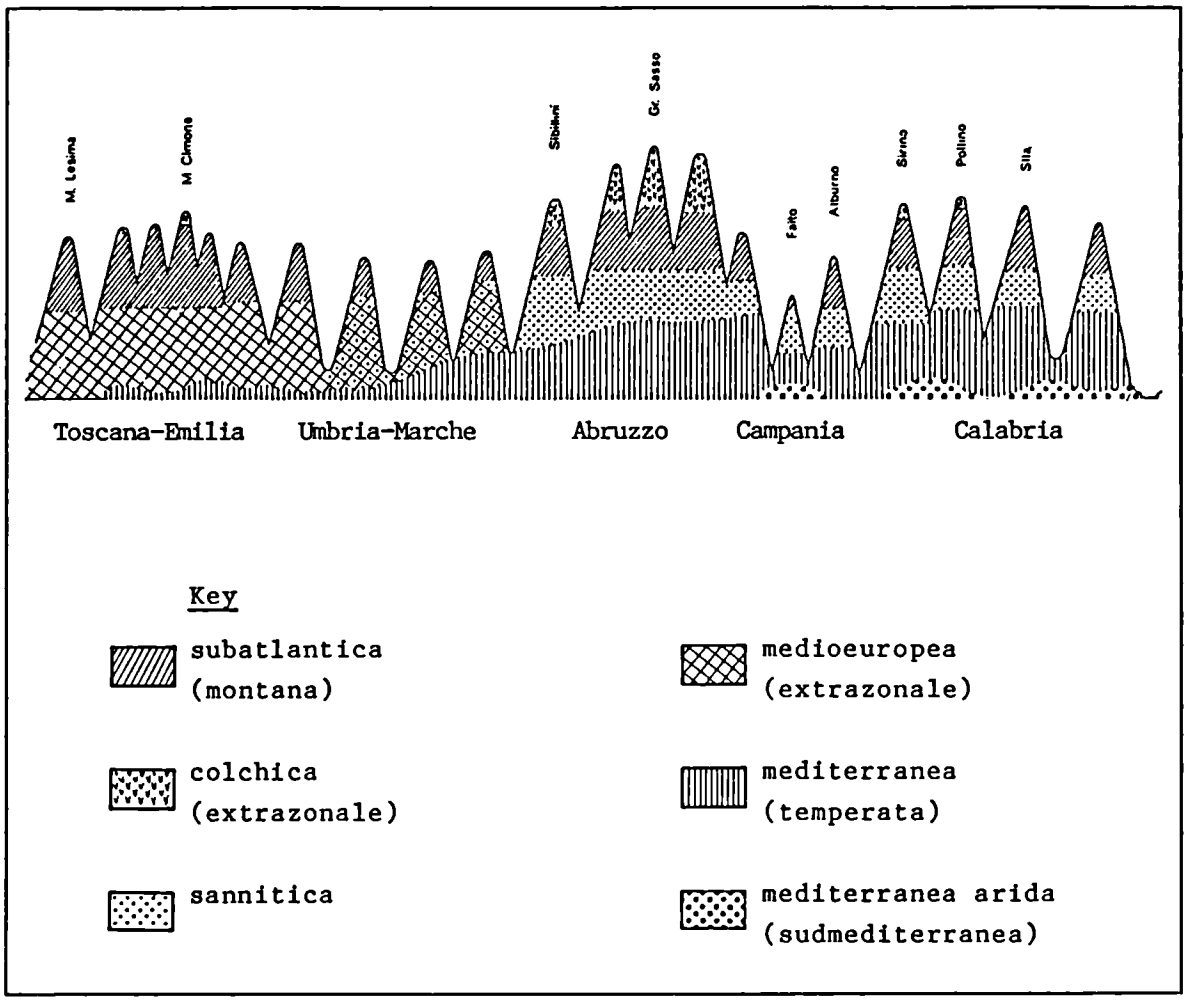


Fig. 12.1: Schematic distribution of vegetation belts along a north-south transect of the Apennines (after Pignatti 1979: Fig. 2)

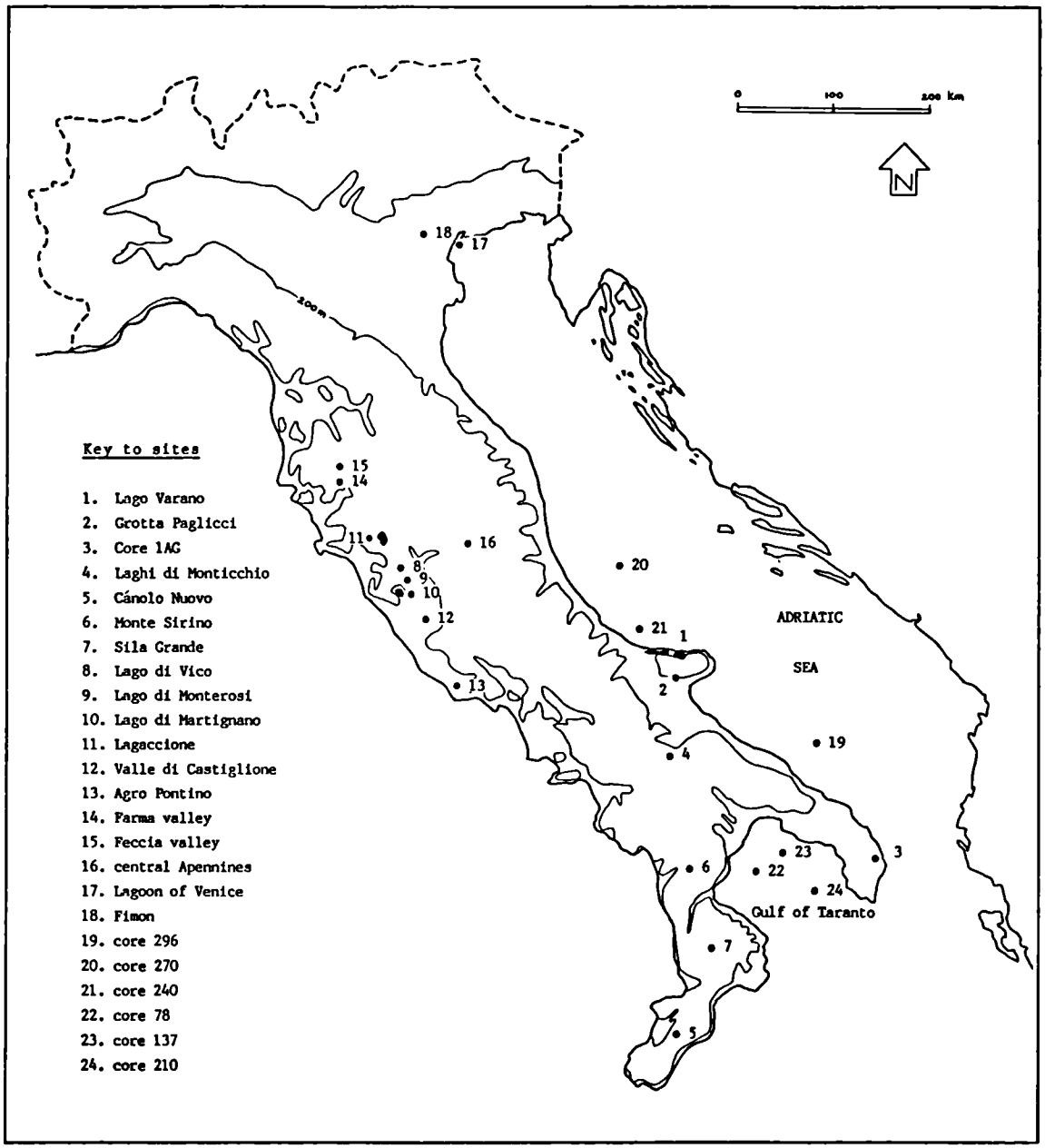


Fig. 12.2: Map of Italy showing core-site locations mentioned in section 12.1
source: author

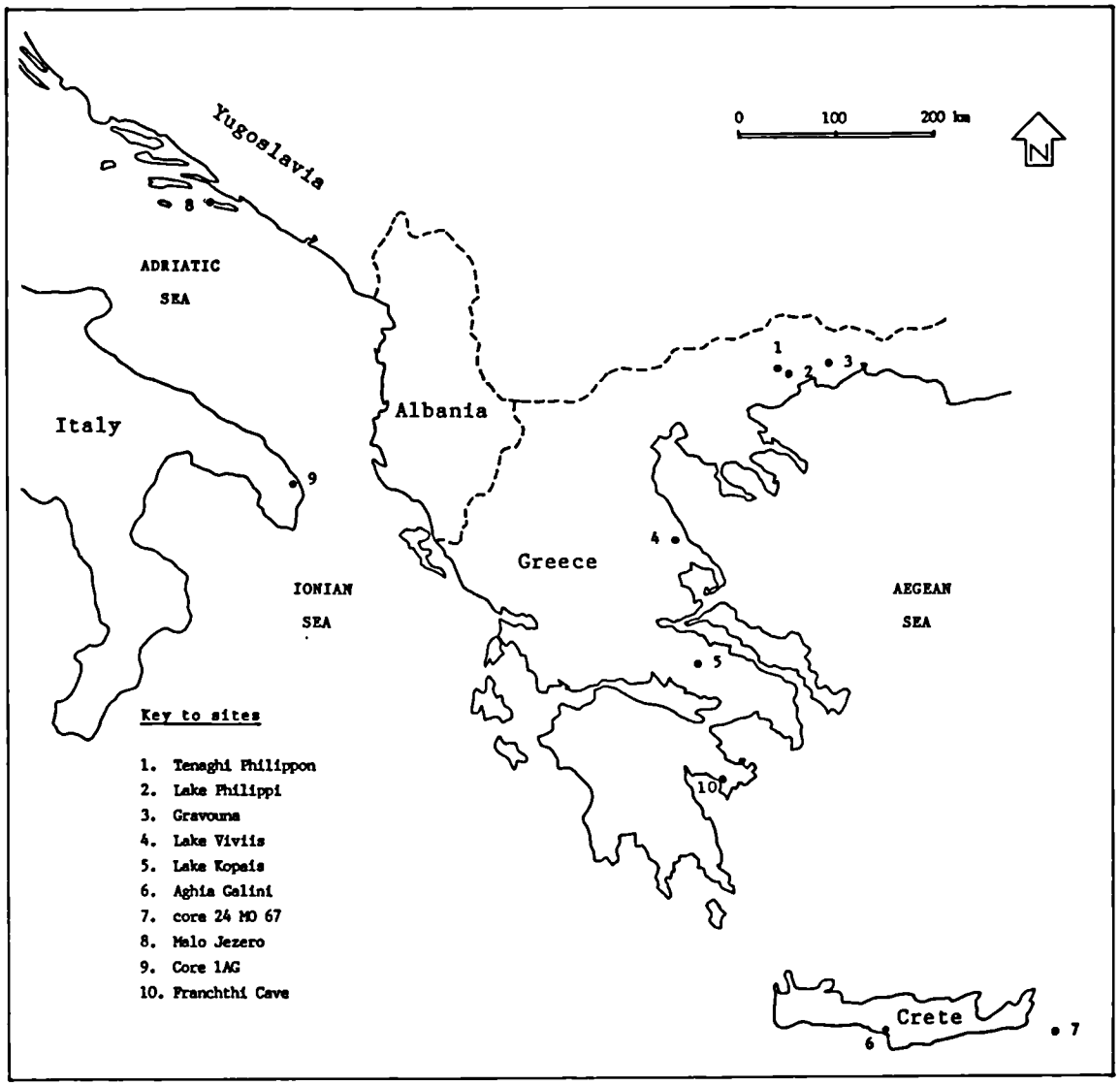
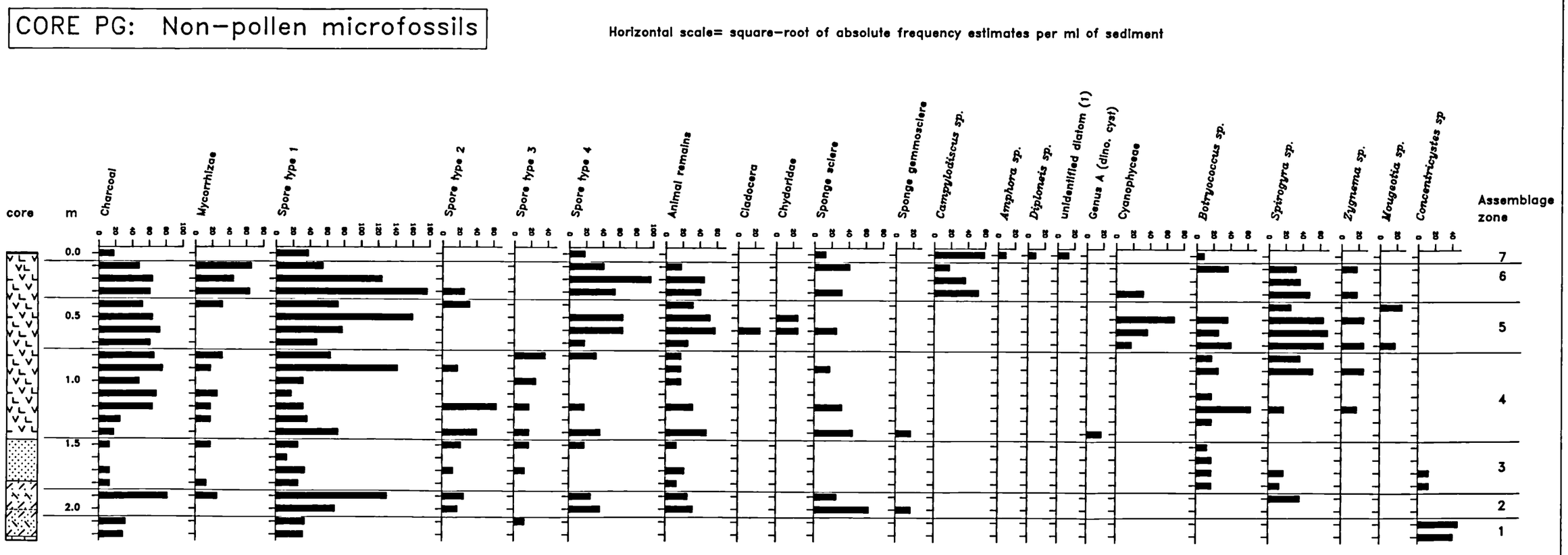


Fig. 12.3: Map of the central Mediterranean region showing core-site locations mentioned in section 12.2
(source: author)

Fig. 9.23

CORE PG: Non-pollen microfossils

Horizontal scale= square-root of absolute frequency estimates per ml of sediment



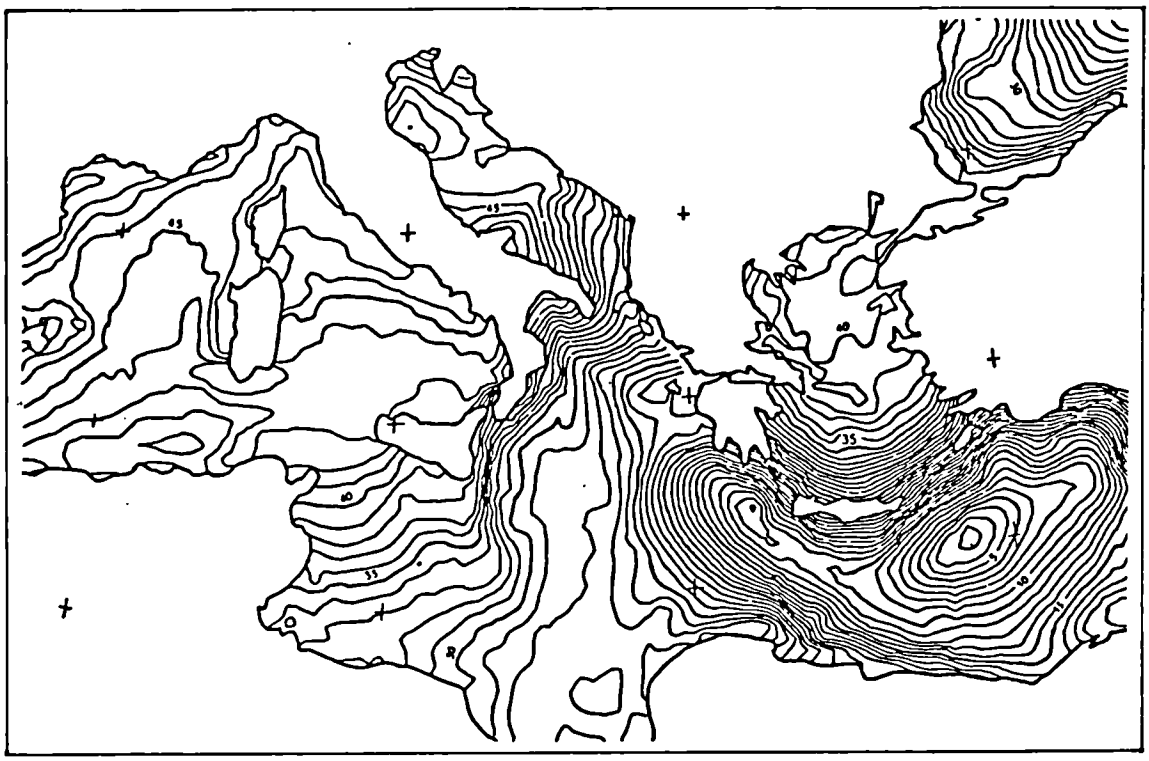


Fig. 12.4: **Map of Mediterranean sea-surface topography (geoid).** Contour interval = 1 m
(after Pirazzoli 1987: Fig. 5.2)

