Project: Ke 287/9 „Untersuchung der Mikrobialithe und Spongien-Assoziation im mit alkalischem Meerwasser gefüllten Kratersee von Satonda (Indonesien) als rezentes Beispiel fossiler Spongiolithfazies", Project Leader: S. Kempe (Darmstadt) & J. Reitner (Göttingen)

Holocene Ostracoda from the Satonda Crater Lake (Indonesia)

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Area of Study: Indonesia, Sunda Islands
Environment: Alkaline crater lake
Stratigraphy: Holocene
Organisms: Ostracods
Depositional Setting: Crater lake
Constructive Processes: —
Destructive Processes: —
Preservation: —
Research Topic: Environmental analyses using ostracods

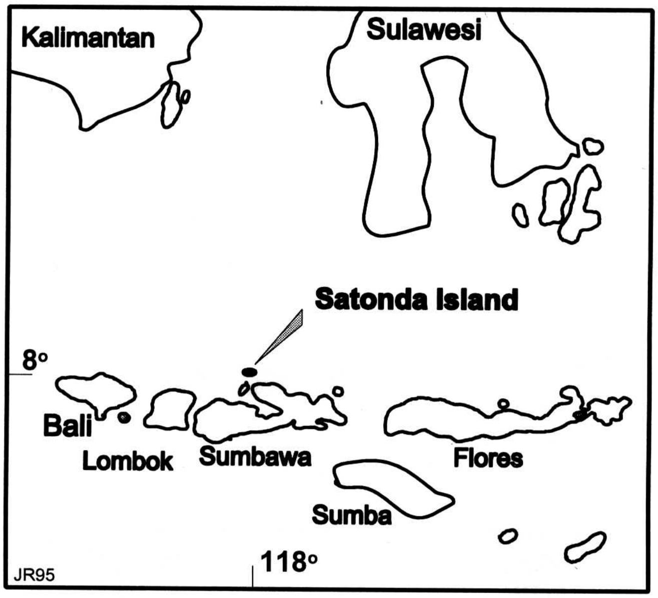


Fig. 1: Location of Satonda Island in the Sunda archipelago, Indonesia.

Abstract

The vertical distribution of Ostracoda from two digs from the beach of the Satonda Crater Lake reflects the Holocene history of its water chemistry. In the lowermost parts, monospecific associations dominate in fresh to brackish waters, whereas there is a higher species diversity and eveness of several marine species, typical for warm and shallow waters, in the middle parts of the sections. In the upper parts of the digs and in the alkaline waters of today's crater lake, the same cypridid species as in the lowermost horizons dominates, indicating the reestablishment of a more stressful environment compared to the marine layers in between.

1 Introduction

During the expedition 1993 4 digs were made on the beach of the Satonda Crater Lake near station 1. The sections start with an organic rich sediment (peat) which probably documents the early fresh water history of the crater basin (more details in Kempe et al. 1996 and Arp et al. 1996). Ostracods and foraminifera are organisms of a marked environmental sensibility. The purpose of this study was to check the paleoecological significance of the abundant ostracoda.

