

## Appendix 5

### Evaluation of the recent marine bivalve bottom community off the Limfjord isthmus based on 61 van Veen grab samples

The aim of this study was to figure the distribution pattern of the autochthonous bivalve faunas from the shore to a depth of about 20 m. The present channel through the isthmus at Thyborøn was also included in the sampling; here the maximum depth is about 9.5 m. In all, five lines were sampled, four out from the shore into the North Sea and 1 crossing the channel. The bottom samples were taken for every drop of 1.5 m from the shore and out to a depth of 20 m. The medium grain size is given for the sand and coarser sediment, while the clayey bottom is listed as clay in the tables, together with the sample number and the actual depth of each sample.

In the tables the bivalves are listed in four categories:

1. With connected valves – black square;
2. Single valves – circle;
3. Fragments – cross;
4. Rolled fragments – cross in a circle.

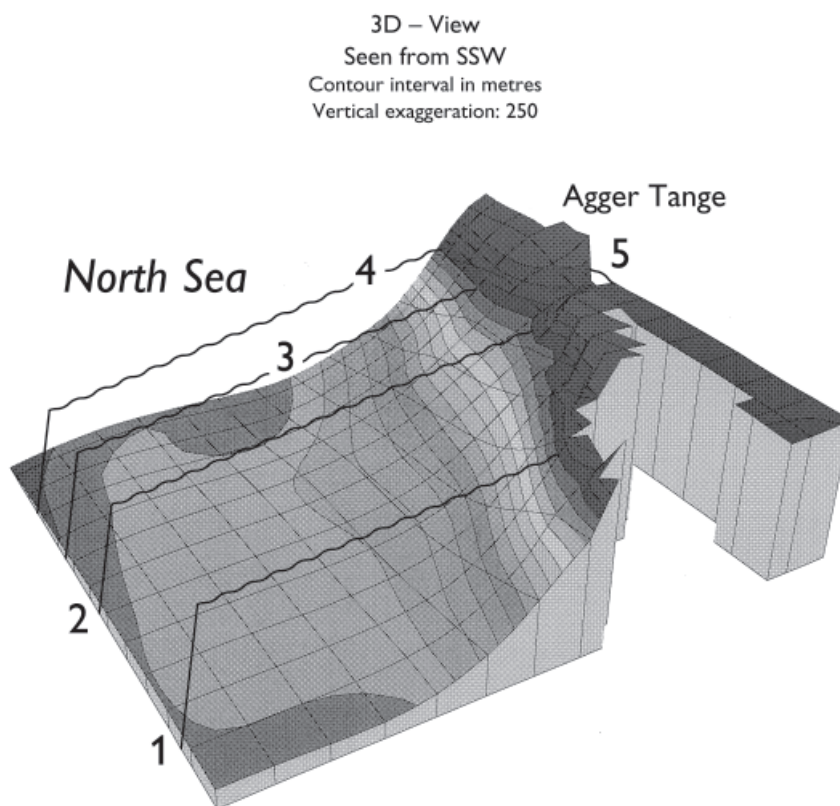
In this graduation a falling probability for the species to be autochthonous is seen. In general, it can be stated that above the 6 m depth contour curve off the Limfjord isthmus no autochthonous specimens have been found – they all seem to be allochthonous or parautochthonous.

All the listed bivalves, except the *Ostrea edulis*, are found in category 1 with connected valves, and this can be taken to mean that they belong to the area.

The species represented only by a few finds are *Tellimya ferruginosa*, *Cerastoderma edule*, *Achanthocardia echinata* and *Macra stultorum*. All of these species are found at places deeper than the 10 m contour line.

