REPORT SNO 3566-96

Depth-dependent variation in soft-bottom fauna

Norwegian Institute for Water Research

REPORT

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Title	Serial No.	Date
Depth-dependent variation in soft-bottom fauna	3566-96	1996.11.06
	Report No. Sub-No. / Pages / Price: Q-456 / 13 / kr 75,-	
Author(s): Rygg, Brage	Topic group: General marine investigations	Distribution
	Geographical area: Norway	Printed: NIVA

Client(s)	Client ref.
Norwegian Institute for Water Research	

Abstract

Depth is an important variable influencing soft-bottom-fauna communities. Lowest diversities were found at depths shallower than 40m, probably due to stronger fluctuations in environmental factors. Maximum diversities were found at 65-115m depth. The decline in diversity deeper than 100m may be caused by different food supply and a more homogenous silt/clay type of sediment, offering fewer niches. Great differences were found between different species. Most species showed a preference to either deep or shallow depths.

4 keywords, Norwegian	4 keywords, English
1. Bløtbunnsfauna	1. Soft-bottom fauna
2. Dyp	2. Depth
3. Artsmangfold	3. Diversity
4. Arter	4. Species

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ISBN 82-577-3116-1

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Depth-dependent variation in soft-bottom fauna

Preface

The data used for this study were obtained from the soft-bottom-fauna database at the Norwegian Institute for Water Research. The database currently includes quantitative data from more than 700 stations in Norwegian fjords and coastal waters, mostly from the 1980s and 1990s.

Oslo, November 1996

Brage Rygg

Contents

1. Material and methods

Data from 631 stations in Norwegian fjords and coastal waters collected during the period from 1976 to 1995 were included in this study. If the same station had been sampled at more than one time, the mean values of the station were calculated. There was a predominance of shallow-water stations (Figure 1). The highest number of stations were located in Southern Norway (Figure 2).

Diversity at different depths was investigated. Samples having less than 100 individuals were excluded, leaving diversity data from 543 stations for further treatment. These were ranked according to depth and a moving average of the diversity values over depth was calculated. A period number of 100 was chosen for the moving average. This smoothed out small-scale variations.

Densities of 44 of the most common soft-bottom macrofauna species/genera at different depths were also investigated (Appendix A). A moving average of density (numbers/m^2) over depth was calculated. A high period number (200) was chosen for the moving average in order to get general trends.

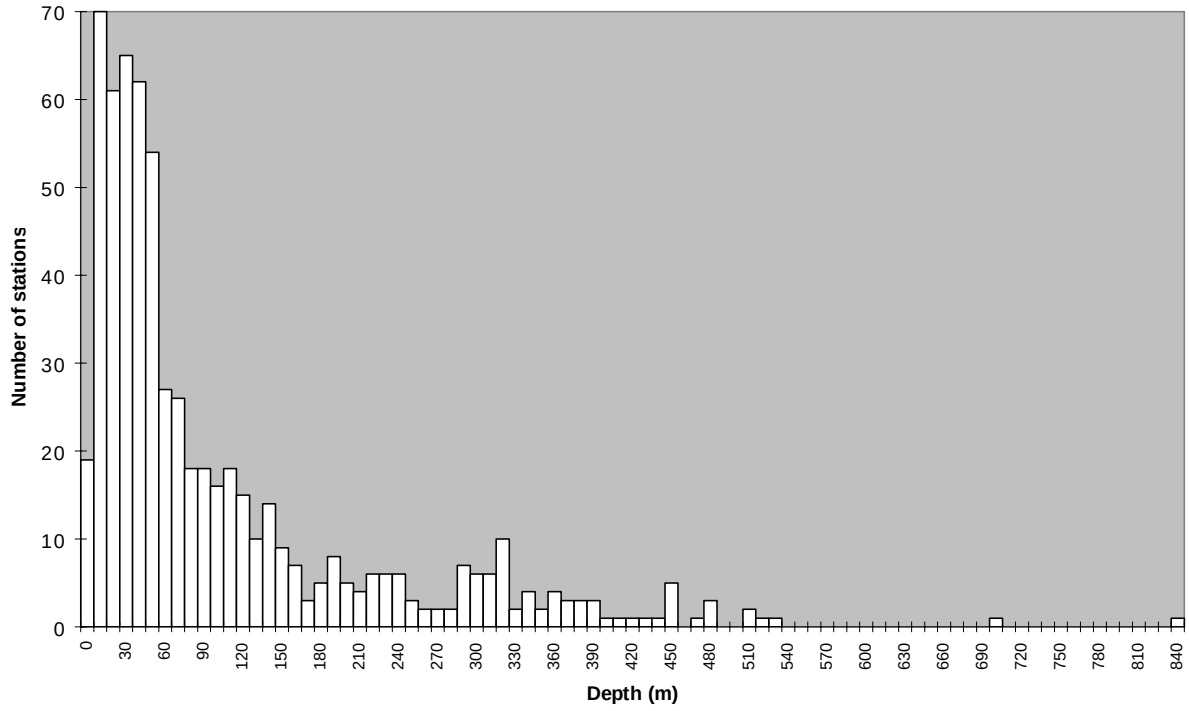


Figure 1. Station depth frequency histogram.