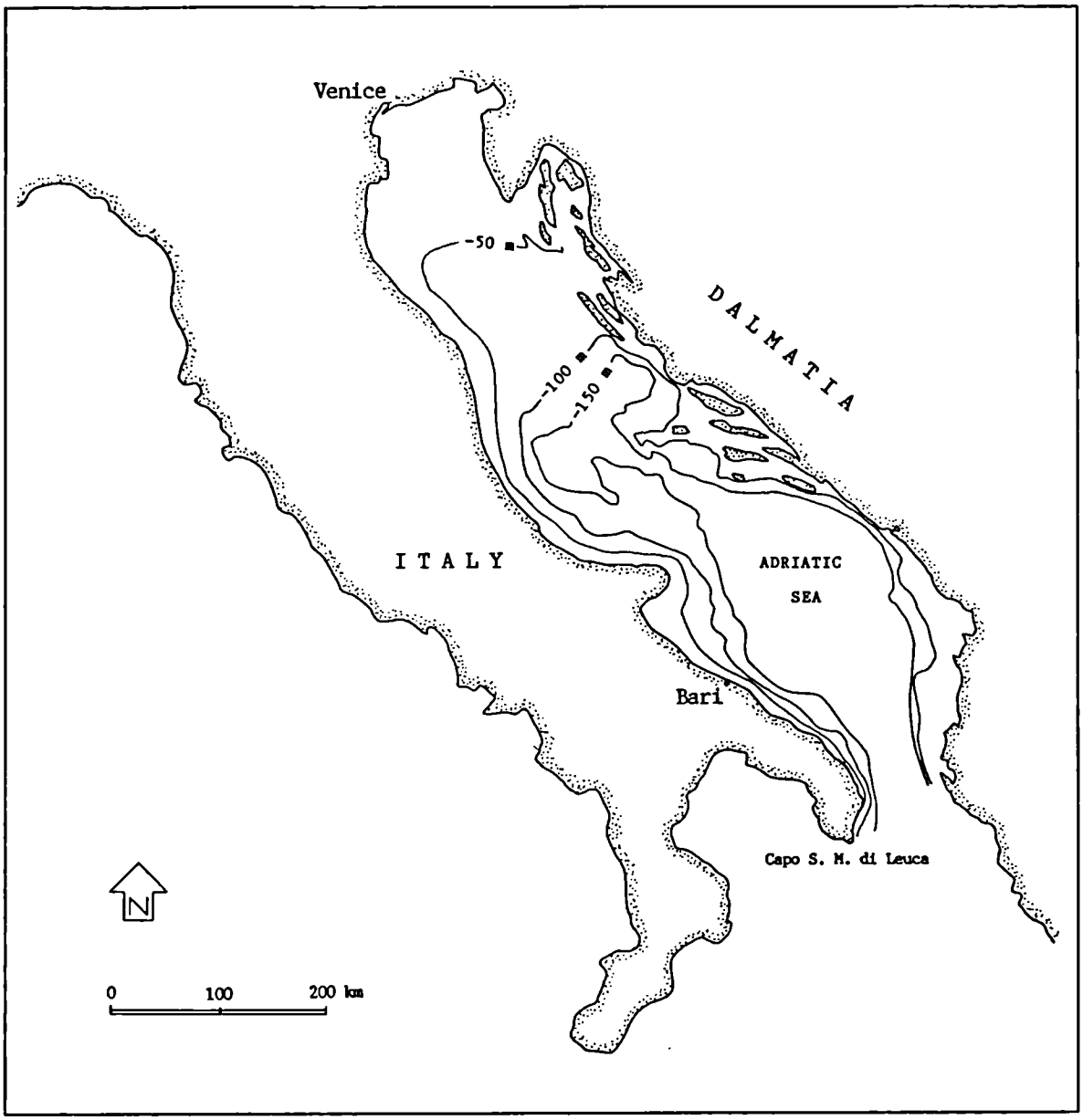
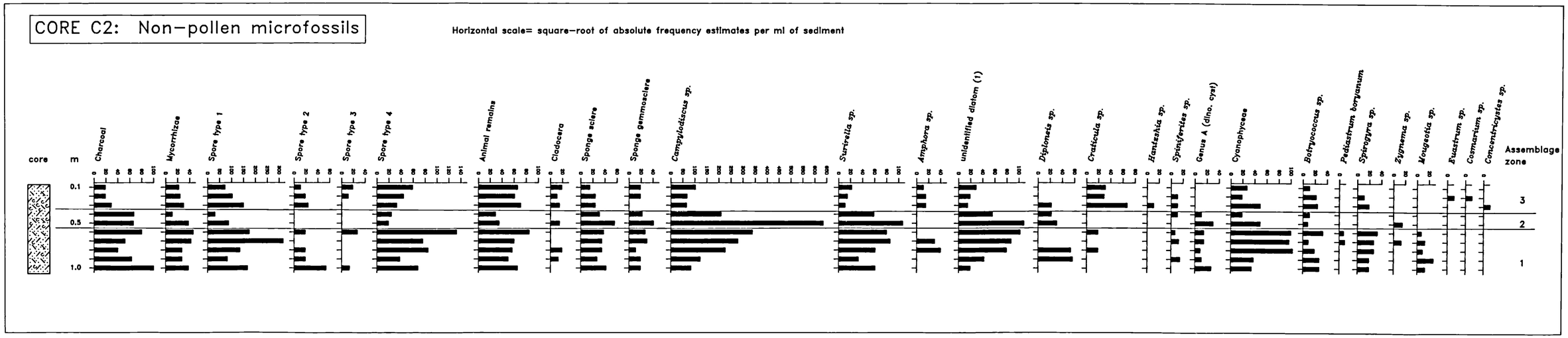


Fig. 12.5: Bathymetric map of the Adriatic Sea (to -150 m)
Source: author

Fig. 9.25


CORE C2: Non-pollen microfossils
Horizontal scale= square-root of absolute frequency estimates per ml of sediment
core
m
0.1
0.5
1.0
Charcoal
Mycorrhizae
Spore type 1
Spore type 2
Spore type 3
Spore type 4
Animal remains
Cladocera
Sponge sclere
Sponge gemmosclere
Campylodiscus sp.
Surirella sp.
Amphora sp.
unidentified diatom (1)
Diploneis sp.
Craticula sp.
Hantzschia sp.
Spiniferites sp.
Genus A (dino. cyst)
Cyanophyceae
Botryococcus sp.
Pediastrum boryanum
Spirogyra sp.
Zygnema sp.
Mougeotia sp.
Euastrum sp.
Cosmarium sp.
Concentricystes sp.
Assemblage zone
3
2
1

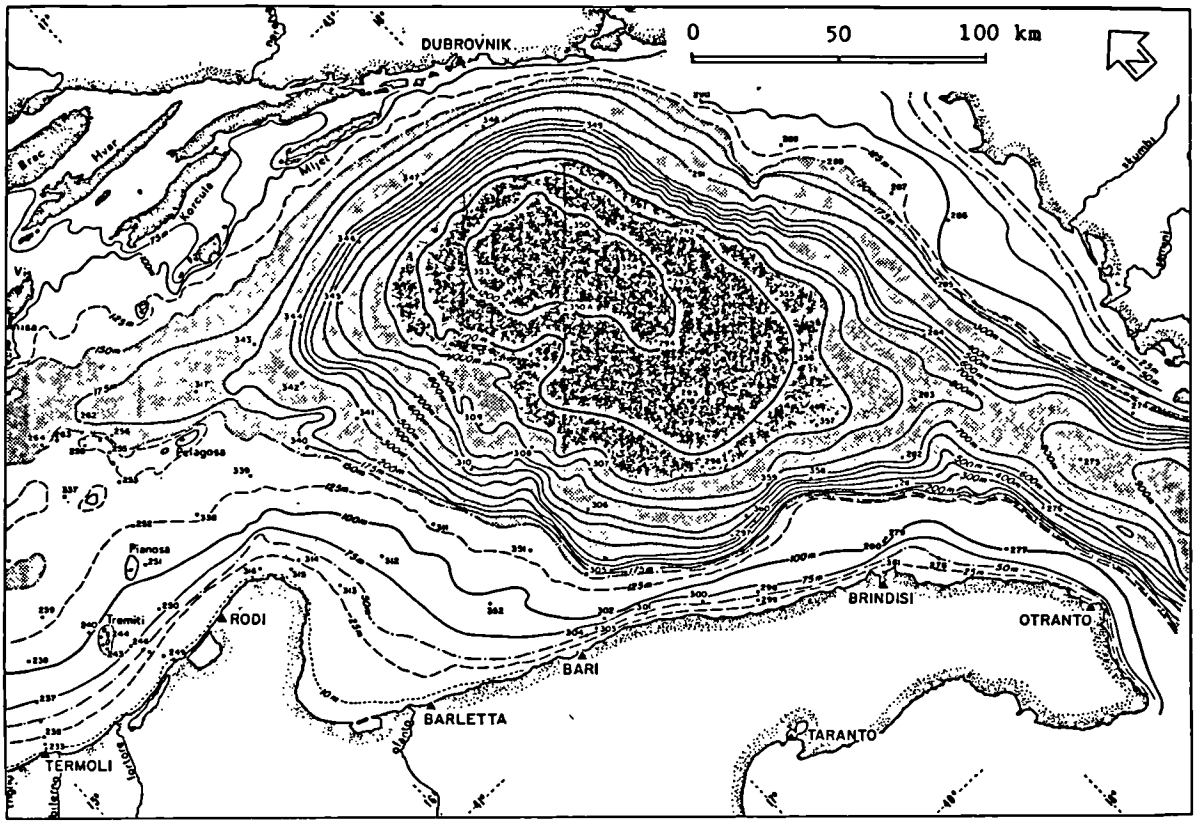
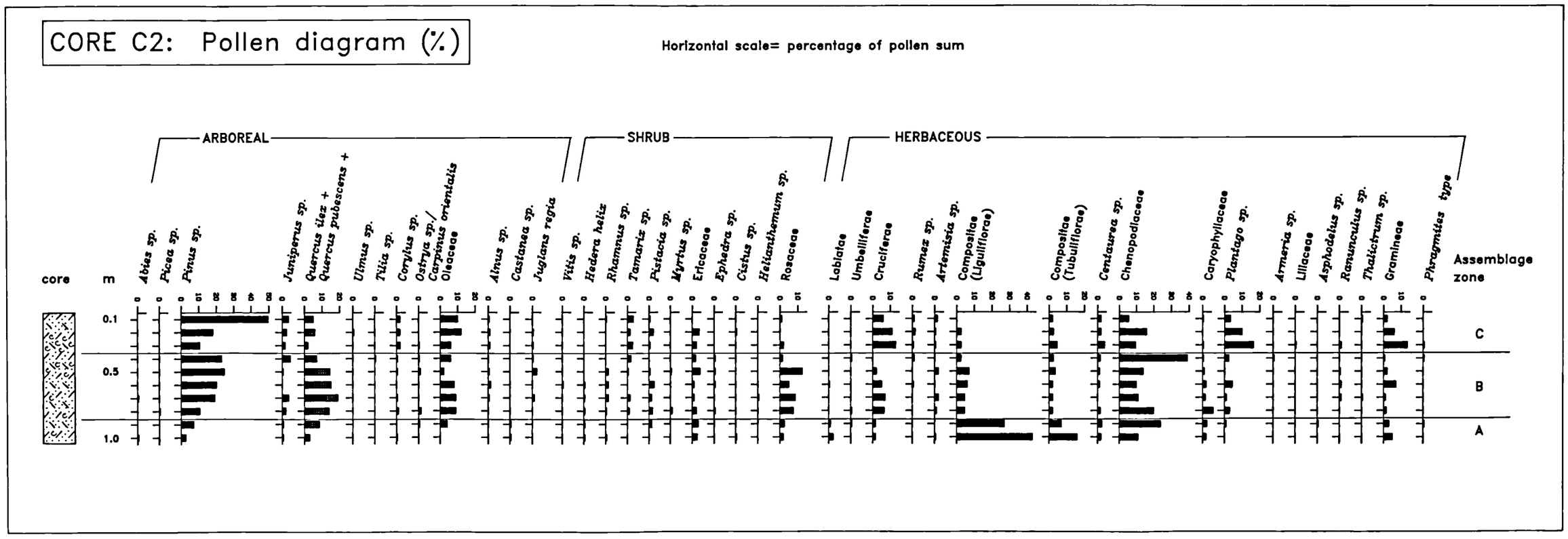


Fig. 12.6: Bathymetric map of the southern Adriatic (after Pigorini 1968: Fig. 9)

Fig. 9.26


CORE C2: Pollen diagram (%)
Horizontal scale= percentage of pollen sum
ARBOREAL
SHRUB
HERBACEOUS
Abies sp.
Picea sp.
Pinus sp.
Juniperus sp.
Quercus ilex + Quercus pubescens +
Ulmus sp.
Tilia sp.
Corylus sp.
Ostrya sp./ Carpinus orientalis
Oleaceae
Alnus sp.
Castanea sp.
Juglans regia
Vitis sp.
Hedera helix
Rhamnus sp.
Tamarix sp.
Pistacia sp.
Myrtus sp.
Ericaceae
Ephedra sp.
Cistus sp.
Helianthemum sp.
Rosaceae
Labiatae
Umbelliferae
Cruciferae
Rumex sp.
Artemisia sp.
Compositae (Liguliflorae)
Compositae (Tubuliflorae)
Centaurea sp.
Chenopodiaceae
Caryophyllaceae
Plantago sp.
Armeria sp.
Liliaceae
Asphodelus sp.
Ranunculus sp.
Thalictrum sp.
Gramineae
Phragmites type
core
m
0.1
0.5
1.0
Assemblage zone
C
B
A

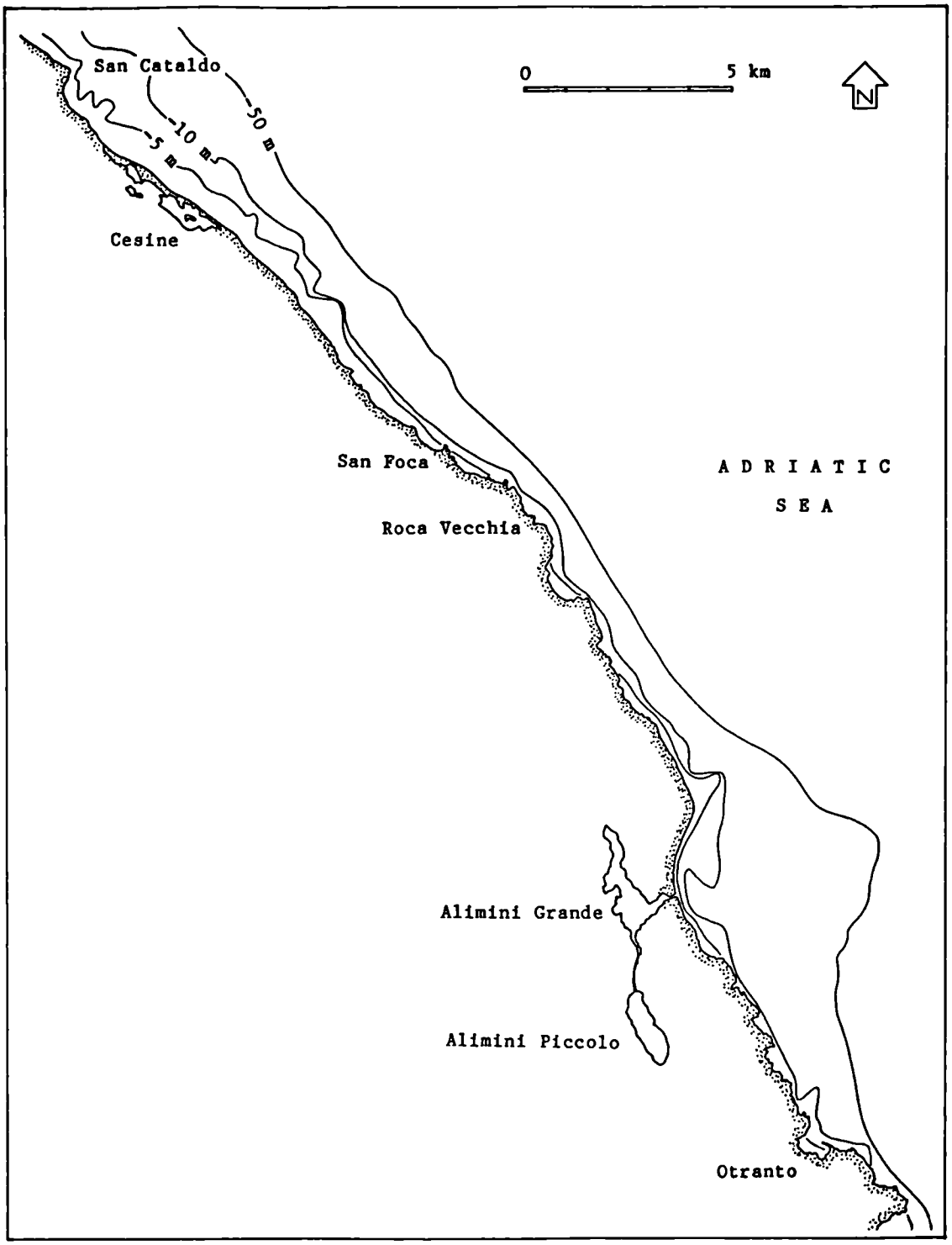
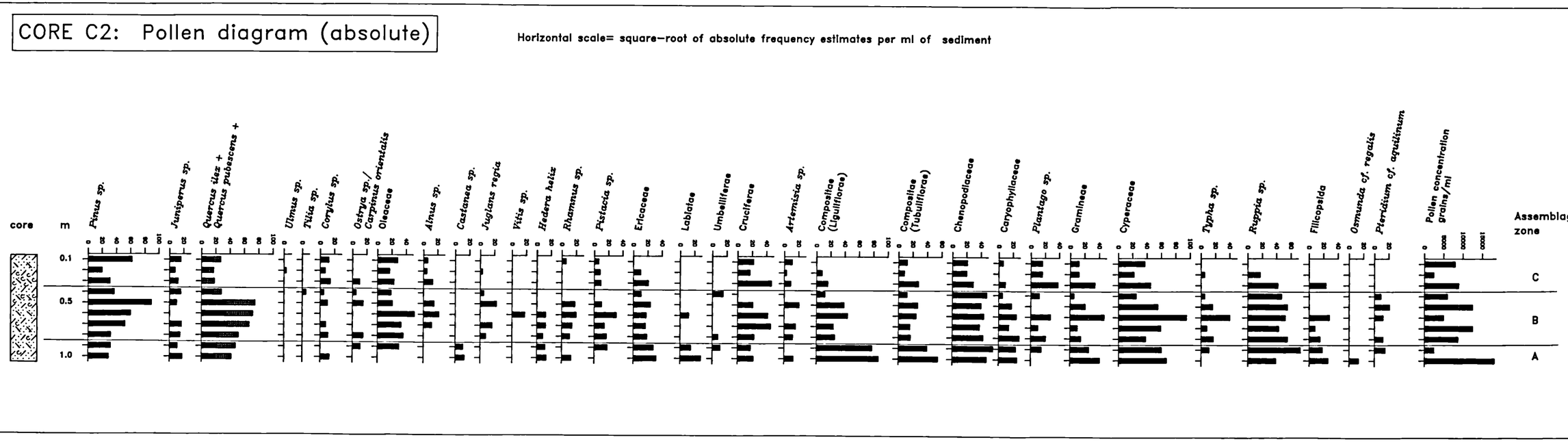


Fig. 12.7: Map of the study-area showing nearshore bathymetry to -50 m
(source: author)

Fig. 9.27

CORE C2: Pollen diagram (absolute)

Horizontal scale= square-root of absolute frequency estimates per ml of sediment



MICROFOSSIL	CORE							
	AP88	AP90	AG	SF	c2	cs1	cs2	PG
cell walls	*	*	*	*	*	*	*	*
leaf hair	-	*	*	-	-	*	-	-
pine epidermis	-	-	-	-	-	*	-	-
charcoal	*	*	*	*	*	*	*	*
hyphae	*	*	*	*	*	*	*	*
mycorrhizae	*	*	*	*	*	*	*	*
fungal spore 1	*	*	*	*	*	*	*	*
fungal spore 2	*	*	*	*	*	*	*	*
fungal spore 3	*	*	*	*	*	*	*	*
fungal spore 4	*	*	*	*	*	*	*	*
animal remains	*	*	*	*	*	*	*	*
Cladocera	/	*	-	-	*	*	-	*
Chydoridae	/	*	-	*	-	*	-	*
sponge sclere	*	*	-	*	*	*	*	*
sponge gemmosclere	*	*	-	-	*	*	*	*
foram. test-lining	/	*	-	-	*	*	*	*
diatoms	*	*	-	-	*	*	*	*
dino. Spiniferites	*	*	-	-	*	*	-	-
dino. Lingulodinium	-	*	-	-	-	-	-	-
dino. Genus A	*	*	-	-	*	*	-	*
Cyanophyceae	*	*	-	-	*	*	*	*
Botryococcus	*	*	-	*	*	*	*	*
Pediastrum	*	*	*	*	*	*	-	-
Spirogyra	*	*	*	*	*	*	*	*
Mougeotia	*	*	*	*	*	*	*	*
Zygnema	*	-	*	*	*	-	*	*
desmid Euastrum	*	*	-	*	*	*	-	-
desmid Cosmarium	*	*	-	*	*	*	-	-
desmid Staurastrum	-	*	-	-	-	-	-	-
Concentricystes	*	*	*	*	*	*	*	*
Type A	*	*	-	-	-	-	-	-

Table 7.1: Summary of microfossil occurrence in the sediment cores

Key: * = present
- = absent (not seen in mounted residue)
/ = not recorded for core AP88 pilot study

Table 8.1

VEGETATION ZONE: Olive grove SAMPLE NO: 1
SITE: S.E of Melendugno GRID REF: BK746607

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Mentha sp.	Mint	0.3	to 2	2.5	5
Olea sp. (canopy)	cultivated Olive	3.5	50-100	77	154
Rubia peregrina	Wild Madder	0.2	to 2	-	-
Additional plants within 5 m radius:					
Compositae				1.5	3
Gramineae	Grasses			2	4.5
Other pollen:					
Alnus				1	2
Caryophyllaceae				0.5	1
Chenopodiaceae				1	2
Gramineae: cereal type				4.5	9
Pinus				2	4
Quercus				1	2
Rosaceae				0.5	1

