Chesapeake Bay Diatoms

By Lisa M. Weimer

Diatoms are golden brown algae (Class Bacillariophyaceae) whose cellular material is contained within a highly silicified cell wall called a frustule, which is often fossilized in marine, estuarine and lacustrine sediments. They are generally classified on the basis of symmetry of the frustule; those with radial symmetry are called centric diatoms and those with axial symmetry are called pennate diatoms. Upon death, the diatom cell walls become incorporated into the sediment where they comprise some of the most abundant microfossils, often achieving nearly 200 million diatoms per square centimeter of sediment.

Diatoms preserved in sediments can provide records of environmental change at time scales ranging from seasonal to millennial (Battarbee, 1986, 1991). Diatoms have been widely used to reconstruct past changes in pH (Gasse and Tekaia, 1983; Birks *et al.,* 1990), salinity (Kjemperud, 1981; Fritz, 1990), nutrients (Whitmore, 1989; Agbeti, 1992; Fritz *et al*., 1993), and climatic changes (Haworth, 1977; Brugan, 1980; Dean *et al.,* 1984).

Previous studies and taxonomic lists of diatoms for the Chesapeake Bay have focused primarily on the phytoplankton component of the diatom flora (Wolfe *et al.,* 1926; Morse, 1947; Griffith, 1961; Mulford, 1962; Patten *et al*., 1963; Marshall, 1984, 1986). More recently, Wilderman (1987) examined distribution patterns of both planktonic and benthic diatoms in the Severn River (a Chesapeake Bay tributary). In a series of papers, Cooper has documented the diatom community structure changes in relation to land-use changes over approximately the past 2,000 years (Cooper, 1993; Cooper, 1995a; Cooper, 1995b; Cooper and Brush, 1991; Cooper and Brush, 1993).

The present study is an effort to document both the modern distribution of diatoms in Chesapeake Bay sediments as well as reconstructing the communities that have been present over the past few millennia. By understanding the relationship between modern diatom community structure and environmental conditions, it may be possible to make reliable inferences about past events in the bay. Here in Plates 1-5, we illustrate diatom taxa from the past 1,000 years from the mesohaline region the Chesapeake Bay and some important diatom taxa found in mid-Bay sediments are listed in Table 3.

Table 3. Some Diatom Taxa found in Chesapeake Bay sediments

Actinocyclus octonarius Ehrenberg

Actinoptychus senarius Ehrenberg

Biddulphia spp.

Cocconeis pediculus Ehrenberg

Cocconeis placentula Hustedt

Coscinodiscus sp. Ehrenberg

Cyclotella spp.

Diploneis didyma Ehrenberg

Diploneis domblittensis (Grunow) Cleve

Diploneis weissflogii (A.S.) Cleve

Diploneis spp.

Endictya oceanica Ehrenberg

Melosira sp. Agardh

Rhaphoneis amphiceros Ehrenberg

Terpsinoe americana (Bail) Rolfs

Thalassiosira baltica (Grunow) Ostenfeld

Thalassiosira sp.

Triceratium favus Ehrenberg

Campylodiscus spp.

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Plate 1

1) *Actinocyclus octonarius* Ehrenberg, PTMC 3-P-2 0-2 cm., x 2200.

2) *Actinocyclus octonarius* Ehrenberg, PTMC 3-P-2 46-48 cm., x 3600.

3) *Actinoptychus senarius* Ehrenberg, PTMC 3-P-2 422-424 cm., x 2000.

4) *Actinoptychus senarius* Ehrenberg, PTMC 3-P-2 48-50 cm., x 1800.

5) *Actinoptychus senarius* Ehrenberg, PTMC 3-P-2 364-366 cm., x 2200.