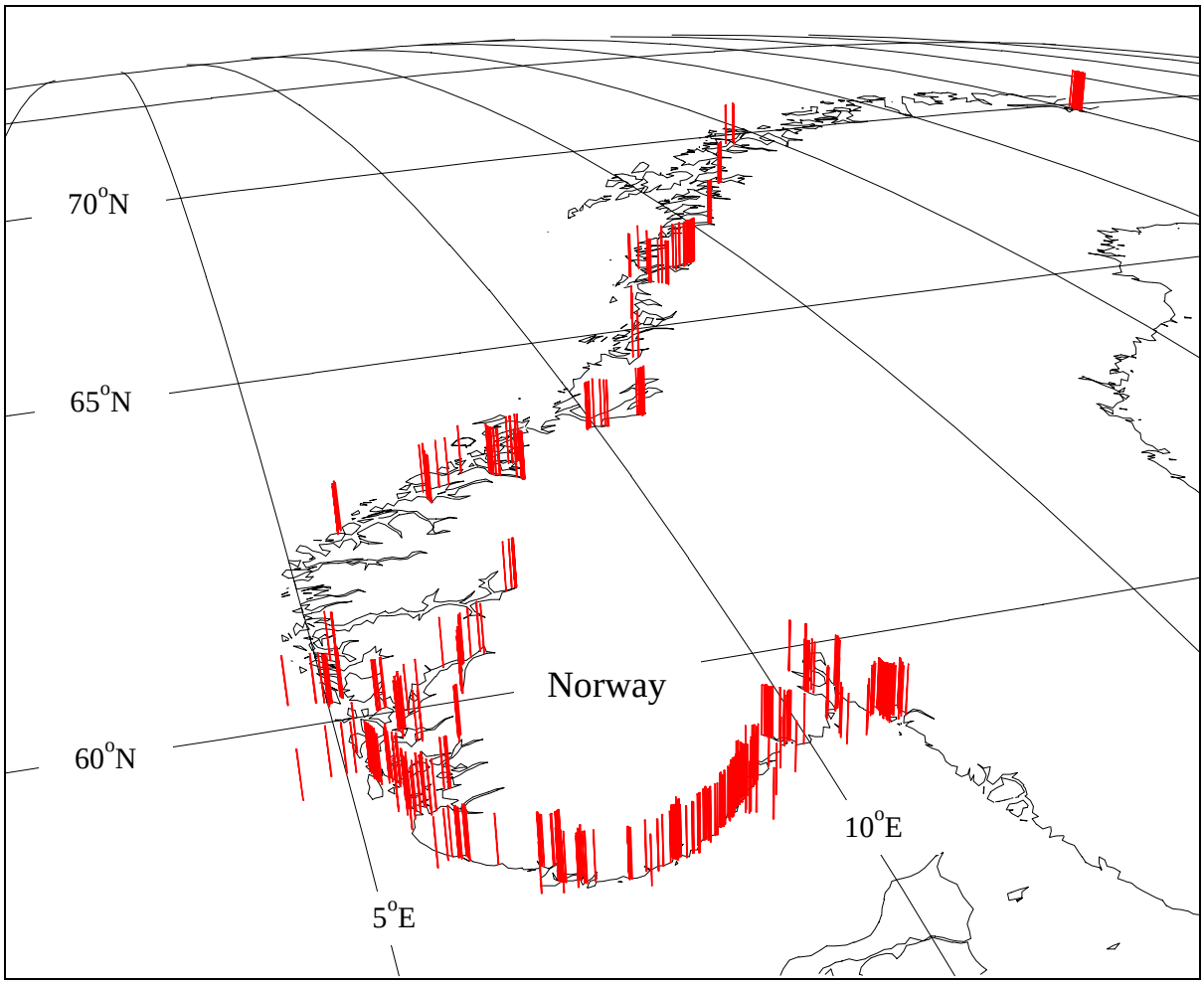


Figure 2. Map of stations.