Fig. 9.29

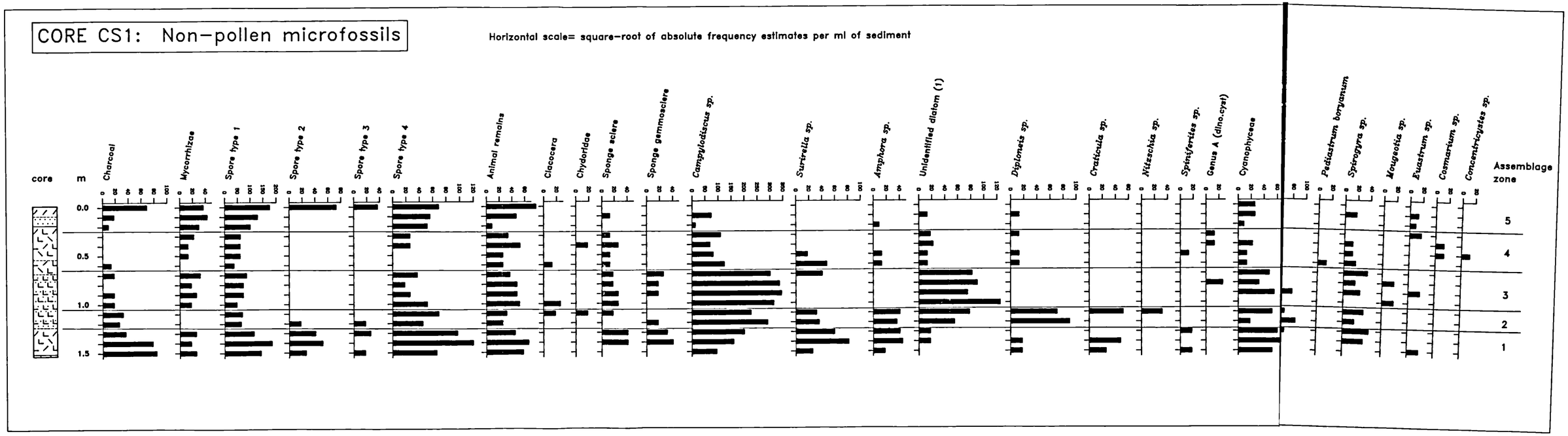

CORE CS1: Non-pollen microfossils
Horizontal scale= square-root of absolute frequency estimates per ml of sediment
core
m
0.0
0.5
1.0
1.5
Charcoal
Mycorrhizae
Spore type 1
Spore type 2
Spore type 3
Spore type 4
Animal remains
Cladocera
Chydoridae
Sponge sclere
Sponge gemmosclere
Campylodiscus sp.
Surirella sp.
Amphora sp.
Unidentified diatom (1)
Diplonels sp.
Cratícula sp.
Nitzschia sp.
Spiniferites sp.
Genus A (dino.cyst)
Cyanophyceae
Pediastrum boryanum
Spirogyra sp.
Mougeotia sp.
Euastrum sp.
Cosmarium sp.
Concentricystes sp.
Assemblage zone
5
4
3
2
1

Table 8.2

VEGETATION ZONE: Abandoned cultivated SAMPLE NO: 2
SITE: W. Alimini Piccolo GRID REF: BK820510

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Anagallis cf. foemina	Blue Pimpernel	0.07	to 2	-	-
Bellardia trixago		0.4	to 2	-	-
Euphorbia sp.	Spurge	0.7	to 2	-	-
Gramineae: cereal	Barley type +	0.9	3-10		
	Oat type	1.0	3-10	22	44
other incl. Briza maxima		0.2	to 2	17.5	35
Linaria sp.		0.1	to 2	-	-
Scabiosa sp.	Scabious	0.5	to 2	-	-
Umbelliferae		0.5	to 2	0.5	1
Additional plants within 5 m radius:					
Compositae				47	94
Cruciferae				1	2
Geranium sp.				-	-
Hypericum sp.	St. John's Wort			-	-
Papaver sp.	Poppy			0.5	1
Thymus sp.	Thyme			0.5	1
Other pollen:					
Chenopodiaceae				1	2
Cistus				1	2
Corylus				0.5	1
Juniperus				1.5	3
Liliaceae				2	4
Malvaceae				1	2
Oleaceae				1.5	3
Pinus				2	4
Rhamnus				0.5	1

Fig. 9.30

CORE CS1: Pollen diagram (%)

Horizontal scale= percentage of pollen sum

ARBOREAL

SHRUB

HERBACEOUS

Pinus sp.
Juniperus sp.
Quercus ilex + Quercus pubescens +
Ulmus sp.
Corylus sp.
Carpinus orientalis Fraxinus (type)
Olea (type)
Oleaceae (total)
Alnus sp.
Castanea sp.
Juglans regia
Vitis sp.
Hedera helix
Rhamnus sp.
Pistacia sp.
Ericaceae
Cistus sp.
Helianthemum sp.
Rosaceae
Poterium sp.
Labiatae
Umbelliferae
Cruciferae
Rumex sp.
Artemisia sp.
Malvaceae
Campanulaceae
Compositae (Liguliflorae)
Compositae (Tubuliflorae)
Chenopodiaceae
Caryophyllaceae
Plantago sp.
Armeria sp.
Liliaceae
Urtica (type)
Ranunculus sp.
Graminae
Cereal type
Phragmites type

core | m | Assemblage zone

0.1 — C
0.5
1.0 — B
1.5 — A

Table 8.3

VEGETATION ZONE: Garigue SAMPLE NO: 3
SITE: W. Alimini Piccolo GRID REF: BK819509

PLANT IDENTIFICATION LATIN	COMMON	HEIGHT m	COVER %	POLLEN %	NO. GRAINS
Within quadrat:					
Campanula sp.		0.6	to 2	-	-
Cistus sp.		0.3	to 2	3.5	7
Compositae:	small indet.+	0.1	to 2		
Anacyclus sp.		0.5	3-10	38.5	77
Cyperaceae	Sedge	0.1	to 2	-	-
Euphorbia sp.	Spurge	0.2	3-10	-	-
Geranium sp.		0.2	to 2	-	-
Gramineae	Grass	0.3	11-25	6.5	13
Leguminosae		0.2	to 2	-	-
Scabiosa	Scabious	0.2	to 2	-	-
Thymus sp.	Thyme	0.2	to 2	1.5	3
Umbelliferae		0.4	to 2	0.5	1
Additional plants within 5 m radius:					
Hypericum sp.	St John's Wort			-	-
Pistacia lentiscus	Mastic Tree			-	-
Quercus coccifera	Kermes Oak			3	6
Other pollen:					
Caryophyllaceae				2.5	5
Cruciferae				3	6
Ericaceae				1	2
Filicales					1
Gramineae: cereal type				1	2
Juniperus				2	4
Malvaceae				0.5	1
Oleaceae				13	26
Pinus				15.5	31
Rhamnus				1	2
Rosaceae				1.5	3
Rumex				1	2

Fig. 9.31

CORE CS1: Pollen diagram (absolute)

Horizontal scale= square-root of absolute frequency estimates per ml of sediment

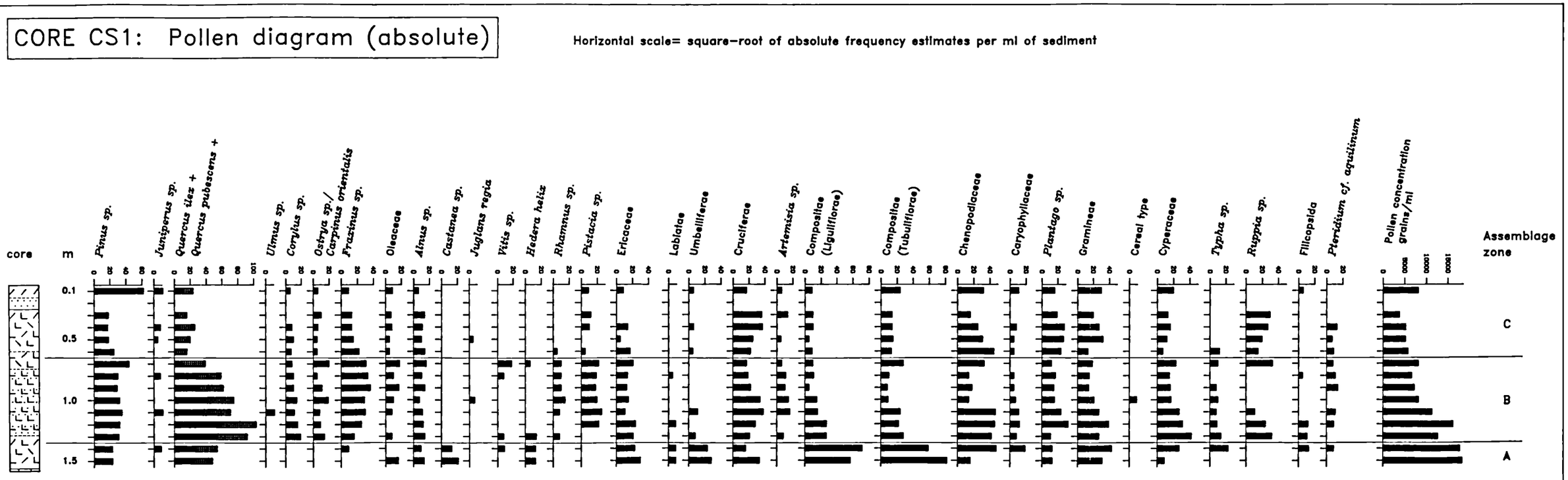


Table 8.4

VEGETATION ZONE: Macchia/garigue SAMPLE NO: 4
SITE: E. side Strittu GRID REF: BK827523

PLANT IDENTIFICATION LATIN	COMMON	HEIGHT m	COVER %	POLLEN %	NO. GRAINS
Within quadrat:					
Allium sp.		0.4	to 2	-	-
Campanula		0.5	to 2	-	-
Cyperaceae	Sedge	0.3	to 2		12
Gramineae	Grass	0.5	3-10	10	20
Leguminosae		0.1	to 2	-	-
Labiatae	Thyme + Phlomis + others	0.5	11-25	2	4
	moss		26-50	-	-
Additional plants within 5 m radius:					
Asparagus acutifolius	Spiny Asparagus			-	-
Compositae				27.5	55
Hypericum sp.	St John's Wort			-	-
Leguminosae				-	-
Pistacia lentiscus	Mastic Tree			-	-
Plantago sp.	Plantain			3.5	7
Saponaria sp.	Soapwort			-	-
Scabiosa sp.	Scabious			1.5	3
Umbelliferae				-	-
Urtica type	nettle type			0.5	1
Other pollen:					
Alnus				0.5	1
Chenopodiaceae				0.5	1
Cruciferae				2.5	5
Ericaceae				0.5	1
Gramineae (cereal type)				2	4
Juniperus				1	2
Oleaceae				9	18
Pinus				35	70
Quercus				1	2
Rosaceae				2.5	5
Vitis				1	2

Table 8.5

VEGETATION ZONE: Coastal Macchia SAMPLE NO: 5
SITE: Cliff-top, S. San Andrea GRID REF: BK829585

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN
LATIN	COMMON	m	%	
Within quadrat:				
Cistus sp.		0.3	26–50	-
Juniperus sp.	Juniper	0.4	26-50	+
Legumonosae		0.4	to 2	-
Rhamnus sp.	Buckthorn	0.8	11-25	-
Additional plants within 5 m radius:				
Gramineae	Grasses			-
Euphorbia sp.	Spurge			-
Other pollen:				
Alnus				+
Compositae				+
Oleaceae				+
Pinus				+

Table 8.6

VEGETATION ZONE: Oak woodland SAMPLE NO: 6
SITE: S. of Roca Nuova GRID REF: BK788602

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Hedera helix	Ivy	0.2	50-100		-
Quercus (canopy) (mixed evergreen and deciduous)	Oak	15	50-100		3
Additional plants within 5 m radius:					
Asparagus acutifolius	Spiny Asparagus				-
Cistus sp.					-
Gramineae	Grasses				1
Ficus carica	Fig				-
Pistacia lentiscus					2
Pteridium sp.	Bracken				1
Rubus	Bramble				-
Other pollen:					
Chenopodiaceae					1
Compositae					2
Cruciferae					2
Cyperaceae					5
Juniperus					8
Oleaceae					1
Pinus					82
Plantago					1
Rumex					1

Fig. 9.34

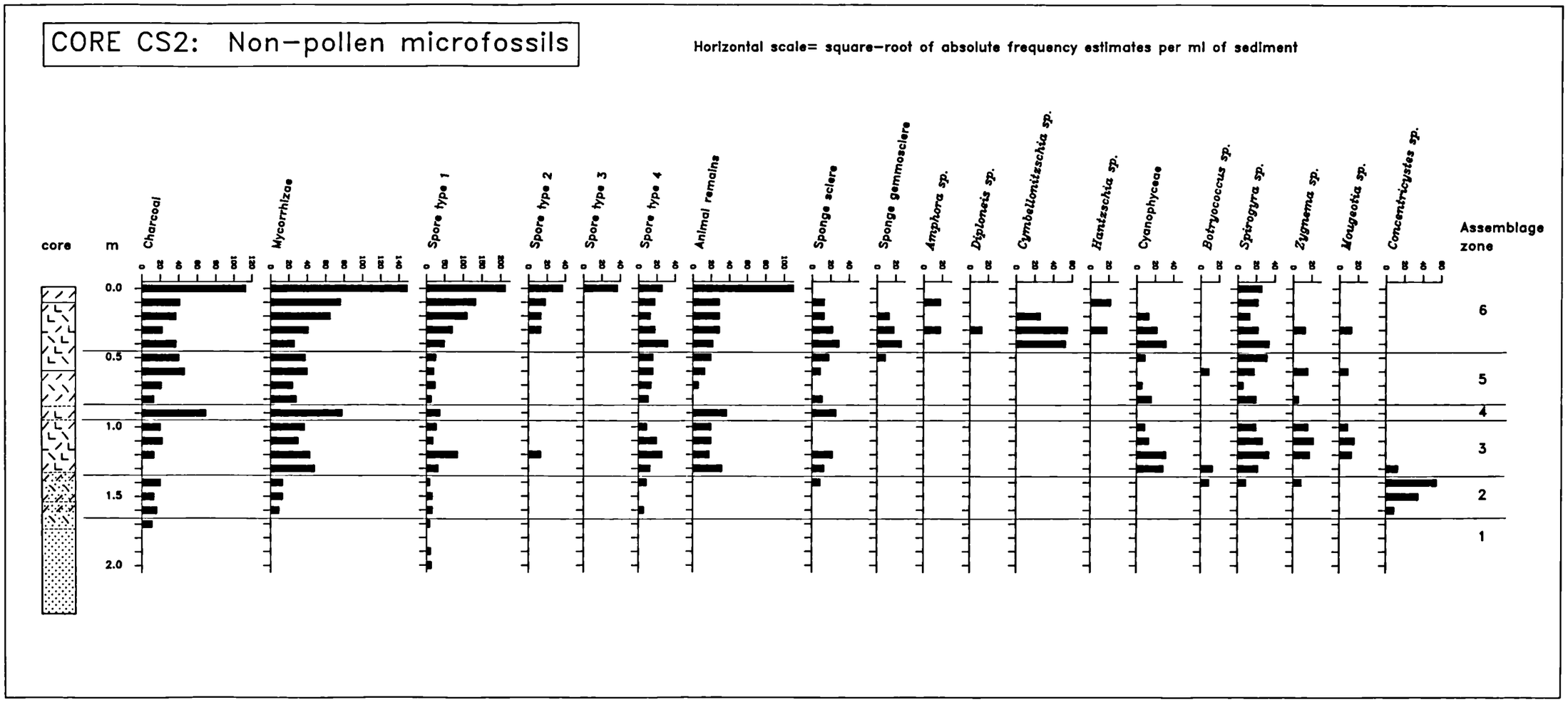

CORE CS2: Non-pollen microfossils
Horizontal scale= square-root of absolute frequency estimates per ml of sediment
core
m
Charcoal
Mycorrhizae
Spore type 1
Spore type 2
Spore type 3
Spore type 4
Animal remains
Sponge sclere
Sponge gemmosclere
Amphora sp.
Diploneis sp.
Cymbellonitzschia sp.
Hantzschia sp.
Cyanophyceae
Botryococcus sp.
Spirogyra sp.
Zygnema sp.
Mougeotia sp.
Concentricystes sp.
Assemblage zone
0.0
0.5
1.0
1.5
2.0
6
5
4
3
2
1

Table 8.7

VEGETATION ZONE: Oak plantation SAMPLE NO: 7
SITE: Cesine reserve GRID REF: BK727714

PLANT IDENTIFICATION LATIN	COMMON	HEIGHT m	COVER %	POLLEN %	NO. GRAINS
Within quadrat:					
Asparagus acutifolius	Spiny Asparagus	0.05	to 2	0.5	1
Hedera type	Ivy type	0.03	to 2	-	-
Rubia peregrina	Wild Madder	0.03	to 2	-	-
Quercus ilex (canopy)	Holm Oak	14.0	50-100	74.5	149
Additional plants within 5 m radius:					
none					
NB: within 20m:					
Eucalyptus sp.				0.5	1
Pinus	Pine			18.5	37
Pistacia lentiscus	Mastic Tree			-	-
Other pollen:					
Alnus				0.5	1
Oleaceae				3.5	7

Table 8.8

VEGETATION ZONE: Mixed oak woodland SAMPLE NO: 8
SITE: S. Elia GRID REF: BK656408

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Gramineae	Grass	0.1	to 2	1	2
Hedera helix	Ivy	-	to 2	0.5	1
Quercus (canopy) (mixed evergreen and deciduous)	Oak	15	50-100	41.5	83
Additional plants within 5 m radius:					
Olea (Olive grove)	Olive			41.5	83
Pistacia lentiscus	Mastic Tree			-	-
Rubus	Bramble			5	10
Other pollen:					
Caryophyllaceae				1	2
Chenopodiaceae				1	2
Compositae				1	2
Cruciferae				1	2
Pinus				2.5	5
Rhamnus				1	2

Table 8.9

VEGETATION ZONE: Phragmites reeds SAMPLE NO: 1AP
SITE: NE Alimini Piccolo GRID REF: BK828514

PLANT IDENTIFICATION LATIN	COMMON	HEIGHT m	COVER %	POLLEN %	NO. GRAINS.
Within quadrat:					
Calystegia sepium	Bindweed	1.0	3-10	0.5	1
Centaurea sp.	Knapweed	0.2	to 2	0.5	1
Compositae	Thistle	0.2	to 2	23	46
Epilobium sp.	Willowherb (hairy)	1.0	3-10	-	-
Galium sp.	Goosegrass	0.4	to 2	-	-
Leguminosae	Clover type	0.3	3-10	-	-
Mentha aquatica	Water Mint	0.4	to 2	1.5	3
Phragmites	Common reed	2.0	3-10	-	-
Typha sp.	Bulrush	2.0	3-10		7
Additional plants within 5 m radius:					
Gramineae	Grasses			14	28
Urtica sp.	nettle type			0.5	1
Other pollen:					
Artemisia				1	2
Chenopodiaceae				17.5	33
Cyperaceae					12
Ericaceae				1.5	3
Juniperus				2	4
Oleaceae				4.5	9
Ostrya/Carpinus orientalis				1	2
Pinus				17	34
Pistacia				0.5	1
Plantago				3	6
Quercus				8.5	17
Rosaceae				2	4
Ruppia					2
Umbelliferae				1	2

Table 8.10

VEGETATION ZONE: Phragmites reeds SAMPLE NO: 3AP
SITE: NW Alimini Piccolo GRID REF: BK822512

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Calystegia sepium	Bindweed	1.0	11-25		-
Epilobium sp.	Willowherb (hairy)	0.8	to 2		-
Galium sp.	Goosegrass	0.2	to 2		-
Iris pseudacorus	Flag Iris	0.8	11-25		-
Juncus sp.	Rush	0.8	11-25		-
Leguminosae	Clover type	0.1	26-50		-
Phragmites	Common reed	1.6	26-50		5
Typha sp.	Bulrush	0.8	to 2		-
Urtica type	Nettle type	0.7	11-25		-
Additional plants within 5 m radius:					
Compositae	Thistle				6
Hydrocotyle vulgaris	Marsh Pennywort				-
Mentha aquatica	Water Mint				2
Other pollen:					
Chenopodiaceae					1
Cyperaceae					71
Gramineae					18
Juniperus					4
Oleaceae					6
Pinus					7

