Atlas of diatoms (Bacillariophyta) from diverse habitats in remote regions of western Canada

by

Loren Bahls, Beverly Boynton, Barb Johnston

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Atlas of diatoms (Bacillariophyta) from diverse habitats in remote regions of western Canada

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Abstract

High-resolution LM images of diatoms from remote regions of western Canada are presented as a contribution to our knowledge of diatom floristics, ecology and biogeography in North America. Approximately 600 taxa are imaged in 132 plates. Genera with the most taxa are *Cymbella* (19 taxa), *Cymbopleura* (29), *Encyonema* (23), *Encyonopsis* (15), *Eunotia* (77), *Gomphonema* (42), *Navicula* (47), *Neidium* (20), *Nitzschia* (35), *Pinnularia* (50) and *Stauroneis* (34). Diatoms were collected from diverse habitats in four of North America's major biomes: Arctic tundra, taiga, Rocky Mountains and Pacific rainforest. Many of the photographed taxa could not be identified to species and are likely new to science. Other taxa may represent new records for North America or Canada. Images of voucher specimens are keyed to individual collection sites. Detailed descriptions of the collection sites include GPS coordinates, colour photographs, vegetation, algal substrates, elevations, pH, temperature and conductivity. Samples were collected from natural substrates in fresh to brackish, flowing and standing waters. Voucher slides are deposited in the Montana Diatom Collection (Helena) and the University of Montana Herbarium (Missoula). Cleaned diatom frustules have been deposited in the Diatom Herbarium of the Academy of Natural Sciences of Philadelphia.

Keywords

diatoms, Canada, North America, biogeography, floristics, ecology, Rocky Mountains, tundra, taiga

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Introduction

From 2009 to 2017, the authors collected 96 diatom samples from a variety of fresh- and brackish-, standing- and flowing-water habitats in remote regions of western Canada (Fig. 1). Collection sites were located in four of North America's major biomes: Arctic tundra, taiga, Rocky Mountains and Pacific rainforest. Representative specimens from those collections are presented here in a series of high-resolution photographic plates as a contribution to our knowledge of diatom floristics, ecology and biogeography in North America.

This atlas is intended as a resource for the study of diatom floristics, diatom biogeography and diatom ecology. It is not intended as a taxonomic resource nor as a definitive account of taxa richness. Priority was given to imaging unknown, unusual, uncommon and visually distinctive taxa and, of the ones that were photographed, only clean, good quality images were used. If a good quality image of a taxon was not available, we did not include that taxon in the atlas. For this reason, we expect that most of the included taxa can be identified from the images alone. For practical reasons, images are presented without written descriptions.

This atlas of diatom images is comparable to Schmidt's Atlas (A. Schmidt 1874–1959), but with three significant differences: (1) this atlas addresses only diatoms from western Canada; (2) illustrations are high-resolution (600 dpi) digital images rather than line drawings; and (3) detailed descriptions are provided for many of the collection sites, including GPS coordinates, colour photographs, terrestrial and aquatic vegetation, algal substrata, elevations, pH, water temperature and conductivity. This atlas might also be thought of as a preliminary illustrated checklist of diatoms from western Canada that are included in the Montana Diatom Collection.

Figure 1. Map of Canada showing diatom collection areas. BB = Baillie and Back Rivers, CM = Coppermine River, CW = Clearwater River, HG = Haida Gwaii, HR = Hood River, WL = Waterton Lakes National Park. Source of base map: www.printablemaps.net

Methods

Samples were collected from rivers, streams, lakes, pools, bogs, fens, beaver ponds and wet meadows in six regions of western Canada (Fig. 1). Most of the samples are from remote locations accessible only by hiking or by kayak or canoe. Elevations at collection sites range from sea level to over 2000 m a.s.l. Many of the sampled water bodies are not named on topographic maps. In these cases, locally descriptive place names are provided by the sampler. Temperature, pH and conductivity were measured in the field with an YSI 556 Multi Probe System or a Eutech Instruments Oakton pH Tester, Model 30. Colour photographs were taken of most collection sites. The Oakton pH meter was calibrated once annually before each field season against standard solutions of pH 4.01 and pH 7.01. However, sampling trips were long and conducted under challenging conditions. The meter may have gone out of calibration and readers should be cautioned about readings other than those taken in Waterton Park.

At each site, diatoms were collected from all available near-shore substrata, including aquatic macrophytes, mosses, rocks, fine sediments and woody debris. Subsamples were combined with ambient water in a single container and preserved with iodine before transport to the laboratory, where they were treated with 30% hydrogen peroxide (H_2O_2) to remove organic matter. After several rinses in distilled water,

cleaned diatom material was dried on cover slips and mounted permanently on glass slides using Naphrax.

Slides were examined under LM with differential interference contrast optics and images were captured using a Leica DM LB2 research microscope and a Spot Insight monochrome digital camera (Model 14.0). Slides examined for this study are deposited in the Montana Diatom Collection (MDC) in Helena and the University of Montana Herbarium in Missoula (MONTU). Vials of cleaned and dried diatom frustules have been deposited in the Diatom Herbarium of the Academy of Natural Sciences (Drexel University) in Philadelphia.

Imaged diatoms were identified by the first author to the lowest practical taxonomic unit using available identification resources. None of the species is described as new to science, but many are designated as unknowns (e.g. *Navicula* sp.) or as comparable to another taxon (cf.). Alternative identifications by reviewers (Acknowledgements) are given in brackets in the figure captions along with the reviewer's initials, thereby giving readers other options for identification.

Format

In keeping with the intended use of this atlas as a resource for the study of diatom floristics and biogeography, images of taxa are presented separately for each of the six regions (Fig. 1). Regions (site descriptions and diatom plates) are presented in the order in which they were sampled, first Waterton Lakes National Park (2009), followed by Haida Gwaii (2013, 2017), Clearwater River (2014), Coppermine River (2015), Baillie-Back Rivers (2016) and Hood River (2017). A master list of taxa and index to the plates is provided in a table at the end of the atlas (Appendix 2).

Taxa are presented in general phylogenetic order following the classification scheme of Round et al. (1990). Centric diatoms are presented first, then araphids, then monoraphids and finally biraphids. The order of genera in the biraphid group may vary from region to region. An effort was made to group species of the same or similar genera on the same plate, but sometimes species of dissimilar genera are presented on the same plate in order to conserve space.

When possible, multiple specimens of a taxon are presented in size-reduction series. However, this was not always possible for rare and uncommon taxa. In general, the number of specimens displayed on a plate is proportional to the relative abundance of that taxon in that region.

Descriptions of collecting sites

The following sections describe the geographic regions that were sampled and the collecting sites in each region.

Waterton Lakes National Park (Figures 2–14, Appendix 1: Plates 1–17)

Waterton Lakes National Park protects 505 km^2 of the southern Canadian Rocky Mountains in south-western Alberta, ranging in elevation from 1,290 to 2,910 m a.s.l. The park forms part of the Crown of the Continent ecosystem, where several different ecological regions meet, leading to extremely high biological diversity. Here you can find species from the Great Plains, the Rocky Mountains and the Pacific Northwest. The park contains 45 different vegetation types, including grasslands, shrub lands, wetlands, lakes, spruce-fir, pine and aspen forests and alpine areas. Waterton lies within the Canadian Rockies ecoregion, which extends into western Montana as Glacier National Park and the Bob Marshall Wilderness complex.

The following description was taken from Woods et al. (2002):

"The Canadian Rockies ecoregion is composed of high, wet mountains. Significant portions are covered by snowfields and glaciers. Glaciated terrain is common and characterized by U-shaped valleys, moraines, cirques, tarns, and outwash features. This ecoregion extends into northern Montana from Alberta and British Columbia. The ecoregion is generally higher and more snow- and ice-covered than the Northern Rockies, and portions are strongly influenced by moist maritime air masses. Melting snow and rainfall are abundant at higher elevations. Some surplus water is stored in glacial deposits, unconsolidated mountain valley fill, and permeable sedimentary rocks. However, areas underlain by crystalline rocks lack sufficient groundwater storage capacity to prevent overland runoff or to develop groundwater supplies; in these places, base flow is meager and high elevation streams generally flow only during rain and snow melt periods. The highest elevations are treeless, glaciated alpine areas. The potential natural vegetation is mostly subalpine fir, Douglas-fir, and Engelmann spruce. Soils are thin or absent on upper mountain slopes but become deeper and more developed below, especially west of the Continental Divide. Recreation, forestry, and mining are common land uses".

In the spring and summer of 2009, 41 samples of benthic diatoms were collected from waters in Waterton Lakes National Park, the Canadian component of the Waterton-Glacier International Peace Park (Table 1, Figures 2–14). The samples were collected in the course of scheduled pond and stream monitoring and assessment projects. All samples consisted of some surface water and scraping of a submerged object. One objective of benthic diatom sampling was to determine the presence and extent in the Park of *Didymosphenia geminata* (Lyngbye) M. Schmidt ("Didymo" or "rock snot"), which at the time was reported in large numbers from many streams in adjacent Glacier National Park (Bahls 2007, Schweiger et al. 2011). Didymo was detected in 14 samples collected from Waterton Lakes National Park in 2009; all of the Waterton samples that contained Didymo were from flowing waters, including the Waterton River, Belly River and several smaller streams.

Table 1. Samples collected from Waterton Lakes National Park in 2009. MDC = Montana Diatom Collection; MONTU = University of Montana Herbarium; NA = data not available.

Sample Numbers		Water Body Name	Latitude (°N)	Longitude (°W)	Slide Numbers		Water Quality Variables		
MDC	Parks Canada				MDC	MONTU	T (°C)	pH	Conductivity (µS/cm)
4520		Cameron Lake at border	49.0000	-114.0578	123-59	39-88	NA	NA	NA
4531	A-13	Stable Pond	49.0683	-113.8900	123-89	40-14	13.0	9.41	351
4532	A-10	Blakiston Roadside Pond	49.1069	-113.9811	123-90	40-15	11.2	8.25	203
4533	A-8	Blakiston Beaver Pond A	49.0928	-113.8864	123-91	40-16	11.0	10.14	389
4534	A-9	Blakiston Beaver Pond B	49.0961	-113.8925	123-92	40-17	10.2	8.71	530
4535	A-1	Linnet Lake	49.0614	-113.9047	123-93	40-18	10.8	9.50	242
4536	A-3	Maskinonge Picnic Area Ponds	49.1114	-113.8397	123-94	40-19	11.4	8.84	560
4537	A-5A	Waterton River Pond A	49.1319	-113.8300	123-95	40-20	11.5	7.05	234
4538	A-5B	Waterton River Pond B	49.1308	-113.8314	123-96	40-21	10.7	7.13	364
4539	A-2	Lonesome Lake	49.0736	-113.8931	123-97	40-22	19.6	8.81	320
4540	A-14A	Sofa Wetland A	49.0656	-113.7450	123-98	40-23	13.7	9.06	306
4541	A-16	Lower Giant's Mirror Pond	49.0522	-113.6861	123-99	40-24	12.8	9.23	279
4542	A-14B	Sofa Wetland B	49.0672	-113.7625	123-100	40-25	13.0	9.08	238
4543	A-6	Indian Springs Pond	49.1297	-113.8731	124-1	40-26	11.3	11.12	302
4544	A-7	Buffalo Springs Pond	49.1253	-113.8531	124-2	40-27	10.2	8.08	344
4545		Waterton River	49.1089	-113.8503	124-3	40-28	NA	NA	NA
4546	WLN-09-01	Cameron Creek	49.0453	-113.9133	124-4	40-29	9.6	7.94	171
4547	WLN-09-02	Belly River	49.0475	-113.6889	124-5	40-30	13.3	8.00	183
4548	WLN-09-05	Cameron Creek	49.0786	-113.9669	124-6	40-31	10.1	8.08	153
4549	WLN-09-07	Lost Horse Creek	49.1211	-113.9983	124-7	40-32	12.1	7.95	241
4550	WLN-09-08	Coppermine Creek	49.1047	-113.9603	124-8	40-33	13.4	7.88	247
4551	WLN-09-09	Hell Roaring Creek	49.0219	-113.8989	124-9	40-34	9.3	8.36	169
4552	WLN-09-10	Boundary Creek	48.9961	-113.9047	124-10	40-35	9.3	8.17	141
4553	WLN-09-11	Blakiston Creek	49.0739	-113.8689	124-11	40-36	11.9	8.82	222
4554	WLN-09-12	Belly River tributary	49.0300	-113.6792	124-12	40-37	18.2	8.62	395
4555	WLN-09-15	Bertha Creek	49.0344	-113.9253	124-13	40-38	7.7	9.02	108
4556	WLN-09-16	Bertha Creek	49.0325	-113.9125	124-14	40-39	8.9	8.90	130
4557	WLN-09-13	Crooked Creek	49.0647	-113.7564	124-15	40-40	11.2	8.61	322
4558	WLN-09-14	Blakiston Creek	49.1058	-113.9814	124-16	40-41	6.7	8.33	214
4559	WLN-09-17	Crooked Creek	49.1167	-113.8294	124-17	40-42	15.2	8.50	392
4560	WLN-09-18	Sofa Creek	49.0775	-113.8386	124-18	40-43	6.0	9.28	289
4561	A-11	Akamina Pools	49.0314	-114.0428	124-19	40-44	14.3	8.25	92
4562	A-17	Cameron Lake Pools	49.0200	-114.0469	124-20	40-45	10.6	8.17	449

Sample Numbers		Water Body Name	Latitude (°N)	Longitude (°W)	Slide Numbers		Water Quality Variables		
MDC	Parks Canada				MDC	MONTU	T (°C)	pH	Conductivity (µS/cm)
4563	WLN-09-03	Rowe Creek	49.0575	-114.0122	124-21	40-46	9.5	7.68	153
4564	WLN-09-04	Lineham Creek	49.0647	-114.0022	124-22	40-47	10.6	8.19	165
4565	WLN-09-06	Bauerman Creek	49.1311	-114.0308	124-23	40-48	12.4	8.01	192
4566	WLN-09-19	Bauerman Creek	49.1389	-114.0417	124-24	40-49	8.0	8.77	201
4567	WLN-09-20	Blakiston Creek	49.1133	-114.0711	124-25	40-50	5.3	9.55	205
4568		Lost Lake	49.1472	-114.1461	124-26	40-51	15.7	8.58	74
4569		Summit Lake	49.0078	-114.0258	124-27	40-52	18.3	8.45	8
4570		Sofa Mountain Ponds	49.0333	-113.7536	124-28	40-53	15.9	7.84	306

Figure 2. The centrepiece of Waterton Lakes National Park is Waterton Lake, which extends southwards for 11 km from the Prince of Wales Hotel in Alberta, Canada (right centre) to the Goat Haunt Ranger Station at the far end of the lake in Montana, USA (middle distance). Waterton Lake at Goat Haunt is the type locality of *Cymatopleura internationale* Bahls (2013). Photo credit: Parks Canada.

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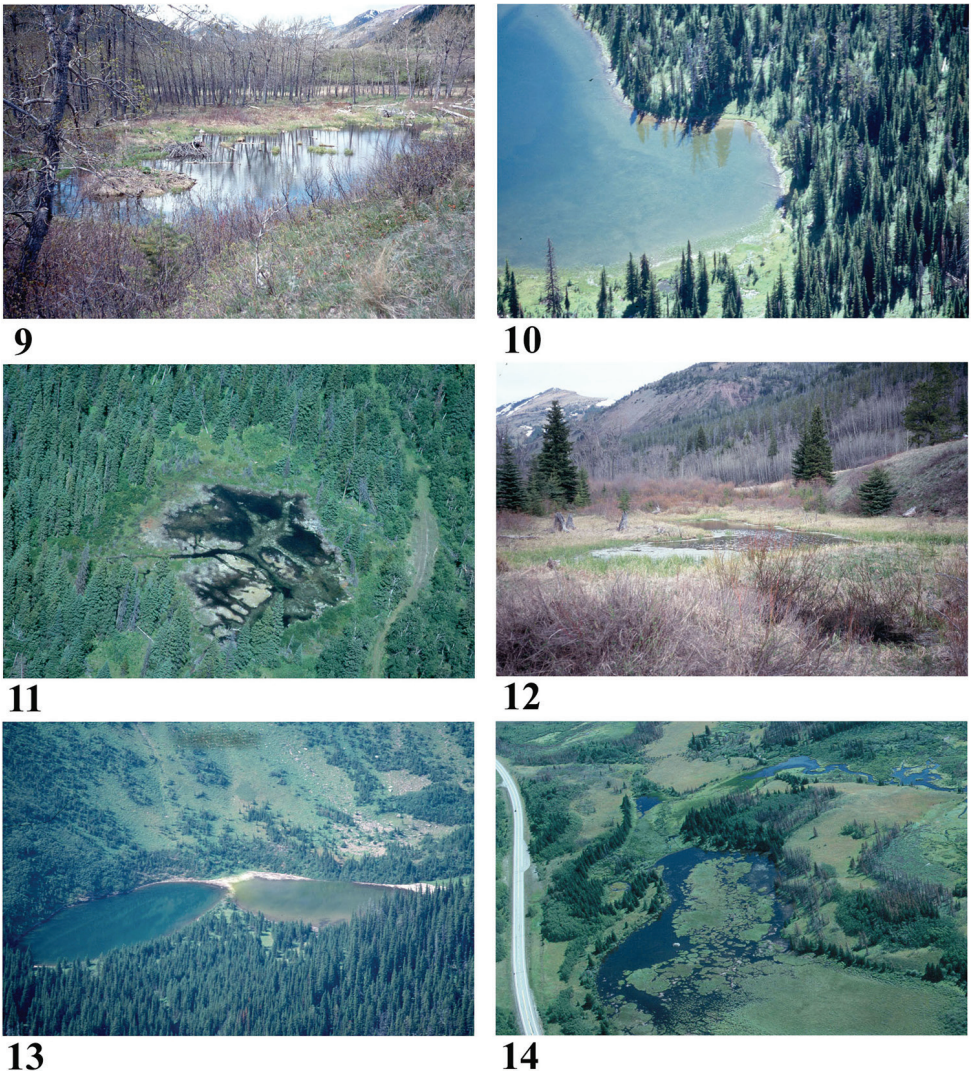
Figures 3–8. Representative flowing-water habitats sampled for diatoms in Waterton Lakes National Park **3** Belly River (4547) **4** Rowe Creek (4563) **5** Bertha Creek (4555, 4556) **6** Bauerman Creek (4565, 4566) **7** Crooked Creek (4559) **8** Cameron Creek (4546, 4548). Photos credit: Parks Canada.



Figures 9–14. Representative standing-water habitats sampled for diatoms in Waterton Lakes National Park **9** Blakiston Beaver Pond B (4534) **10** Summit Lake (4569) **11** Lower Giant's Mirror Pond (4541) **12** Blakiston Roadside Pond (4532) **13** Lost Lake (4568) **14** Sofa Wetland B (4542). Photos credit: Parks Canada.