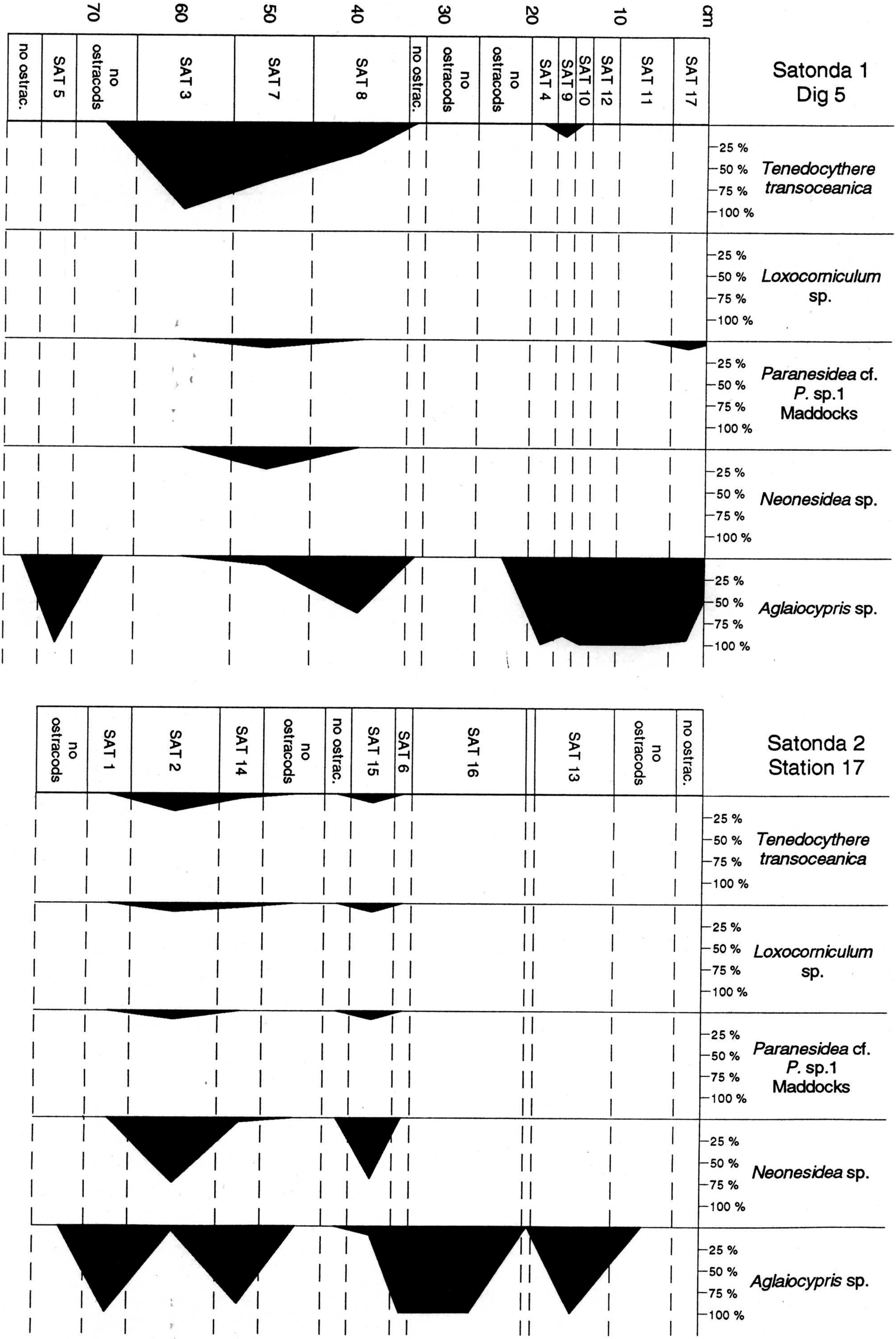
From two selected digs each of 70-80 cm depth, 27 samples have been examined for their ostracod inventory. 17 samples yielded a mostly uniform ostracod fauna. Of the eight species which have been identified, five occur in more than one sample and thus have been studied in more detail in order to obtain information about the Holocene water history of Satonda Crater Lake. For further details on the crater lake see Kempe & Kazmierczak (1993).