2. Results

Depth was found to be an important factor affecting the soft-bottom-fauna communities.

2.1 Diversity

The moving average curves for diversity vs. depth are shown in Figure 3. The starting point of the curves represents the average diversity value among the 100 shallowest stations (1-30 m depth), the end point the 100 deepest stations (175-850 m depth). The lowest diversity was found at shallow depths. The diversity increased with increasing depth up to a maximum value of the moving average in the depth interval of 65-115 m. Towards greater depths, the diversity declined steadily. This decline was more pronounced in the ES_{100} index than in the H index. The low diversity at shallow depths is probably caused by greater fluctuations in environmental factors. The decline in diversity deeper than 100 m may be caused by i.a., changes in food supply and a more homogenous silt/clay type of sediment, offering fewer niches.

2.2 Species

The moving average curves for density over depth are shown in Figure 4. The starting point of the curves represents the average density value (number/m^2) among the 200 most shallow stations (1-40 m depth), the end point the 200 deepest stations (105-850 m depth). Great differences were found between different species. Most species showed a preference to either deep or shallow depths. Few species preferred intermediate depths. Very few species, e.g. the polychaete *Terebellides stroemi*, had densities almost independent of depth. It is beyond the scope of this study to investigate the specific causes of the depth preferences of the different species.

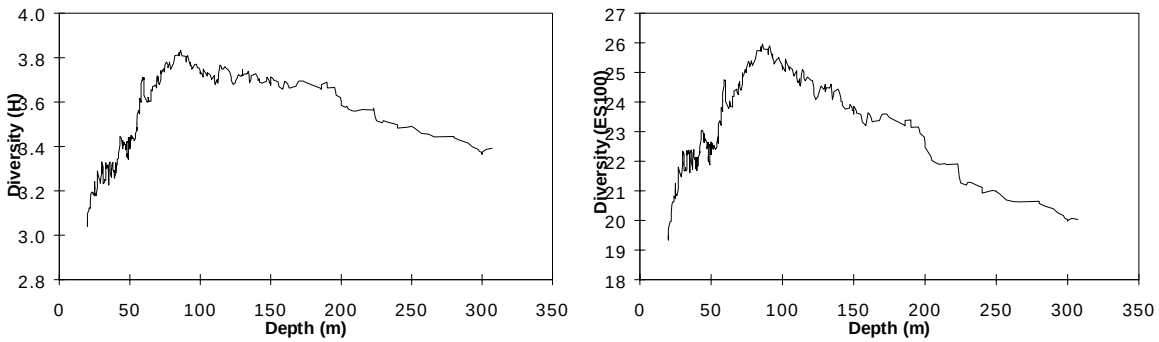
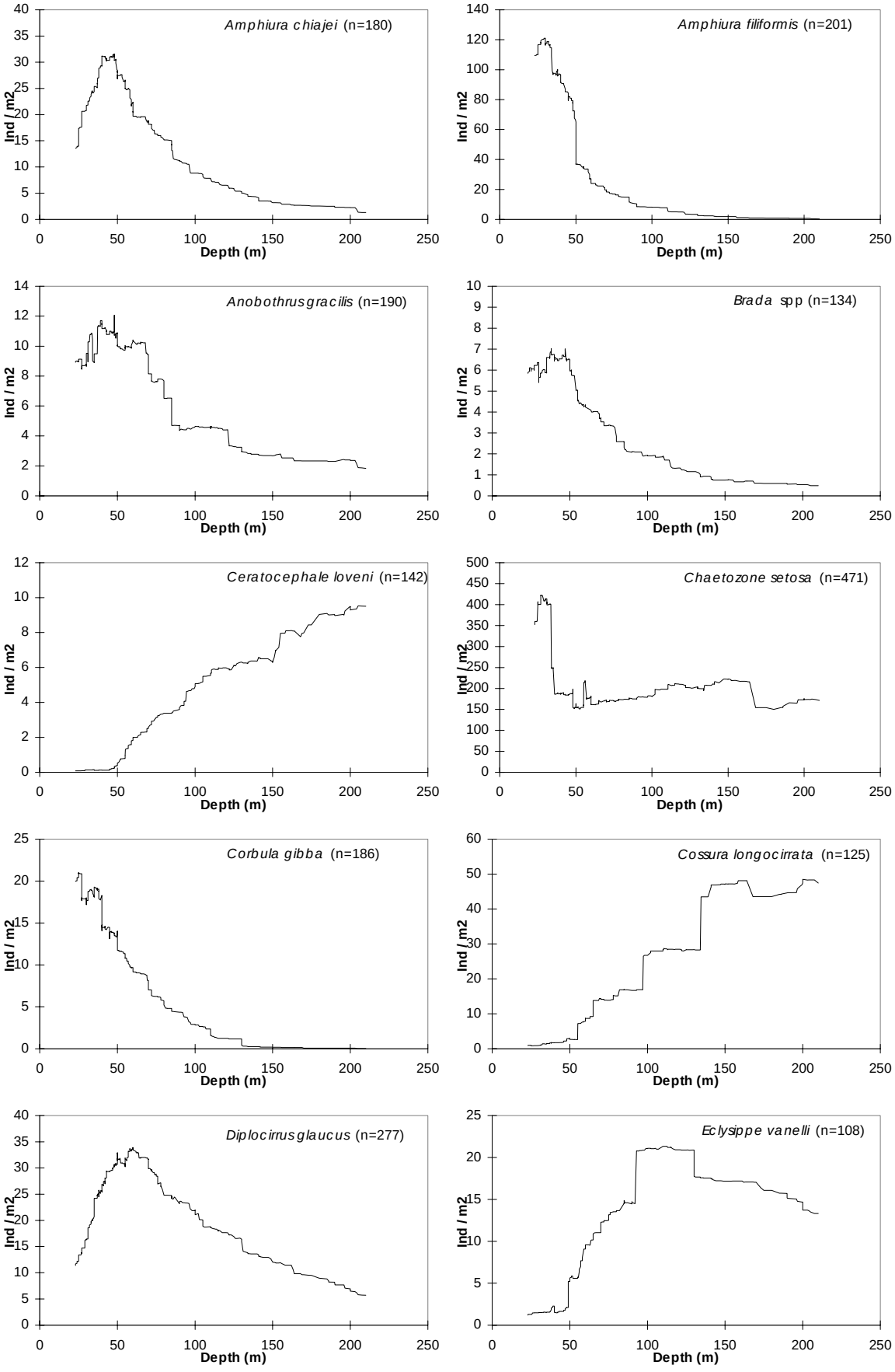
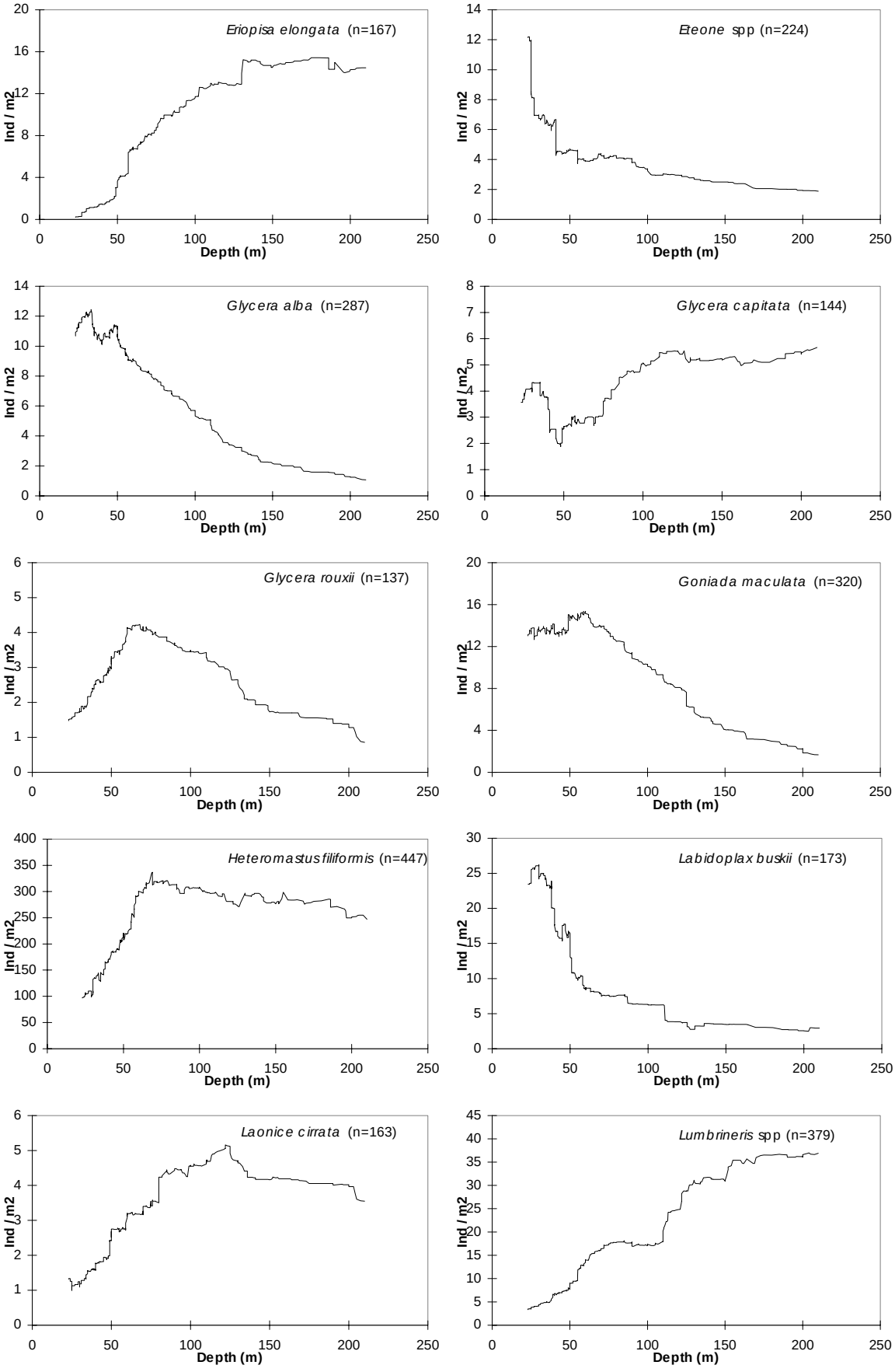
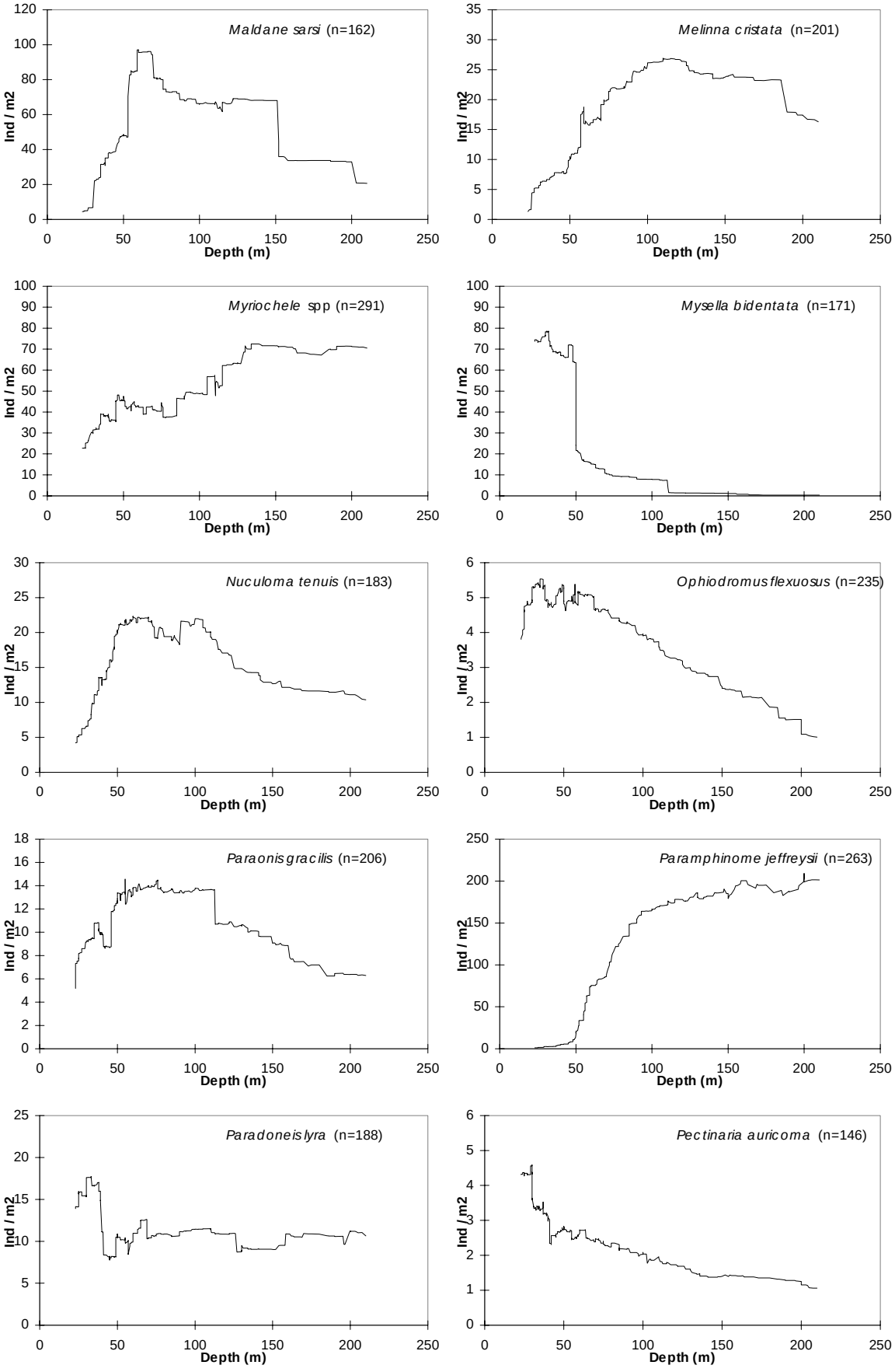