Table 8.11

VEGETATION ZONE: Phragmites reeds SAMPLE NO: 1AG
SITE: Marsh- N. of Alimini Grande GRID REF: BK821558

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Calystegia sepium	Bindweed	1.0	3-10	-	-
Compositae	Thistle	0.6	to 2	29.5	59
Epilobium sp.	Willowherb	0.7	3-10	-	-
Filicales sp.	ferns	0.7	26-50		4
Juncus sp.	rush	1.5	3-10	-	-
Leguminosae	Clover type	1.0	3-10	-	-
Mentha aquatica	Water mint	0.6	to 2	3	6
Phragmites	Common reed	2.0	11-25	2	4
Typha sp.	Bulrush	1.0	11-25		-
Additional plants within 5 m radius:					
Galium sp.	Goosegrass			-	-
Rubus sp.	Bramble			-	-
Other pollen:					
Alnus				0.5	1
Caryophyllaceae				1	2
Chenopodiaceae				1.5	3
Cruciferae				7	14
Gramineae				5	10
Juniperus				8.5	17
Oleaceae				13.5	27
Pinus				27.5	55
Quercus				0.5	1
Umbelliferae				0.5	1

Table 8.12

VEGETATION ZONE: Phragmites reeds SAMPLE NO: SF1
SITE: Marsh-NW. of San Foca GRID REF: BK772653

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Calystegia sepium	Bindweed	0.7	to 2	-	-
Compositae	thistle +	0.4	11-25		
	marigold type	0.5	3-10	57.5	115
Cyperaceae	Sedge	1.0	3-10		56
Gramineae	Grasses	0.4	to 2	11	22
Phragmites	Common reed	1.5	11-25	-	-
Additional plants within 5 m radius:					
none					
Other pollen:					
Chenopodiaceae				2.5	5
Cruciferae				5.5	11
Labiatae				0.5	1
Oleaceae				10.5	21
Pinus				12	24
Typha					1
Umbelliferae				0.5	1

Table 8.13

VEGETATION ZONE: Brackish marsh SAMPLE NO: CS1
SITE: Cesine Salapi GRID REF: BK725724

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Juncus acutus	Sharp-pointed Rush	1.8	50-100	-	-
Phragmites	Common reed	1.8	3-10	-	-
Additional plants within 5 m radius:					
Cyperaceae	Sedge				-
Tamarix sp.				-	10
	Lavender type			-	-
Other pollen:					
Compositae				-	4
Cruciferae				-	1
Pinus				-	3
Quercus				-	1
Rhamnus				-	1
Rosaceae				-	1

Table 8.14

VEGETATION ZONE: Phragmites reeds SAMPLE NO: CS2
SITE: Cesine Salapi GRID REF: BK724721

PLANT IDENTIFICATION LATIN	COMMON	HEIGHT m	COVER %	POLLEN %	NO. GRAINS
Within quadrat:					
Calystegia sepium	Bindweed	0.8	26-50	-	-
Juncus sp.	rush	0.8	26-50	-	-
Phragmites	Common reed	1.0	11-25	-	-
Additional plants within 5 m radius:					
Compositae				2	4
Epilobium sp.	Willowherb (hairy)			-	-
Rubus sp.	Bramble			-	-
Other pollen:					
Cyperaceae					1
Gramineae				1	2
Pinus				94	188
Tamarix				2.5	5
Vitis				0.5	1

Table 8.15

VEGETATION ZONE: Shore/marsh edge SAMPLE NO: PG
SITE: SW Pantano Grande GRID REF: BK743706

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Phragmites	Common reed	1.5	26-50	-	-
	succulent plant	0.03	3-10	-	-
Additional plants within 5 m radius:					
Calystegia sepium	Bindweed			-	-
Chenopodiaceae	Goosefoot +				
Salicornia sp.	Glasswort			-	2
Other pollen:					
Compositae				-	1
Cruciferae				-	1
Pinus				-	7

MICROFOSSIL	SURFACE-SAMPLE												
	1	2	3	4	7	8	1AP	3AP	1AG	SF1	CS1	CS2	PG
plant cell walls	*	*	*	*	*	*	*	*	*	*	*	*	*
leaf hair	*					*							
pine epidermis					*	*							
charcoal		*	*		*		*	*	*	*	*	*	*
hyphae	*	*	*	*	*	*	*	*		*	*	*	
mycorrhizae		*	*	*			*	*	*	*	*	*	
fungal spore 1	*	*	*	*	*	*	*	*	*	*	*	*	*
fungal spore 2	*	*	*	*		*	*	*		*	*	*	
fungal spore 3	*	*	*	*		*	*	*	*	*	*	*	*
fungal spore 4	*	*	*	*	*	*	*	*	*	*	*	*	*
animal fragments	*	*	*	*	*	*	*		*	*	*	*	*
Cladocera													
Chydoridae													
sponge sclere			*				*						*
sponge gemmosclere													
foram. test lining												*	*
diatoms							*		*				*
dino. Spiniferites							*						
dino. Lingulodinium													
dino. Genus A													
Cyanophyceae											*		
Botryococcus							*						*
Pediastrum							*						
Spirogyra									*			*	
Mougeotia													
Zygnema			*										
desmid Euastrum													
desmid Cosmarium			*										
desmid Staurastrum													
Concentricystes		*	*	*			*		*				
Type A													

Table 8.16: Summary of microfossil occurrence in the spot surface-samples

key: * = present

PLANT	olive grove	arable	garigue	macchia/garigue	oak wood	mixed oak wood	SURFACE SAMPLE						
	1	2	3	4	7	8	1AP	3AP	1AG	SF1	CS1	CS2	PG
Alnus sp.	+			+	+				+				
Artemisia sp.							+						
Calystegia sp.							●	0	0	0		0	0
Campanulaceae			0	0									
Caryophyllaceae	+		+	0		+			+				
Centaurea sp.							●						
Chenopodiaceae	+	+		+		+	+	+	+	+			●
Cistaceae		+	●										
Compositae	●	●	●	●		+	●	●	●	●	+	●	+
Corylus sp.		+											
Cruciferae		●	+	+		+			+	+	+		+
Cyperaceae			0	●			+	+		●	0	+	
Epilobium sp.							0	0	0			0	
Ericaceae sp.			+	+			+						
Eucalyptus sp.					●								
Euphorbia sp.		0	0										
Filicopsida			+						●				
Geranium sp.		0	0										
Gramineae	●	●	●	●		●	●	+	+	●		+	
cereal type	+	●	+	+									
Hedera sp.					0	●							
Hydrocotyle sp.								0					
Hypericum sp.		0	0	0									
Iris sp.								0					
Juncus sp.								0	0		0	0	
Juniperus sp.		+	+	+			+	+	+				
Labiatae	●	●	●	●			●	●	●	+			
Leguminosae			0	0			0	0	0				
Liliaceae		+		0	●								
Malvaceae		+	+										
Oleaceae	●	+	+	+	+	●	+	+	+	+			
Ostrya/Carp.							+						
Papaver sp.		0											
Phragmites							0	●	●	0	0	0	0
Pinus sp.	+	+	+	+	●	+	+	+	+	+	+	+	+
Pistacia sp.			0	0	0	0	+						
Plantago sp.				●			+						
Primulaceae sp.		0											
Quercus sp.	+		●		●	●	+		+		+		
Rhamnus sp.		+	+			+					+		
Rosaceae sp.	+		+	+		0	+		0		+	0	
Rubiaceae sp.	0				0	0		0	0				
Rumex sp.			+										
Ruppia sp.							+						
Scabiosa sp.		0	0	●									
Scrophulariaceae		0											
Tamarix sp.											●	+	
Typha sp.							●	0	0	+			
Umbelliferae		●	●	0			+		+	+			
Urtica sp.				●			●	0					
Vitis sp.				+								+	

Table 8.17: **Composite list of plants and pollen taxa in spot locations, showing the presence/absence of plants recorded in the field and pollen recorded from the surface-samples**

Key: 0 = Plant present in quadrat, or within 5 m of quadrat
● = Plant present (as above) + pollen recorded in sample
\+ = Pollen recorded in sample but plant not present

Table 8.18

VEGETATION ZONE: Coastal dune SAMPLE NO: C1
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Carpobrotus acinaciformis	Red Hottentot Fig	0.1	26-50	55.5	111
Compositae:					
Santolina sp.		0.2	3-10	0.5	1
Additional plants within 5 m radius:					
Graminae:					
Ammophila arenaria	Marram Grass			2.5	5
Calystegia soldanella	Sea Bindweed			-	-
Other pollen:					
Cruciferae				14.4	29
Ericaceae				0.5	1
Graminae: cereal type				2.5	5
Tamarix				6	12
Pinus				15.5	31
Pistacia				0.5	1
Plantago				0.5	1
Ranunculus				0.5	1
Rhamnus				0.5	1
Rutaceae				0.5	1

Table 8.19

VEGETATION ZONE: Bottom of dune SAMPLE NO: C2
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Calystegia soldanella	Sea Bindweed	0.1	to 2	-	-
Carpobrotus acinaciformis	Red Hottentot Fig	0.1	11-25	45	90
Gramineae	Grass	0.6	to 2	2.5	5
	Lavender type	0.2	to 2	-	-
Additional plants within 5 m radius:					
Cyperaceae	Sedge			1	2
Other pollen:					
Alnus				2	4
Chenopodiaceae				0.5	1
Compositae				8	4
Cruciferae				5	10
Gramineae: cereal type				1	2
Juniperus				0.5	1
Tamarix				3.5	7
Pinus				36.5	73
Plantago				2	1
Rhamnus				0.5	1

Table 8.20

VEGETATION ZONE: Rear of dune SAMPLE NO: C3
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Calystegia soldanella	Sea Bindweed	0.1	to 2	-	-
Carpobrotus acinaciformis	Red Hottentot Fig	0.1	11-25	16	32
Gramineae:					
Ammophila arenaria	Marram Grass +	0.6	3-10		
	other grasses	0.6	50-100	11	22
Additional plants within 5 m radius:					
Juncus acutus	Sharp-pointed Rush			-	-
Pistacia lentiscus	Mastic Tree			-	-
Other pollen:					
Alnus				0.5	1
Chenopodiaceae				1.5	3
Compositae				21	42
Cruciferae				0.5	1
Cyperaceae					8
Ericaceae				0.5	1
Gramineae: cereal type				1.5	3
Juniperus				1	2
Tamarix				8	16
Pinus				37	74
Quercus				0.5	1

Table 8.21

VEGETATION ZONE: Coarse grass SAMPLE NO: C4
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Gramineae	Grasses	1.0	50–100	25	50
Juncus acutus	Sharp-pointed rush	1.0	to 2	-	-
Additional plants within 5 m radius:					
Cyperaceae	Sedge				6
Plantago sp.	Plantain			10.5	21
Other pollen:					
Caryophyllaceae				1	2
Chenopodiaceae				0.5	1
Compositae				6	12
Cruciferae				0.5	1
Labiatae				0.5	1
Liliaceae				1.5	3
Myrtus				1	2
Pinus				46	92
Tamarix				7	14

Table 8.22

VEGETATION ZONE: Coarse grass SAMPLE NO: C5
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Gramineae	Grasses	1.0	50-100	4	8
Juncus acutus	Sharp-pointed Rush	1.0	to 2	-	-
Additional plants within 5 m radius:					
Cyperaceae	Sedge				6
Compositae				7	14
Pistacia lentiscus	Mastic Tree			-	-
Tamarix sp.				7	14
Other pollen:					
Alnus				0.5	1
Caryophyllaceae				1	2
Chenopodiaceae				1	2
Cruciferae				1	2
Gramineae: cereal type				0.5	1
Liliaceae				1	2
Myrtus				1	2
Pinus				73.5	147
Plantago				2	4
Quercus				1	2

Table 8.23

VEGETATION ZONE: Stony garigue SAMPLE NO: C6
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Carpobrotus acinaciformis	Red Hottentot Fig	0.1	to 2	1	2
Gramineae	Grasses	0.3	11-25	7	14
Leguminosae	Clover type	0.1	to 2	-	-
Pistacia lentiscus	Mastic Tree	0.2	11-25	-	-
Umbelliferae		0.2	to 2	0.5	1
Additional plants within 5 m radius:					
Acacia sp.				-	-
Plantago sp.	Plantain			1.5	3
Tamarix sp.				3	6
Other pollen:					
Alnus				1	2
Chenopodiaceae				1.5	3
Compositae				16	32
Cruciferae				1	2
Cyperaceae					5
Gramineae: cereal type				0.5	1
Pinus				67	134

Table 8.24

VEGETATION ZONE: Grass/Plantago SAMPLE NO: C7
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Cyperaceae	Sedge	0.05	to 2		21
Juncus sp.	Rush	0.6	to 2	-	-
Plantago sp.	Plantain	0.06	50-100	11	22
Umbelliferae		0.05	to 2	-	-
	moss		to 2	-	-
Additional plants within 5 m radius:					
Compositae				5.5	11
Gramineae	Grasses			1.5	3
Leguminosae				-	-
Pistacia lentiscus	Mastic Tree			1.5	3
Tamarix sp.				-	-
Other pollen:					
Alnus				0.5	1
Cruciferae				4	8
Liliaceae				0.5	1
Myrtus				0.5	1
Oleaceae				1.5	3
Pinus				74	151

Table 8.25

VEGETATION ZONE: Macchia SAMPLE NO: C8
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Compositae		0.2	to 2	12	24
Gramineae	Grasses	0.05	to 2	2	4
Leguminosae	Clover type	0.1	to 2	-	-
Pistacia lentiscus	Mastic Tree	0.8	11-25	0.5	1
Plantago sp.	Plantain	0.05	11-25	2.5	5
Rhamnus sp.	Buckthorn	1.5	26-50	-	-
	moss		to 2	-	-
Additional plants within 5 m radius:					
Acacia sp.				-	-
Liliaceae:					
Asparagus acutifolius	Spiny Asparagus			0.5	1
Rubus sp.	Bramble			-	-
Umbelliferae				-	-
Tamarix sp.				2.5	5
Other pollen:					
Chenopodiaceae				0.5	1
Cruciferae				0.5	1
Cyperaceae					5
Juniperus				0.5	1
Labiatae				0.5	1
Pinus				77	154

Table 8.26

VEGETATION ZONE: Macchia SAMPLE NO: C9
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Gramineae	Grasses	0.2	to 2	0.5	1
Pistacia lentiscus	Mastic Tree	1.5	50–100	-	-
Rhamnus sp.	Buckthorn	1.0	3-10	-	-
Rubus sp.	Bramble	0.1	to 2	-	-
	moss		11-26		-
Additional plants within 5 m radius:					
Acacia sp.				-	-
Liliaceae:					
Asparagus acutifolius	Spiny asparagus			1.5	3
Pinus sp.	Pine			90	180
Sedum sp.	Stonecrop			-	-
Other pollen:					
Compositae				6	12
Chenopodiaceae				0.5	1
Cruciferae				0.5	1
Cyperaceae					1
Tamarix				1	2

Table 8.27

VEGETATION ZONE: Garigue SAMPLE NO: C10
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Gramineae	Grasses	0.2	to 2	-	-
Plantago sp.	Plantain	0.1	3-10	-	-
Sedum sp.	Stonecrop	0.2	3-10	-	-
	lichen		to 2	-	-
	moss		3-10	-	-
Additional plants within 5 m radius:					
Pinus sp.	Pine			99	198
Pistacia lentiscus	Mastic Tree			-	-
Thymus sp.	Thyme			-	-
Umbelliferae				-	-
Other pollen:					
Compositae				0.5	1
Quercus				0.5	1

Table 8.28

VEGETATION ZONE: Pine plantation SAMPLE NO: C11
SITE: Cesine Transect GRID REF: BK7272

PLANT IDENTIFICATION		HEIGHT	COVER	POLLEN	NO.
LATIN	COMMON	m	%	%	GRAINS
Within quadrat:					
Pinus sp.	Pine	1.5	50-100	91	182
Pistacia lentiscus	Mastic Tree	0.4	3-10	-	-
Plantago sp.	Plantain	0.07	11-25	1	2
	lichen	50-100		-	-
	moss	to 2		-	-
Additional plants within 5 m radius:					
Leguminosae	Clover type			-	-
Rhamnus sp.	Buckthorn			-	-
Sedum sp.	Stonecrop			-	-
Thymus sp.	Thyme			-	-
Other pollen:					
Gramineae				0.5	1
Tamarix				4	8
Unidentified				3.5	7

MICROFOSSIL	TRANSECT SAMPLE-NUMBER										
	11	10	9	8	7	6	5	4	3	2	1
plant cell walls	*	*	*	*	*	*	*	*	*	*	*
leaf hair										*	
pine epidermis	*			*	*			*			
charcoal	*	*	*	*	*	*	*	*	*		
hyphae	*	*		*	*		*	*	*		*
mycorrhizae	*	*	*	*	*	*	*	*	*		
fungal spore 1	*	*	*	*	*	*	*	*	*	*	*
fungal spore 2	*			*				*	*		
fungal spore 3	*	*	*	*	*		*	*	*	*	
fungal spore 4	*	*	*				*	*	*		
crenulate spor.											
animal fragments	*	*	*	*	*	*	*	*	*	*	*
Cladocera											
Chydoridae											
sponge sclere								*			
sponge gemmosclere											
foram. test lining							*				
diatoms											
dino. Spiniferites											
dino. Lingulodinium											
dino. Genus A											
Cyanophyceae											
Botryococcus								*			
Pediastrum											
Spirogyra											
Mougeotia											
Zygnema											
desmid Euastrum											
desmid Cosmarium											
desmid Staurastrum											
Concentricystes Type A	*					*					

Table 8.29: Summary of microfossil occurrence in surface-samples along the Cesine transect

Key: * = present

PLANT	SURFACE SAMPLES										
	1	2	3	4	5	6	7	8	9	10	11
Acacia sp.						0		0	0		
Alnus sp.		+	+		+	+	+				
Calystegia sp.	0	0	0								
Carpobrotus sp.	●	●	●			●					
Caryophyllaceae				+	+						
Chenopodiaceae		+	+	+	+	+		+	+		
Compositae	●	+	+	+	●	+	●	●	+	+	
Cruciferae	+	+	+	+	+	+	+	+	+		
Cyperaceae		●	+	●	●	+	●	+	+		
Ericaceae sp.	+		+								
Graminèae	●	●	●	●	●	●	●	●	●	0	+
cereal type	+	+	+		+	+					
Juncus sp.			0	0	0		0				
Juniperus sp.		+	+					+			
Labiatae				+				+			
Leguminosae						0	0	0			0
Liliaceae				+	+		+	●	●		
Myrtus sp.				+	+		+				
Pinus sp.	+	+	+	+	+	+	+	+	●	●	●
Pistacia sp.	+		0		0	0	●	●	0	0	0
Plantago sp.	+	+		●	+	●	●	●		0	0
Quercus sp.			+		+					+	
Ranunculus sp.	+										
Rhamnus sp.	+	+						0	0		0
Rosaceae sp.								0	0		
Rutaceae	+										
Tamarix sp.		+	+	+	●	●	0	●	+		+
Umbelliferae						●	0	0		0	

Table 8.30: Composite list of plants and pollen taxa along the Cesine transect, showing the presence/absence of plants recorded in the field and pollen recorded from the surface-samples

Key: 0 = Plant present in quadrat or within 5m of quadrat
0 = Plant present (as above) + pollen in sample
+ = Pollen recorded in sample but plant not present

Table 8.31

VEGETATION ZONE: Phragmites reed-bed SAMPLE NO: A1
SITE: Alimini Piccolo Transect GRID REF: BK8251