Haida Gwaii Archipelago (Queen Charlotte Islands) (Figures 15–28, Appendix 1: Plates 18–37)

The Haida Gwaii Archipelago lies about 500 km northwest of Vancouver Island and is separated from the British Columbia mainland by the 70 to 100 km-wide Hecate Strait (Fig. 1). The Archipelago consists of a 300 km-long, north-south trending group

of islands in the shape of a "V". Along the western branch of the "V" is a mountain range with summits over 1,100 m elevation. Higher elevations on the archipelago support mountain hemlock and alpine tundra vegetation; lower elevations are dominated by coastal red cedar, pine, western hemlock and Sitka spruce (Banner et al. 1989).

The coastline along the eastern edge of Haida Gwaii has fluctuated dramatically since 12,000 years BP (Josenhans et al. 1995, 1997). At that time, sea level was about 150 m lower than it is today. By 9,000 years BP, the sea level had risen sharply to 15 m higher than today and remained at that level until about 5,000 years BP, falling to current levels by about 2,000 years BP. These fluctuations are the result of interplay between isostatic, eustatic and tectonic forces in the area. As a result of these fluctuations, Holocene archaeological sites (9,000–5,000 years BP) are stranded in the forest well above their original coastal locations. Diatom remains in sediments of coastal fresh-water ponds include evidence of past salt-water intrusions (Pienitz et al. 2003).

Six samples were collected from freshwater habitats in July 2013 and another three samples were collected from fresh and brackish waters in May 2017 (Table 2). The three samples collected in 2017 were originally numbered 1, 2 and 3 but are renumbered 7, 8 and 9 here to avoid confusion with the 2013 samples. Sites sampled in 2013 were accessed from the coast by kayak; sites sampled in 2017 were accessed by inland routes. The following descriptions of the sample sites are taken from the field notes of Beverly Boynton.

Fresh-water samples, July 2013

All samples included squeezed vegetation, a scraped rock or stick, surface water and a few ml of iodine added. Samples were taken well above any tidal influence. Sites would all have infrequent human visitation (maybe less than yearly, or even never), especially since I (BB) walked upstream further than needed if people were getting drinking water.

Sample #1, Harriet Harbour stream pool (Fig. 15) July 11, 2013

52°17.422'N, 131°12.799'W Elevation near sea level

Flowing stream, sample from a pool. Mature western hemlock forest with some western red cedar and red alder, plus salal, grasses, mosses. The abandoned Jedway mine is to the west and north, but this stream seems to be outside their operations. (Jedway was an iron-copper mine, last operating in 1969.) Rock scrapings, plus vegetation squeeze, surface water.

Sample #2, Island Bay stream pool (Fig. 16) July 13, 2013

52°21.130'N, 131°24.643'W Elevation 20 m

Clear water, pools interspersed with small fast-flowing rocky cascades. Western hemlock, western red cedar, salal, mosses, ferns. Vegetation squeeze was of short black and green mosses, scraping was of a submerged stick with filamentous green vegetation (algae?) and surface slime.

Sample #3, lake on Mt. Yatza (front cover, Figs 17, 18) July 14, 2013
52°20.533'N, 131°26.172'W Elevation 550 m
Vegetation squeeze consisted of roots of submerged sedge and black moss; scraping from a submerged rock and surface water. Many sundews on shore, along with grasses, sedges.

Sample #4, lake on Juan Perez Sound/De La Beche Inlet (Fig. 19) July 20, 2013
52°33.121'N, 131°38.422'W Elevation 10 m
Site is 170 m from sea by GPS straight line, beyond the outlet choked with deadfall and yellow pond lilies (no ducks, but other birds seen on the lake, many dragonflies). Clear water, rocky (granite?), moss and sediment on bottom, some submerged grass-like plants. Forested around lake with western hemlock, western red cedar, no Sitka spruce or shore pines. Vegetation squeeze of dirty moss, rock scrape, surface water. Probably very few have been here, with good reason as even though it was a short distance, it was a vicious bushwhack.

Sample #5, stream pool on west end of Kostan Inlet (Fig. 20) July 20, 2013
52°34.752'N, 131°42.999'W Elevation 11 m
A pool just below a riffle. Open ground with grasses, in forest of western hemlock, Sitka spruce, western red cedar, red alder. Rocky shore and stream bottom. Hard to squeeze water from the brown moss on some rocks, no submerged plants or other vegetation. Squeezed what I could, added some water from near bottom, scraped rock with brown moss and slime, surface water.

Sample #6, stream pool east of Lyell Point (Fig. 21) July 22, 2013
52°42.456'N, 131°43.033'W Elevation 116 m
Stream scant but brisk flow into a small pool. Clear water, brown moss and rocks. Forest of red alder, western hemlock, western red cedar, salal, mosses, ferns. Squeezed brown moss (which was longer and easier to squeeze than previous samples), scraped a rock, surface water. Probably no one has been to this particular place.

Fresh- and brackish-water samples, May 2017

All samples included squeezed vegetation, a scraped rock or stick, surface water and a few ml of iodine added. According to locals, May was more rainy and cooler than usual.

Sample #7, roadside bog off Route BC-16 W (Figs 22–25) May 9, 2017
53°55.629'N, 132°06.419'W Elevation 48 m pH 4.36, T 10.6 °C
Large bog area, mostly dry, with scattered shore pine, tiny western red cedar with yellowish needles, scattered small common juniper and black crowberry, grasses, bog rosemary, Labrador tea, bog cranberry, *Sphagnum* and other mosses, lichen. Deep layer of peat (dug 0.3 m down with more peat below). Sample from a small area of standing water ~2 m square. Sunny, except where grassy edges of water

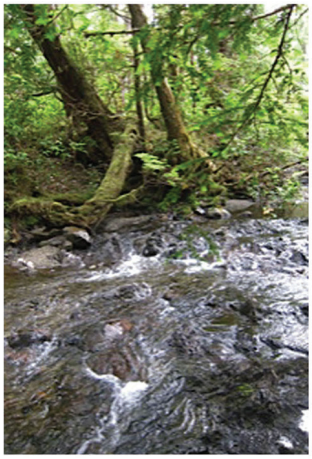
block the sun. This bog is in the Queen Charlotte Lowlands, on northeast Graham Island, an area quite unlike the topography of the rest of Haida Gwaii, which has a central forested plateau area and mountain ranges. This lowland area is part of the Hecate Depression and includes the Argonaut Plain.

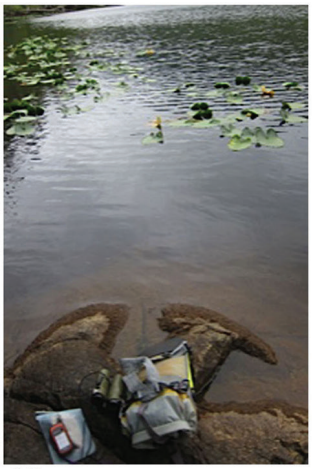
Sample #8, East Limestone Island forest bog (Fig. 26) May 14, 2017
52°54.645'N, 131°36.868'W Elevation 33 m pH 7.6, T 10.8 °C
East Limestone Island is a small limestone island off the east coast of Haida Gwaii. The sample is from a bog with standing water, at the base of a huge Sitka spruce uprooted during a blow down in 2010. The site seems too far from ocean to get sea spray or surge tides. Mosses, grasses, ferns. Sunny when sun in the east, then shady. Thimbleberry, a few other forbs not yet budding.

Sample #9, mouth of river entering Rennell Sound (Fig. 27) May 20, 2017
53°24.543'N, 132°31.821'W Elevation 0 m pH 7.40, T 12.2 °C
Brackish (?) sample. River mouth is directly facing Rennell Sound, tide was rising (still had 1–2 hours to go), wind was blowing into the Sound from Pacific Ocean. Rainy and foggy as often is the case on west coast Haida Gwaii. There was a faint current in middle of the river, slack/eddy on edges where sample was taken (about 15 m from the Sound itself). Sand and gravel bottom and on surrounding land, with a submerged dead western red cedar at sample site providing the scrape; a few clumps of green algae floating around provided the vegetation squeeze.

Table 2. Samples collected from Haida Gwaii Archipelago in 2013 and 2017. BB = Beverly Boynton; MDC = Montana Diatom Collection; MONTU = University of Montana Herbarium.

Sample Number		Habitat Type	Latitude (°N)	Longitude (°W)	Slide Numbers	
MDC	BB				MDC	MONTU
5062	1	stream pool	52.2903	-131.2133	127-55	42-61
5063	2	stream pool	52.3522	-131.4108	127-56	42-62
5064	3	small lake	52.3422	-131.4361	127-57	42-63
5065	4	large lake	52.5519	-131.6403	127-58	42-64
5066	5	stream pool	52.5792	-131.7164	127-59	42-65
5067	6	stream pool	52.7075	-131.7172	127-60	42-66
6888	7	bog	53.9272	-132.1070	136-27	49-62
6889	8	bog	52.9108	-131.6145	136-28	49-63
6890	9	river mouth	53.4090	-132.5304	136-29	49-64





Figures 15–21. Haida Gwaii collection sites in 2013 **15** Site 1 (5062) **16** Site 2 (5063) **17, 18** Site 3 (5064) **19** Site 4 (5065) **20** Site 5 (5066) **21** Site 6 (5067). Photo credits: Beverly Boynton, D. Moore (**15**), Hope Sneller Moore (**17**).

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Figures 22–28. Haida Gwaii collection sites in 2017 **22–25** Site 7 (6888) **26** Site 8 (6889) **27** Site 9 (6890) **28** Rennell Sound from sample site 9. Photos credit: Beverly Boynton.

Clearwater River Corridor (Figures 29–41, Appendix 1: Plates 38–55)

The following account is taken from the field notes of Beverly Boynton:

Sampling was done in June 2014 while on a 20-day canoe trip from the headwaters of the Clearwater River in Saskatchewan (Forrest Lake) to its confluence

with the Athabasca River in Alberta (Fig. 1), estimated to be about 480 river kilometres. Moser et al. (2004) reported on the ecology of diatoms in lakes of Wood Buffalo National Park, which is located about 200 km northwest of the Clearwater/Athabasca River confluence.

The first six samples are from the boreal forest of the Canadian Shield. This area is largely an open-canopy jack pine, black spruce and white spruce forest, with extensive areas of lichens. There are also numerous shrubs, including willows, alders, birch and some forbs. The soil is shallow, i.e. often just an inch (2.5 cm) of forest detritus, on top of deep sand. The area has almost no rocks of any size that we saw (except in rapids) until we were almost off the Shield. The Shield itself is Precambrian granitic rock.

The last three samples are from the Western Canada Sedimentary Basin (depositions from inland seas advancing and retreating). This area has numerous outcrops and gorges of limestone and dolomite. The soil is much deeper, organic soil with clay, supporting a mixed forest of closed-canopy paper birch, white spruce, balsam poplar and a great many shrubs and forbs.

Both areas are topographically fairly flat (especially on the Shield), with an enormous number of shallow gouges from the Laurentide Ice Sheet, which are filled with water. One does not need to walk far to encounter a bog, fen, marsh, swamp, pond, lake or creek. Drainage is generally poor because of the flatness. The hydrology is still quite young and sorting itself out and still influenced by post-glacial rebound.

No samples came from the Clearwater River itself or from areas that seemed to be receiving flow from the River. Because of the low number of people on most sections of the river, along with most people's general distaste for spending time in bogs, fens, marshes and swamps, the specific sampling sites are probably rarely if ever visited and did not seem to be disturbed. Mosquitoes and blackflies were moderately bad in general on this trip, but were not worse at the sampling sites and posed little problem for the Slime Crew (my husband assisted with some collecting). As always, seeking out these microhabitats added immensely to the interest of the trip; botany and geology were highlights.

All samples consisted of some surface water, a vegetation squeeze and scraping of a submerged object. There were no rocks to scrape and the sticks (when found) had only a minimal slimy feel. If sediment was present on the surface, it was sampled.

Coordinates are WGS84, latitude-longitude in degrees and decimal minutes, elevation in metres. Unfortunately, my camera drowned after the first week; pictures are then from my Itouch; however, the last nine days were quite overcast and I barely was able to keep my Itouch recharged from my Solio. All samples are from the watershed of the Clearwater River.

Sample #1, bog near Naomi Lake (Fig. 29) June 8, 2014

57°38.383'N, 109°02.102'W Elevation 498 m pH 6.2, T not taken

Looks like I forgot the iodine on this; I added some on July 1. Area of small bogs within a larger area of semi-open jack pine, reindeer moss and Labrador tea. In the bog: mountain cranberry, Labrador tea, lichens, mosses.

Sample #2, bog near outlet of Dell Lake (Figs 30, 31) June 9, 2014
57°35.342'N, 108°51.487'W Elevation 480 m pH 4.6, T not taken
Clear, sunny, no obvious flow. *Sphagnum* blanket with a lot of leatherleaf, some larch, small balsam fir, Labrador tea, cottongrass, cloudberry.

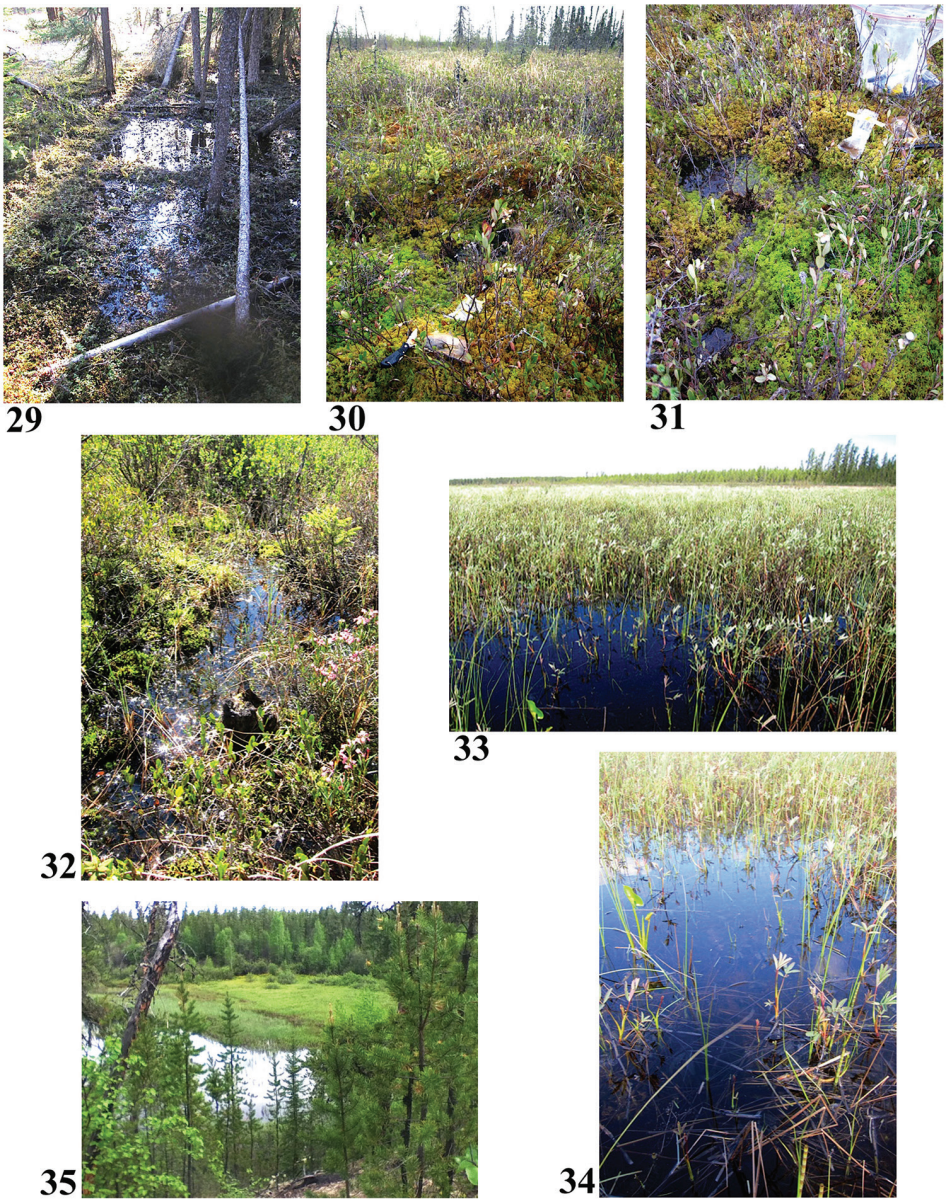
Sample #3, bog between Lloyd Lake and First Gorge (Fig. 32) June 13, 2014
57°10.563'N, 108°38.360'W Elevation 470 m pH 4.96, T not taken
Sphagnum moss, sunny, clear, no obvious flow. A few small jack pine and black spruce, a lot of bog birch, sedges, bog rosemary and bog laurel. Elk scat in the water.

Sample #4, fen adjacent to a lake (Figs 33, 34) June 14, 2014
57°05.537'N, 108°19.593'W Elevation 453 m no pH or T taken
Looks like I forgot the iodine on this; I added some on July 1. Extensive area of standing water adjacent to a lake. Moss, *Sphagnum*, bog rosemary, bog birch, leather leaf, jack pine, river birch, a few sedges, Labrador tea. Sediment on surface.

Sample #5, wet grassy meadow near Granite Gorge (Figs 35, 36) June 16, 2014
57°00.298'N, 108°26.680'W Elevation 439 m pH 6.89, T 16.2 °C
The Clearwater runs through Granite Gorge with big rapids, then a fairly large arm doubles back to end at edge of sample site meadow. Samples are at an elevation such that it probably does not get flooded from the river (this was a high water year while we were there). The grass is thick with wet muck and some standing water. My sample is near base of a steep-sloped bench of jack pines and paper birch, with a few small balsam poplars, plus lichens, mosses, cranberries, kinnikinnick etc. One picture shows a small flow of water coming off the bench to sample site. Sample site has marsh cinquefoils, bog birch, grasses, willows, dwarf raspberry. Sample taken from a small area of open water with no obvious flow, sunny, clear. Some specks of sediment floating on top, plus 10 × 10 cm blobs of red-brown stuff floating. Some (natural?) oil seeps here. Bottom is muck and debris. [The Alberta tar sands are about 100 km northwest of here.]

Sample #6, swamp above Olsen Rapid (Fig. 37) June 17, 2014
56°55.749'N, 108°39.526'W Elevation 437 m pH 5.22, T 13.9 °C Swamp with mature jack pine, alive in water. A few grasses. Water clear, no obvious flow, surface has clusters of bubbles (amphibian eggs?). Bottom mucky with organic detritus. Swamp is within a mature jack pine forest with the usual lichens, cranberries, dwarf blueberries, many wild lily of the valley and bunchberries. Some fireweed, mosses, Saskatoon (service berry).

Sample #7, small stream (Figs 38, 39) June 20, 2014
56°46.338'N, 109°17.041'W Elevation 371 m pH 7.7, T 21.5 °C



Figures 29–35. Collection sites along the Clearwater River corridor **29** Site 1 (6273) **30, 31** Site 2 (6274) **32** Site 3 (6275) **33, 34** Site 4 (6276) **35** Site 5 (6277). Photos credit: B. Boynton.