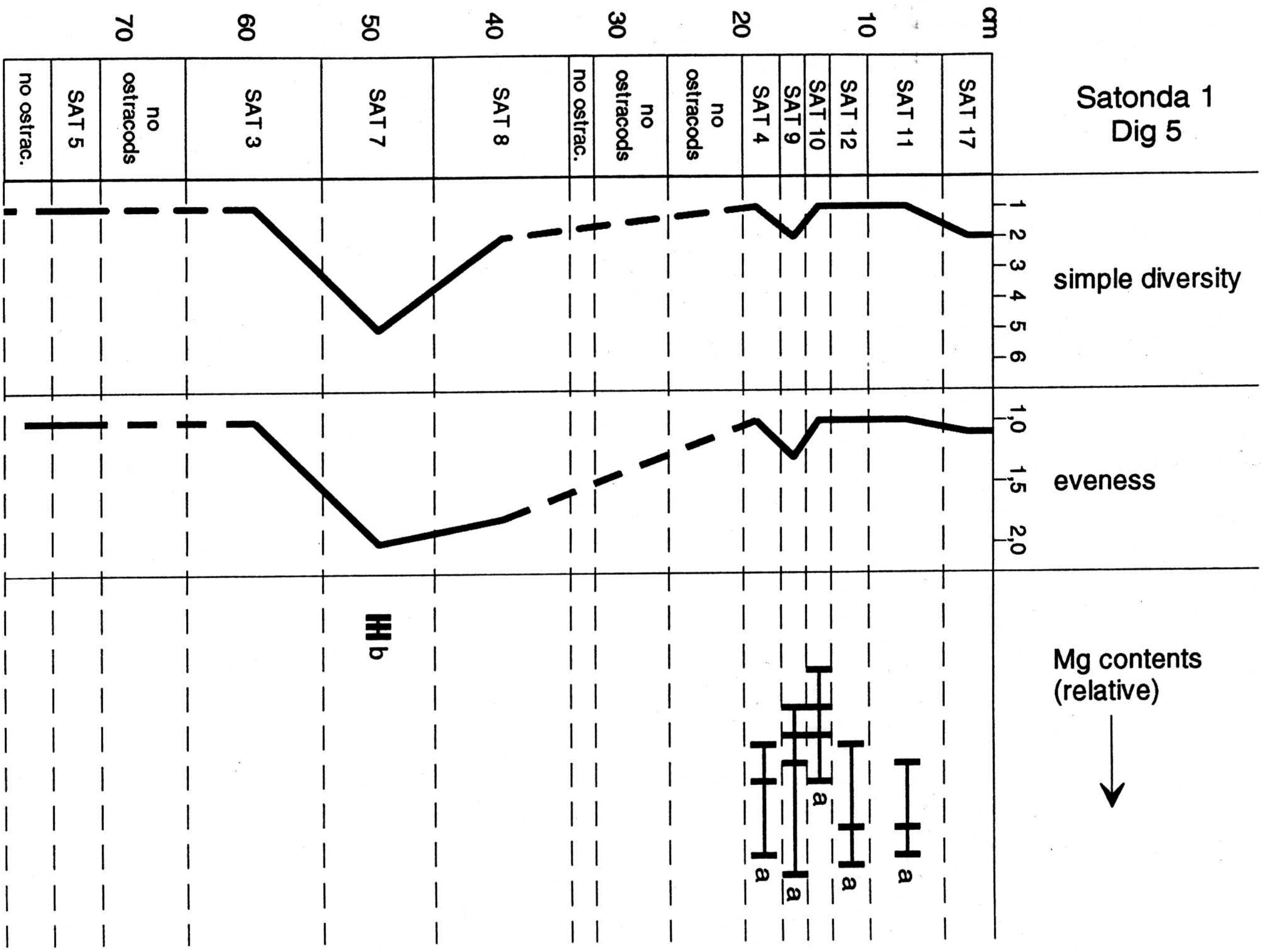
2 Results

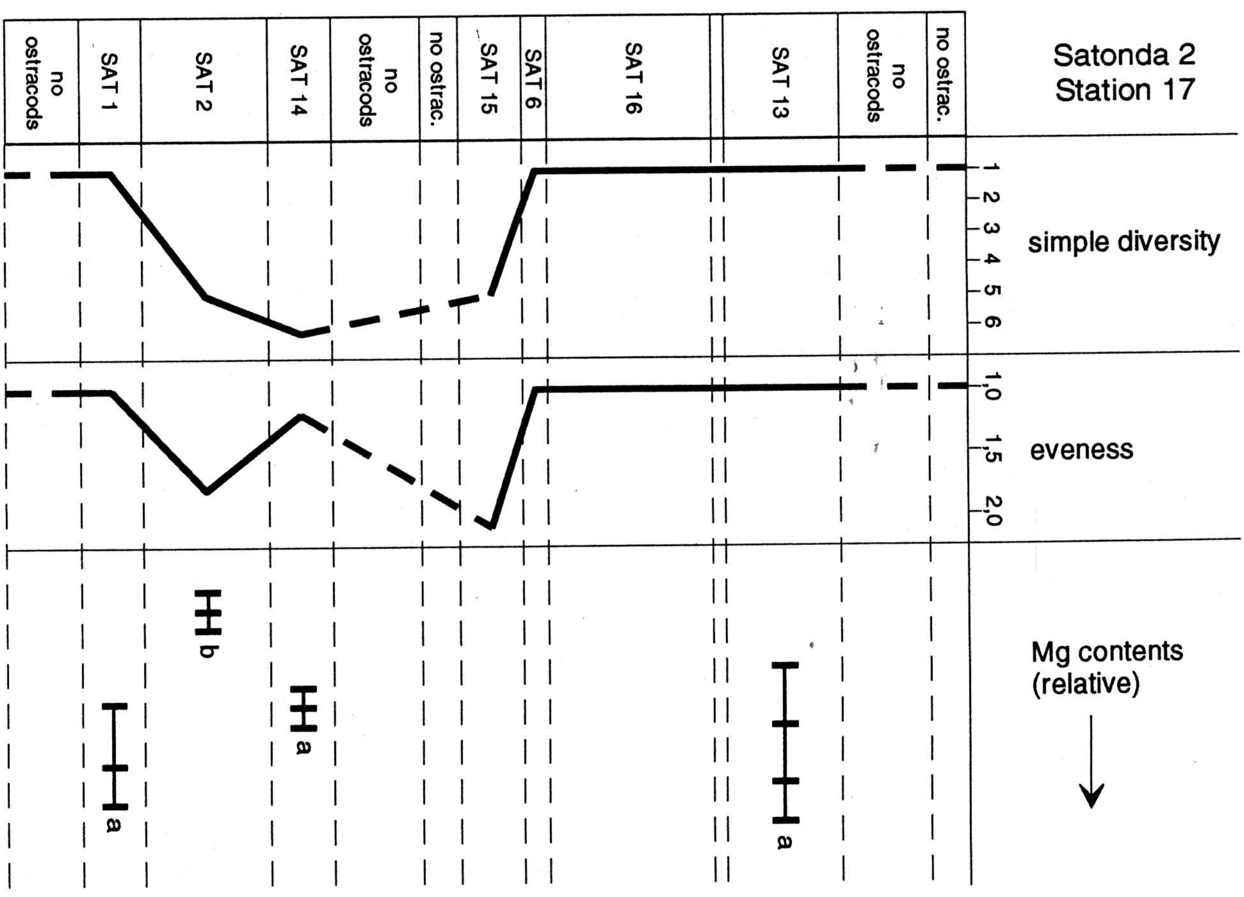
Aglaiocypris sp. (Pl. 1/18-20) is the dominant species in the lowermost and in the upper parts of the sections (Fig. 2). In 9 samples, it displays low diversity, monospecific associations. However, *Aglaiocypris* is also somewhat dominant in other samples which show a higher simple diversity, but also low eveness. Monospecific associations or associations dominated by this species obviously indicate a more stressful regime compared to the marine conditions reflected in several samples from the lower middle part of the sections. Species of this genus have been described from shallow marine waters worldwide (Kempf 1986, 1995),

Fig. 1 (next page): Quantitative distribution of five dominant ostracod species in two sections (Dig 5 and Station 17) from Satonda Crater Lake. *Aglaiocypris* sp. is dominant and provides mostly monospecific associations in the lowermost part and in the upper 35 cm of the sections. Ostracod associations from samples 35-65 cm below surface are more diverse and contain several euhaline species.
Fig. 2 (page after next): Simple diversity and eveness of ostracod associations and some exemplary measurements of relative Mg contents in ostracod shells from in two sections (Dig 5 and Station 17) from Satonda Crater Lake.