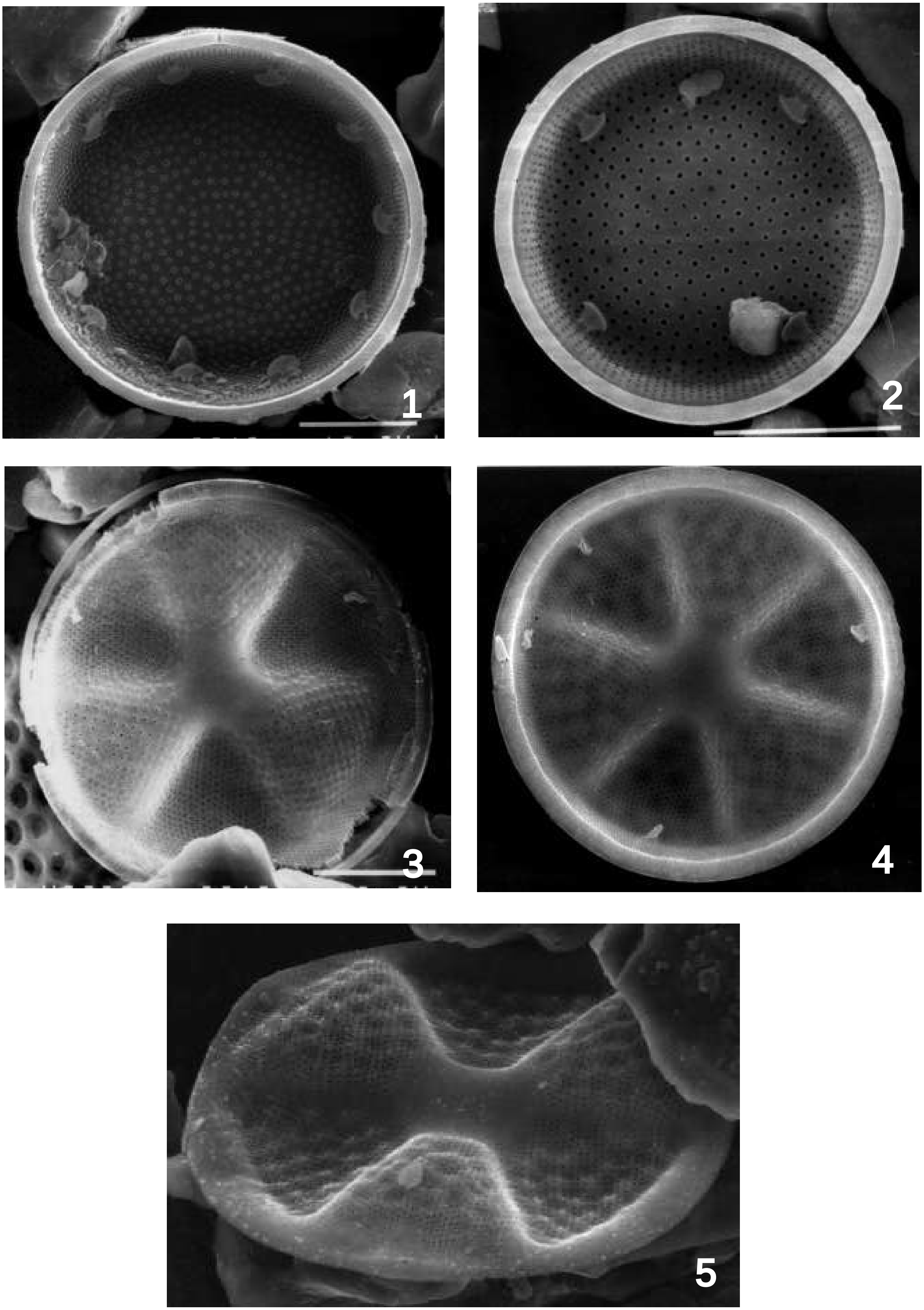
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Plate 2

1) *Cyclotella* sp., PTMC 3-P-2 0-2 cm., x 3000.

2) *Cocconeis pediculus* Ehrenberg, PTMC 3-P-2 364-366 cm., x 4800.

3) *Cyclotella* sp., PTMC 3-P-2 364-366 cm., x 3600.

4) *Cocconeis placentula* Hustedt, PTXT 2-P-3 100-102 cm., x 6000.

5) *Cyclotella* sp., PTMC 3-P-2 0-2 cm., x 2600.

6) *Terpsinoe americana* (Bail.) Rolfs, PTMC 3-P-2 422-424 cm., x 2000.