Small semi-shaded, slowly-flowing stream, clear water, draining towards Clearwater. Birch, willow and alder forest, with mosses, currant, strawberry, horsetails, *Mertensia*. Bottom was leafy detritus, muck. Sample was from a still pool. Still on the Shield, pink granitic rock with frequent outcrops.

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Figures 36–41. Collection sites along the Clearwater River corridor **36** Site 5 (6277) **37** Site 6 (6278) **38, 39** Site 7 (6279) **40** Site 8 (6280) **41** Site 9 (6281). Photos credit: Beverly Boynton.

Table 3. Samples collected from the Clearwater River corridor, June 2014. BB = Beverly Boynton; MDC = Montana Diatom Collection; MONTU = University of Montana Herbarium.

Sample Number		Habitat Type	Latitude (°N)	Longitude (°W)	Slide Numbers	
MDC	BB				MDC	MONTU
6273	1	bog	57.6397	-109.0350	131-34	46-40
6274	2	*Sphagnum* bog	57.5892	-108.8581	131-35	46-41
6275	3	*Sphagnum* bog	57.1761	-108.6394	131-36	46-42
6276	4	fen	57.0922	-108.3267	131-37	46-43
6277	5	wet grassy meadow	57.0050	-108.4447	131-38	46-44
6278	6	swamp	56.9292	-108.6589	131-39	46-45
6279	7	small stream	56.7722	-109.2839	131-40	46-46
6280	8	wet meadow	56.6978	-109.9767	131-41	46-47
6281	9	shady pool	56.6539	-110.9553	131-42	46-48

Sample #8, wet meadow above bend in Clearwater (Fig. 40) June 22, 2014
56°41.860'N, 109°58.600'W Elevation 304 m pH 7.52, T 18.7 °C
Depression in meadow with standing water, no visible flow, clear, sunny. Willows, cattails, grasses, plumed false Solomon seal, patches of mosses in water along with detritus on bottom. This was the only such extensive wet meadow we saw on the trip and it was in the Western Sedimentation Basin, with the river now in a wide valley with wooded ridges on either side of the valley. No outcrops or boulders and the sandy benches were quite infrequent. Shrubs and trees were bigger and more diverse, with soil much deeper (black, a lot of organic material before reaching clay-sand). Grass was 1–1.5 m tall, thick, meadow rue. Many pools of water in the entire area.

Sample #9, pool near Greentree Provincial Campground (Fig. 41) June 24, 2014
56°39.233'N, 110°57.320'W Elevation 256 m pH 7.52, T 12.7 °C
In woods (birch, balsam poplar, alder, balsam fir), standing water, no obvious flow, shady. Immediate area around this was pretty flat. Dwarf raspberry, currants, grasses, horsetails. Brown and green algae blobs on surface, bottom has muck and detritus.

Coppermine River Corridor (Figures 42–57, Appendix 1: Plates 56–76)

The following account is taken from the field notes of Beverly Boynton:

Sampling was done while on a 28-day canoe trip on the Coppermine River (Fig. 1), from Point Lake near the headwaters, to its mouth in Coronation Gulf of the Arctic Ocean, about 450 river kilometres. All samples were from fresh water, none closer to the

Arctic Ocean than about 10 km; no samples were taken from the Coppermine River itself. Only sample #1 was from Northwest Territories; the rest are from Nunavut, Canada.

The trip began in the upper Coppermine, which is a system of lakes on Arctic tundra, above the treeline. At Redrock Lake, the Coppermine leaves the tundra to enter white spruce forest with willow and birch shrubs. Treeline and its transition zone follow the protected river valley up to the Coppermine Mountains, though tundra predominates in places beyond the river valley. At Big Bend, the trees thin and become shorter. Past the Coppermine Mountains, the terrain is predominantly tundra vegetation of grasses and sedges, lichens, willows and smaller birch shrubs.

The entire trip was on the Canadian Shield, though this Precambrian granitic rock was not always visible due to postglacial till and sediment deposition. A huge glacial lake, Lake Coppermine, formed during deglaciation when a lobe of the ice sheet blocked the Coppermine's outlet to the sea. This lake extended from Fairy River to Rocky Defile and has left behind lake sediments of marl. Further downriver, the Coppermine cuts through sandstone, limestone and dolomite, forming gorges. The river then goes through the Muskox Intrusion, which was formed during the Proterozoic from mantle plumes. This is one of the globe's largest basalt flood plains and consists of rock types such as gabbro, which is the rock type from Escape Rapids to Coronation Gulf (Dredge 2001).

Place names were non-existent, so descriptive terms are used here.

Sample #1, grassy meadow at Wolf Camp (Fig. 42) July 20, 2015
65.8268°N, 114.3896°W Elevation 350 m pH 8.18, T 12 °C
Standing water, about 10 m × 5 m, in a large, sunny grassy meadow with a few willows. About 100 m from river. No visible surface inlet/outlet. Beyond the meadow, there is a small ridge with granitic bedrock outcrops. Water is clear, with bottom of *Sphagnum* moss. Surrounded by red and green moss, grasses, no forbs. Sample: surface water, *Sphagnum* squeeze, scraped slimy stick.

Sample #2, Coppermine tributary at marl bluff (Figs 43, 44) July 24, 2015
66.3652°N, 114.4949°W Elevation 281 m pH 8.38, T 19.2 °C
Small, sluggish tributary of Coppermine River, about 105 m above the confluence. Sunny area with grey clay on bottom and on stream bank (strong reaction to HCl). Some cotton grass, grasses, no forbs; further away are white spruce, birch shrubs, buffalo berry, marl bluffs. Water is clear, with a small fish. Sample: surface water, superficial bottom sediment, squeezed grass roots, scraped branch and twig.

Sample #3, small lake at Orchid Camp (Figs 45, 46) July 26, 2015
66.7441°N, 115.3878°W Elevation 282 m pH 8.6, T 22.4 °C
Multiple little lakes about 113 m from Coppermine. Sunny, maybe 1 m deep, *Sphagnum* moss, surrounded by cotton grass, mosses, birch shrubs, white spruce. In a low area, no obvious surface inlet/outlet. Twinflowers, squirrel egg yellow orchid and yellow lady's slipper orchid nearby.

Sample #4, small stream at Bear Skull Camp (Figs 47, 48) July 28, 2015
66.8800°N, 116.3331°W Elevation 288 m pH 7.5, T 17.4 °C
Small meandering stream of still water in large, sunny, hummocky meadow between two long sandy eskers. Maybe 0.6 m deep, *Sphagnum* and aquatic grasses on bottom. Sample: surface water, grass root squeeze, scraped a branch.

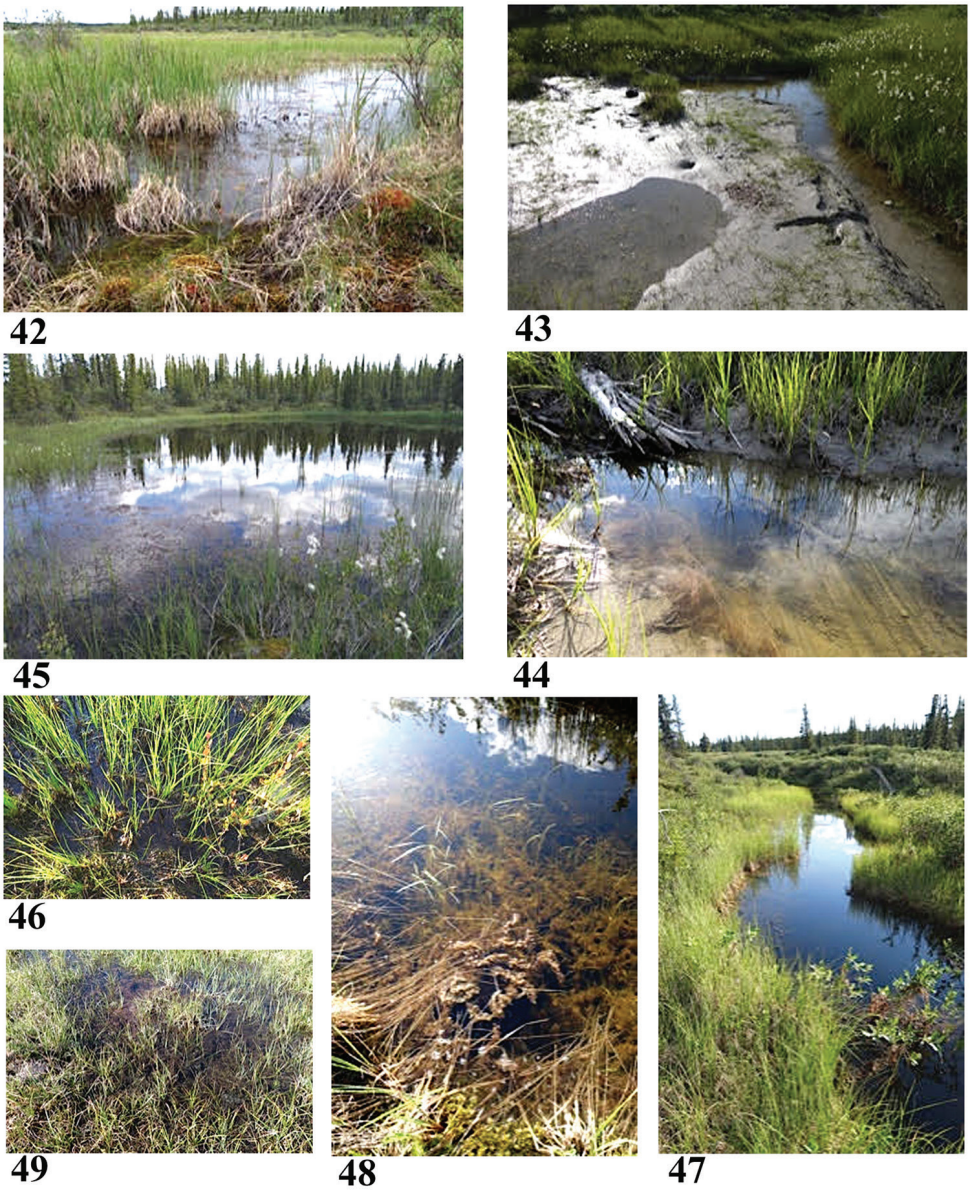
Sample #5, tundra pool (Fig. 49) July 30, 2015
67.2461°N, 116.3628°W Elevation 489 m pH 8.1, T 17.2 °C
Sunny area of hummocks with pools of standing water, surrounded by sedges, grasses, no forbs, rocky. Maybe 0.3 m deep, muddy bottom with decaying vegetation. Clear water, no surface inlet/outlet noted. Split a rock, good reaction from HCl; green specks on split surface may have been copper ore. About 7 km from Coppermine River.

Sample #6, Red Sand Lake (Fig. 50) July 30, 2015
67.2528°N, 116.3602°W Elevation 472 m pH 8.0, T 20.5 °C
Lake 6.9 km from Coppermine. Clear water with surface algae, sunny, about 15 cm deep at edge. Surrounded by grasses, sedges, no forbs. Sample: surface water, poor squeeze of hard-to-pull grasses, scraped a slimy rock. Bottom with reddish-brown colour [iron-oxidizing bacteria?].

Sample #7, September Mountains Lake (Fig. 51) August 1, 2015
67.1936°N, 115.7955°W Elevation 440 m pH 8.3, T 17.4 °C
Lake with clear water, sunny. *Sphagnum* moss and mud on bottom, surrounded by aquatic grasses. About 3.7 km from Coppermine. Sample: surface water, grass squeeze, no sticks or accessible stones to scrape.

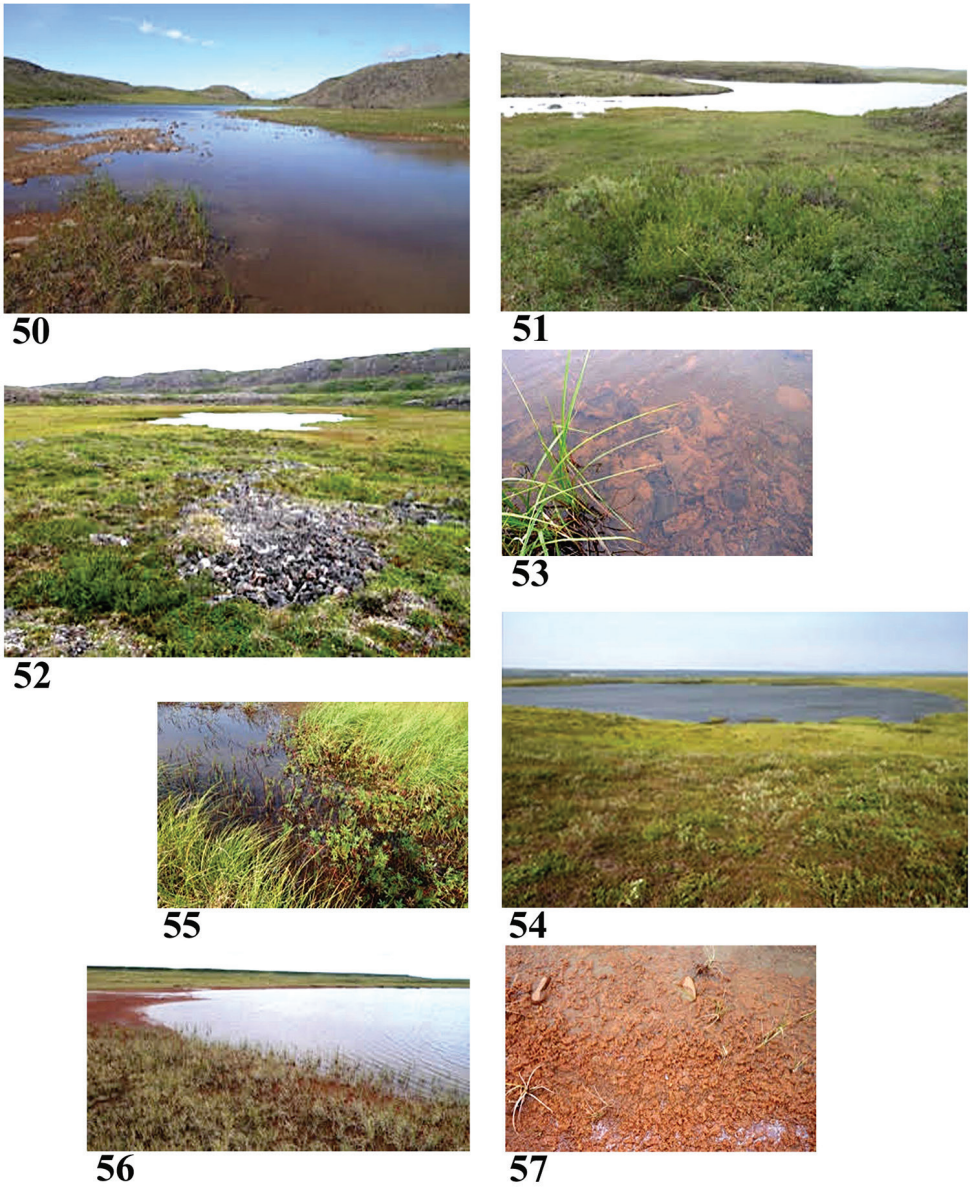
Table 4. Samples collected from the Coppermine River corridor, July/August 2015. BB = Beverly Boynton; MDC = Montana Diatom Collection; MONTU = University of Montana Herbarium.

Sample Numbers		Habitat Type	Latitude (°N)	Longitude (°W)	Slide Numbers	
MDC	BB				MDC	MONTU
6824	1	lake	65.8268	-114.3896	135-62	48-97
6825	2	stream	66.3652	-114.4949	135-63	48-98
6826	3	lake	66.7441	-115.3878	135-64	48-99
6827	4	stream	66.8800	-116.3331	135-65	48-100
6828	5	pool	67.2461	-116.3628	135-66	49-1
6829	6	lake	67.2528	-116.3602	135-67	49-2
6830	7	lake	67.1936	-115.7955	135-68	49-3
6831	8	lake	67.3350	-115.7965	135-69	49-4
6832	9	lake	67.6181	-115.4367	135-70	49-5
6833	10	lake	67.7657	-115.3817	135-71	49-6



Figures 42–49. Collection sites along the Coppermine River corridor **42** Site 1 (6824) **43, 44** Site 2 (6825) **45, 46** Site 3 (6826) **47, 48** Site 4 (6827) **49** Site 5 (6828). Photos credit: Beverly Boynton.

Sample #8, Coppermine Mountains Lake (Figs 52, 53) August 3, 2015
67.3350°N, 115.7965°W Elevation 435 m pH 8.2, T 14.8 °C
Small lake with clear water, surrounded by aquatic grasses, sedges. Bottom with reddish-brown algae-like growth [iron-oxidising bacteria?]. About 4 km from Coppermine. Sample: surface water, squeezed grass roots, scraped rocks from bottom.



Figures 50–57. Collection sites along the Coppermine River corridor **50** Site 6 (6829) **51** Site 7 (6830) **52, 53** Site 8 (6831) **54, 55** Site 9 (6832) **56, 57** Site 10 (6833). Note mats of iron-oxidising bacteria in Figs **50, 53, 56, 57**. Photos credit: Beverly Boynton.

Sample #9, Escape Rapids Lake (Figs 54, 55) August 6, 2015

67.6181°N, 115.4367°W Elevation 145 m pH 6.76, T 18 °C

Moderately large lake in tundra in wet, hummocky area. No definite inlet, outlet. This is now in the area of post-glacial marine sedimentation from sea level changes;

fresh water sample may be influenced by marine sediments. Clear water, sunny, aquatic plants, grasses, sedges, willows, marsh cinquefoils. Mud and algae on bottom. Sample is from a quiet backwater on a very windy day. Sample: surface water, plant squeeze, no rocks or sticks to scrape.

Sample #10, Bloody Falls Tundra Lake (Figs 56, 57) August 8, 2015
67.7657°N, 115.3817°W Elevation 72 m pH 8.17, T 11.3 °C One of many small lakes in area of tundra and hummocks. Red sand, rocks, and algae [iron-oxidising bacteria?] on bottom. Clear water, sunny, some insects in water. Grasses, sedges, willows surround the lake. Sample: surface water, grass squeeze, scraped non-slimy rock.

Baillie & Back River Corridors (Figures 58–72, Appendix 1: Plates 77–108)

The following account is taken from the field notes of Beverly Boynton:

Sampling was done while on a 26-day canoe trip that went from a lake on the Baillie River (a main tributary of the Back River), to the Baillie's confluence with the Back River, then down the Back River, passing through Pelly Lake and ending on Mission Island in Upper Garry Lake, about 445 river km from our starting point (Fig. 1). Elevation at our put-in on the Baillie was 284 m, about 168 m near the confluence of the Baillie and Back Rivers (a 120 m drop over about 185 km), then the Back essentially becomes flatwater, with an elevation at our take out on Mission Island of 148 m (a drop of only 20 m over the final 260 km). All samples are fresh water from Nunavut.