PLANT IDENTIFICATION		HEIGHT	COVER
LATIN	COMMON	m	%
Within quadrat:			
Calystegia sepium	Bindweed	1.0	11-25
Epilobium sp.	Willowherb	0.6	to 2
Mentha aquatica	Water Mint	0.5	to 2
Phragmites	Reeds	1.5	50-100
Hydrocotyle vulgaris	Marsh Pennywort	0.1	to 2
Additional plants within 5 m radius:			
Typha sp.	Bulrush		
Iris pseudacorus	Flag Iris		

Table 8.32

VEGETATION ZONE: outer marsh-zone SAMPLE NO: A6
SITE: Alimini Piccolo Transect GRID REF: BK8251

PLANT IDENTIFICATION		HEIGHT	COVER
LATIN	COMMON	m	%
Within quadrat:			
Calystegia sepium	Bindweed	0.5	3-10
Compositae	Thistle	0.4	to 2
Epilobium sp.	Willowherb	0.6	to 2
Juncus sp.	Rush	0.8	to 2
Leguminosae	Clover type	0.5	11-25
Mentha aquatica	Water Mint	0.5	to 2
Additional plants within 5 m radius:			
Iris pseudacorus	Flag Iris		
Orchis cf. laxiflora	Orchid		
Typha sp.	Bulrush		

MICROFOSSIL	TRANSECT SAMPLE-NUMBER					
	6	5	4	3	2	1
plant cell walls	*	*	*	*	*	*
leaf hair						
Pine epidermis						
charcoal	*	*	*	*	*	*
hyphae	*	*	*	*	*	*
mycorrhizae	*	*	*	*	*	*
fungal spore 1	*	*	*	*	*	*
fungal spore 2	*		*	*	*	*
fungal spore 3	*	*	*	*	*	*
fungal spore 4	*	*	*	*	*	*
animal fragments	*	*	*	*	*	*
Cladocera						
Chydoridae				*		
sponge sclere						
sponge gemmosclere						
foram. test lining						
diatoms	*					
dino. Spiniferites						
dino. Lingulodinium						
dino. Genus A						
Cyanophyceae						
Botryococcus						
Pediastrum						
Spirogyra	*			*	*	*
Mougeotia			*	*		*
Zygnema				*		*
desmid Euastrum						
desmid Cosmarium			*	*	*	*
desmid Staurastrum						
Concentricystes	*			*		
Type A						

Table 8.33: Summary of microfossil occurrence in surface-samples along the Alimini Piccolo transect

Key: * = present

MICROFOSSIL	MUD SAMPLE					
	A. Piccolo		A. Grande		Pantano Grande	
	A	B	C	D	E	F
plant cell walls		*	*		*	*
leaf hair	*	*			*	
pine epidermis						
charcoal		*	*	*	*	
hyphae	*	*				*
mycorrhizae						
fungal spore 1	*	*	*	*	*	*
fungal spore 2	*					
fungal spore 3		*				
fungal spore 4	*		*	*	*	*
animal fragments	*	*	*		*	*
Cladocera	*					
Chydoridae	*	*			*	
sponge sclere	*		*	*		
sponge gemmosclere					*	
foram. test lining				*		*
diatoms	*	*	*	*	*	*
dino. Spiniferites						
dino. Lingulodinium						
dino. Genus A	*					
Cyanophyceae	*	*			*	
Botryococcus	*				*	*
Pediastrum	*				*	
Spirogyra						
Mougeotia						
Zygnema						
desmid Euastrum	*					
desmid Cosmarium					*	
desmid Staurastrum	*					
Concentricystes						
Type A						
pyrite	*				*	

Table 8.34: Summary of microfossil occurrence in the modern-mud samples

Key: * = present

SITE	CORE	DEPTH (Max)	STRAT-GRAPHY	MACRO-FOSSILS	MICROFOSSILS pollen	MICROFOSSILS other
Alimini Piccolo	AP88	3.6m	●	●	●	●
	1AP	6.67m	●	●	●	●
	2AP	2.42m	●			
	3AP	3.25m	●			
Alimini Grande	1AG	5.1m	●	●	●	●
Paludi Pozzelle	PP1	1.09m	●			
Roca Vecchia	RV88	0.95m	●			
San Foca	SF88	1.3m	●			
	SF1	2.87m	●	●	●	●
Cesine	C1	0.78m	●			
	PG	2.25m	●	●		●
	C2	1.0m	●	●	●	●
	CS1	1.53m	●	●	●	●
	CS2	2.37m	●	●		●
	C3	1.53m	●			
	C4	1.0m	●	●		
	CM	1.43m	●			