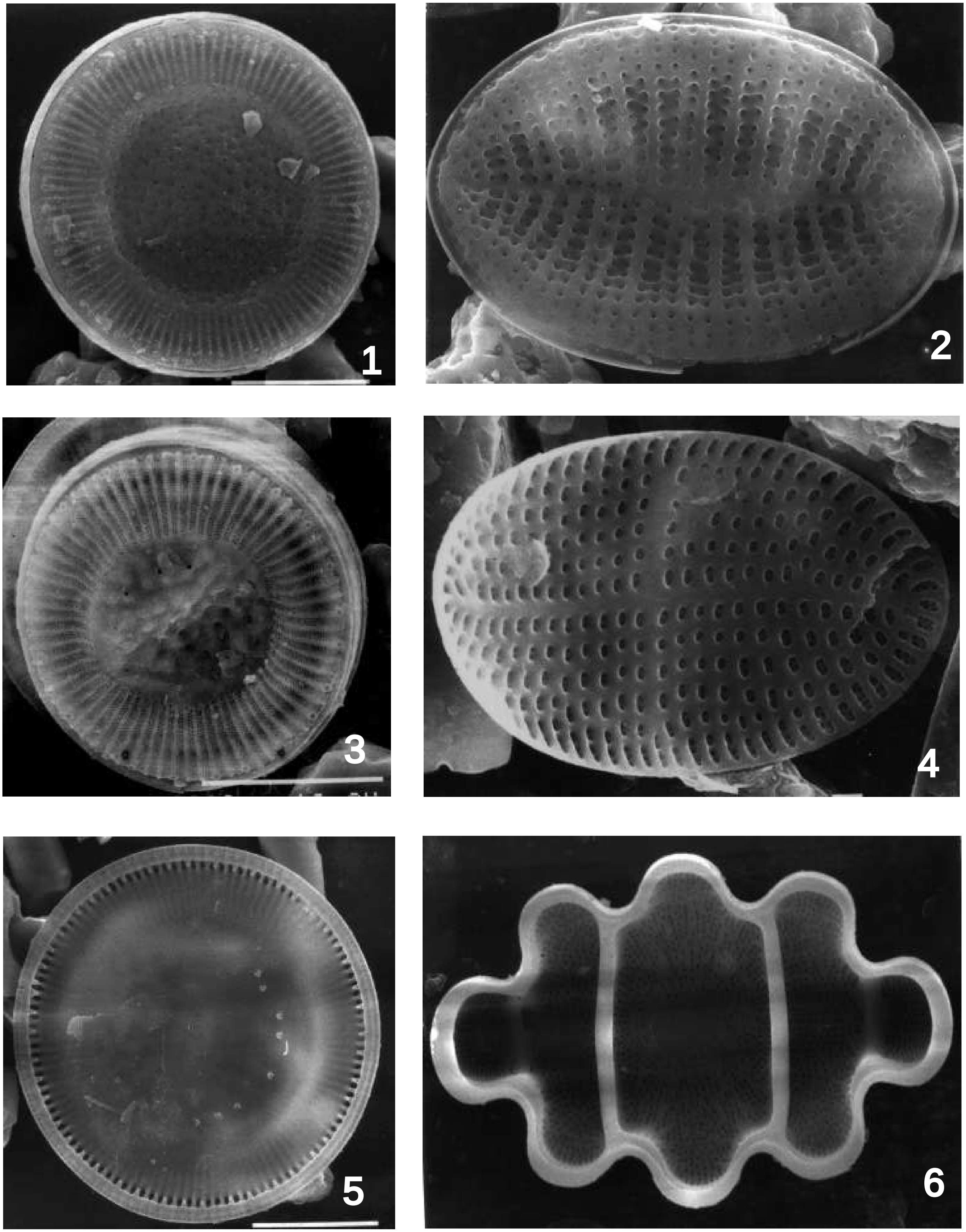
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Plate 3

1) *Diploneis* sp., PTMC 3-P-2 80-82 cm., x 4400.

2) *Diploneis* sp., PTMC 3-P-2 364-366 cm., x 3600.

3) *Diploneis didyma* Ehrenberg, PTMC 3-P-2 222-224 cm., x 2200.

4) *Diploneis domblittensis* (Grunow) Cleve, PTMC 3-P-2 48-50 cm., x 2400.

5) *Diploneis weissflogii* (A.S.) Cleve, PTMC 3-P-2 364-366 cm., x 4000.

6) *Rhaphoneis amphiceros* Ehrenberg, PTMC 3-P-2 364-366 cm., x 2600.