Next to the rare species mentioned above is *Spisula*

### Bathymetry off the Agger Tange



## Sediment sampling transect 1

Molluscan species	M.G.S. mm	clay	clay	clay	0.440	0.614	clay	0.690	0.245	0.272	0.356	0.409	0.426	0.475
	SAMPLE no.	184	183	182	181	180	179	178	177	176	175	174	173	172
	DEPTH m	18.2	18.1	16.6	15.0	13.6	12.1	10.5	9.0	7.6	6.2	4.8	3.1	1.3
<i>Nucula</i> sp		⊗				⊗	○	×	○	×	×			
<i>Mytilus edulis</i> Linnaeus 1758									○	■	■	○	○	○
<i>Ostrea edulis</i> (Linnaeus 1758)		⊗	⊗								○			
<i>Mysella bidentata</i> (Montagu 1803)					○				○	○				
<i>Tellimya ferruginosa</i> (Montagu 1803)														
<i>Cerastoderma edule</i> (Linnaeus 1758)				⊗							○	×		
<i>Acanthocardia echinata</i> (Linnaeus 1758)		⊗				⊗		⊗	⊗					⊗
<i>Mactra stultorum</i> (Linnaeus 1758)														
<i>Spisula subtruncata</i> (da Costa 1778)		○	⊗		○	○	×	⊗	■	○	○			⊗
<i>Spisula solida</i> (Linnaeus 1758)		○		■	○	○			×		○			
<i>Phaxas pellucidus</i> (Pennant 1777)			■		■				■	■	■			
<i>Fabulina fabula</i> (Gmelin 1791)									■					
<i>Angulus tenuis</i> (da Costa 1778)														
<i>Chamelea striatula</i> (da Costa 1778)		■		⊗					■		■	⊗		
<i>Corbula gibba</i> (Olivi 1792)			⊗	⊗	○	⊗	⊗	⊗	⊗		○	○		
<i>Barnea candida</i> (Linnaeus 1758)				⊗			×	⊗	⊗	×	×	×	⊗	

*solida*, which has been found only autochthonous at four sampling localities – and there at depths of more than 13 m – three of them on clayey bottoms.

*Corbula gibba* is found also at depths of more than 13 m and often on clayey bottoms.

Out of the remaining seven species not yet mentioned, six are autochthonous from the 6 m depth contour curve and out to about 20 m (where the sampling stopped). These species are: *Mysella bidentata*, *Spisula subtruncata*, *Phaxas pellucidus*, *Fabulina fabula*, *Angulus tenuis* and *Chamelea striatula*. These species are found on both sandy and clayey bottoms.

*Barnea candida* has been found in category 1 – with connected valves – in two of the profiles off the Limfjord isthmus and also in the channel at Thyborøn. The species is connected with clay bottom as a substrate for its boring activity.

As an exception, specimens of *Mytilus edulis* with connected valves have been taken at depths of about 3 m – but only juveniles, which are also found at greater depths. These occurrences are taken as parautochthonous, originating from the nearby groynes protecting the Limfjord isthmus.

## Sediment sampling transect 2

Molluscan species	M.G.S. mm	clay	clay	clay	0.464	0.985	1.959	0.268	0.248	0.261	0.432	0.511	0.601	16.280
	SAMPLE no.	185	186	187	188	189	190	191	192	193	194	195	196	197
	DEPTH m	19.9	17.9	16.5	15.0	13.6	12.1	10.4	9.0	7.3	6.0	4.5	3.0	1.4
Nucula sp								⊗	×	×	×			
Mytilus edulis Linnaeus 1758									×	○	×	○	×	×
Ostrea edulis (Linnaeus 1758)							⊗							
Mysella bidentata (Montagu 1803)								×	×	■				
Tellimya ferruginosa (Montagu 1803)								×	⊗					
Cerastoderma edule (Linnaeus 1758)				○							○			
Acanthocardia echinata (Linnaeus 1758)					×	×	×							×
Mactra stultorum (Linnaeus 1758)	×	×												
Spisula subtruncata (da Costa 1778)	■	○	■					■	■	■	○			
Spisula solida (Linnaeus 1758)	○	○		○	■	○	○	○	○					
Phaxas pellucidus (Pennant 1777)		■	○					■	■					
Fabulina fabula (Gmelin 1791)	■	■	■	■			■	■	■		×			
Angulus tenuis (da Costa 1778)	■	■												
Chamelea striatula (da Costa 1778)	■		■	■			○							⊗
Corbula gibba (Olivi 1792)	○	○	×	○					○				×	
Barnea candida (Linnaeus 1758)					×			×	×		×			