The sampling area is subarctic tundra on the Canadian Shield, with continuous permafrost and a thin active layer of reportedly acidic soil. There are some areas of granitic outcrops, but most of the river corridor is covered with extensive deposits from de-glaciation of the Laurentide Ice Sheet, including sandy eskers, large sand flats and areas of mostly sorted till and sediments. In addition, there are extensive areas of peat, with sphagnum moss and other mosses. Lichen species were fairly ubiquitous. The area is well above the treeline, except for one small area on the Baillie that has a relic stand of white spruce. The shrubs include dwarf birch, small willow species, red alder and various Ericaceae species. Other plants included grasses, sedges and the expected flora for subarctic bogs, fens and uplands.

Annual precipitation is low, making this area a polar desert, but during summer, snow melt and thawing of the active layer results in waterlogged soil and a network of lakes, streams, rivers and wetlands. Throughout the collection area were numerous ponds, pools of standing water, wet peatlands and wet to moist areas of hummocks and patterned ground, in addition to dry uplands.

From local reports, May and June were rainy months, at least in Yellowknife, about 480 km to the west of our put-in. The Back clearly had high waters, as most dry riverbeds noted on maps were covered with water. The Back drains a huge area and, being a lowlands

river on permafrost, the accumulated water is slow to discharge into the Arctic Ocean. We had a number of high wind days that kept us from paddling and a few periods of rain.

Place names are my own descriptive terms, sometimes adding nearby names from Canadian maps.

Sample #1, pond in wetland near the Baillie River (Figs 58, 59) July 4, 2016
64°53.020'N, 105°46.733'W Elevation 239 m pH 7.9, T 22 °C
A small, shallow, sunny tundra pool, about 10 m by 5 m, in a large wetland with plenty of mosquitoes, situated on a terrace above the Baillie River. No surface inlet or outlet seen. Clear water, red-brown algae and sediments [iron-oxidising bacteria] on bottom. Surrounding vegetation includes dwarf birch, willow, Labrador tea, grass, sedges. Further away from river and pond is a ridge with granitic outcrops. Sample: surface water, grass and algae squeeze, scraped stick.

Sample #2, pond near Merganser Camp off the Baillie River (Fig. 60) July 6, 2016
64°53.118'N, 105°04.829'W Elevation 214 m pH 7.15, T 18.6 °C
Tundra pond in a large, flat, sunny area of moist hummocks with no standing water between them. No surface inlet or outlet seen. Clear water, brown algae and sediments on bottom. Surrounding vegetation includes dwarf birch, willow, Labrador tea, cloudberry, mountain avens, pink and yellow louseworts, bog rosemary, grass, and sedges including cotton grass. Further away from the river and pond is a ridge with granitic outcrops. Sample: surface water, squeezed vegetation and scrape.

Sample #3, backwater on the Baillie (Fig. 61) July 8, 2016
64°57.726'N, 104°35.904'W Elevation 198 m pH 7.1, T 19.4 °C
Still backwater in sunny area on the Baillie River, in an area of flooding. Clear water, river bottom of sand and fine silt, submerged aquatic plants. Sand and boulders on shoreline, but no plants. Sample: surface water, rooted submerged plant squeeze, scraped rock.

Sample #4, pond near Mud Beach Camp off the Back (Fig. 62) July 11, 2016
65°57.726'N, 103°35.828'W Elevation unknown pH 6.4, T 23.9 °C
Tundra pond in sunny area. Surrounding vegetation includes willow, Labrador tea, yellow lousewort, bog rosemary, aquatic grasses, sedges, mosses.

Sample #5, pond near Hill Camp off the Back (Fig. 63) July 12, 2016
65°23.521'N, 103°23.291'W Elevation 189 m pH 6.2, T 22.7 °C
Tundra pond in sunny area, with short grasses, forbs and shrubs further from the pond. Clear water, bottom with red-coloured sediments [probably colonies of iron-oxidising bacteria]. Vegetation surrounding the pond includes dwarf birch, willow, Labrador tea, yellow lousewort, bog rosemary, cloudberry, mosses. Sample taken on windy day from lee end.

Table 5. Samples collected from the Baillie and Back River corridors, July 4–July 26, 2016. BB = Beverly Boynton; MDC = Montana Diatom Collection; MONTU = University of Montana Herbarium.

Sample Numbers		Habitat Type	Latitude (°N)	Longitude (°W)	Slide Numbers	
MDC	BB				MDC	MONTU
6856	1	pool in wetland	64.8837	-105.7789	135-94	49-29
6857	2	pond	64.8853	-105.0805	135-95	49-30
6858	3	river backwater	64.9621	-104.5984	135-96	49-31
6859	4	pond	65.9621	-103.5971	135-97	49-32
6860	5	pond	65.3920	-103.3882	135-98	49-33
6861	6	pool	65.6039	-102.6807	135-99	49-34
6862	7	river backwater	65.9111	-101.8610	135-100	49-35
6863	8	wetland	65.9405	-101.4412	136-1	49-36
6864	9	pond	65.8964	-101.0479	136-2	49-37
6865	10	wetland	65.8989	-101.0356	136-3	49-38
6866	11	small stream	65.9063	-100.7711	136-4	49-39

Sample #6, pool near Inuksuk Camp off the Back (Fig. 64) July 14, 2016
65°36.231'N, 102°40.844'W Elevation 205 m pH 6.44, T 18.7 °C
Small pool of standing water in area of moist hummocks, atop a bedrock granite ridge. Clear water, grasses and mosses in water and on bottom (intermittent standing water). Surrounding vegetation includes dwarf birch, Labrador tea, alpine azalea, cloudberry, sedges, cottongrass, mosses, lichens. Sample: surface water, squeezed aquatic grasses.

Sample #7, eddy on the Back River (Fig. 65) July 19, 2016
65°54.663'N, 101°51.659'W Elevation 156 m pH 7.28, T 13.6 °C
Sunny area in a backwater of the Back River. Clear water, fine silt bottom. Aquatic plants in water. Sample: surface water, squeeze submerged roots/stems, difficult scrape of submerged rock.

Sample #8, wetland near Pelly Monument Camp at Pelly Lake (Fig. 66) July 20, 2016
65°56.431'N, 101°26.474'W Elevation 158 m pH 7.17, T 16.2 °C
Sunny area of patterned ground, filled with clear standing water. Vegetation includes aquatic plants, grasses, mosses, a few forbs, but no shrubs. Much goose scat, feathers, many molting geese ran off upon our arrival. Sample: surface water, squeezed submerged roots.

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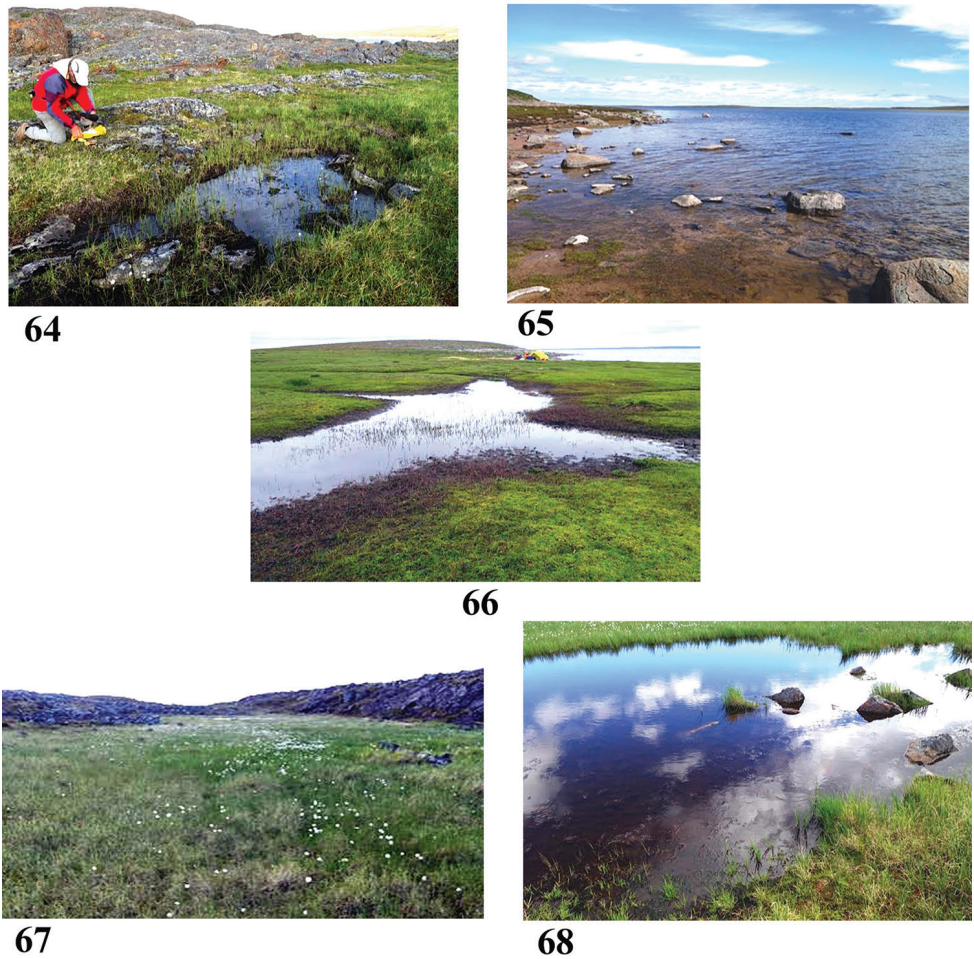
Figures 58–63. Collection sites along the Baillie and Back River corridors **58, 59** Site 1 (6856) **60** Site 2 (6857) **61** Site 3 (6858) **62** Site 4 (6859) **63** Site 5 (6860). Note microbial mat of red iron-oxidising bacteria in **59** Photos credit: Beverly Boynton.

Sample #9, pond on tundra near Cabin Camp (Figs 67, 68) July 22, 2016
65°53.784'N, 101°02.873'W Elevation 166 m pH 6.80, T, 15.7 °C
Long tundra pond in a swath of moist hummocks with cottongrass, situated between two granite ridges. Water possibly has channels that connect with Pelly Lake. Sunny, sediments and algae on bottom. Vegetation includes a few dwarf birch, Labrador tea, cottongrass, grass, moss. Many mosquitoes, a pair of red-necked phalaropes and snow buntings flew by. Sample: surface water, plant squeeze, rock scrape.



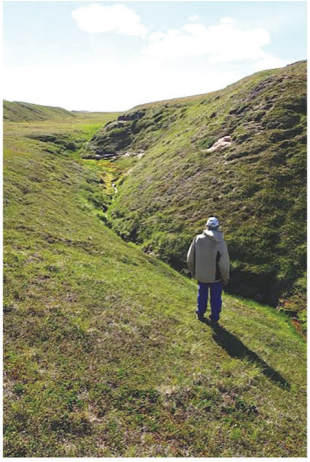
Figures 64–68. Collection sites along the Baillie and Back River corridors **64** Site 6 (6861) **65** Site 7 (6862) **66** Site 8 (6863) **67, 68** Site 9 (6864). Photos credit: Beverly Boynton.

Sample #10, Pelly Cove wetland (Figs 69, 70) July 24, 2016
65°53.931'N, 101°02.134'W Elevation 179 m pH 6.9, T 11.6 °C
Sunny area of clear water, bottom with sediments and *Sphagnum* moss, algae, surrounded by granite rocks. Vegetation includes Labrador tea, mountain cranberry, bog rosemary, grasses and mosses.

Sample #11, Mission Island rivulet (Figs 71, 72) July 26, 2016
65°54.380'N, 100°46.266'W Elevation 166 m pH 6.6, T 13.5 °C
Sample from pool of clear still water, partly shaded by willows, in small creek flowing down a broad swale between two tundra ridges. Bottom with algae, sediments, mosses. Surrounding vegetation includes willow, *Potentilla*, grass, moss. Sample: surface water, grass squeeze, scraped stick.

69

70



71

72

Figures 69–72. Collection sites along the Baillie and Back River corridors **69, 70** Site 10 (6865) **71, 72** Site 11 (6866). Photos credit: Beverly Boynton.

Hood River Corridor (Figures 73–97, Appendix 1: Plates 109–132)

The following account is taken from the field notes of Beverly Boynton:

Sampling was done while on a 27-day, 300-km canoe trip in Nunavut, from the headwaters of the Hood River to the north end of the peninsula dividing the Hood River mouth in Arctic Sound from Baillie Bay (both are in Bathurst Inlet of Coronation Gulf of the Arctic Ocean). Elevation at our put-in is 414 m and the mouth of the Hood is at sea level.

The Hood River is on the Central Continental Arctic portion of North America, on the Precambrian Canadian Shield. It lies between the Contwoyto Plateau to the south (a 450 m high plateau of gently rolling drift) and the Tree River uplands to the north and west (a lower, dissected granite plateau of smooth rock-knob hills with deep valleys) and flows through isolated, rugged tundra. For most of its length, the Hood is less than 150 km south of Coronation Gulf of the Arctic Ocean as it runs west to east. There are many areas of Precambrian granitic outcrops, but much of the surface along the river corridor is covered with extensive deposits from de-glaciation of the

Laurentide Ice Sheet, with areas of sorted and unsorted till and sediment, including sandy eskers, sand, mud and clay flats.

The lower half of the Hood has some metamorphic rocks of quartzite and slate, with clay tills. The Wilberforce Hills to the east are the dissected edge of the Contwoyto Plateau. About 50 km from its mouth, the Hood turns abruptly to the north in its run to the coast. The river then lies in a broad flood plain with evidence of previous salt-water incursions from when sea levels were higher.

Bathurst Inlet is a physiographic division of the Shield, with a major NNE to SSW fault forming the boundary between the uplands and the Coronation Gulf Lowlands. It is a complex submerged valley, a 200 km-long extension of the Coronation Gulf lowlands penetrating the Shield, with west-dipping diabase and basalt sills, often overlying basalt. The Queen Maud Lowlands lie to the east of the Inlet.

The river is all above the Arctic Circle, well above the treeline, with continuous permafrost and a thin active layer of soil. Lichen species were ubiquitous as were Ericaceae spp., dwarf birch, willow, alder, sedges and grasses. Mosses seemed less extensive than seen on other barren grounds trips; we identified 50 species of arctic wildflowers.

Unfortunately, strong headwinds prevented us from paddling to the actual estuary of the Hood in Arctic Sound and, even more disappointing, a hike to the tip of the peninsula ended on tall undercut bluffs that prevented a descent to the ocean at the northernmost point. For this reason, the final Hood River sample was about 8 km upstream from Arctic Sound and the first Bathurst Inlet sample (on east side of the peninsula) was perhaps half a mile to the south of the headlands of the peninsula.

The Hood River was very low this season, presumably due to low winter snow, an early snow and ice meltoff and lack of rain. Compared to a personal account by friends who paddled the river in 2013 and found it to be low water, this year the river was much lower.

There is considerable research being done on the arctic freshwater system in the face of climate change. Significant changes include rising surface air temperatures, warming permafrost and shrub encroachment on the northern tundra. Storage and cycling of fresh water on land has changed along with precipitation, river discharge, lake abundance and size and soil moisture.

In total, 16 samples of benthic diatoms were collected from water bodies along the Hood River corridor. (There is no sample #10.) The following field notes describe the sampling sites. Datum is WGS84, coordinates are latitude-longitude in degrees and decimal minutes; elevation is in metres. Place names are my own (BB) descriptive terms, sometimes adding nearby names from Canadian maps.

Sample #1, lake near headwaters of the Hood River (Figs 73, 74) July 2, 2017

66°34.513'N, 112°52.756'W Elevation 426 m pH 8.18, T 18.2 °C

Lake in dry uplands with no defined inlet/outlet, but surrounded by various low ridges with granite bedrock. Scrape was on rock with leafy black algae; water was clear but with glops of gold/brown floating on surface. Usual dwarf birch, Ericaceae, forbs mosses, lichens.

Sample #2, lake near Windy Point Camp, headwaters of the Hood River (Fig. 75) July 4, 2017

66°36.929'N, 112°28.089'W Elevation 415 m pH 5.72, T 15.9 °C

Lake in dry uplands with granite outcrops and boulders, in a valley between two ridges. Dwarf birch, sedges, bog rosemary, Labrador tea, cottongrass, mountain cranberry, lichens and mosses. Brown sediments and algae on bottom.

Sample #3, flowing stream (Fig. 76) Elevation unknown July 4, 2017

66°36.929'N, 112°28.089'W (coordinates approximate) pH 5.95, T 11.1 °C

Briskly flowing stream with bed of small granite boulders, sunny with some shade from banks. Sample is from a flat area of stream that is maybe an area of springs (the stream flows down a pretty good gradient for the area). Sample is from a quiet side pool. Green mosses, some sedges, tall willows.

Sample #4, moist hummocks (Figs 77, 78) July 8, 2017

66°39.164'N, 111°53.829'W Elevation 380 m pH 5.7, T 12.2 °C

Red moss, *Vaccinium*, scattered dwarf birch and Labrador tea. The tundra in general seems very dry this season. Sample was just an ooze in the hummocks.

Sample #5, large lake with short outlet to Hood (Figs 79, 80) July 8, 2017

66°38.165'N, 111°52.434'W Elevation 376 m pH 6.73, T 20.6 °C

Sample #6, wet meadow near Kapolak Camp (Figs 81, 82) July 11, 2017

66°37.970'N, 111°26.082'W Elevation 372 m pH 5.9, T 13.1 °C

Sedges, mosses, bottom with sediments and brown moss, sunny. In area of dwarf birch, Labrador tea.

Sample #7, Wright River (Figs 83, 84) July 15, 2017

66°50.173'N, 110°23.237'W Elevation 285 m pH 7.4, T 16.9 °C

Quiet pool on edge Wright River, a major tributary to the Hood River. Water clear, sunny, brown algae on rocks, no vegetation in water, the usual dwarf birch and tundra vegetation.