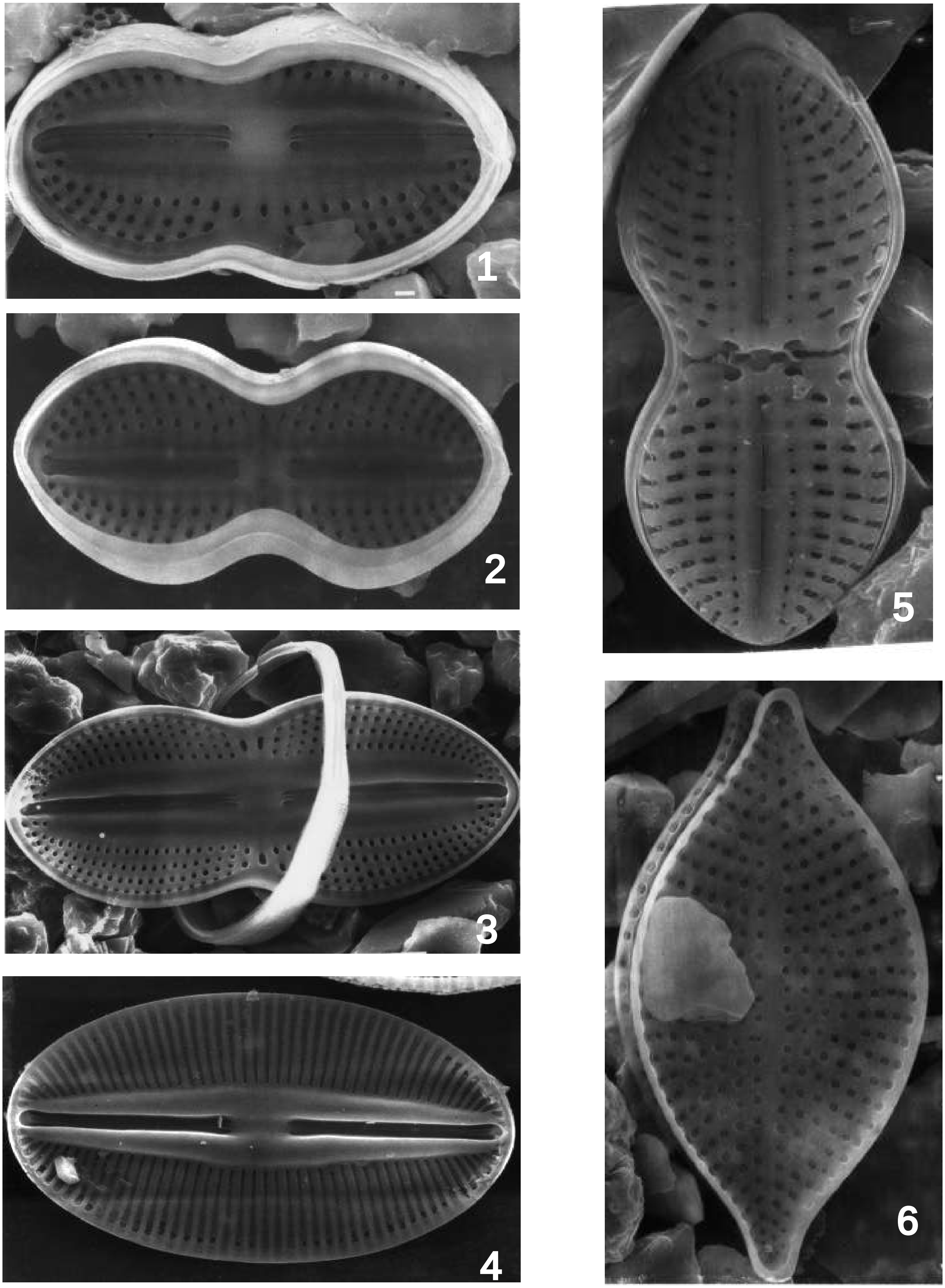
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Plate 4

1) *Endictya oceanica* Ehrenberg 1845, PTMC 3-P-2 0-2 cm., x 6600.

2) *Thalassiosira baltica* (Grunow) Ostenfeld, PTMC 3-P-2 0-2 cm., x 3600.

3) *Thalassiosira baltica* (Grunow) Ostenfeld, PTMC 3-P-2 222-224 cm., x 2200.

4) *Thalassiosira* sp., PTMC 3-P-2 46-48 cm., x 2400.