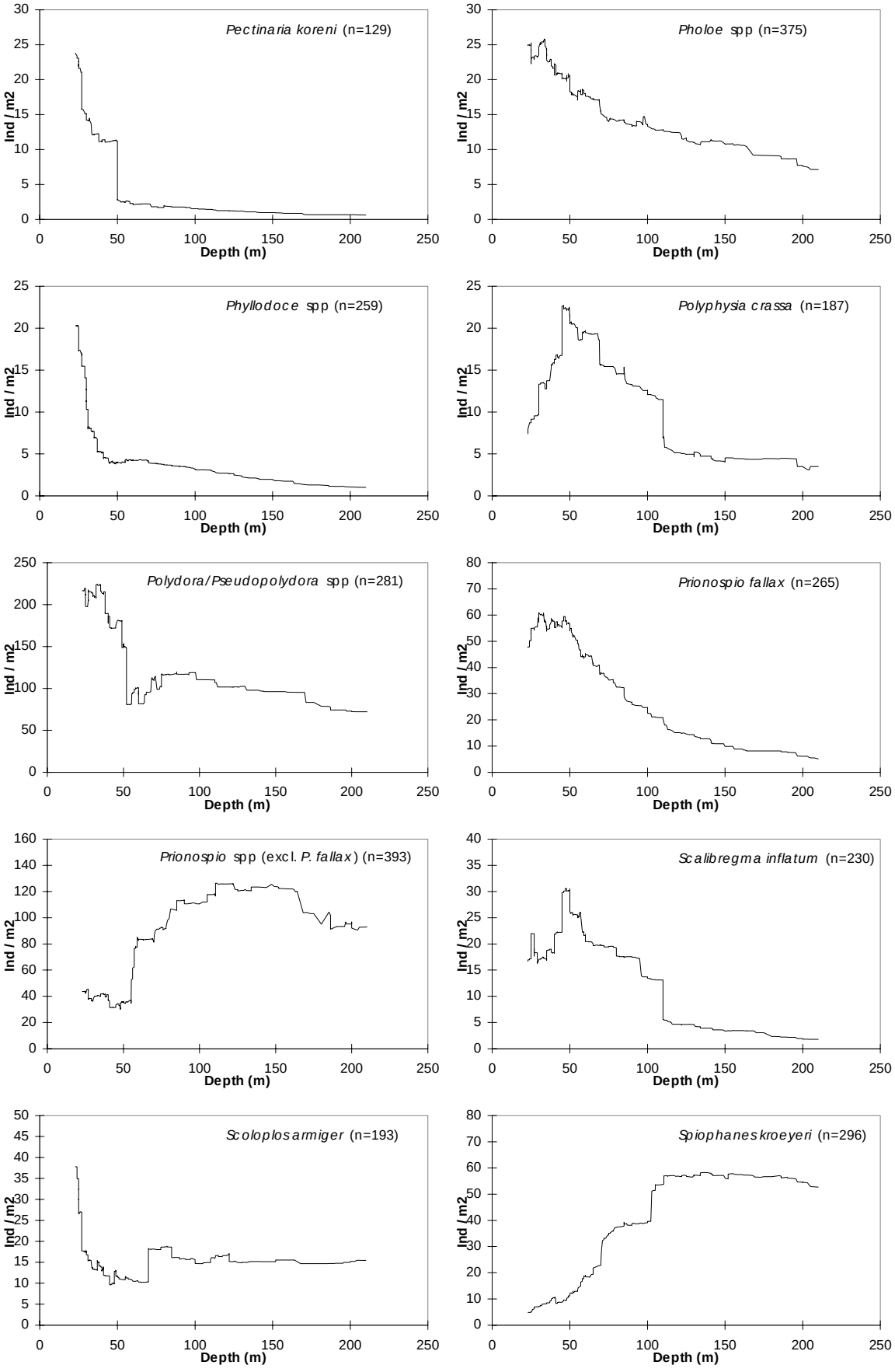
Figure 3. Moving average (period=100) of Shannon-Wiener diversity (H) and expected number of species among 100 individuals (ES_{100}) vs. depth at 543 stations.