Sample #8, Wilberforce Hills, lake (Figs 85, 86) July 20, 2017

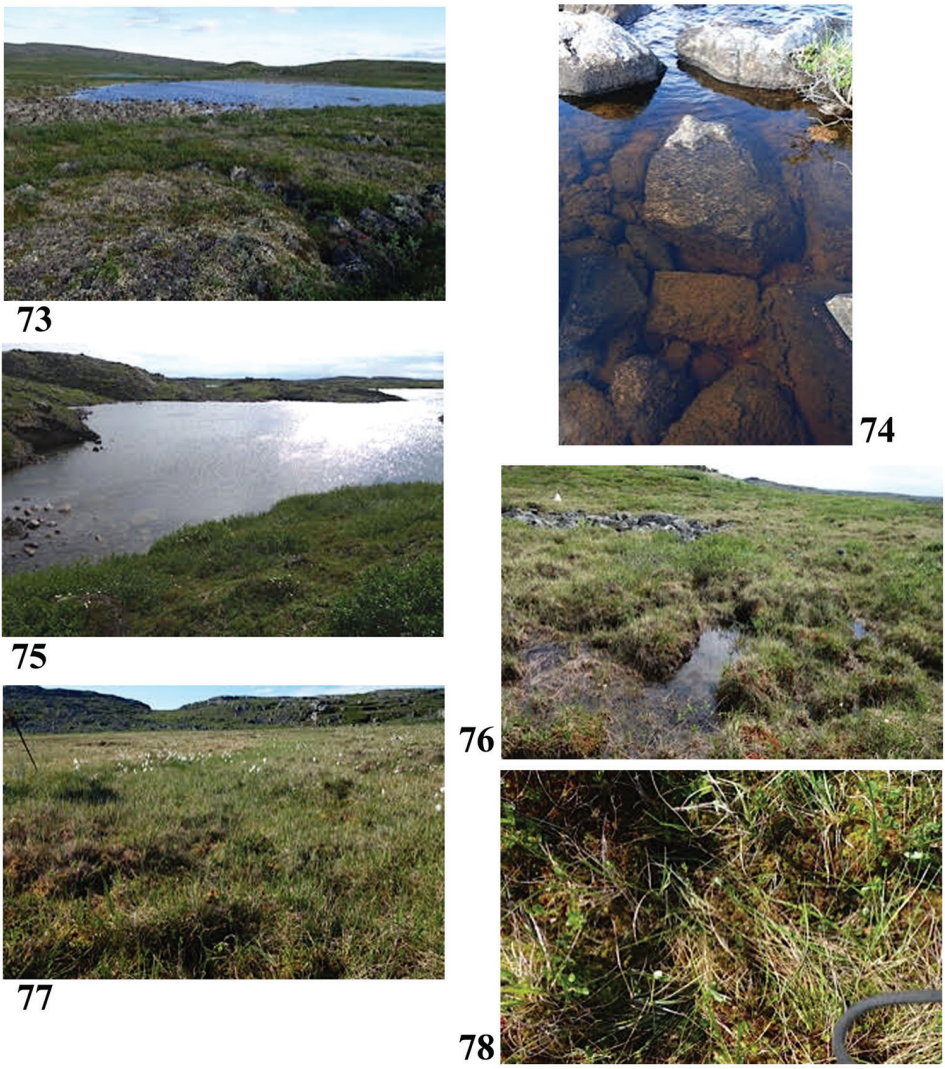
67°03.819'N, 108°40.383'W Elevation 273 m pH 7.24, T 11.8 °C

Large sunny lake with inlet from relatively high hills to the east and short outlet into the Hood River. Granite on shore, dwarf birch, willow, mosses, lichens, sedges, Ericaceae.

Sample #9, Hood River below Wilberforce Falls (Fig. 87) July 22, 2017

67°06.931'N, 108°49.194'W Elevation 35 m pH 6.80, T 15.7 °C

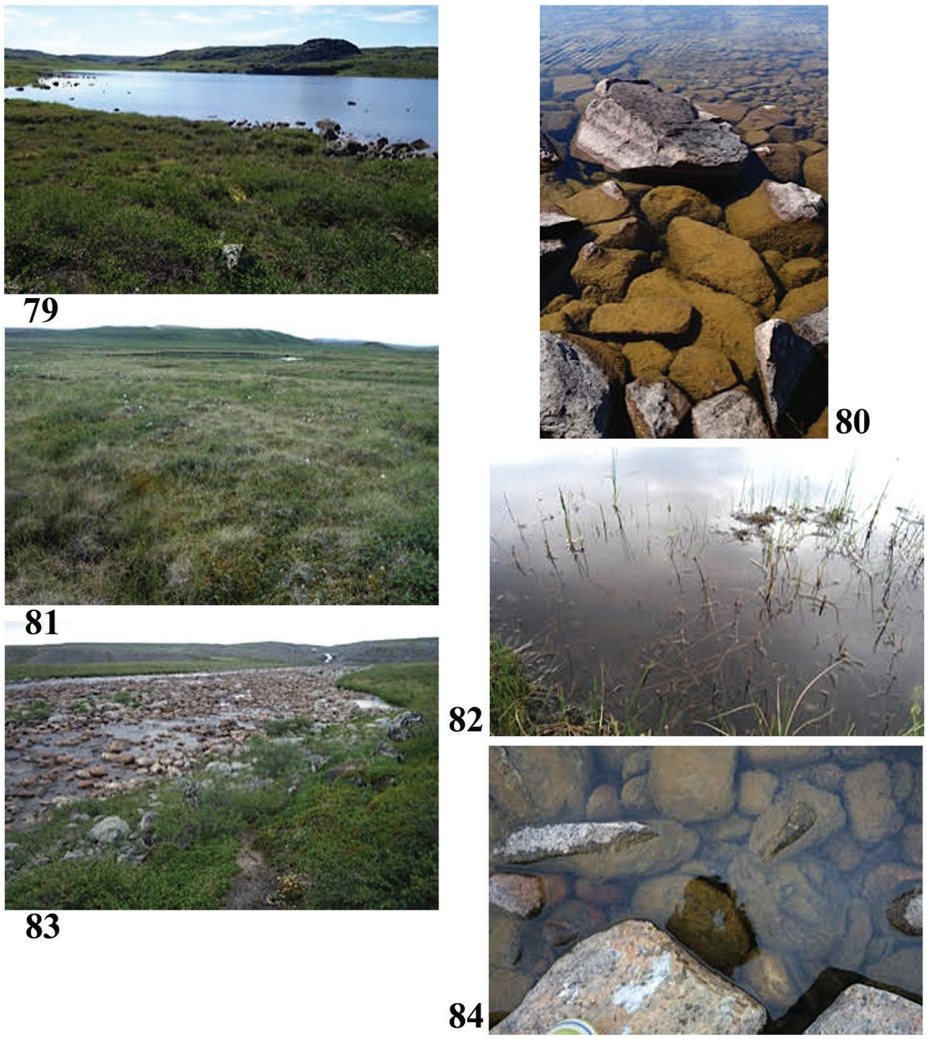
Tiny eddy with sand and gravel bottom, no plants or algae visible.



Figures 73–78. Collection sites along the Hood River corridor **73, 74** Site 1 (6898) **75** Site 2 (6899) **76** Site 3 (6900) **77, 78** Site 4 (6901). Photos credit: Beverly Boynton.

Sample #10, James River moist meadow (Fig. 88) July 23, 2017
67°12.274'N, 108°48.547'W Elevation 33 m pH 6.28, T 8.4 °C
Sample from standing water in a moist meadow to south of James River, a main tributary of the Hood River. Sedges, clear, sunny.

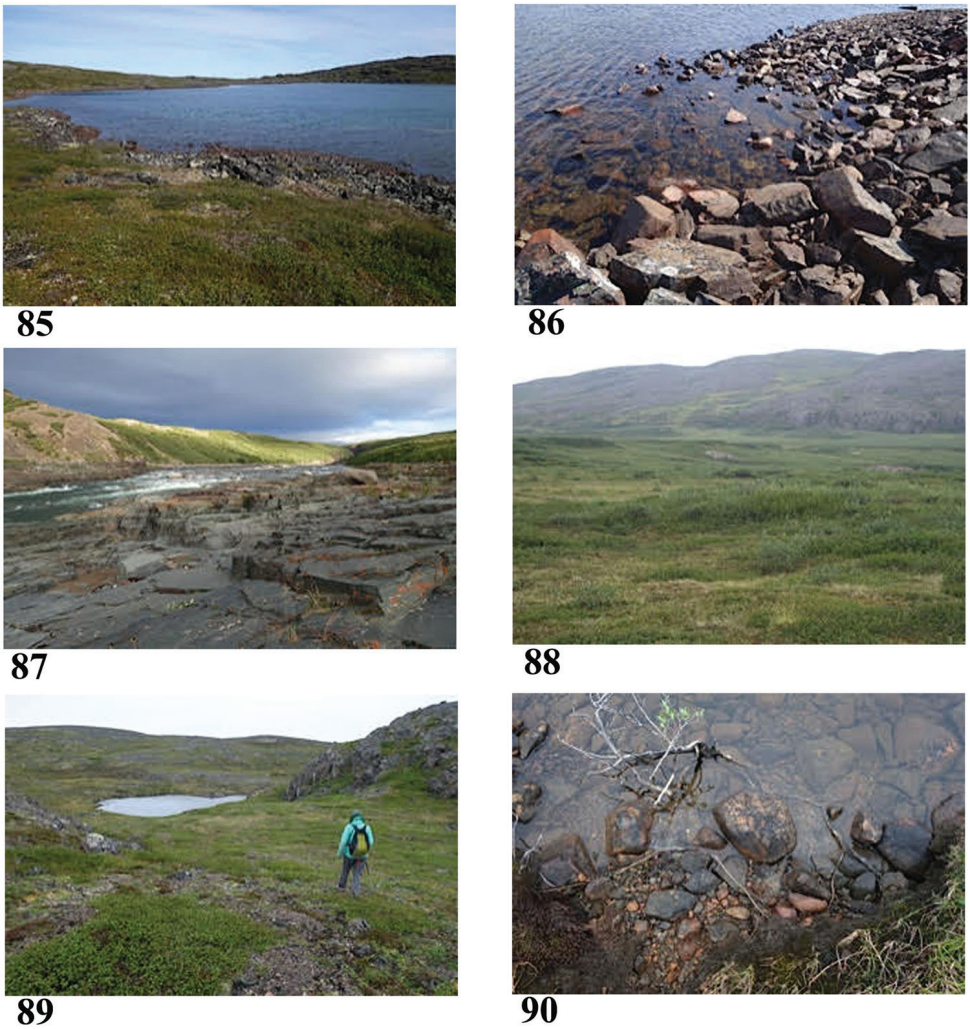
Sample #11, James River lake (Figs 89, 90) July 23, 2017
67°11.910'N, 108°50.912'W Elevation 236 m pH 7.26, T 13.0 °C



Figures 79–84. Collection sites along the Hood River corridor **79, 80** Site 5 (6902) **81, 82** Site 6 (6903) **83, 84** Site 7 (6904). Photos credit: Beverly Boynton.

Sample from a moderately large lake that drains into the James River, though drainage was dry. No definite inlet noted, but is in basin of granite ridges. Sunny area, but had started to rain.

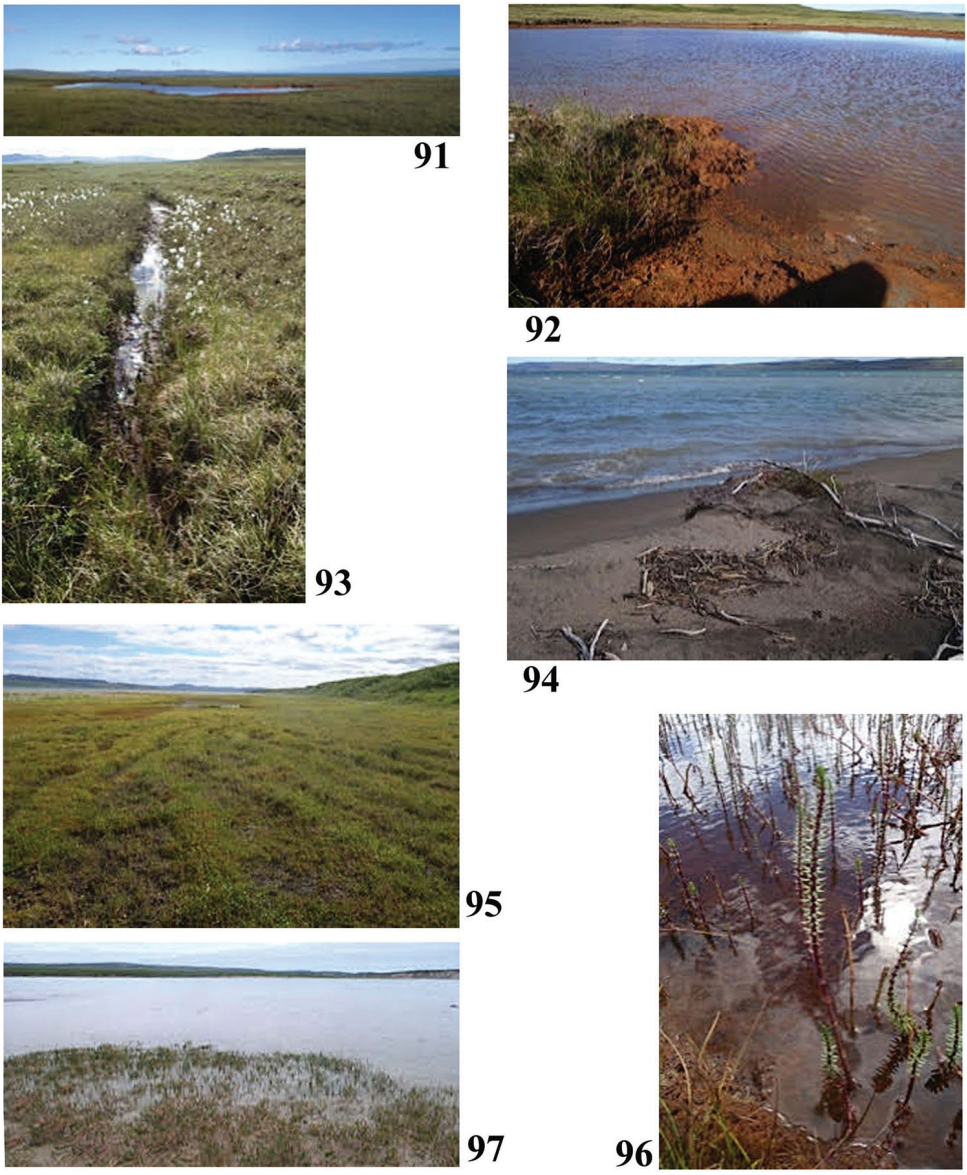
Sample #12, Red Sediment Lake (Figs 91, 92) July 27, 2017
67°23.024'N, 108°51.758'W (coordinates approximate) pH 8.5, T 13.7 °C
Sample from area of tundra on the peninsula that divides the final 8 km of the Hood River and its estuary from Baillie Bay. Dwarf birch, Ericaeae, sedges, cottongrass, heather, cranberry, willow. Includes a benthic sample.



Figures 85–90. Collection sites along the Hood River corridor **85, 86** Site 8 (6905) **87** Site 9 (6906) **88** Site 11 (6907) **89, 90** Site 12 (6908). Photo credits: Beverly Boynton, Raymond White (Fig. **88**).

Sample #13, ice wedge (Fig. 93) July 27, 2017
67°23.307'N, 108°51.931'W Elevation 23 m pH 5.9, T 16.1 °C
Moderately large ice wedge with standing water, on tundra of the peninsula that divides the final 8 km of the Hood River and its estuary from Baillie Bay. Dwarf birch, Ericaceae.

Sample #14, Arctic Sound of Bathurst Inlet (Fig. 94) July 27, 2017
67°24.994'N, 108°51.572'W Elevation 0 m pH 6.6, T 13.5 °C



Figures 91–97. Collection sites along the Hood River corridor **91, 92** Site 13 (6909) **93** Site 14 (6910) **94** Site 15 (6911) **95, 96** Site 16 (6912) **97** Site 17 (6913). Photos credit: Beverly Boynton.

Sample from sandy beach, with moderately strong north winds causing small surf. Area is somewhat south and east from the head of the peninsula that divides the final 8 km of the Hood River and its estuary from Baillie Bay. Tried to get surface water. No plants, sunny.

Table 6. Samples collected from the Hood River corridor in 2017. BB = Beverly Boynton; MDC = Montana Diatom Collection; MONTU = University of Montana Herbarium.

Sample Numbers		Habitat Type	Latitude (°N)	Longitude (°W)	Slide Numbers	
MDC	BB				MDC	MONTU
6898	1	lake	66.5752	-112.8793	136-37	49-72
6899	2	lake	66.6155	-112.4682	136-38	49-73
6900	3	stream	66.6155	-112.4682	136-39	49-74
6901	4	hummocks	66.6527	-111.8972	136-40	49-75
6902	5	lake	66.6361	-111.8739	136-41	49-76
6903	6	meadow	66.6328	-111.4347	136-42	49-77
6904	7	river	66.8362	-110.3873	136-43	49-78
6905	8	lake	67.0637	-108.6731	136-44	49-79
6906	9	river	67.1155	-108.8199	136-45	49-80
6907	11	meadow	67.2046	-108.8091	136-46	49-81
6908	12	lake	67.1985	-108.8485	136-47	49-82
6909	13	lake	67.3837	-108.8626	136-48	49-83
6910	14	pool	67.3885	-108.8655	136-50	49-84
6911	15	sandy beach	67.4166	-108.8595	136-51	49-85
6912	16	mud flat	67.4125	-108.8571	136-52	49-86
6913	17	river	67.3745	-108.8864	136-53	49-87

Sample #15, mare's tail flooded area, Baillie Bay (Figs 95, 96) July 27, 2017
67°24.752'N, 108°51.423'W Elevation 0 m pH 8.5, T 18.0 °C
Mud flat flooded with water, with mare's tails, sample from west side of Baillie Bay.

Sample #16, Hood River at last camp (Fig. 97) July 28, 2017
67°22.472'N, 108°53.183'W Elevation 5 m pH 7.14, T 9.6 °C
Sandy shore of Hood River, about 8 km upstream from its mouth in Arctic Sound.

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The authors are extremely grateful to Kalina Manoylov for shepherding our manuscript through reviews, and to reviewers Paul Hamilton, Katherine Johnson and Maria Saburova for their many helpful comments and corrections. We thank Brad Bahls, Stephanie Crowshoe, Doug MacNearney and Raymond White for assisting in the field.