5) *Triceratium favus* Ehrenberg, PTMC 3-P-2 422-424 cm., x 720.

6) *Triceratium favus* Ehrenberg, PTMC 3-P-2 422-424 cm., x 660.

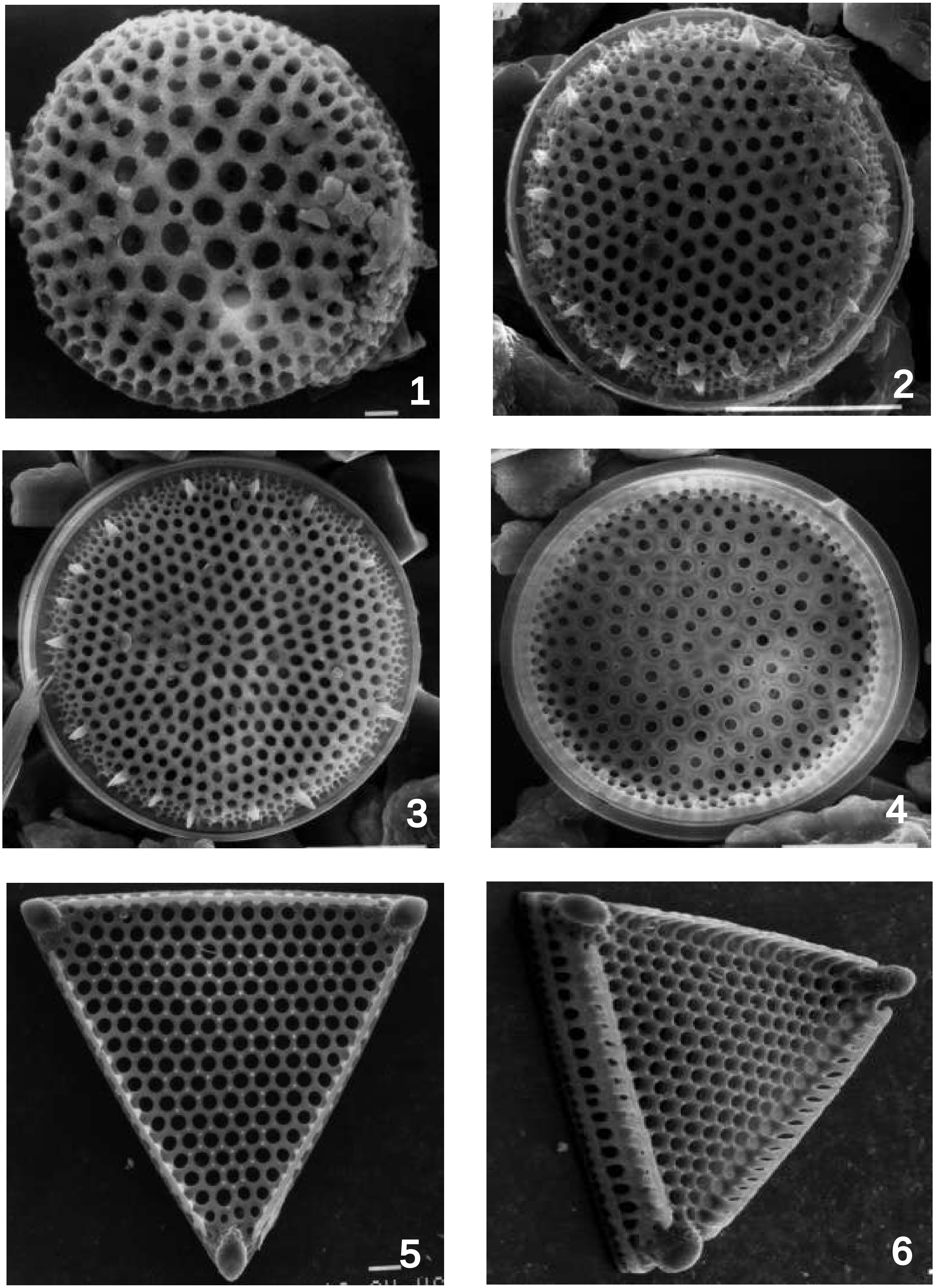
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Plate 5

1) *Biddulphia* sp. Gray, PTXT 2-G-3, x 507.