Table 9.1: Summary of the sediment-cores and analyses
● = analyses completed

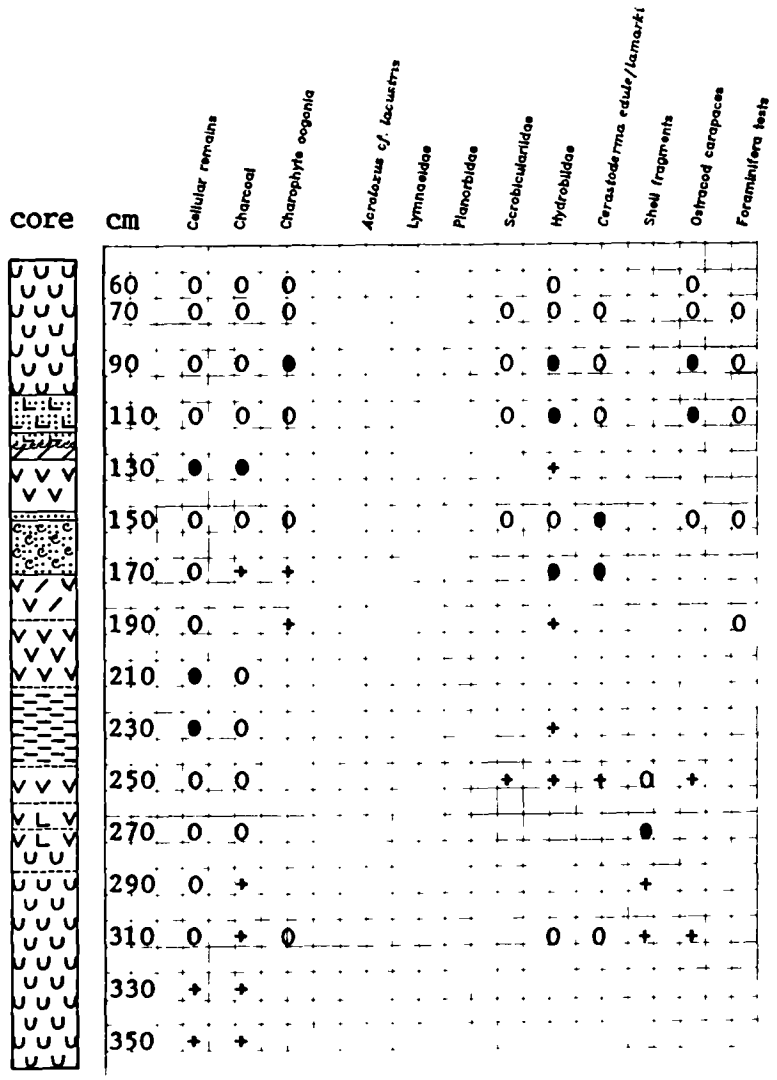


Table 9.2: Macrofossil distribution in core AP88

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

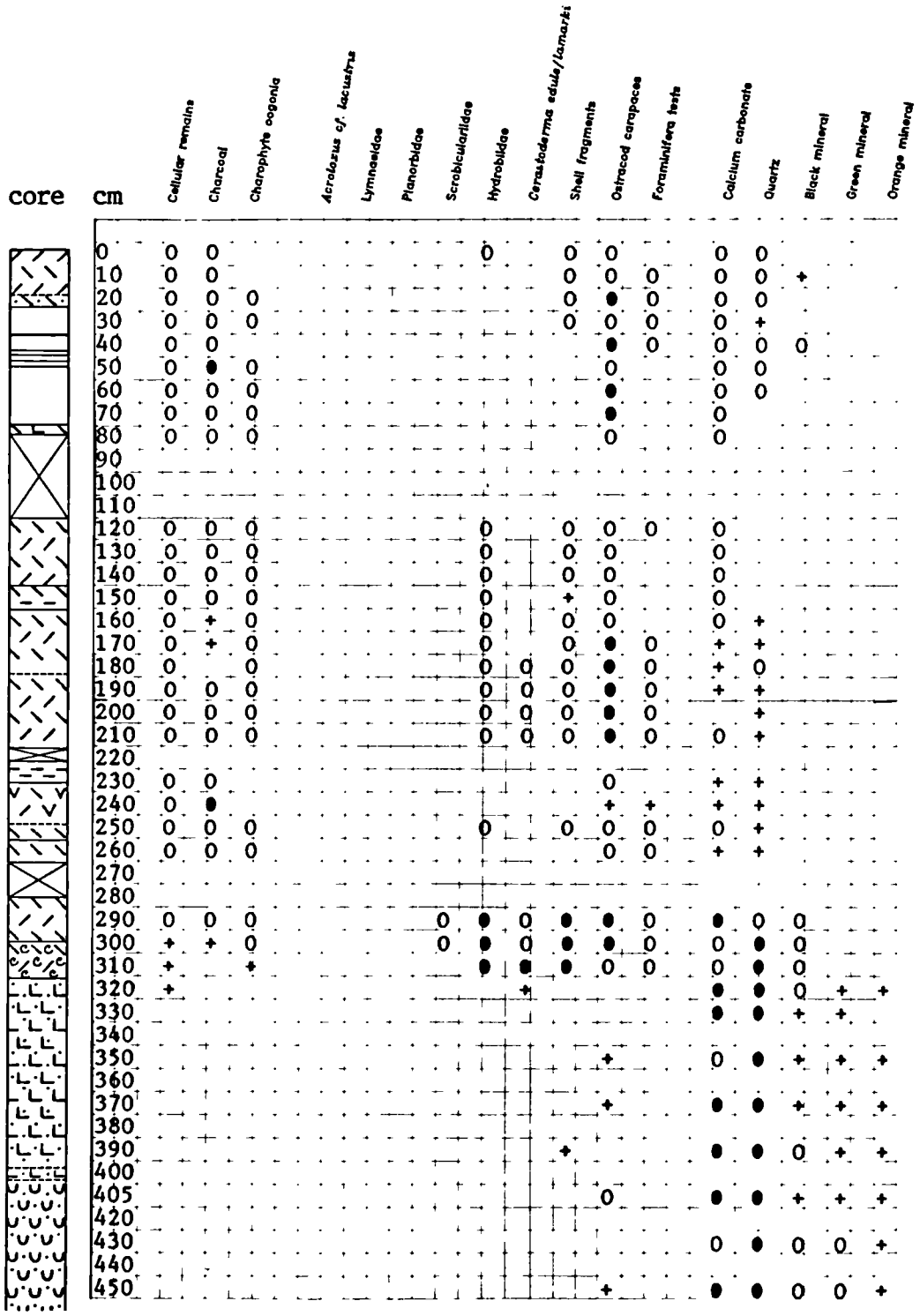


Table 9.3: Macrofossil and mineral distribution in core 1AP

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

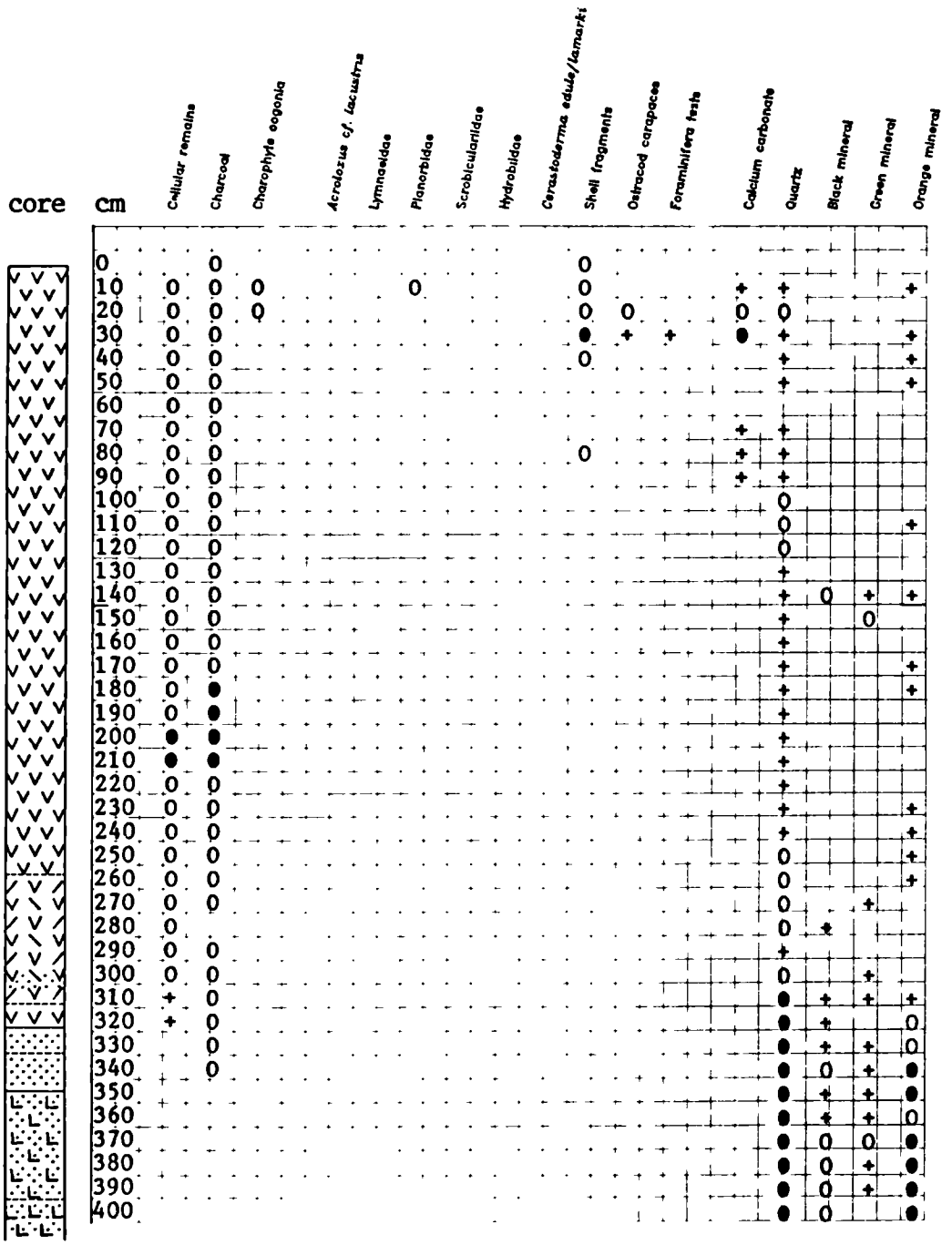


Table 9.4: Macrofossil and mineral distribution in core 1AG

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

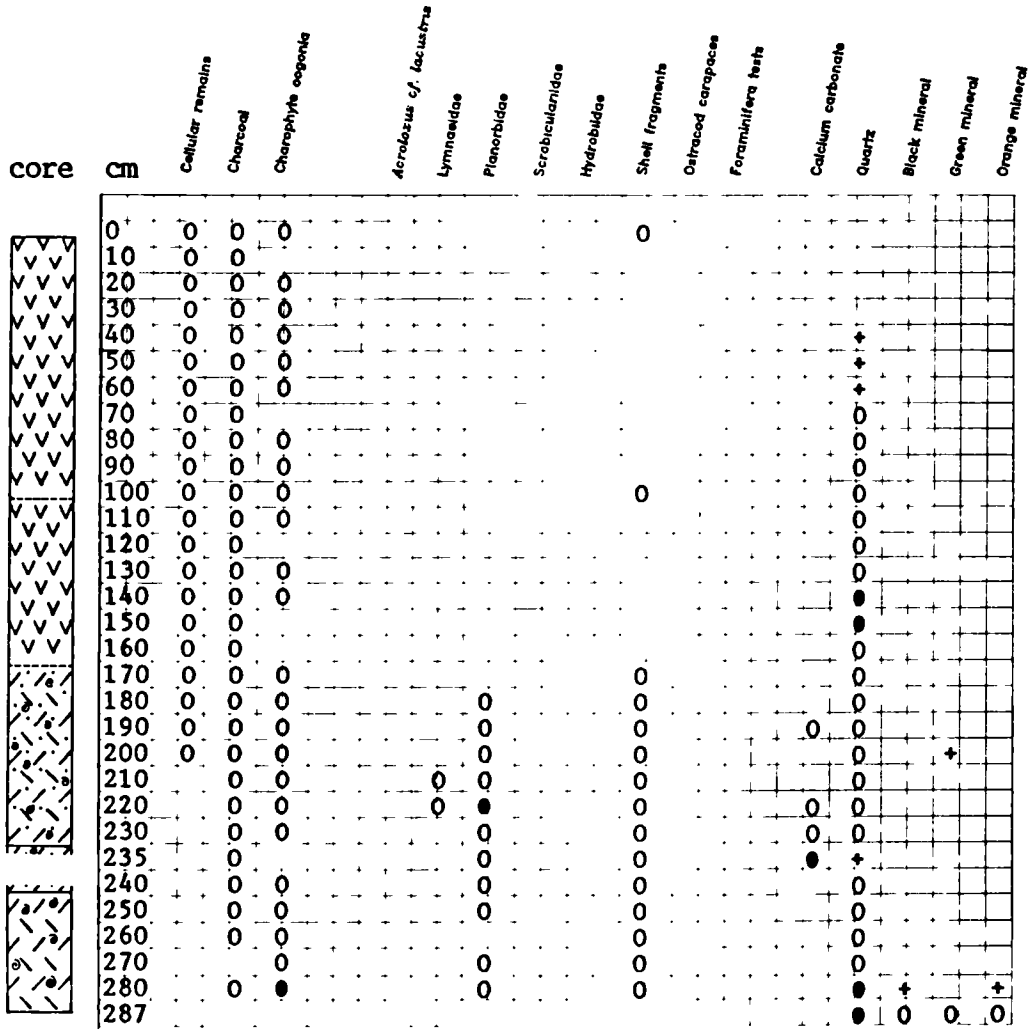


Table 9.5: Macrofossil and mineral distribution in core SF1

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

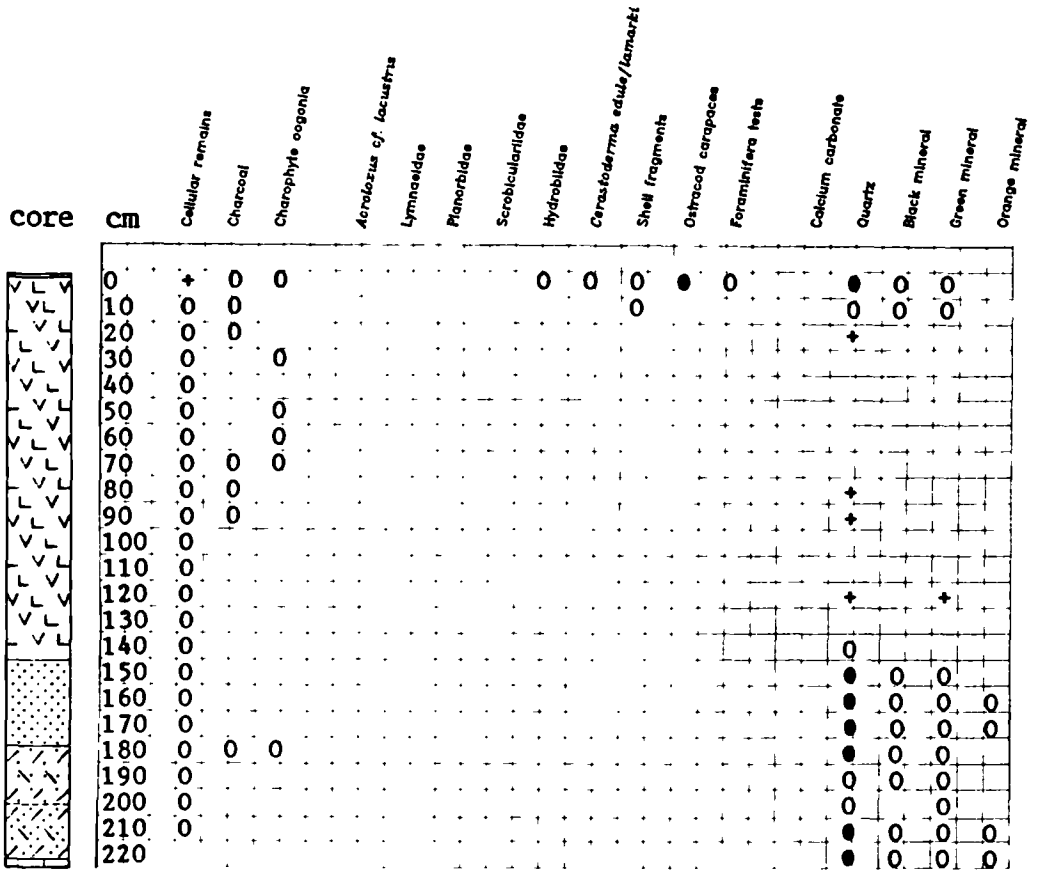


Table 9.6: Macrofossil and mineral distribution in core PG

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

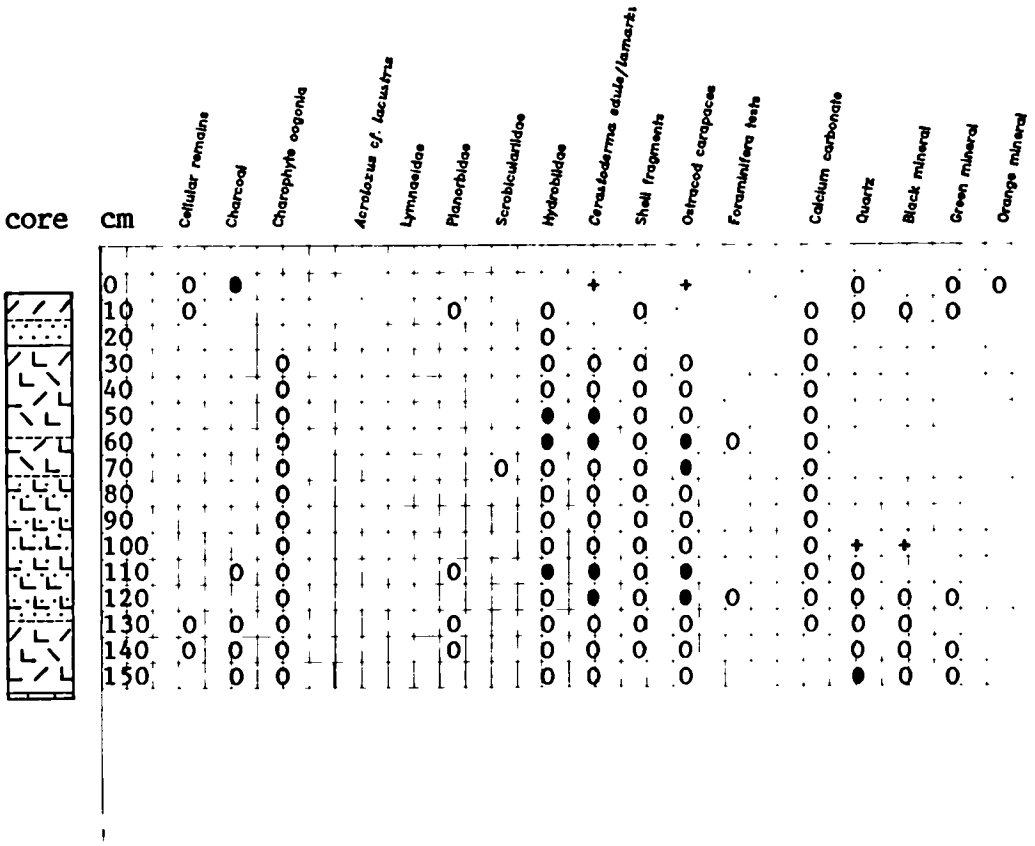


Table 9.8: Macrofossil and mineral distribution in core CS1

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

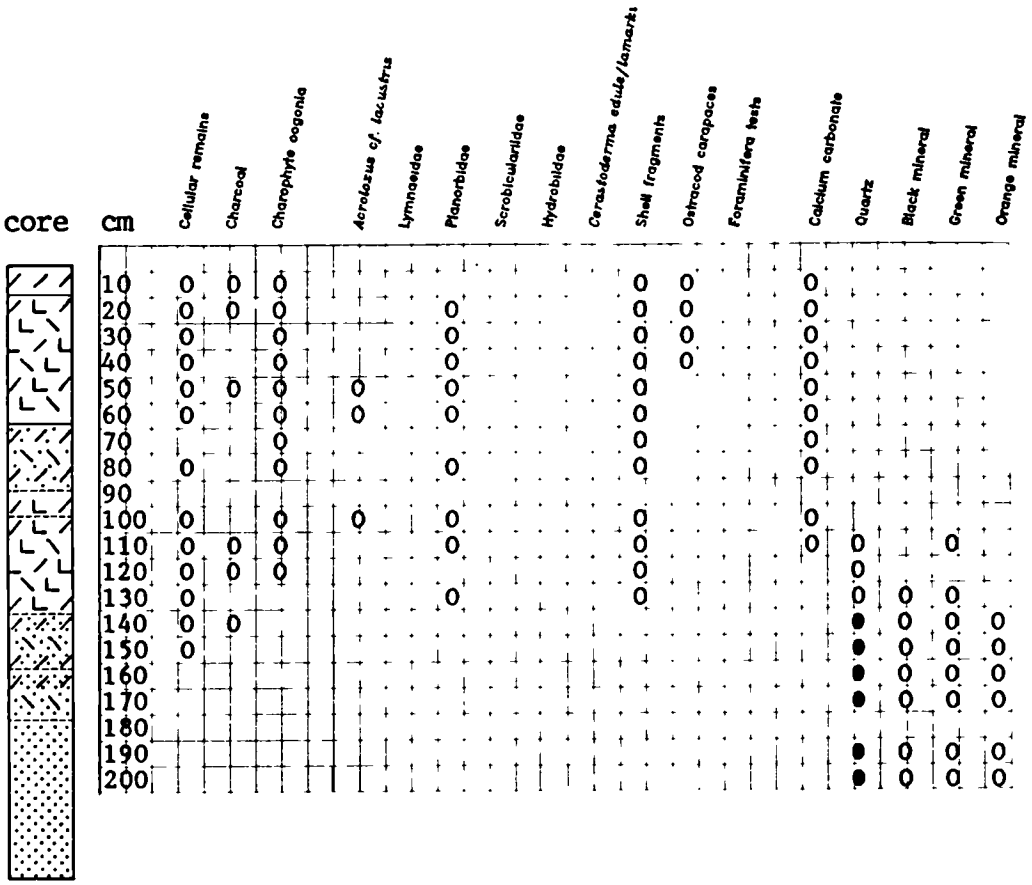


Table 9.9: Macrofossil and mineral distribution in core CS2

key: ● = abundant
0 = present (frequent)
\+ = present (scarce)

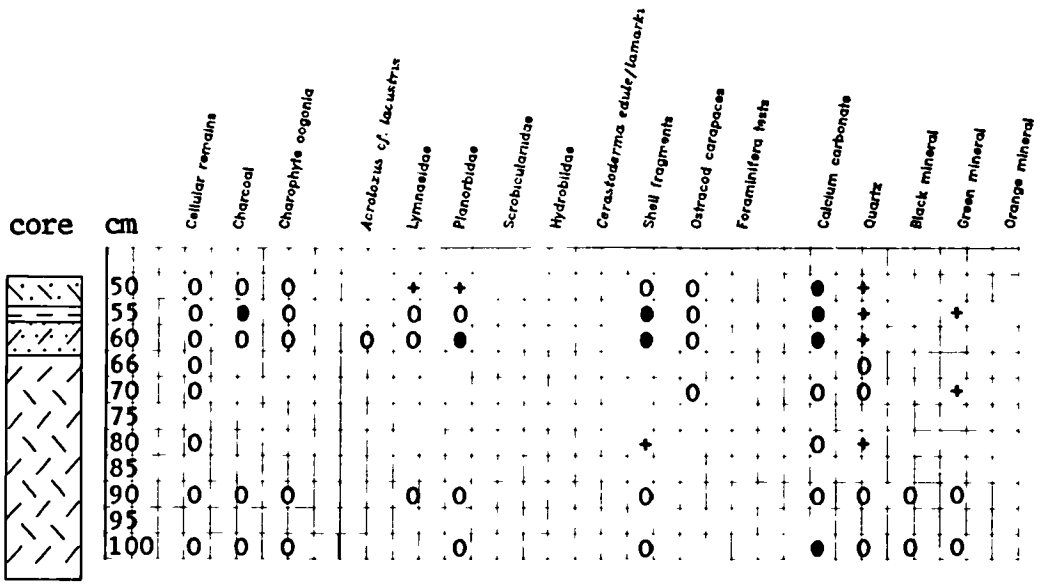


Table 9.10: Macrofossil and mineral distribution in core C4

key: 0 = abundant
0 = present (frequent)
+ = present (scarce)

Table 12.1

SITE	TIME SPAN	M a.s.l	CORE LOCATION	AUTHOR & DATE
Southern Italy:				
Lago Varano	Holocene ?	0-5?	coastal plain	Pasa & Pasa Durante 1962
Grotta Paglicci	15500-14500 BP	197	cave sediments	Satta & Renault-Miskovsky 1985
Laghi di Monticchio	late-glacial to present	530?	marshy lake-margin	Watts 1985
Laghi di Monticchio	boreal to sub-atlantic	656	lake-margin	Ferrarini & Totaro 1978
Cánolo Nuovo	37000+ BP to mid-Holocene ?	900	peat bog	Grüger 1977
Monte Sirino	Neolithic and Bronze Age	1500	?	De Lorenzo & Dainelli 1923 in Biancofiore 1957
Sila Grande	1200 BP to present	1540	marsh	Ferrarini 1978
Sea cores:				
Adriatic, core 296	late glacial & Holocene	-1063	SE basin, east of Bari	Bottema & van Straaten 1966
Adriatic, core 270	late glacial & Holocene	-170	mid Adriatic east of Pescara	Bottema & van Straaten 1966
Adriatic, core 240	5000 BP to present ?	-105	shelf east of Termoli	Bottema 1974
Gulf of Taranto 78	Holocene	-748	platform	Belfiore *et al.* 1982
Gulf of Taranto 137	Holocene	-830	platform	as above
Gulf of Taranto 210	Holocene	-421	platform	as above

Table 12.2

SITE	TIME SPAN	M a.s.l	CORE LOCATION	AUTHOR & DATE
Central Italy:				
Lago di Vico	60800 BP to sub-boreal	507	crater-lake	Frank 1969
Lago di Monterosi	24500 to present	237	crater-lake	Bonatti 1970
Lago di Martignano	11000 to present	200	crater-lake	Kelly & Huntley 1991
Lagaccione	late Pleistocene Holocene	400+	drained lake	Hunt 1988
Valle di Castiglione	42000 BP to 3500 BP	44	drained lake	Alessio et al. 1986
Valle di Castiglione	250000BP to present	44	drained lake	Follieri et al. 1988
Agro Pontino	c. 35000 BP to late Neolithic	20 ?	coastal plain	Eisner et al. 1986
Farma valley	late glacial & Holocene	200	lacustrine sediments	Ferrarini & Marraccini 1978
Feccia valley	Medieval ?	265	fluvial terrace	Gilbertson et al. 1983
central Apennines	post-glacial to present	1300-1400	peats	Chiarugi 1936, 1939
Lagoon of Venice	6000 BP to present	0?	lagoon sediments	Horowitz 1966/67
Fimon	late glacial & post-glacial	26?	lake-side	Lona 1960

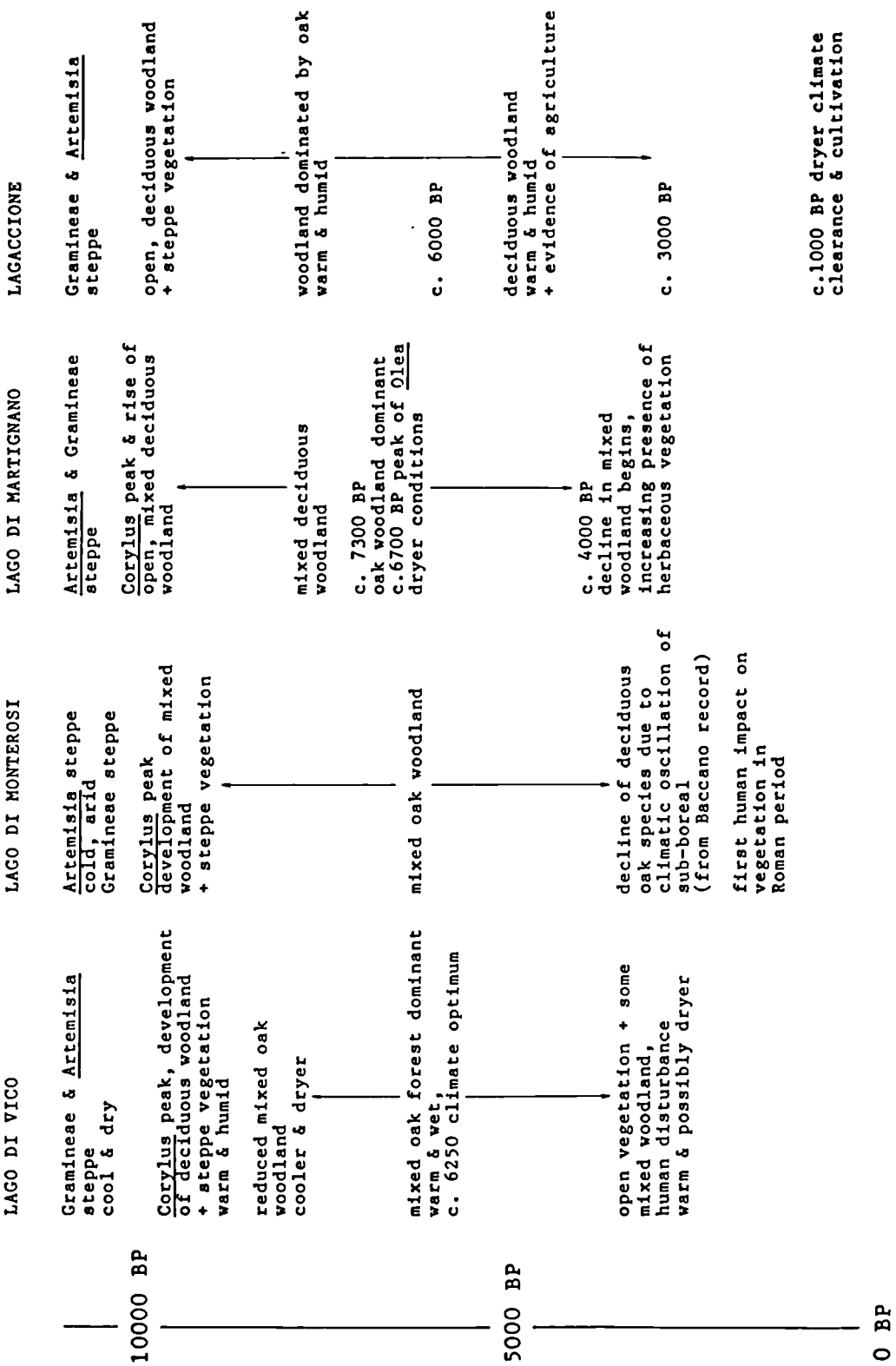


Table 12.3: Summary of Holocene environmental change at crater-lake locations in central Italy
source: author

The Plates

The plates were prepared from photographs of specimens observed in the present research. Descriptions of the pollen and non-pollen microfossils shown, are given in chapter 7, parts 1 & 2. Specimens are referenced by their microscope-slide number, followed by coordinates for their location on the slide; coordinates are given according to the 'Rivelin Finder' system (see Dorning 1990). Most of the pollen specimens are from reference slides prepared by the author from modern pollen (see 6.3.2); specific coordinates are not given. All specimens are at x1100 magnification, unless stated otherwise.

PLATE 1

1/1 Quercus ilex, polar view, high focus, reference slide.
1/2 Quercus ilex, polar view, middle focus, reference slide.
1/3 Quercus ilex, equatorial view, middle focus, reference slide.
1/4 Quercus ilex, equatorial view, high focus, reference slide.
1/5 Quercus ilex, equatorial view, middle focus, reference slide.
1/6 Quercus ilex, oblique view, high focus, reference slide.
1/7 Quercus pubescens type, polar view, high focus, 1AP-55, C37.
1/8 Quercus pubescens type, polar view, middle focus, 1AP-55, C37.
1/9 Quercus pubescens type, equatorial view, middle focus, 1AP-55, S35.

PLATE 1

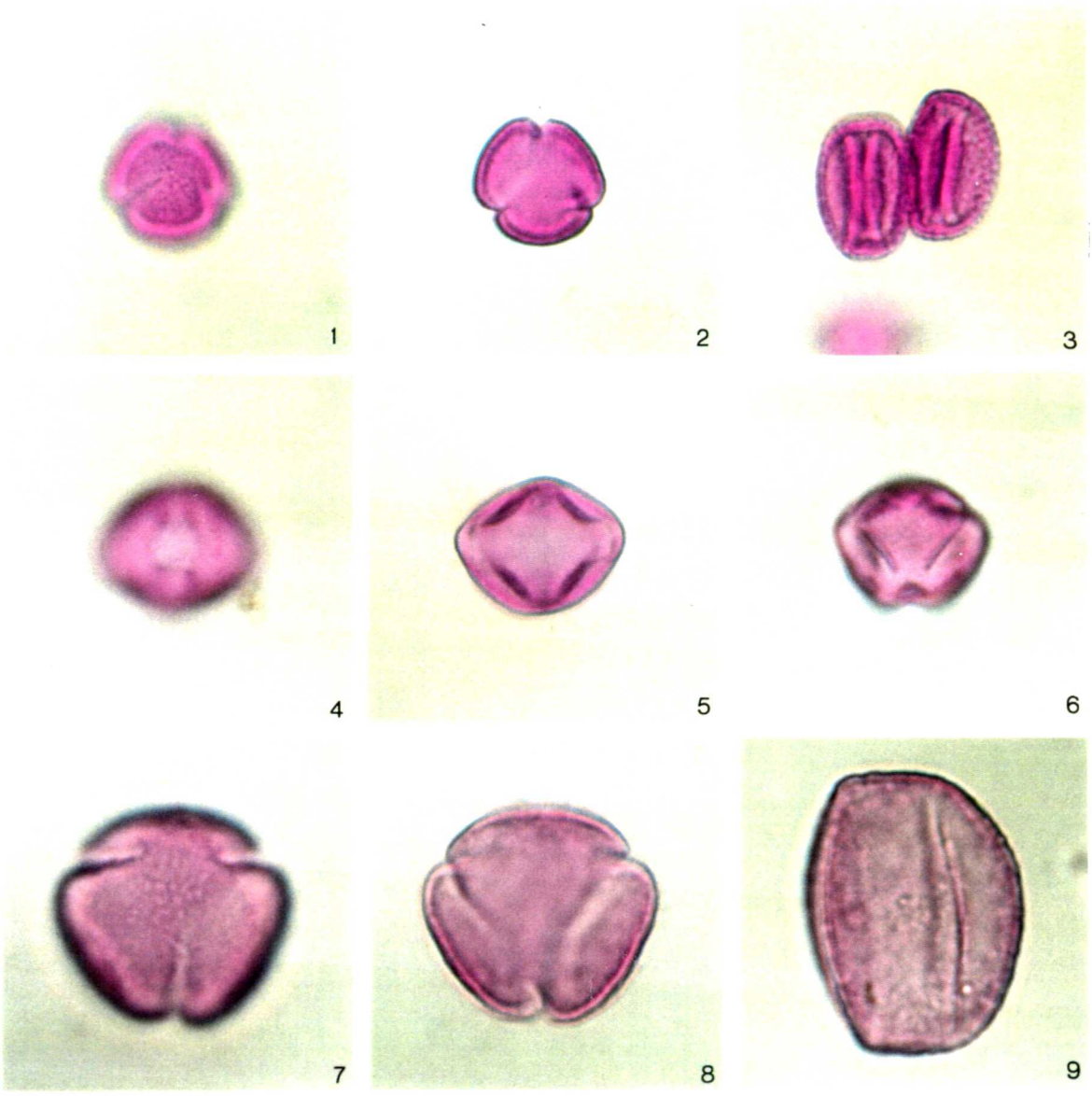
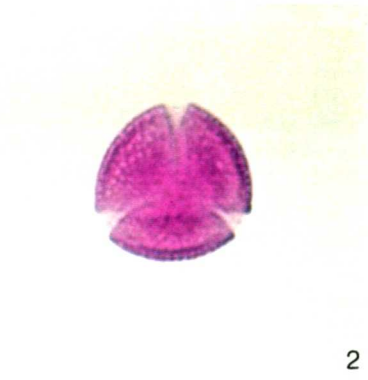


PLATE 2

2/1 Fraxinus sp., polar view, high focus, reference slide.
2/2 Fraxinus sp., polar view, middle focus, reference slide.
2/3 Fraxinus sp., equatorial view, high focus, reference slide.
2/4 Olea sp., polar view, high focus, reference slide.
2/5 Olea sp., polar view, middle focus, reference slide.
2/6 Olea sp., equatorial view, high focus, reference slide.
2/7 Tamarix cf. africana, polar view, high focus, reference slide.
2/8 Tamarix cf. africana, polar view, middle focus, reference slide.
2/9 Tamarix cf. africana, equatorial view, middle focus, reference slide.