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Appendix 1: Plates of diatom images

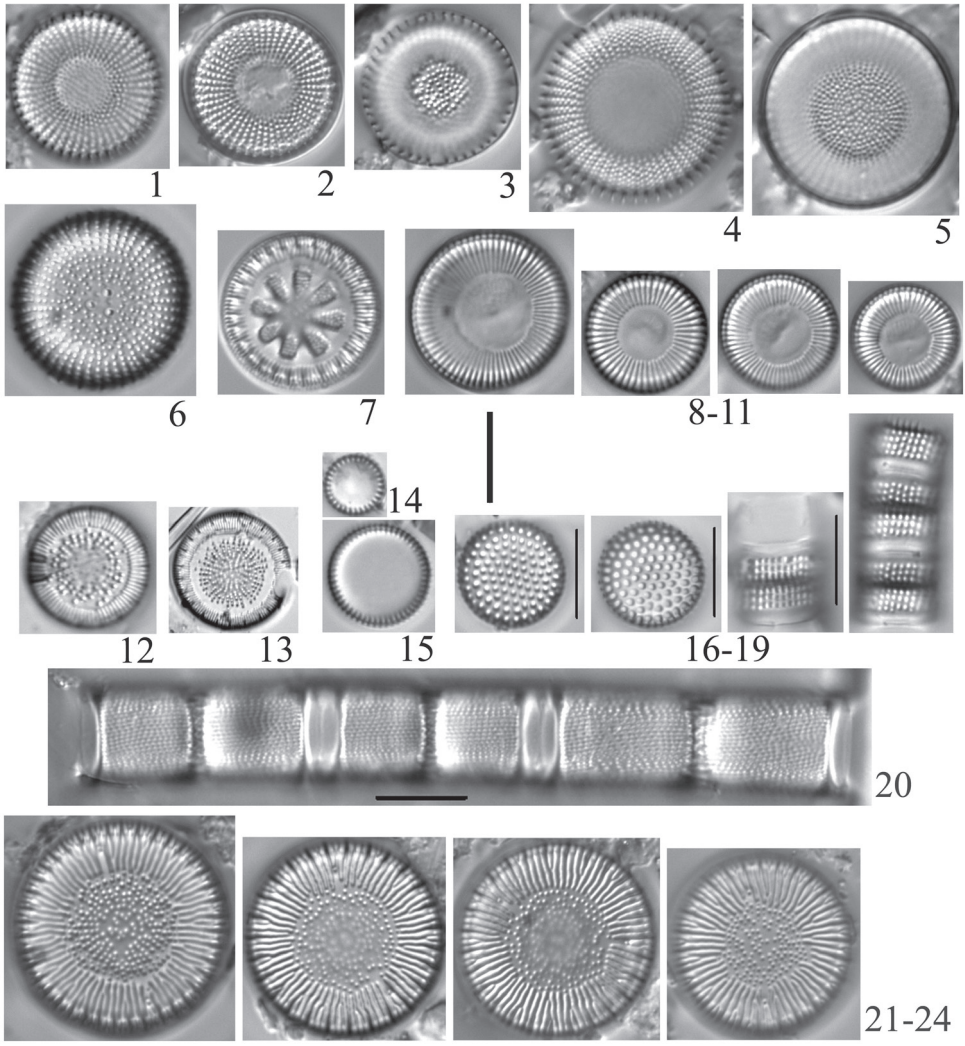

Plate 1. Waterton. **1–5** *Stephanodiscus alpinus* (4520, 4546). **2–3** and **4–5** are of the same valves **6** *Orthoseira roeseana* (4531) **7** *Lindavia antiqua* (4520) **8–11** *Cyclotella distinguenda* (4533) **12, 13** *Lindavia praetermissa* (4544) **14, 15** *Aulacoseira alpigena* (4569) **16–19** *Aulacoseira nivalis* (4569) **20** *Aulacoseira italica* (4536) **21–24** *Lindavia affinis* (4520). Scale bars: 10 µm.

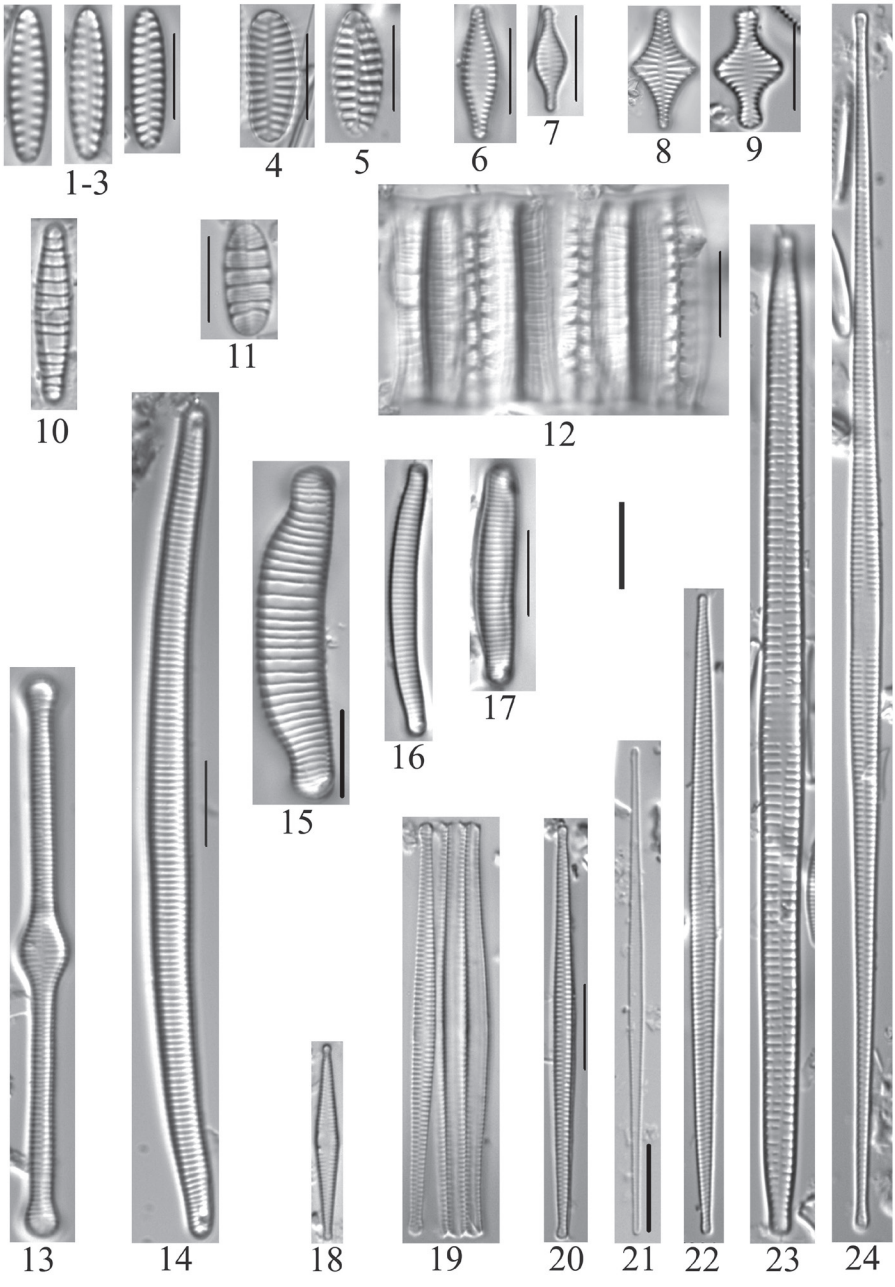

Plate 2. Waterton. **1–3** *Staurosirella lapponica* (4520, 4532, 4542) **4** *Staurosira* sp. (4545) **5** *Staurosirella* sp. [cf. *S. pinnata*] (4568) **6** *Pseudostaurosira brevistriata* var. *inflata* (4533) **7** *Staurosira oldenburgioides* (4562) **8** *Staurosirella* sp. [cf. *S. leptostauron*] (4562) **9** *Staurosira construens* (4542) **10** *Diatoma moniliformis* (4547) **11, 12** *Meridion lineare* (4532) **13** *Tabellaria flocculosa* (4520) **14** *Eunotia juettnerae* [*E. bilunaris* PH] (4538) **15** *Eunotia arcus* (4542) **16** *Eunotia botuliformis* (4520) **17** *Eunotia rhomboidea* (4569) **18** *Fragilaria* sp. (4520) **19** *Fragilaria crotonensis* (4532) **20, 22** *Fragilaria tenera* (4532) **21** *Fragilaria nanana* (4520) **23** *Ulnaria ulna* (4546) **24** *Synedra* sp. [cf. *S. acus* var. *delicatissima*] (4520). Scale bars: 10 µm.

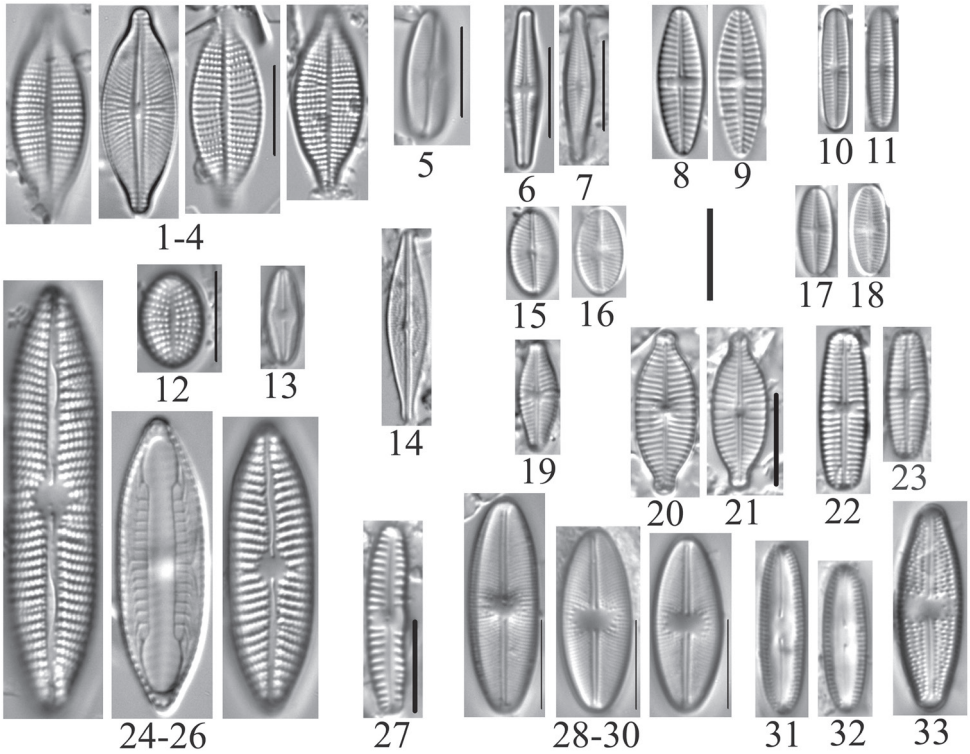

Plate 3. Waterton. **1–4** *Karayevia clevei* var. *bottnica* (4545) **5** *Eucocconeis alpestris* (4533) **6, 7** *Achnanthidium* sp. (4546, 4547) **8, 9** *Platessa conspicua* (4539) **10, 11** *Rossithidium pusillum* (4520) **12** *Cocconeis pseudothumensis* (4545) **13** *Diadesmis perpusilla* (4520) **14** *Brachysira microcephala* (4520) **15, 16** *Psammothidium* sp. [cf. *P. daonense* PH] (4569) **17, 18** *Psammothidium curtissimum* [*P. saccula* PH] (4520) **19** *Geissleria* (?) sp. (4520) **20, 21** *Geissleria similis* (4520, 4570) **22, 23** *Geissleria paludosa* (4520, 4542) **24–26** *Mastogloia grevillei* (4533) **27** *Reimeria* sp. [*R. sinuata* PH] (4520) **28–30** *Cavinula davisiae* (4562) **31, 32** *Diatomella balfouriana* (4562) **33** *Luticola mutica* (4561). Scale bars: 10 µm.

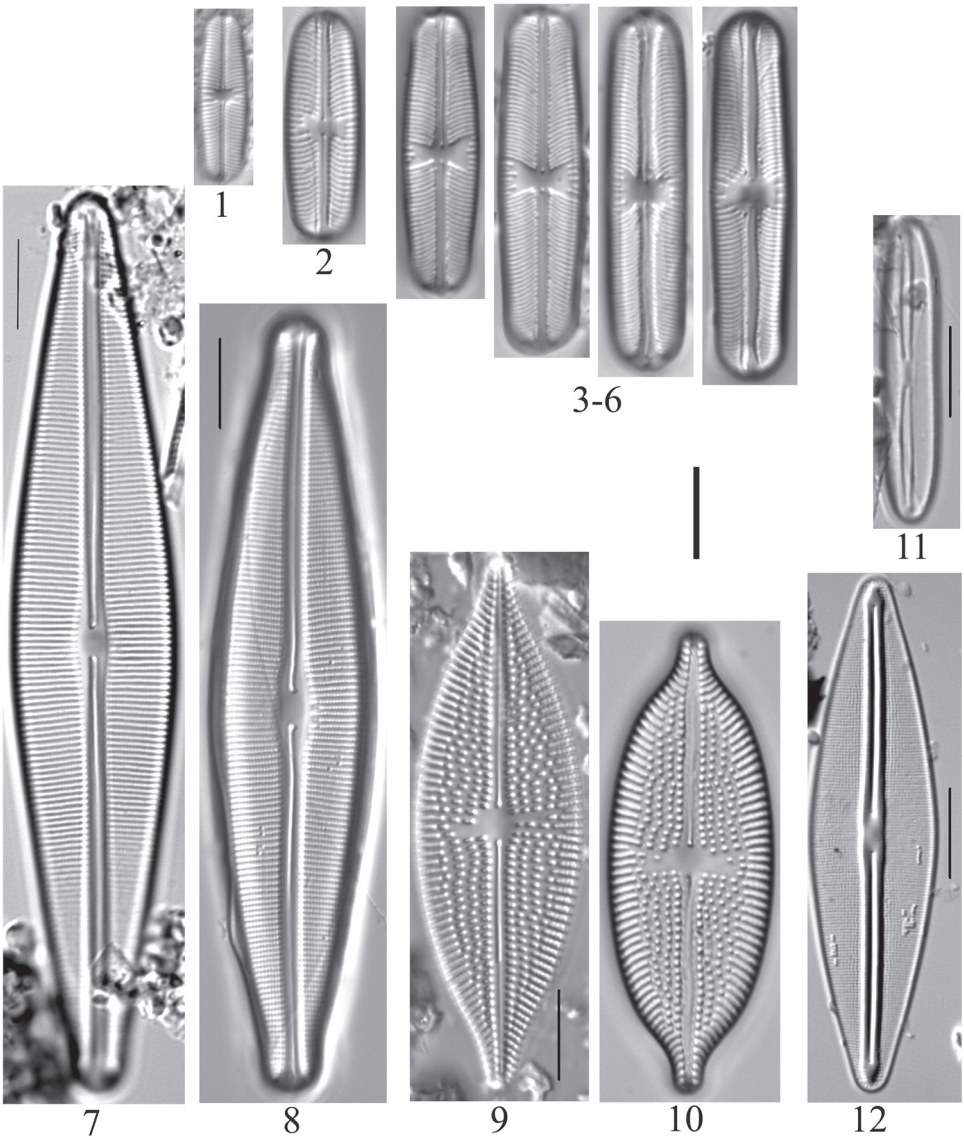

Plate 4. Waterton. **1** *Sellaphora pupula* (4570) **2** *Sellaphora laevissima* (4568) **3–6** *Sellaphora parapupula* (4520, 4531, 4542) **7** *Craticula sardiniana* (4543) **8** *Craticula johnstoniae* (4561) **9** *Aneumastus rostratus* (4547) **10** *Aneumastus tusculus* (4540) **11** *Frustulia amosseana* (4543) **12** *Frustulia saxonica* (4569). Scale bars: 10 µm.

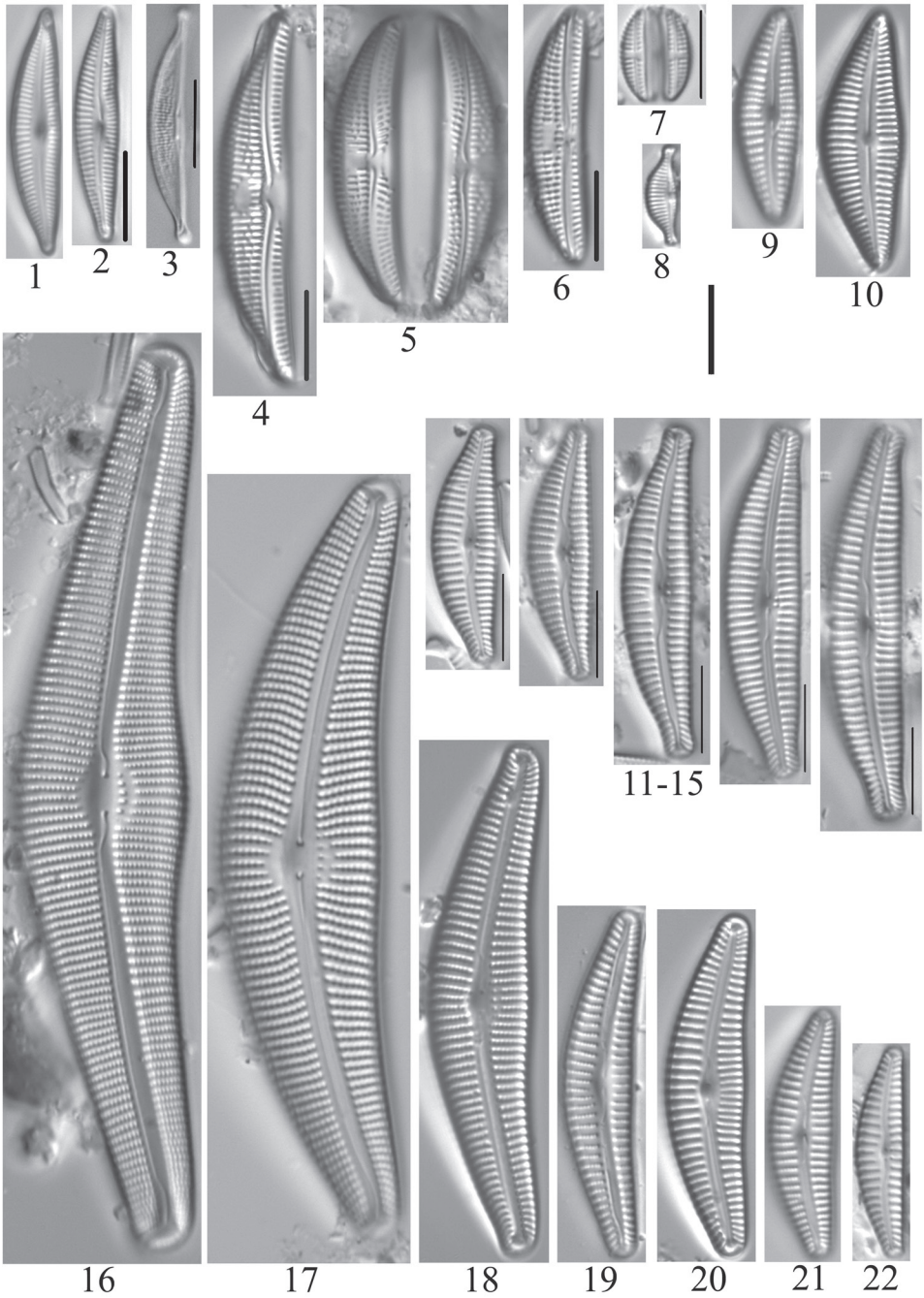

Plate 5. Waterton. **1, 2** *Delicata delicatula* (4534) **3** *Halamphora coraensis* (4543) **4, 5** *Amphora copulata* (4542, 4562) **6** *Amphora* sp. (4543) **7** *Amphora pediculus* (4562) **8** *Amphora thumensis* (4545) **9** *Cymbella neoleptoceros* (4542) **10** *Cymbella stigmaphora* (4534) **11–15** *Cymbella excisiformis* (4546). Valves in this population have two stigmata **16** *Cymbella neocistula* var. *islandica* (4520) **17** *Cymbella proxima* (4520) **18** *Cymbella neocistula* (4534) **19** *Cymbella alpestris* (4541) **20, 21** *Cymbella hantzschiana* (4534) **22** *Cymbella cosleyi* (4520). Scale bars: 10 μm.