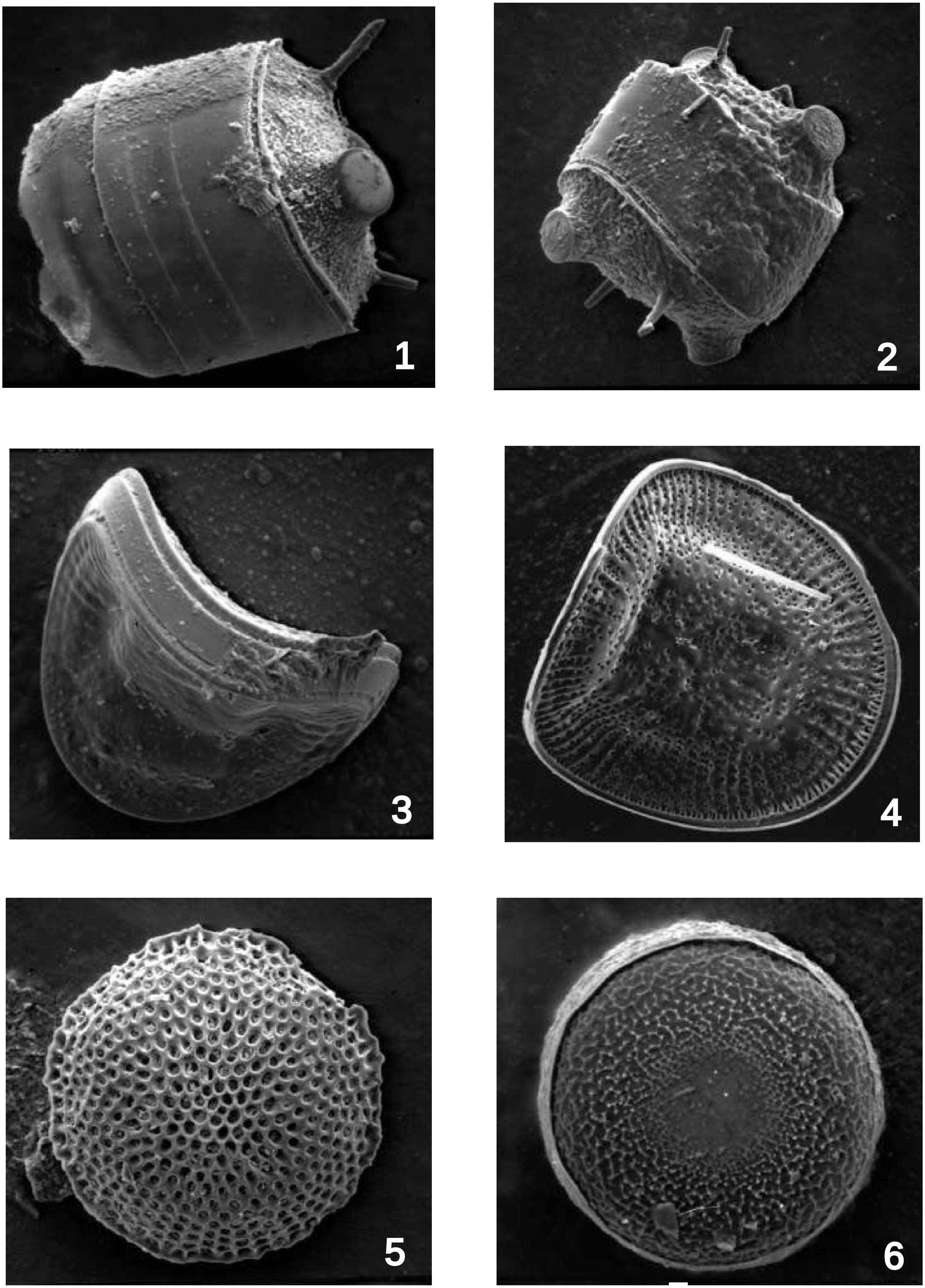
2) *Biddulphia* sp. Gray 1821, PTXT 2-G-3, x 391.

3) *Campylodiscus* sp. Kutzing, PTXT 2-G-3, x 472.

4) *Campylodiscus* sp. Kutzing, PTXT 2-G-3, x 366.

5) *Coscinodiscus* sp. Ehrenberg, PTXT 2-G-3, x 432.