PLATE 2

1



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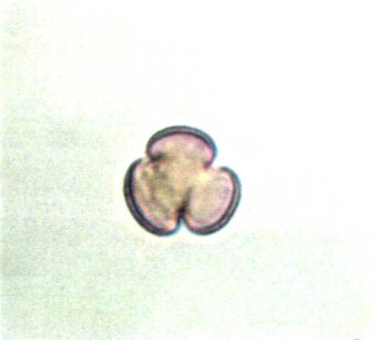


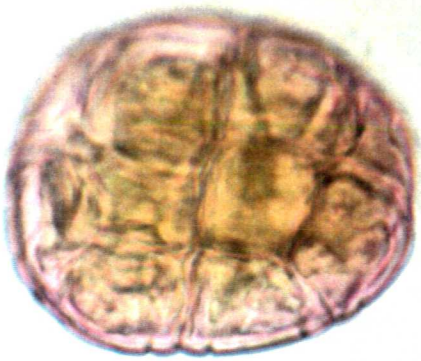
8

9

PLATE 3

3/1 Acacia cyanophilla, equatorial view, high focus, reference slide.
3/2 Acacia cyanophilla, equatorial view, low focus, reference slide.
3/3 Opuntia ficus-indica, high focus, x550, reference slide.
3/4 Opuntia ficus-indica, middle focus, x550, reference slide.

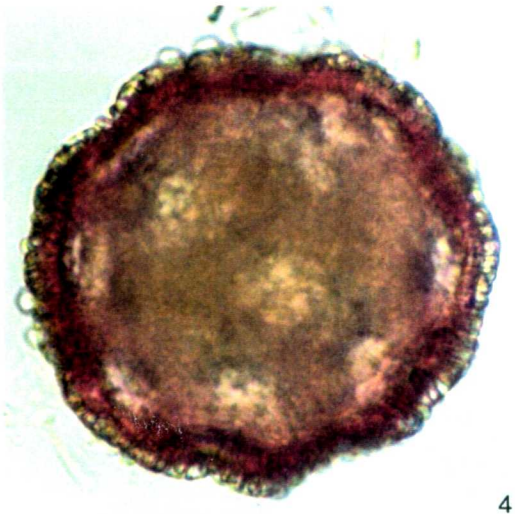
PLATE 3



1

2

3



4

PLATE 4

4/1 Carpobrotus acinaciformis, polar view, high focus, reference slide.
4/2 Carpobrotus acinaciformis, polar view, middle focus, reference slide.
4/3 Carpobrotus acinaciformis, equatorial view, high focus, reference slide.
4/4 Citrus limon, polar view, high focus, reference slide.
4/5 Nerium oleander, equatorial view, middle focus, reference slide.
4/6 Cistus albidus, equatorial view, high focus, reference slide.
4/7 Citrus limon, polar view, middle focus, reference slide.
4/8 Nerium oleander, equatorial view, high focus, reference slide.
4/9 Cistus albidus, equatorial view, middle focus, reference slide.
4/10 Citrus limon, polar view + equatorial view, reference slide.
4/11 Phragmites type, equatorial view, middle focus, AP-SS1, S45.
4/12 Phragmites type, polar view, high focus, AP-SS1, O38.

PLATE 4

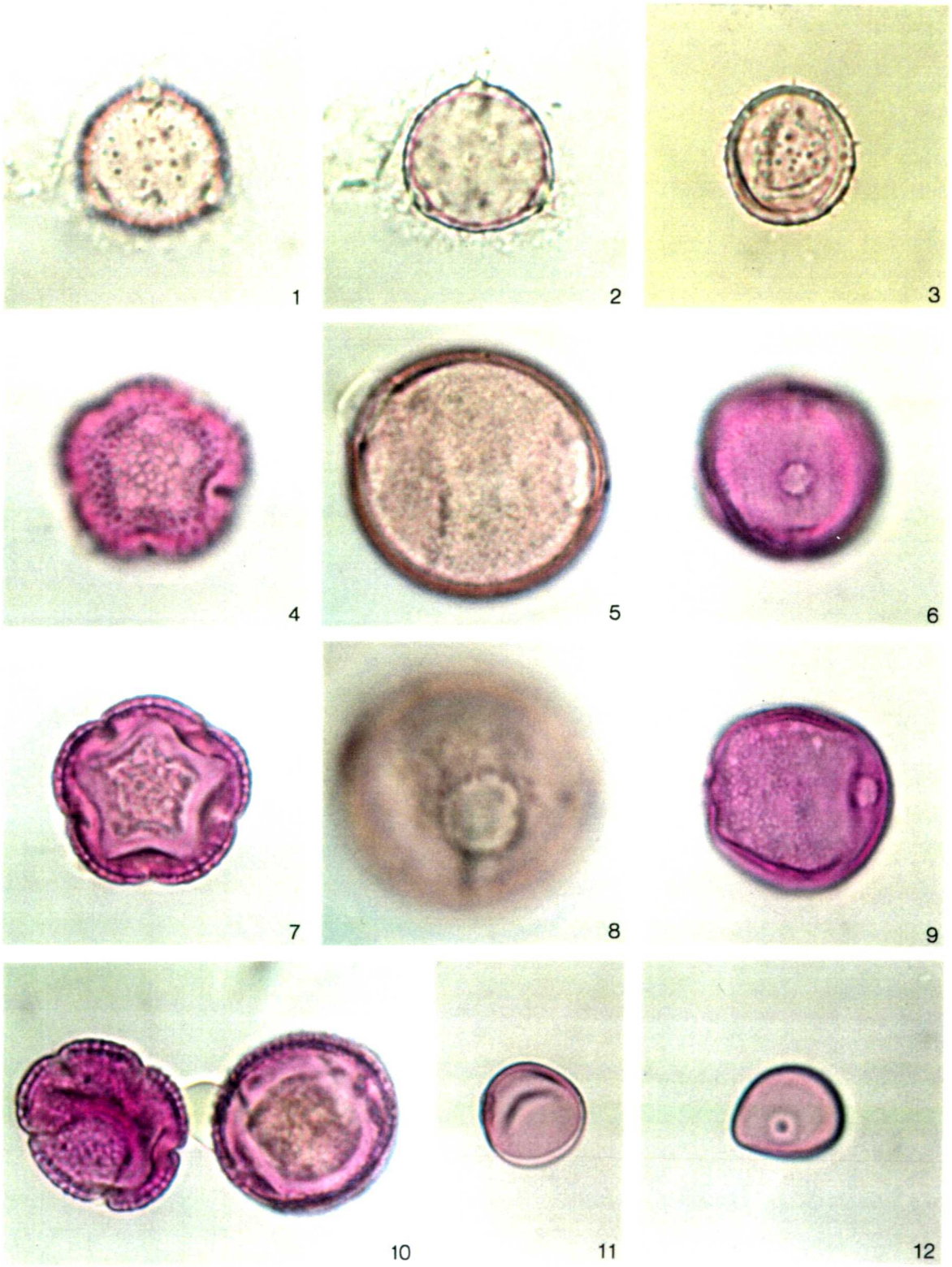
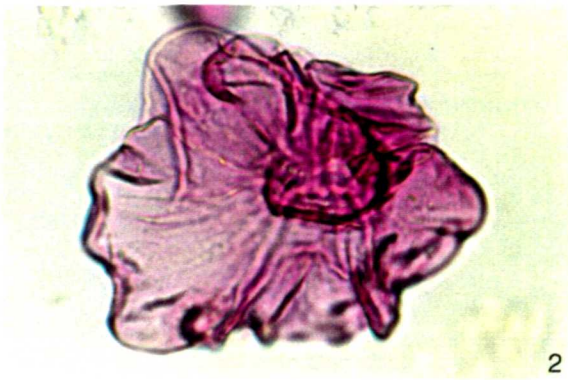


PLATE 5

5/1 Cellular plant remains, PG-90, L51, x550.
5/2 Leaf hair, CSS-1, E38, x550.
5/3 Cellular plant remains, AG-70, V44, x550.
5/4 Fungal spore type 1, AP-110c, V46.
5/5 Fungal spore type 2, AP-SS1b, F47.
5/6 Fungal spore type 3, AP-230a, Y40.
5/7 Fungal spore type 3, AP-230a, R44.
5/8 Fungal spore type 3, AG-200, G36, x550.
5/9 Fungal spore type 4, C2-20, A53, x550.
5/10 Mycorrhiza, PG-180, L41.
5/11 Mycorrhiza, CS1-20, J43, x550.

PLATE 5


1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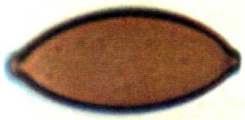
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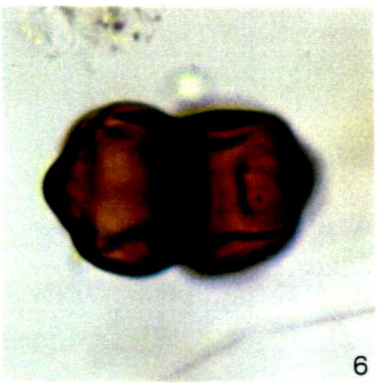
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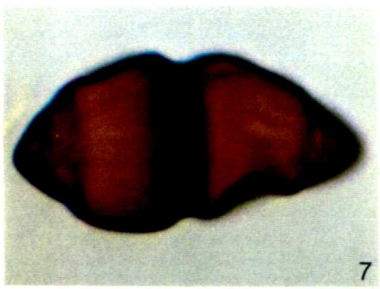
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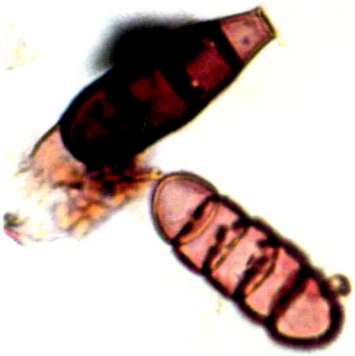
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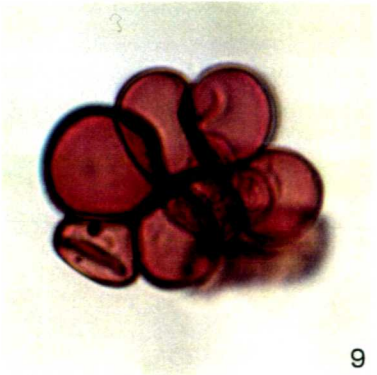
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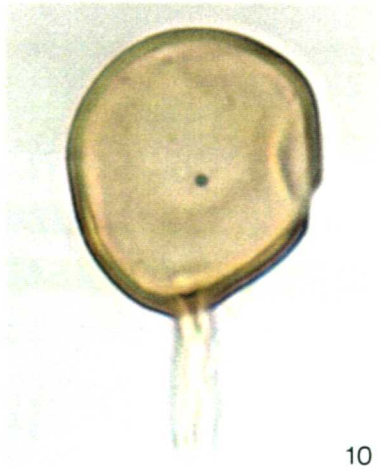
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11

PLATE 6

6/1 Animal remains, 1AP-50, J45, x275.
6/2 Animal remains, AP-90, T41, x550.
6/3 Cladoceran remains, NEAP, T34, x550.
6/4 Insect eye?, C2-40, L45, x550.
6/5 Chydorid head-shield, AP-90, F36, x275.
6/6 Foraminifera test-lining, CS2-40, W52, x550.
6/7 Sponge sclere, 1AP-50, N34, x550.
6/8 Sponge gemmosclere, 1AP-70, E43.

PLATE 6

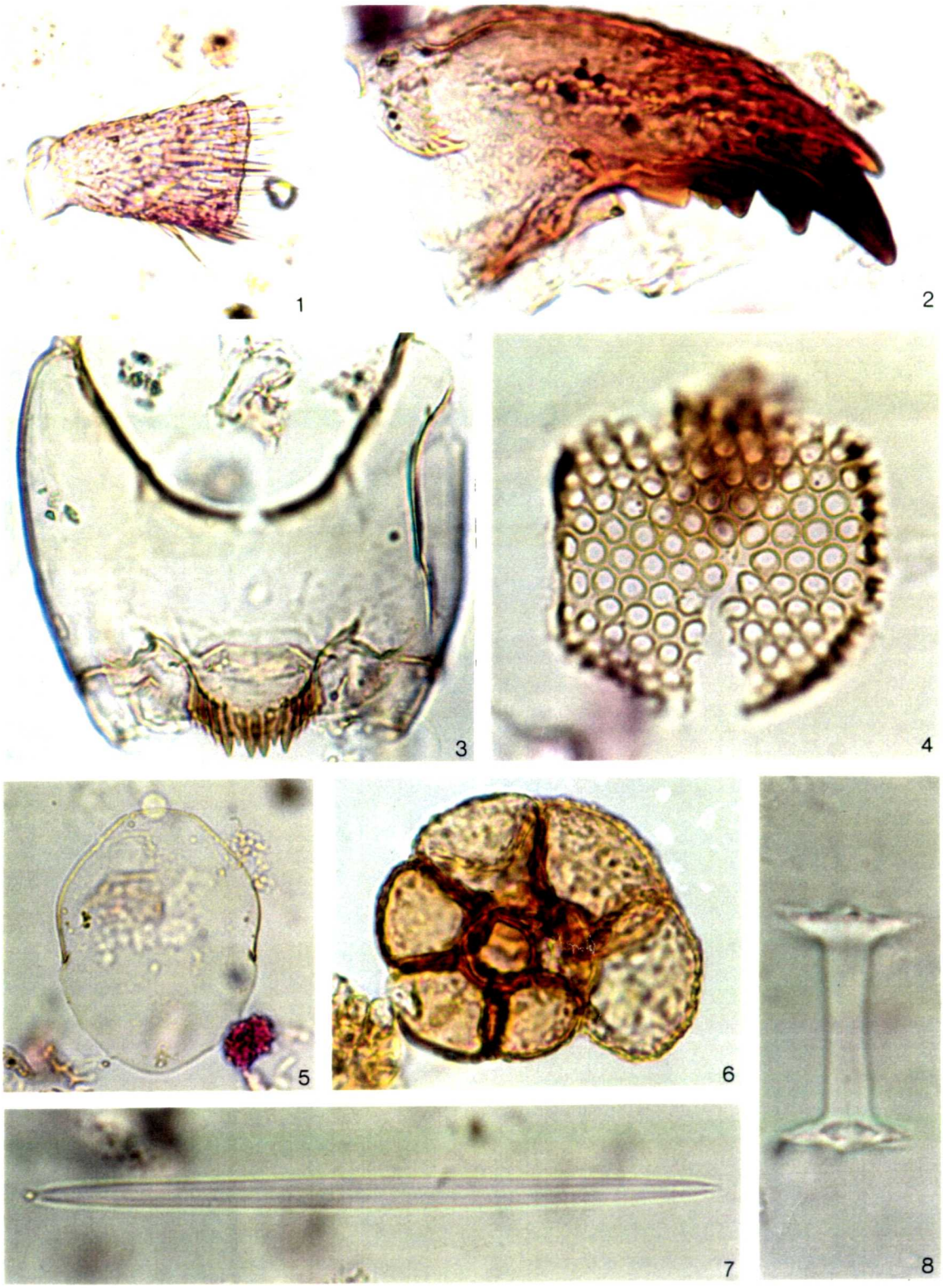
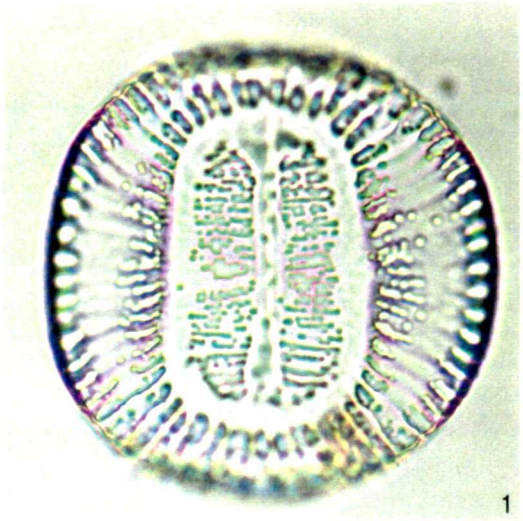


PLATE 7

7/1 Campylodiscus sp., AP-95(md4), D41, x550.
7/2 Surirella sp., AP-95(md4), G41, x550.
7/3 Amphora sp., AP-95(md4), G46, x550.
7/4 Scoliopleura sp., AP-95(md4), S50.
7/5 Diploneis sp., AP-95(md4), N46.
7/6 Paralia sp., 1AP-15, C38, x550.
7/7 unidentified diatom genus (1), CS1-110.