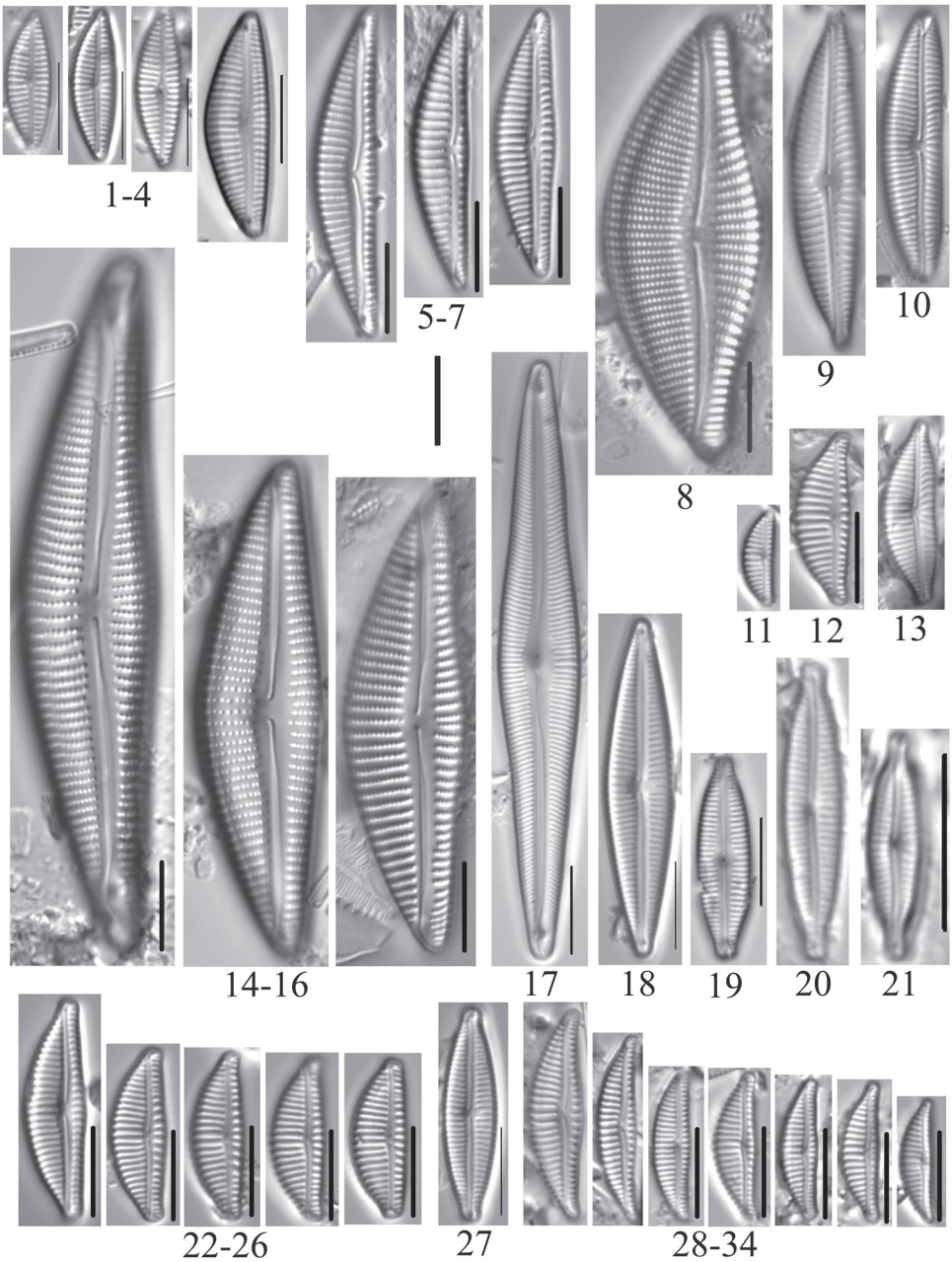

Plate 6. Waterton. **1–4** *Encyonema* sp. (4543, 4569) **5–7** *Encyonema procerum* [*E. silesiacum* sensu lato PH] (4542) **8** *Encyonema temperei* [cf. *E. temperei* PH] (4542) **9** *Encyonema hebridicum* (4569) **10** *Encyonema norvegicum* (4542) **11** *Encyonema minutum* (4520) **12** *Encyonema ventricosum* (4568) **13** *Encyonema hamsherae* (4570) **14–16** *Encyonema hintzii* (4539, 4542) **17** *Encyonopsis montana* (4545) **18** *Encyonopsis* sp. (4569) **19** *Encyonopsis* sp. (4569) **20** *Encyonopsis subminuta* (4520) **21** *Encyonopsis alpina* [*E. microcephala* PH] (4547) **22–26** *Encyonema ventricosum* (4520, 4568) **27** *Kurtkrammeria aequalis* (4569) **28–34** *Encyonema fogedii* (4520). Scale bars: 10 µm.

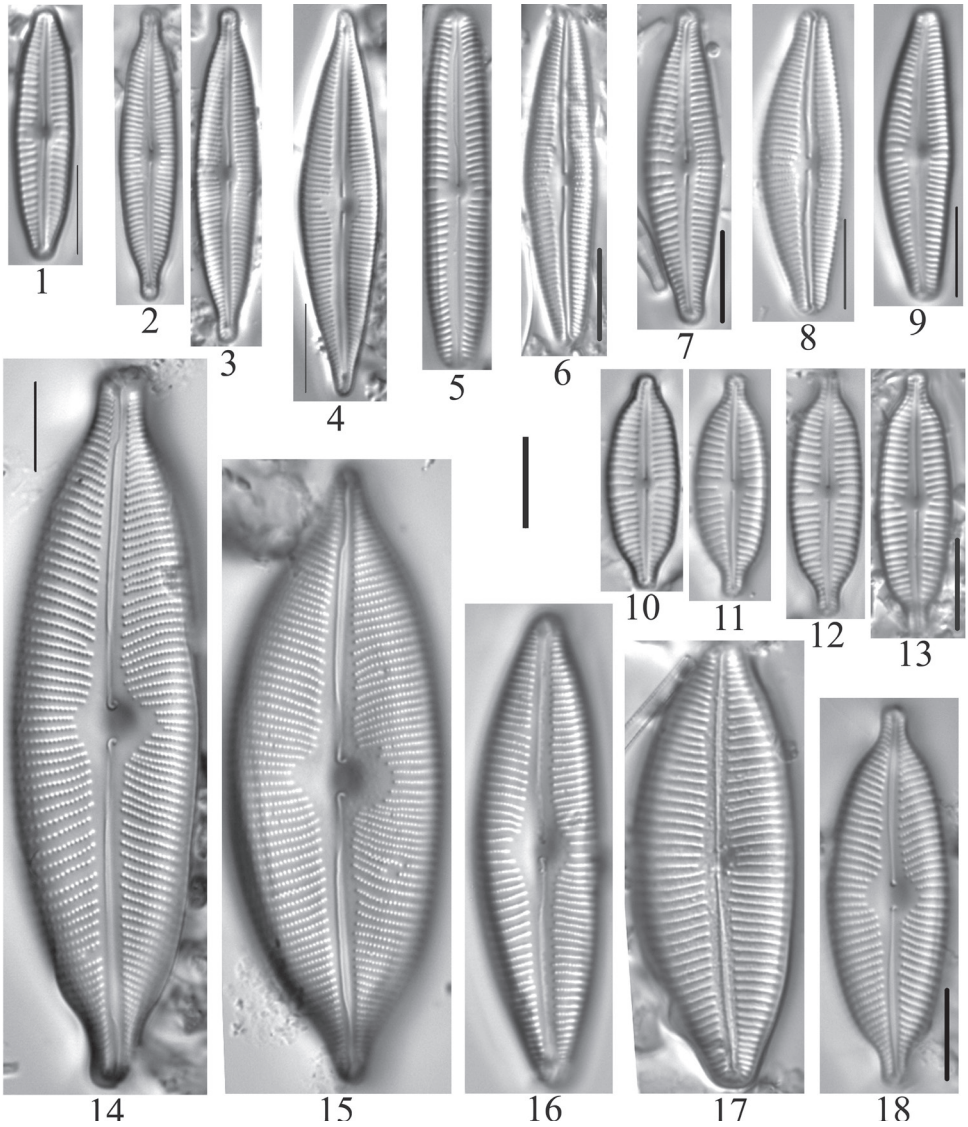

Plate 7. Waterton. **1** *Cymbopleura hybrida* (4533, 4545) **2, 3** *C. angustata* [*C. angustata* var. *tenuis* PH] (4533, 4544) **4** *C. lapponica* (4533, 4547) **5** *C. oblongata* (4533, 4546, 4547) **6** *C. incerta* [*C. incerta* var. *grunowii* PH] (4547) **7** *C. rupicola* [cf. *C. rupicola* PH] (4547) **8** *C. heilprinensis* [cf. *C. heilprinensis* PH] (4534) **9** *C. subaequalis* [cf. *C. florentina* PH] (4533, 4534, 4547) **10, 11** *C. amphicephala* [*C. similiformis* PH] (4520) **12, 13** *C. similiformis* (4533, 4547) **14** *C. subcuspidata* (4534, 4542) **15** *C. apiculata* (4540) **16** *C. rainierensis* [= *Cymbella gondwana*?] (4569) **17** *C. lata* (4545) **18** *C. anglica* (4520). Scale bars: 10 µm.

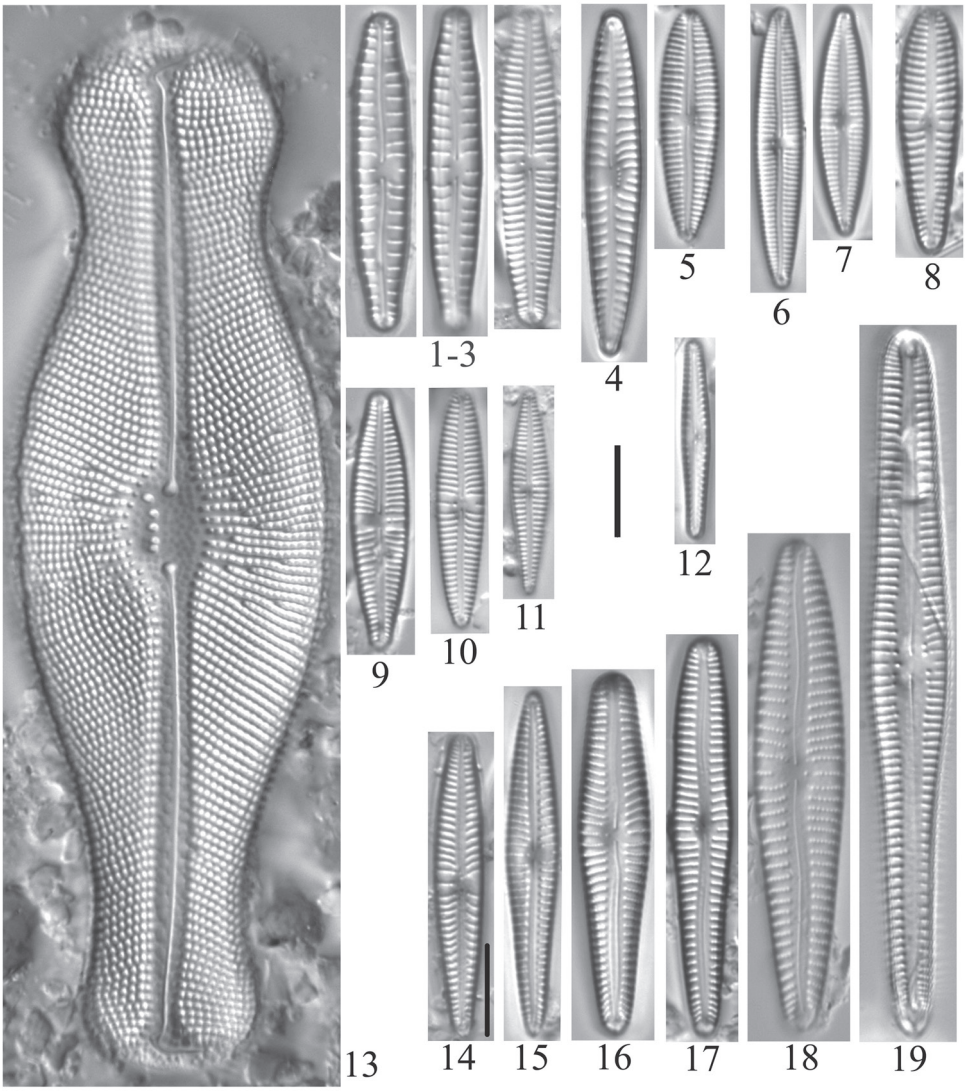

Plate 8. Waterton. **1–3** *Gomphonema sarcophagus* [Fig. **3** *Gomphonema* sp. PH] (4532, 4536) **4, 5** *Gomphonema multipunctatum* (4536) **6, 7** *Gomphonema hebridense* (4531, 4539) **8** *Gomphonema minutum* (4520) **9** *Gomphonema exilissimum* (4532) **10** *Gomphonema* sp. (4539) **11** *Gomphonema auritum* (4570) **12** *Gomphonema pygmaeum* (4520) **13** *Didymosphenia geminata* (4547) **14** *Gomphonema longilineare* [*G. cymbelliclinum* PH] (4547) **15** *Gomphonema acidoclinatum* (4543) **16, 17** *Gomphonema subclavatum* (4536, 4538, 4540) **18** *Gomphonema affine* (4531) **19** *Gomphonema* sp. (4536). Scale bars: 10 µm.

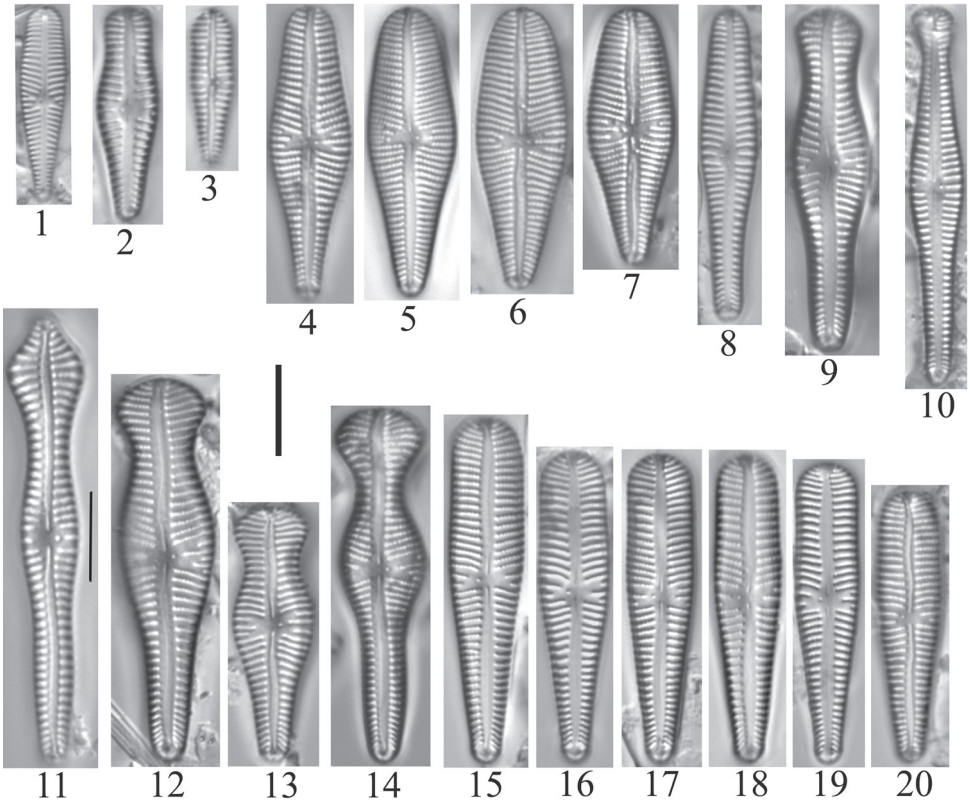

Plate 9. Waterton. **1** *Gomphosinica geitleri* (4520) **2** *Gomphonema* sp. [cf. *G. capitatum*] (4543) **3** *Gomphonema angusticephalum* (4542) **4–7** *Gomphonema pala* (4539) **8** *Gomphonema* sp. (4520) [cf. *Gomphonema angusticlavatum* or cf. *G. subclavatum* (KJ)] **9** *Gomphonema capitatum* (4532) **10** *Gomphonema subtile* (4542) **11** *Gomphonema brebissonii* sensu lato (4543) **12, 13** *Gomphonema truncatum* sensu lato (4545) **14** *Gomphonema anglicum* (4542) **15–20** *Gomphonema* sp. [*G. sublaticollum* (KJ)] (4562, 4570). Scale bar: 10 μm.

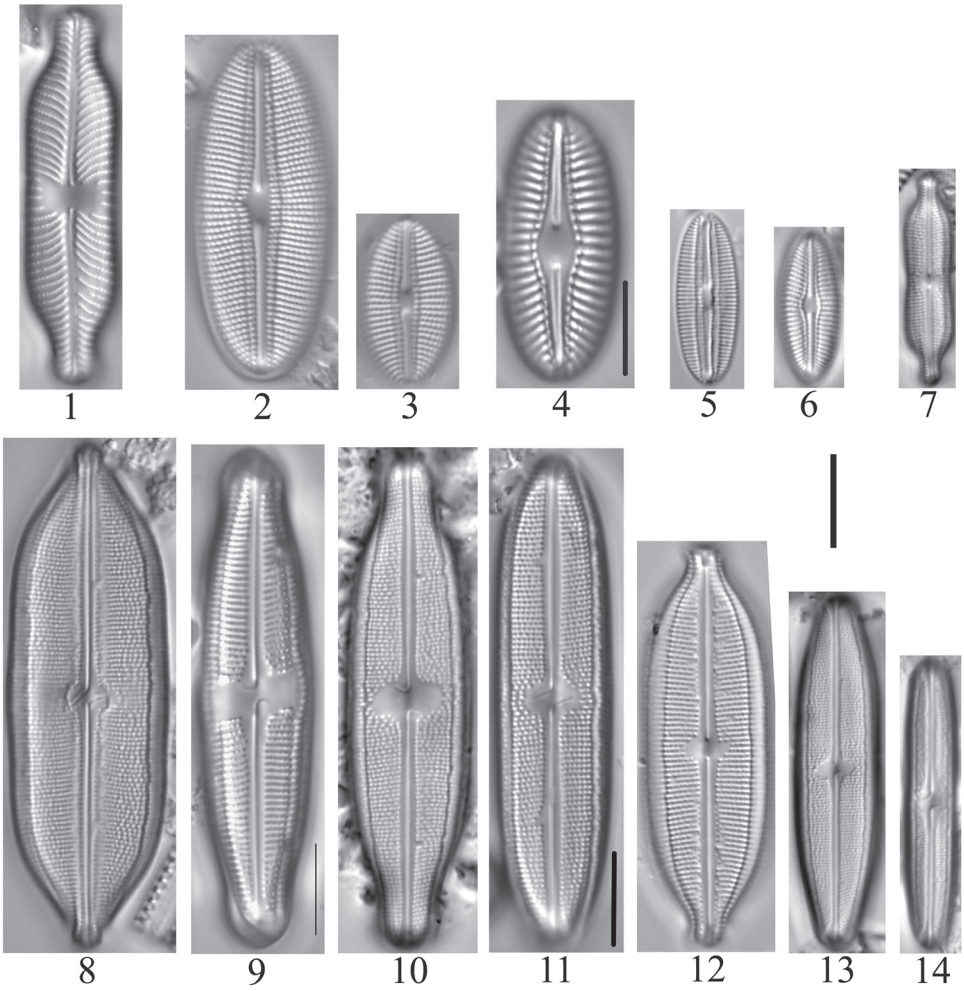

Plate 10. Waterton. **1** *Placoneis abiskoensis* (4542, 4545) **2, 3** *Diploneis parma* (4520) **4** *Diploneis pseudovalis* (4543) **5** *Diploneis oculata* (4533) **6** *Diploneis oblongella* (4533) **7** *Neidiomorpha binodiformis* (4533) **8** *Neidium apiculatum* (4542) **9** *Neidium fogedii* (4543) **10** *Neidium affine* var. *longiceps* [*Neidium* sp. PH] (4570) **11** *Neidium* sp. (4543) **12** *Neidium dubium* (4520, 4542) **13** *Neidium affine* [*Neidium potapovae* PH] (4569) **14** *Neidium bisulcatum* (4532). Scale bars: 10 µm.