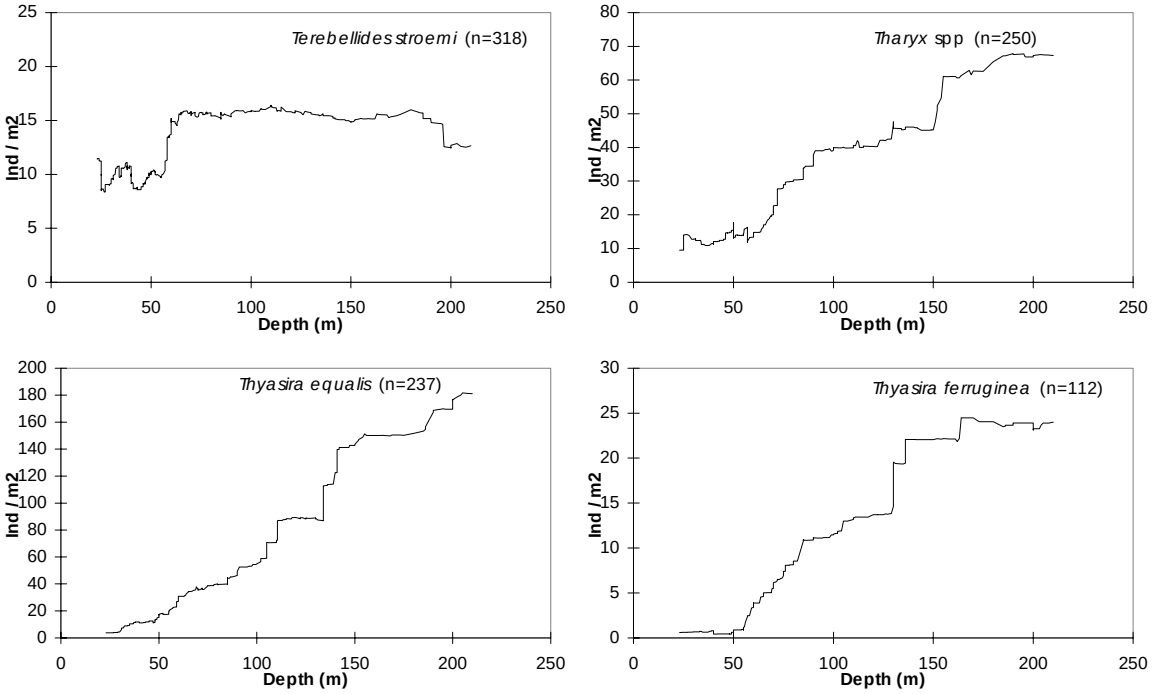
Figure 4 (page 8-12). Moving average of densities (numbers/m^2) of 44 common species vs. depth. "n" denotes the species's number of occurrencies among the 543 stations (e.g. n=180 for *Amphiura chiajei*).