Reitner, J., Neuweiler, F. & Gunkel, F. (eds., 1996): Global and Regional Controls on Biogenic Sedimentation. I. Reef Evolution. Research Reports. – Göttinger Arb. Geol. Paläont., **Sb2**, 119-123, Göttingen


Satonda 1
Dig 5
cm
70
60
50
40
30
20
10
no ostrac.
SAT 5
no ostracods
SAT 3
SAT 7
SAT 8
no ostrac.
no ostracods
no ostracods
SAT 4
SAT 9
SAT 10
SAT 12
SAT 11
SAT 17
25 %
50 %
75 %
100 %
Tenedocythere transoceanica
Loxocorniculum sp.
Paranesidea cf. P. sp.1 Maddocks
Neonesidea sp.
Aglaiocypris sp.
Satonda 2
Station 17
no ostracods
SAT 1
SAT 2
SAT 14
no ostracods
no ostrac.
SAT 15
SAT 6
SAT 16
SAT 13
no ostracods
no ostrac.


Satonda 1
Dig 5
simple diversity
eveness
Mg contents
(relative)
cm
10
20
30
40
50
60
70
SAT 17
SAT 11
SAT 12
SAT 10
SAT 9
SAT 4
no ostracods
no ostracods
no ostrac.
SAT 8
SAT 7
SAT 3
no ostracods
SAT 5
no ostrac.
1
2
3
4
5
6
1,0
1,5
2,0
a
b


Satonda 2
Station 17
simple diversity
eveness
Mg contents
(relative)
no ostrac.
no ostracods
SAT 13
SAT 16
SAT 6
SAT 15
no ostrac.
no ostracods
SAT 14
SAT 2
SAT 1
no ostracods
1
2
3
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6
1,0
1,5
2,0
a
b

but, as a member of the ecologically wide-ranging family Paracyprididae, may perhaps tolerate more restricted environments such as reduced salinities or increased alkalinities.