6) *Melosira* sp. Agardh, PTXT 2-G-3, x 792.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Depth (cm.)	*Thalassiosira eccentrica*	*Thalassiosira decipiens*	*Thalassiosira baltica*	*Thalassiosira spp.*	*Coscinodiscus marginatus*	*Cyclotella bodanica*	*Cyclotella striata*	*Cyclotella meneghiniana*	*Cyclotella pseudostelligera*	*Cyclotella stylorum*	*Cyclotella spp.*	*Paralia sp.*	*Actinopthycus senarius*	*Actinocyclus octonarius*	*Actinocyclus normanii*	*Hyalodiscus scoticus*	*Auliscus sp.*	*Cocconeis placentula*	*Cocconeis scutellum*	*Cocconeis disculus*	*Cocconeis clandestina*	*Delpheneis sp.*	*Melosira sp.*	*Raphoneis amphiceros*	*Raphoneis surirella*	*Gomphonema angustatum*	*Gomphonema parvulum*
0-2	11	22	3	7		2	5	3	2		143		1	1	4			2	3					2			1
20-22	11	70	3	5			21		1	3	67	5	2		2			4	1					1			
60-62	7	35		5			9		1	1	50	5	1					8	1		3						
80-82	11	24	1	7	4		12	4	2		38	12	4					4					1	1			
100-102	9	21	2	0			5	1	2	1	54	6	1	1	1			3	1			1					
120-122	7	15		1	1		9		1		58	9	1	4				8	1				1	1			
140-142	9	16		1			6		7		20	33	3		4	1	1	3	1			2	3	2	1		
160-162	11	17	2	4			14	2	17	2	29	22	2					9	5			3	1	1			
180-182	13	29	2	0			16		11	2	11	25	1	1	2			11	1	2		2	1	2			
198-200	22	23	1	4			20	2	38	2	41		1	1	5			18	4	2			12	3		1	

Gomphonema minutum	*Gomphonema olivaceum*	*Gomphonema spp.*	*Fallacia sp.*	*Diploneis smithii*	*Diploneis modica*	*Diploneis fusca*	*Diploneis bombus*	*Diploneis vetula*	*Diploneis weissflogii*	*Diploneis coffeaformis*	*Diploneis sp.*	*Gyrosigma sp.*	*Gyrosigma spencerii*	*Pleurosigma diverse-striata*	*Rhopolodia acuminata*	*Nitzschia antillarum*	*Nitzschia marginulata*	*Nitzschia panduriformis*	*Nitzschia palea*	*Nitzschia sp.*	*Navicula abunda*	*Navicula baileyana*	*Navicula lyra*	*Navicula brachium*	*Navicula punctigera*	*Navicula pygmaea*	*Navicula spp.*	*Mastigloia pumila*
1		1			1							1	1							20							13	
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									1											9			1				5	
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				2										1						5						2	1	
	1			2			1			1								1		5	4			3			2	
			1	1			1				1		1			1		3		6	2						3	
								2	2								1			2	2	1	1				5	1
		2				1						1	1		3	3	3			33							5	

Anorthoneis eurystoma	*Synedra sp.*	*Opephora martyi*	*Opephora olsenii*	*Opephora sp.*	*Fragilaria brevistrata*	*Fragilaria construens*	*Fragilaria fasciculata*	*Fragilaria sp.*	*Trachysphenia acuminata*	*Rhoicosphenia sp.*	*Trachyneis aspera*	*Caloneis westii*	*Cymbella sp.*	*Amphora coffeaeformis*	*Amphora fogediana*	*Amphora normanii*	*Amphora sp.*	*Eunotia sp.*	*Triceratium perpendiculare*	*Surirella fastuosa*	*Grammatophora sp.*	*Eunotogramma sp.*	*Acnanthes delicatula*	*Acnanthes sp.*	*Leptocylindricus cf danicus spore*	*Chataceros spore*	*Other*	Total
	13																							1				264
	15			5		3								1														223
	4	1	2	1	2	3		6	1								1					1		1	3	2		170
			2			4	1	5									1					2			4	5	1	166
						2		17		1													3		3	2		148
	3		1		1			2			1	1	1										1		2			141
	2		2			1		1			1									2	2		2		5	4		155
1	19													1				1		3	1				4			191
1	8										1				1	1							1		5			167
	8	1	1			2					2		1						1	4	1		1		14			288