Amphiura chiajei (n=180)
Amphiura filiformis (n=201)
Anobothrus gracilis (n=190)
Brada spp (n=134)
Ceratocephale loveni (n=142)
Chaetozone setosa (n=471)
Corbula gibba (n=186)
Cossura longocirrata (n=125)
Diplocirrus glaucus (n=277)
Eclysippe vanelli (n=108)
Ind / m2
Depth (m)


Eriopisa elongata (n=167)
Eteone spp (n=224)
Glycera alba (n=287)
Glycera capitata (n=144)
Glycera rouxii (n=137)
Goniada maculata (n=320)
Heteromastus filiformis (n=447)
Labidoplax buskii (n=173)
Laonice cirrata (n=163)
Lumbrineris spp (n=379)
Ind / m2
Depth (m)


Maldane sarsi (n=162)
Melinna cristata (n=201)
Myriochele spp (n=291)
Mysella bidentata (n=171)
Nuculoma tenuis (n=183)
Ophiodromus flexuosus (n=235)
Paraonis gracilis (n=206)
Paramphinome jeffreysii (n=263)
Paradoneis lyra (n=188)
Pectinaria auricoma (n=146)
Ind / m2
Depth (m)


Pectinaria koreni (n=129)
Pholoe spp (n=375)
Phyllodoce spp (n=259)
Polyphysia crassa (n=187)
Polydora/Pseudopolydora spp (n=281)
Prionospio fallax (n=265)
Prionospio spp (excl. *P. fallax*) (n=393)
Scalibregma inflatum (n=230)
Scoloplos armiger (n=193)
Spiophanes kroeyeri (n=296)
Ind / m2
Depth (m)


Terebellides stroemi (n=318)
Tharyx spp (n=250)
Thyasira equalis (n=237)
Thyasira ferruginea (n=112)
Ind / m2
Depth (m)

Appendix A. The 44 species/genera included in the depth preference analysis

Group	Family	Name of species/genus
OPHIUROIDEA	Amphiuridae	*Amphiura chiajei* Forbes
OPHIUROIDEA	Amphiuridae	*Amphiura filiformis* (O.F.Mueller)
POLYCHAETA	Ampharetidae	*Anobothrus gracilis* (Malmgren 1865)
POLYCHAETA	Flabelligeridae	*Brada* spp
POLYCHAETA	Nereidae	*Ceratocephale loveni* Malmgren 1867
POLYCHAETA	Cirratulidae	*Chaetozone setosa* Malmgren 1867
BIVALVIA	Corbulidae	*Corbula gibba* (Olivi 1792)
POLYCHAETA	Cossuridae	*Cossura longocirrata* Webster & Benedict 1887
POLYCHAETA	Flabelligeridae	*Diplocirrus glaucus* (Malmgren 1867)
POLYCHAETA	Ampharetidae	*Eclysippe vanelli* (Fauvel 1936)
AMPHIPODA	Melitidae	*Eriopisa elongata* Bruzelius
POLYCHAETA	Phyllodocidae	*Eteone* spp
POLYCHAETA	Glyceridae	*Glycera alba* (O.F.Mueller 1776)
POLYCHAETA	Glyceridae	*Glycera capitata* Oersted 1843
POLYCHAETA	Glyceridae	*Glycera rouxii* Audouin & Milne Edwards 1833
POLYCHAETA	Goniadidae	*Goniada maculata* Oersted 1843
POLYCHAETA	Capitellidae	*Heteromastus filiformis* (Claparede 1864)
HOLOTHUROIDEA	Synaptidae	*Labidoplax buski* (McIntosh)
POLYCHAETA	Spionidae	*Laonice cirrata* (M.Sars 1851)
POLYCHAETA	Lumbrineridae	*Lumbrineris* spp
POLYCHAETA	Maldanidae	*Maldane sarsi* Malmgren 1865
POLYCHAETA	Ampharetidae	*Melinna cristata* (M.Sars 1851)
POLYCHAETA	Oweniidae	*Myriochele* spp
BIVALVIA	Lasaeidae	*Mysella bidentata* (Montagu 1803)
BIVALVIA	Nuculidae	*Nuculoma tenuis* (Montagu)
POLYCHAETA	Hesionidae	*Ophiodromus flexuosus* (Delle Chiaje 1822)
POLYCHAETA	Paraonidae	*Paradoneis lyra* (Southern 1914)
POLYCHAETA	Amphinomidae	*Paramphinome jeffreysii* (McIntosh 1868)
POLYCHAETA	Paraonidae	*Paraonis gracilis* (Tauber 1879)
POLYCHAETA	Pectinariidae	*Pectinaria auricoma* (O.F.Mueller 1776)
POLYCHAETA	Pectinariidae	*Pectinaria koreni* Malmgren 1865
POLYCHAETA	Sigalionidae	*Pholoe* spp
POLYCHAETA	Phyllodocidae	*Phyllodoce* spp
POLYCHAETA	Spionidae	*Polydora/Pseudopolydora* spp
POLYCHAETA	Scalibregmidae	*Polyphysia crassa* (Oersted 1843)
POLYCHAETA	Spionidae	*Prionospio fallax* Soederstroem 1920
POLYCHAETA	Spionidae	*Prionospio* spp (excl. *P. fallax*)
POLYCHAETA	Scalibregmidae	*Scalibregma inflatum* Rathke 1843
POLYCHAETA	Orbiniidae	*Scoloplos armiger* (O.F.Mueller 1776)
POLYCHAETA	Spionidae	*Spiophanes kroeyeri* Grube 1860
POLYCHAETA	Trichobranchidae	*Terebellides stroemi* M.Sars 1835
POLYCHAETA	Cirratulidae	*Tharyx* spp
BIVALVIA	Thyasiridae	*Thyasira equalis* (Verrill & Bush)
BIVALVIA	Thyasiridae	*Thyasira ferruginea* (Forbes)