## Sediment sampling transect 3

Molluscan species	M.G.S. mm	clay	clay	clay	clay	0.264	0.183	0.271	0.257	0.202	0.216	0.265	0.369	0.446	0.538
	SAMPLE no.	212	213	214	215	216	217	218	219	220	221	222	223	224	225
	DEPTH m	21.0	19.4	18.0	16.7	15.1	13.7	12.0	10.5	9.0	7.6	6.1	4.4	3.0	1.5
Nucula sp						×	○	×	×	×	×	×	×	×	⊗
Mytilus edulis Linnaeus 1758				○	■	■	■	■	■	○	○	■	×	×	⊗
Ostrea edulis (Linnaeus 1758)												⊗			
Mysella bidentata (Montagu 1803)	■				■	■	■		■		○				
Tellimya ferruginosa (Montagu 1803)															
Cerastoderma edule (Linnaeus 1758)		×		○	○	■	○	○			○				
Acanthocardia echinata (Linnaeus 1758)		×		⊗		×	⊗					⊗			⊗
Mactra stultorum (Linnaeus 1758)		■				×		⊗							
Spisula subtruncata (da Costa 1778)	■		○	■	■	■	○	■	■	○	○				⊗
Spisula solida (Linnaeus 1758)				■		■									
Phaxas pellucidus (Pennant 1777)	■	■			×	×		■							
Fabulina fabula (Gmelin 1791)	■	■			■	■		■	■	■	■				
Angulus tenuis (da Costa 1778)	■	■			○		○			■	■				
Chamelea striatula (da Costa 1778)	■	■	○	■	■		○	○	○	×	○	○			
Corbula gibba (Olivi 1792)	■	○	○	■	○	○					○	○	○		
Barnea candida (Linnaeus 1758)		○		×	■	■	○	⊗	×	×	×	×	×		⊗

### Sediment sampling transect 4

Molluscan species	M.G.S. mm	clay	clay	clay	clay	0.228	clay	0.215	0.276	0.237	0.312	0.350	0.533	10.427	0.581
	SAMPLE no.	211	210	209	208	207	206	205	204	203	202	201	200	199	198
	DEPTH m	21.2	19.3	17.9	16.3	14.9	13.7	12.1	10.4	8.9	7.6	6.1	4.8	3.2	1.6
Nucula sp										○	×	×	×		
Mytilus edulis Linnaeus 1758		■	■	■		■	○	○	■	○	■	×	■	×	
Ostrea edulis (Linnaeus 1758)															
Mysella bidentata (Montagu 1803)		■	■	■	■	■	○	○	○						
Tellimya ferruginosa (Montagu 1803)		■			○		○								
Cerastoderma edule (Linnaeus 1758)						○		○	○	○	○				
Acanthocardia echinata (Linnaeus 1758)							×	■							
Mactra stultorum (Linnaeus 1758)		×				○			×		×				
Spisula subtruncata (da Costa 1778)		○	■	■	■	■	○	○	○	○	■	■	○		
Spisula solida (Linnaeus 1758)		○			○										
Phaxas pellucidus (Pennant 1777)		■			■	■		■	■		×				
Fabulina fabula (Gmelin 1791)		■	■	■	■	■	○	■	■			■			
Angulus tenuis (da Costa 1778)		■	■	■	■		■	■			■				
Chamelea striatula (da Costa 1778)		○	■	■	■	■	○						○		
Corbula gibba (Olivi 1792)		○	○	■	○	○	■	○		○	○	×			
Barnea candida (Linnaeus 1758)		×	×	■		○	■	×	×	×	×	×	⊗	⊗	

### Sediment sampling transect 5

Molluscan species	M.G.S. mm	0.532	0.483	0.556	0.407	0.506	0.441	0.452
	SAMPLE no.	226	227	228	229	230	231	232
	DEPTH m	5.2	6.5	8.8	9.4	6.3	5.0	1.7
Nucula sp		×	×	×		×		
Mytilus edulis Linnaeus 1758		■	⊗	■	○	■	■	×
Ostrea edulis (Linnaeus 1758)								×
Mysella bidentata (Montagu 1803)			■		○	○		
Tellimya ferruginosa (Montagu 1803)					×			
Cerastoderma edule (Linnaeus 1758)					○	○	■	
Acanthocardia echinata (Linnaeus 1758)		⊗		⊗				⊗
Mactra stultorum (Linnaeus 1758)								×
Spisula subtruncata (da Costa 1778)		⊗	○	○	○	○	×	
Spisula solida (Linnaeus 1758)							○	
Phaxas pellucidus (Pennant 1777)								
Fabulina fabula (Gmelin 1791)		⊗	■	×		■		
Angulus tenuis (da Costa 1778)							○	
Chamelea striatula (da Costa 1778)							○	
Corbula gibba (Olivi 1792)		■		■	○	■	■	
Barnea candida (Linnaeus 1758)		×	⊗	×	■	○		⊗