PLATE 7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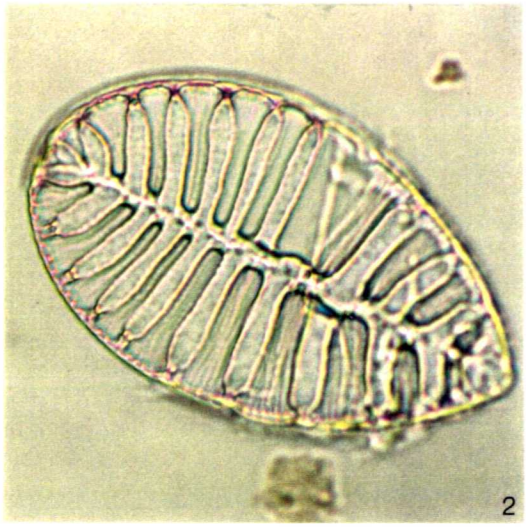
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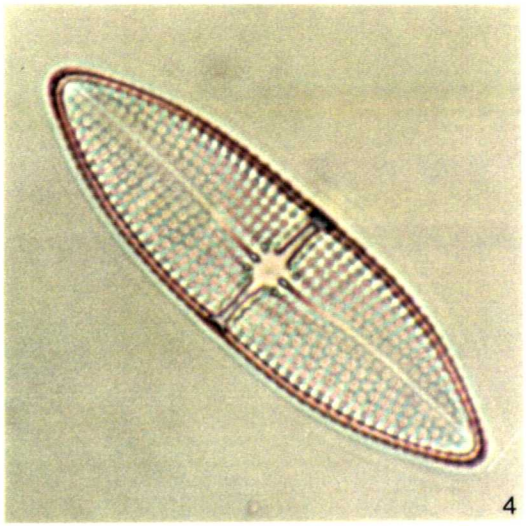
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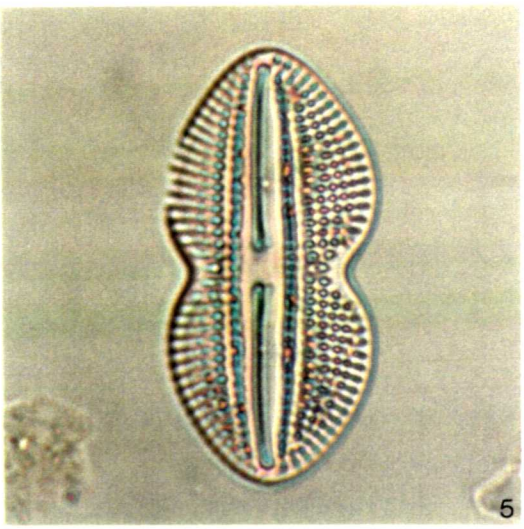
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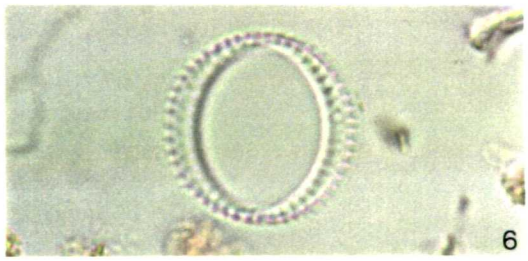
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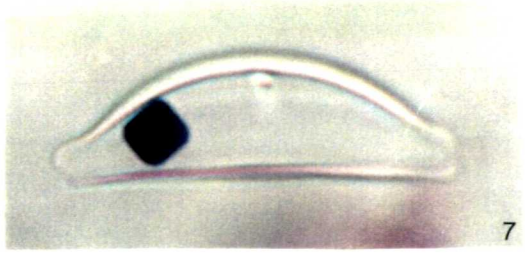
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PLATE 8

8/1 Spiniferites sp., high focus, 1AP-200, M36.
8/2 Spiniferites sp., middle focus, 1AP-200, M36.
8/3 Spiniferites sp., high focus, 1AP-200, G42.
8/4 Spiniferites sp., middle focus, 1AP-200, G42.
8/5 Lingulodinium machaerophorum, high focus, 1AP-30(bl), P29, x550.
8/6 Lingulodinium machaerophorum, middle focus, 1AP-30(bl), P29, x550.

PLATE 8

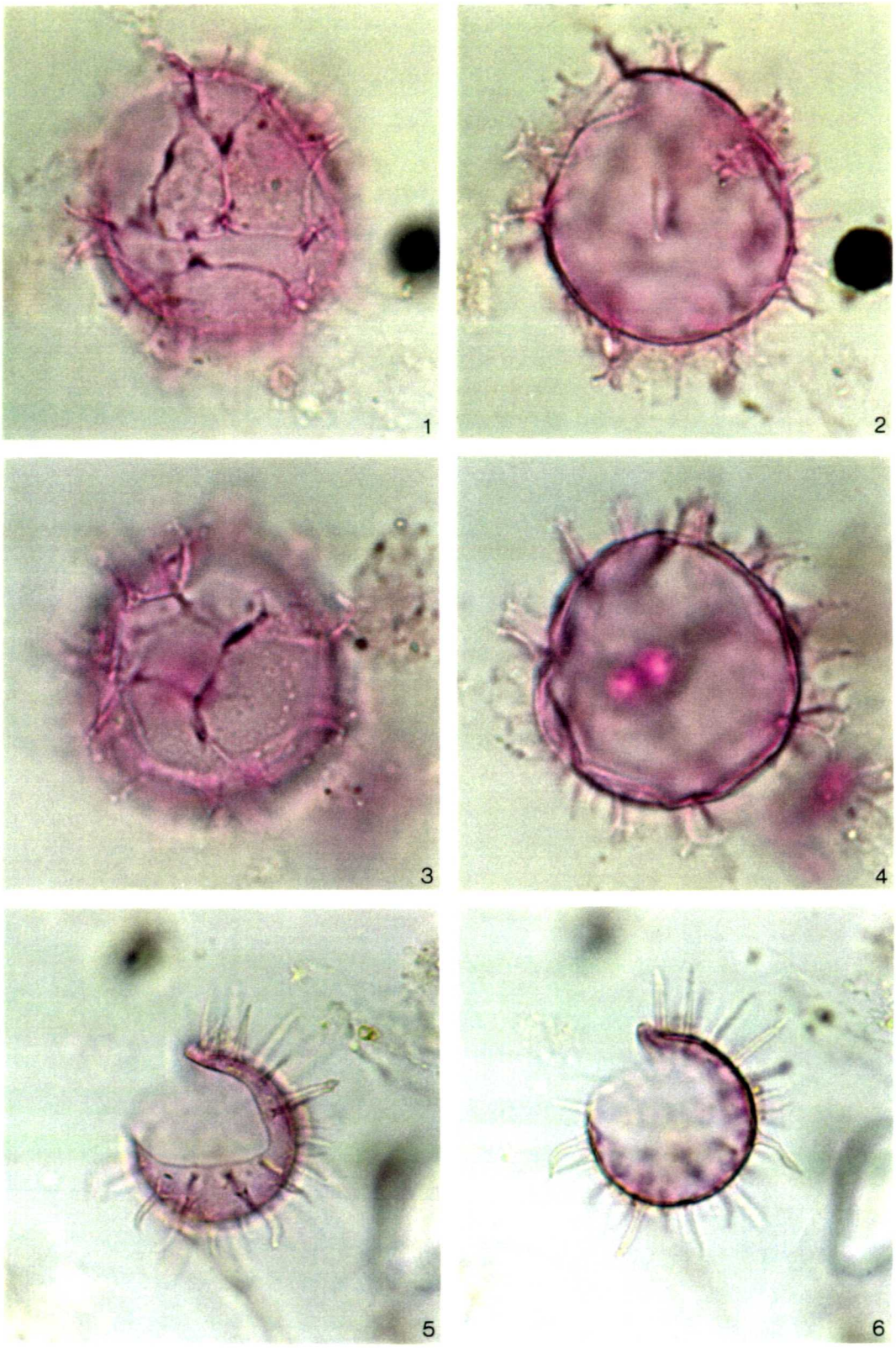


PLATE 9

9/1 Dinoflagellate 'Genus A', high focus, AP-100, L36.
9/2 Dinoflagellate 'Genus A', middle focus, AP-100, L36.
9/3 Dinoflagellate 'Genus A', high focus, C2-60, N40.
9/4 Dinoflagellate 'Genus A', middle focus, C2-60, N40.

PLATE 9

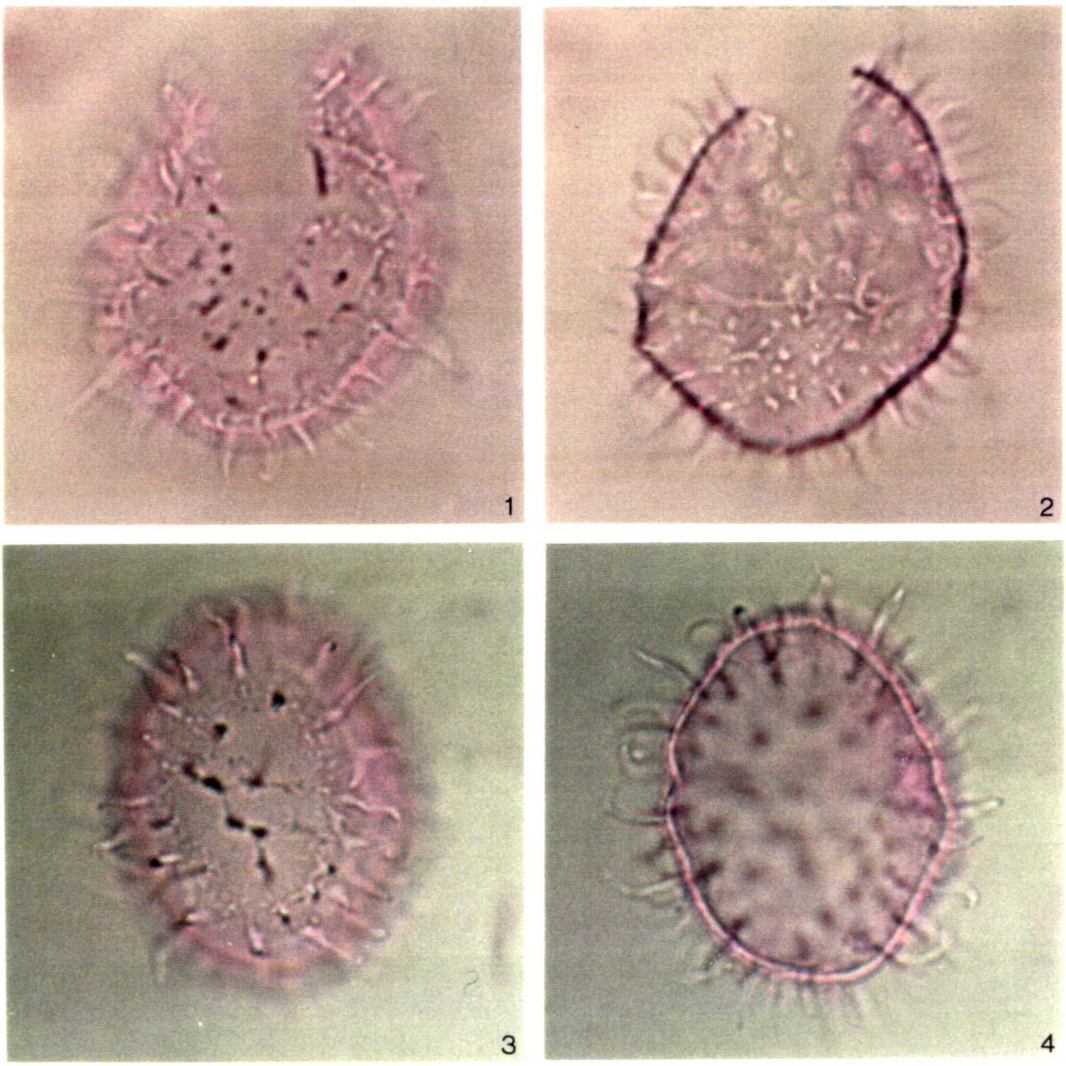


PLATE 10

10/1 Sheath of Cyanophyceae, CS1-100, S48, x550.
10/2 Sheath of Cyanophyceae with precipitated calcium carbonate, C2-20, G45, x550.
10/3 Botryococcus sp., AP-90, L44, x550.
10/4 Mougeotia sp., AG-110, O46.
10/5 Mougeotia sp., APSS1, L47.
10/6 Staurastrum sp., 1AP-50, W32.
10/7 Cosmarium sp., 1AP-50, H52.
10/8 Euastrum sp., AP-150b, M41
10/9 Staurastrum sp., 1AP-80, P42.
10/10 Cosmarium sp., 1AP-80, L50, x550.
10/11 Euastrum sp., AP-150b, G42.

PLATE 10

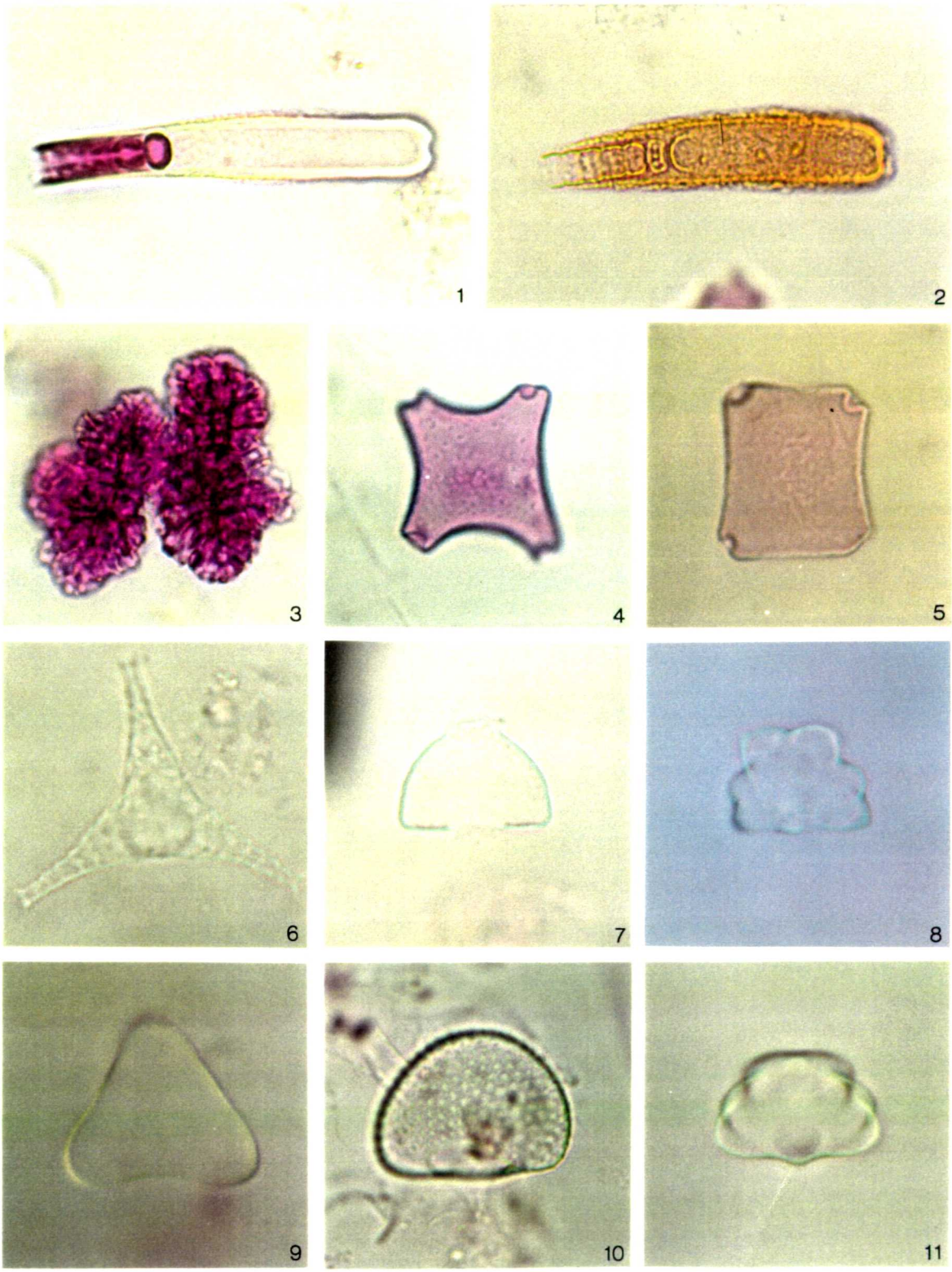
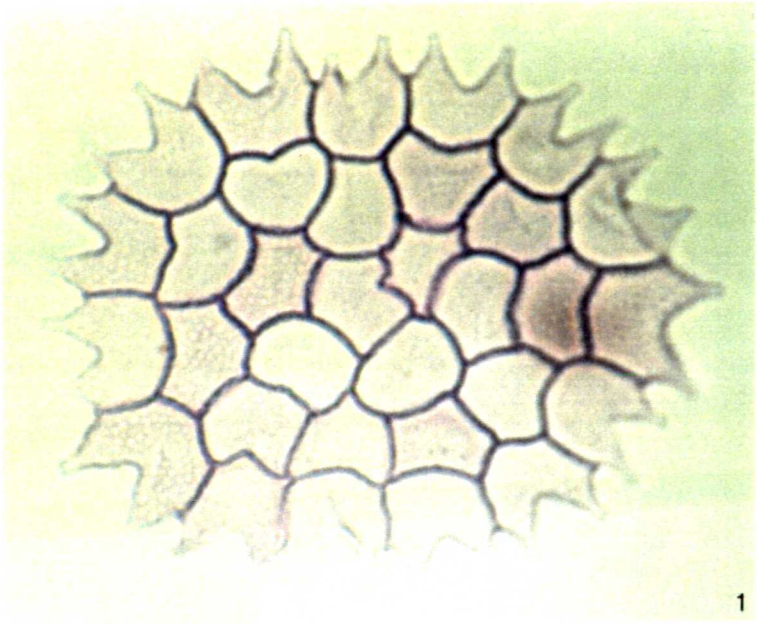


PLATE 11

11/1 Pediastrum cf. boryanum, 1AP-190, Q40.
11/2 Pediastrum cf. boryanum, 1AP-200, X49, x550.
11/3 Zygnema sp., AG-140bl, J46.
11/4 Spirogyra sp., AP-230a, E43.
11/5 Spirogyra sp., APSS1b, G45.
11/6 Spirogyra sp., AG-110, S33.

PLATE 11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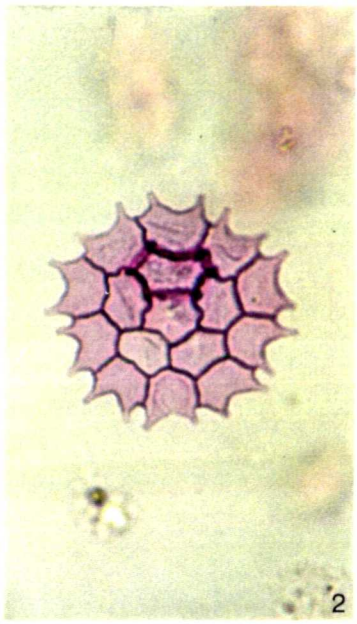
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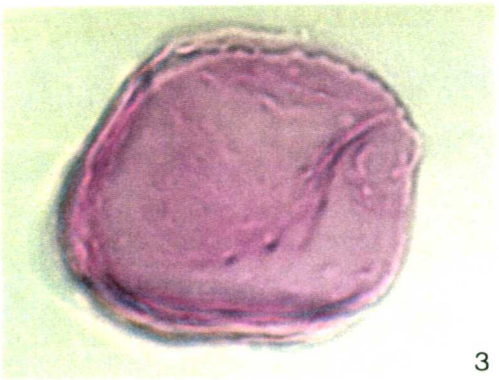
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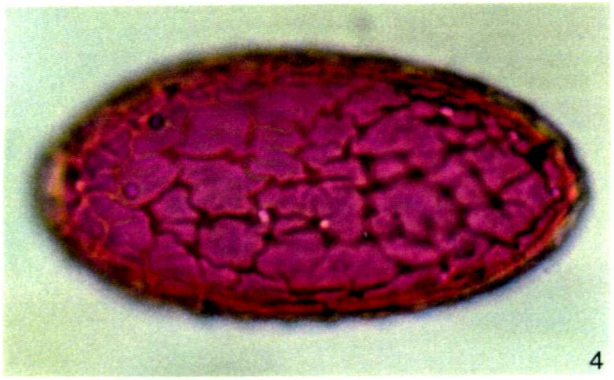
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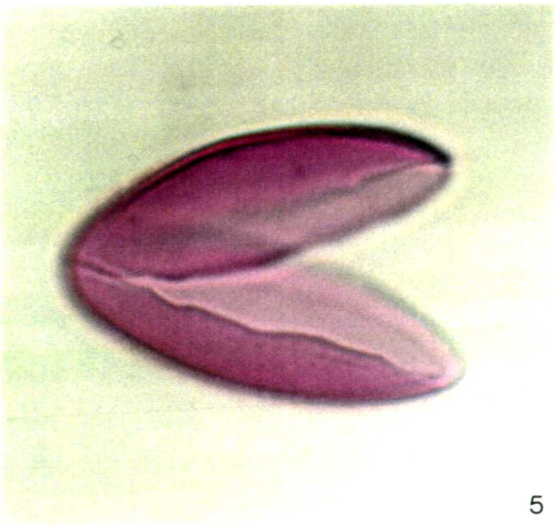
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PLATE 12

12/1 Concentricystes cf. circulus, polar view, AG-110, J46.
12/2 Concentricystes cf. circulus, equatorial view, AG-110, Y51.
12/3 Type A, high focus, AP-90, L44.
12/4 Type A, middle focus, AP-90, L44.
12/5 Type A, high focus, C2-40, Q44.
12/6 Type A, middle focus, C2-40, Q44.

PLATE 12