From 35 to 65 cm below surface the sections comprise different taxa indicating a normal marine, euhaline environment (Fig. 3). Although *Aglaiocypris* is still frequent in a few samples from this horizon, other species which are adapted to these euhaline, shallow water conditions abound (Fig. 2).

Tenedocythere transoceanica (TEETER) (Pl. 2/1-8) is a morphologically extremely stable species which has been described from many localities in the Caribbean Sea, Pacific Ocean, and Red Sea (CRONIN 1988). The species occurs mainly in shallow-marine carbonate environments, euhaline waters, often in isolated atolls.

Loxocorniculum, *Paranesidea* and *Neonesidea* are also genera which usually occur in euhaline waters. Many species have been reported from shallow-marine carbonate environments. Species similar to the Satonda forms have, for instance, been described from reefs and atolls in the Caribbean Sea (MADDOCKS 1974, KRUTAK 1982), Japan (TABUKI & NOHARA 1995), the Red and Java Seas, and the Pitcairn Islands (WHATLEY & ROBERTS 1995).

In addition, there are a few more, but rare ostracods indicating marine conditions such as *Paracytheridea*, in this part of the section.

Both diversity and eveness are highest in the 35 to 65 cm below the surface of the sections indicating a normal marine, euhaline environment (Fig. 3). On the contrary, diversity and eveness are low in the upper 35 cm and in the lowermost parts of the sections pointing to a more restricted environment.

Exemplary Mg measurements (Fig. 3) were carried out on shells of different taxa (a=*Aglaiocypris*, b=*Neonesidea*) and must therefore be interpreted with great care. Lower Mg values of six *Neonesidea* shells from samples SAT 2 and SAT 7 can also be interpreted as a vital effect. The results correspond to the general trend (CHIVAS et al. 1986) that among ostracods which belong to different families those with the eldest ancestry have lower Mg values: *Neonesidea* is a member of the geologically very old family Bairdiidae, whereas *Aglaiocypris* is a member of the much younger family Paracyprididae.

In the samples under study, ostracods are associated with other microscopic organic remains such as foraminifera, serpulids, otoliths, and gastropods. Amongst these, the foraminifera provide the best correlation with the results derived from the analyses of ostracods. High abundances of foraminifera indicating euhaline environments and the strongest marine influence are correlated in each case with high abundances of the ostracod genus *Neonesidea* (samples SAT 2, 7 and 15, Fig. 2), which, as a bairdiid, is also indicative of a strong marine influence. On the other hand, in samples dominated by the ostracod genus *Aglaiocypris*, such as the uppermost 35 cm in both sections (Fig. 2), such foraminifera are rare or lacking, being replaced by forms indicating more restricted environments.

Acknowledgements

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Plate 1:

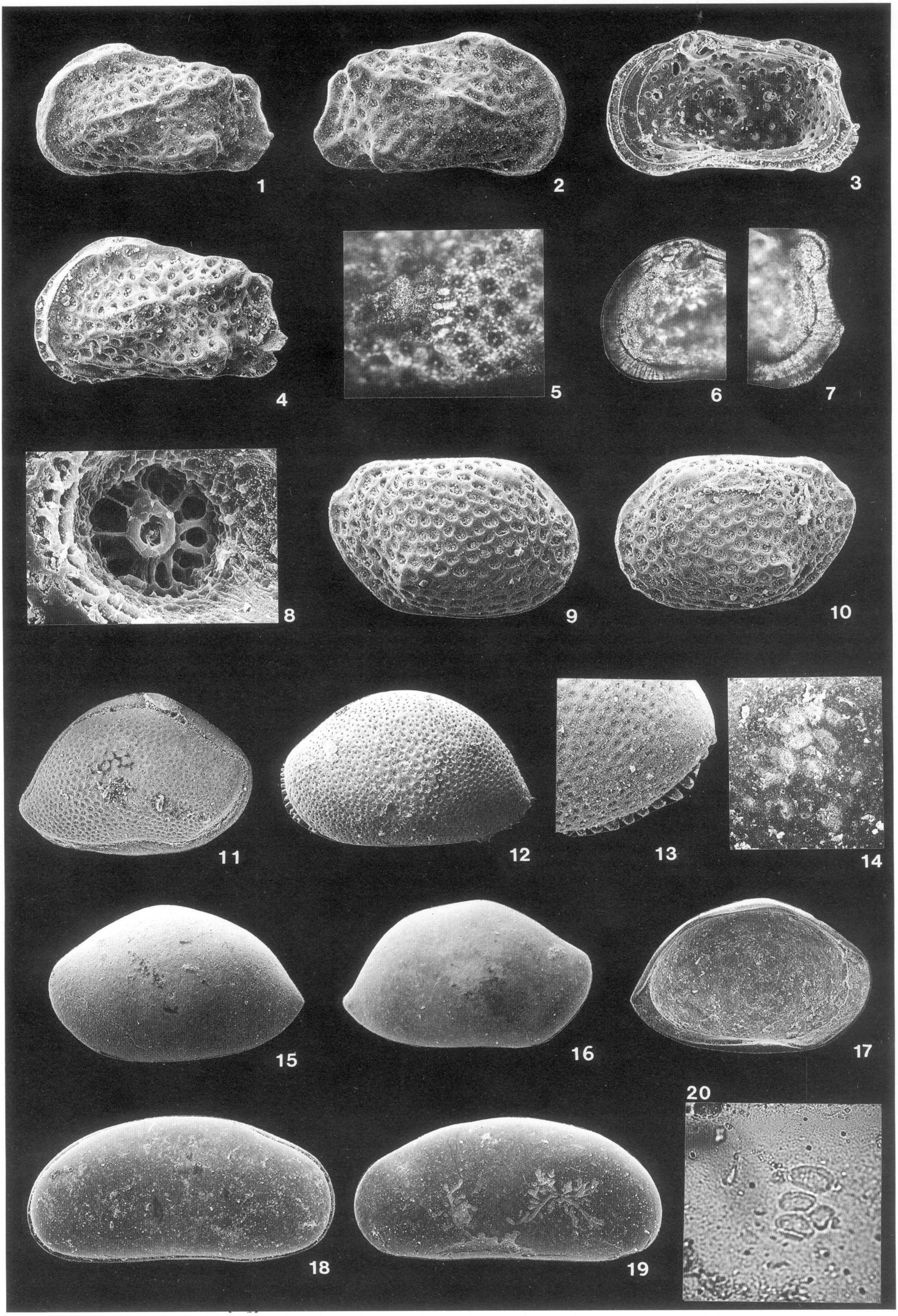
Figs. 1-8: *Tenedocythere transoceanica* (TEETER 1975). Fig. 1: LV, length=0.45 mm. Fig. 2: RV, length=0.47 mm. Both from sample SAT 2. Fig. 3: RV interior, length=0.53 mm. Fig. 4: LV, length=0.53 mm. Fig. 5: muscle scars and sieve pores, transmitted light, width of figure=0.15 mm. All from sample SAT 7. Fig. 6: RV, anterior margin, transmitted light, height=0.26 mm. Fig. 7: RV, posterior margin, transmitted light, height=0.23 mm. Both from sample SAT 2. Fig. 8: sieve pore, diameter=0.015 mm, sample SAT 7.

Figs. 9-10: *Loxocorniculum* sp. Fig. 9: RV, length=0.47 mm. Fig. 10: LV, length=0.51 mm. Both from sample SAT 2.

Figs. 11-14: *Paranesidea* cf. *P.* sp.1 MADDOCKS 1974. Fig. 11: RV, length=0.73 mm, sample SAT 2. Fig. 12: LV, length=0.63 mm. Fig. 13: detail of posteroventral margin, sample SAT 2. Fig. 14: interior view of muscles scars, width of figure=0.18 mm, sample SAT 7.

Figs. 15-17: *Neonesidea* sp. Fig. 15: LV, length=0.89 mm. Fig. 16: RV, length=0.9 mm. Fig. 17: LV interior, length=0.95 mm. All from sample SAT 2.

Figs. 18-20: *Aglaiocypris* sp. Fig. 18: RV, length=0.76 mm. Fig. 19: LV, length=0.78 mm Both from sample SAT 1. Fig. 20: muscle scars, transmitted light, width of figure=1/3 of ostracod length, samples SAT 9.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