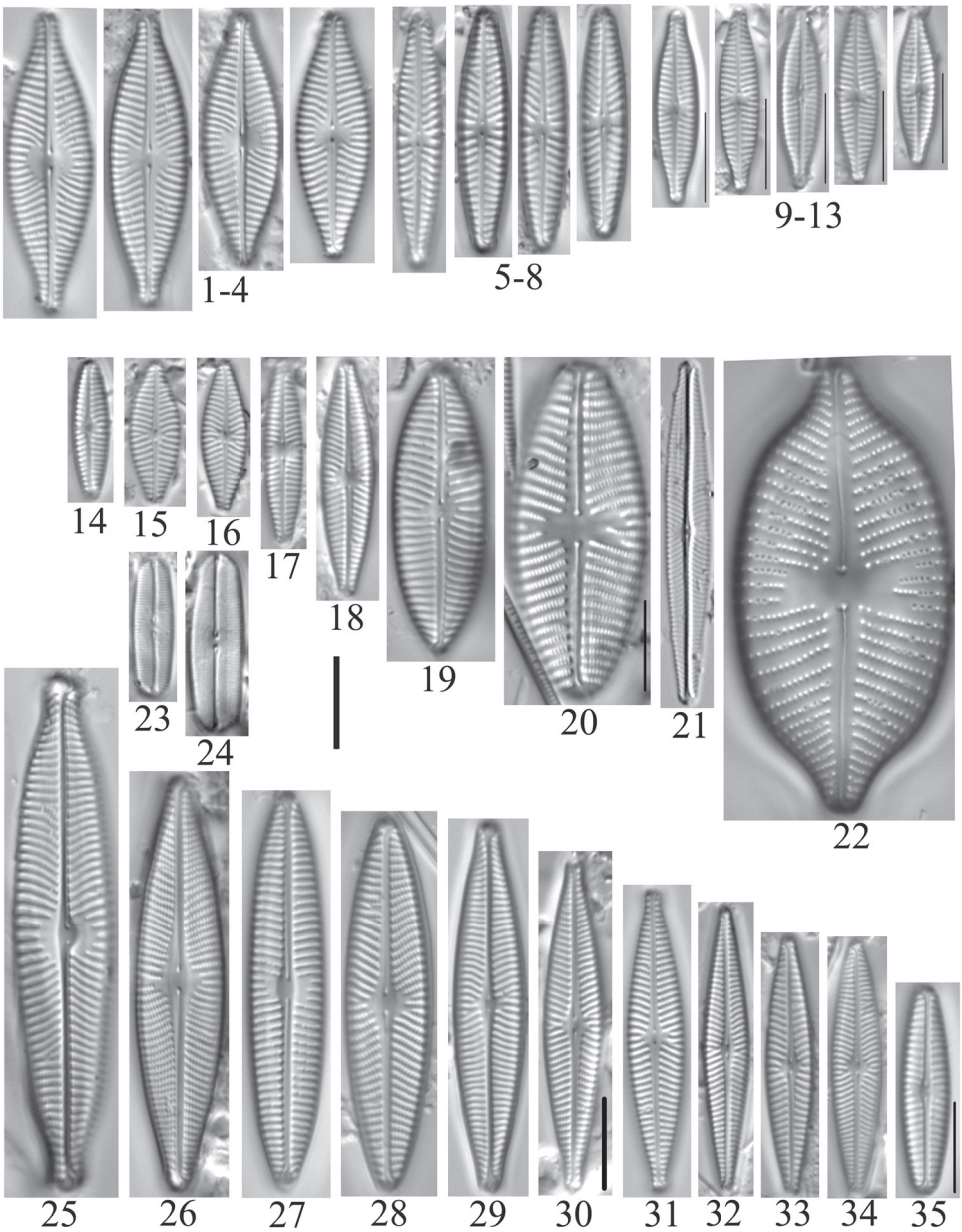

Plate 11. Waterton. **1–4** *Navicula caroliniae* (4532, 4539, 4570) **5–8** *N. seibigiana* (4533) **9–13** *N. trilatera* (4533) **14** *N. arctotenelloides* (4520) **15** *N. antonii* (4570) **16** *N. reichardtiana* (4570) **17** *N. veneta* [cf. *N. veneta* PH] (4570) **18** *N. lundii* (4562) **19** *N. upsaliensis* (4545) **20** *N. reinhardtii* (4545) **21** *N. leptostriata* (4569) **22** *N.* (*Placoneis*) *amphibola* (4540) **23** *N. lenzii* (4545) **24** *N. subhamulata* (4520) **25** *N. viridulacalcis* (4568) **26** *N. trivialis* (4533) **27** *N. tripunctata* (4562) **28** *N. weberi* (4520) **29** *N. schweigeri* (4546, 4568) **30, 31** *N. wildii* (4534, 4545, 4547, 4568) **32** *N. cryptotenella* (4520) **33** *N. notha* [*Navicula* sp. PH] (4533, 4540, 4541 4542) **34** *N.* sp. (4520) **35** *N. libonensis* (4545). Scale bars: 10 μm.

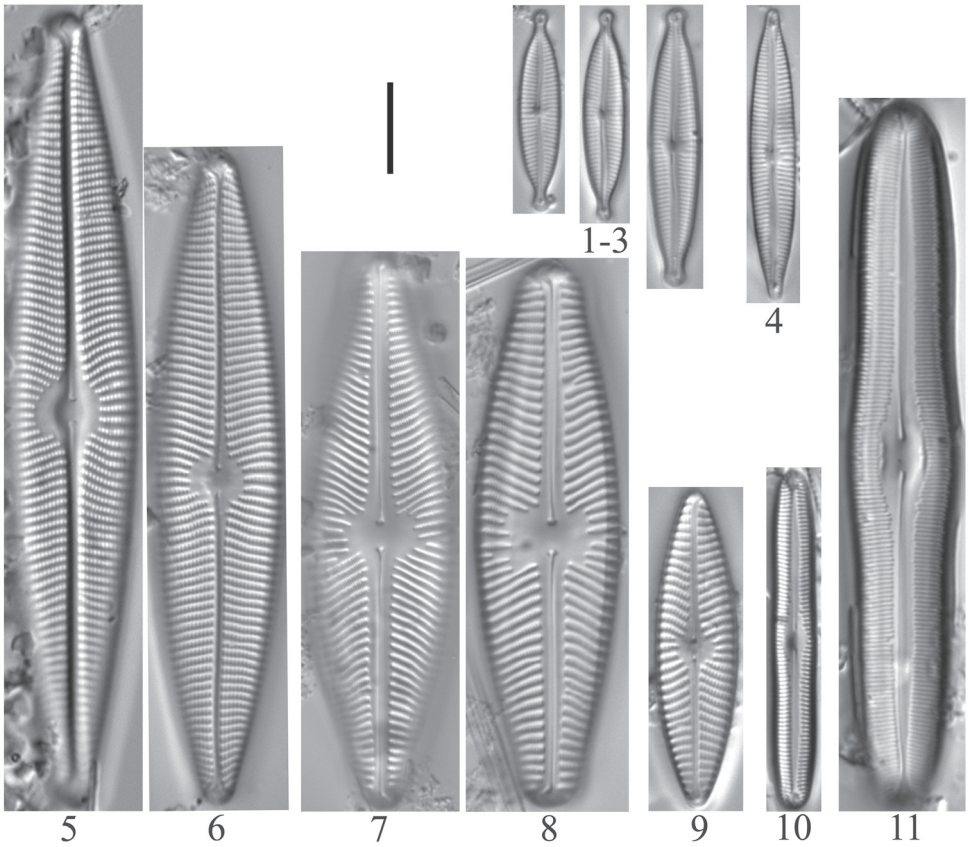

Plate 12. Waterton. **1–3** *Encyonopsis czarneckii* [*E. alpina* or *E. subminuta* PH] (4533) **4** *Encyonopsis cesatii* (4533) **5, 6** *Navicula vulpina* (4520) **7, 8** *Navicula aurora* (4520) **9** *Navicula weberi* (4520) **10** *Caloneis tenuis* (4520) **11** *Caloneis* sp. (4532). Scale bar: 10 µm.

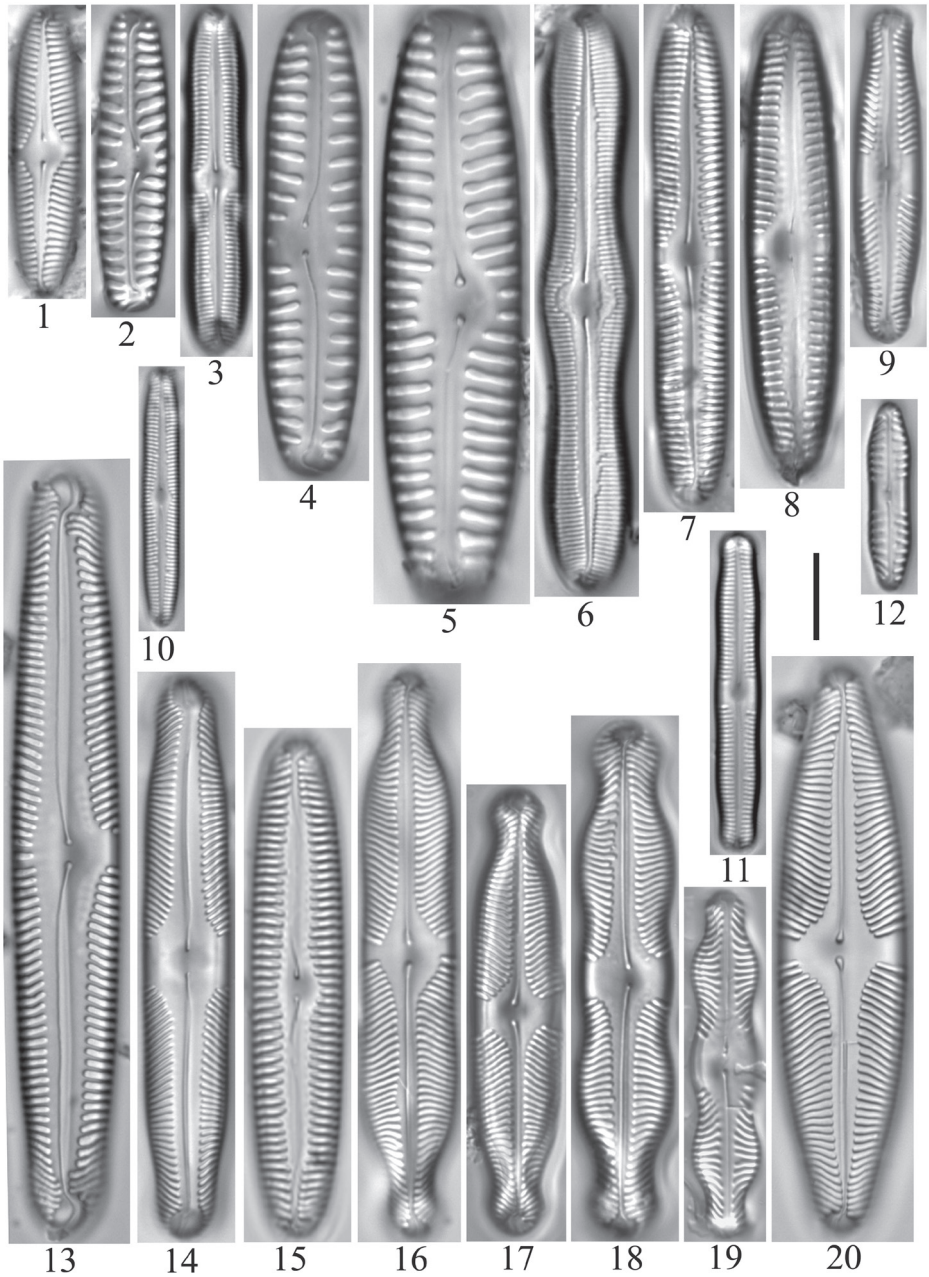

Plate 13. Waterton. **1** *Pinnularia brebissonii* (4570) **2** *Pinnularia borealis* (4561) **3** *Caloneis* sp. [*C. bacillum* sensu lato PH] (4531) **4** *Pinnularia borealis* var. *scalaris* (4561) **5** *Pinnularia rabenhorstii* (4561) **6** *Caloneis schumanniana* (4543, 4547) **7** *Pinnularia crucifera* (4543) **8** *Pinnularia isostauron* (4561) **9** *Pinnularia lunata* (4531) **10** *Caloneis tenuis* (4520) **11** *Caloneis undulata* [*Caloneis* sp. PH] (4520, 4540, 4543) **12** *Pinnularia obscura* (4568) **13** *Pinnularia sudetica* (4569) **14** *Pinnularia microstauron* (4537, 4543) **15** *Pinnularia viridis* [*P. complexa* var. *minor* PH] (4531) **16** *Pinnularia biceps* (4569, 4570) **17** *Pinnularia anglica* [*P. biceps* PH] (4534) **18** *Pinnularia septentrionalis* (4568) **19** *Pinnularia turbulenta* (4534) **20** *Pinnularia pseudosuchlandtii* (4569). Scale bar: 10 μm.

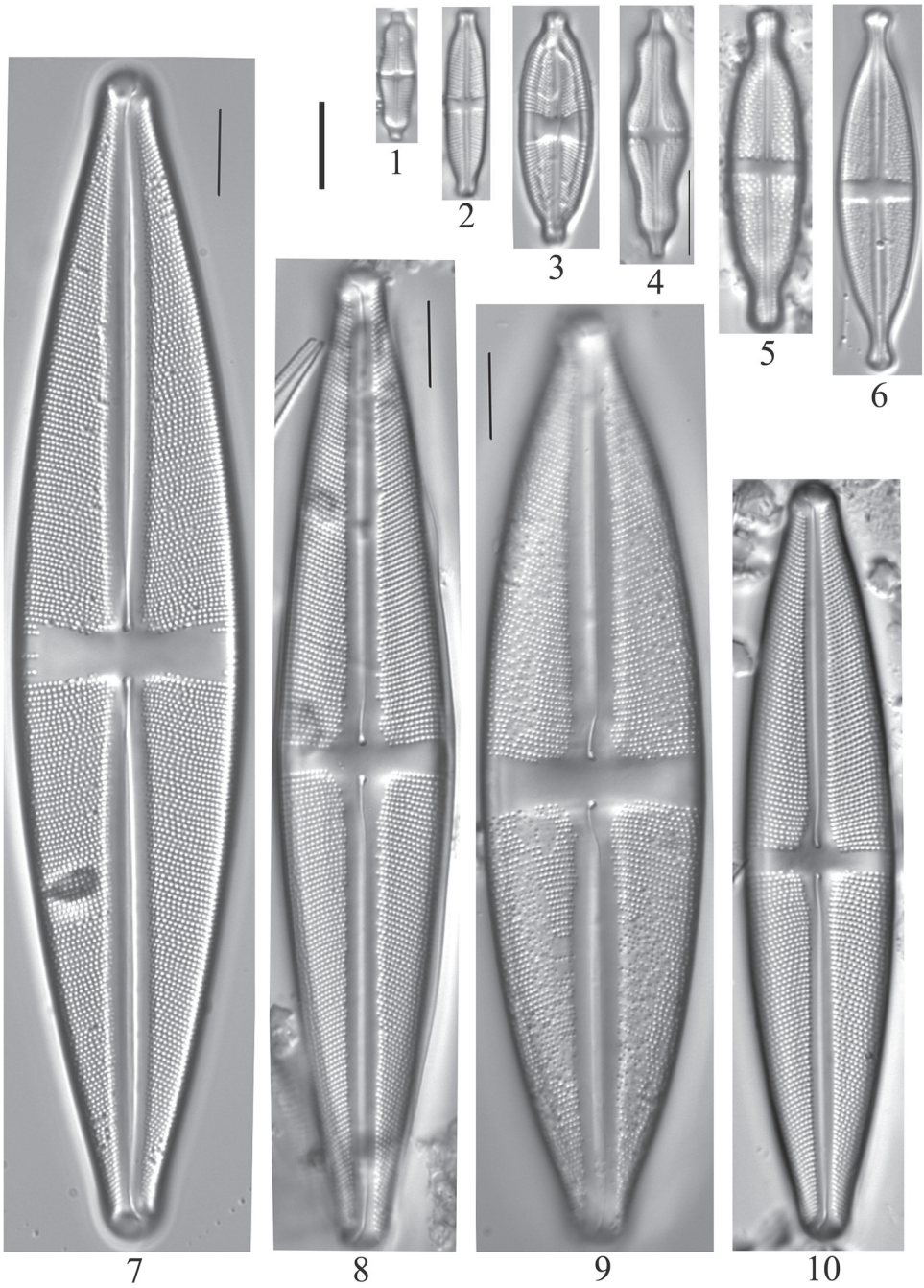

Plate 14. Waterton. **1** *Stauroneis separanda* (4532) **2** *Stauroneis kriegeri* (4562) **3** *Stauroneis* sp. (4535) **4** *Stauroneis smithii* (4562) **5** *Stauroneis lauenburgiana* (4532) **6** *Stauroneis kootenai* (4561) **7** *Stauroneis heinii* (4541, 4561) **8** *Stauroneis phoenicenteron* (4532, 4539) **9** *Stauroneis circumborealis* (4561) **10** *Stauroneis gracilis* (4532, 4539). Scale bars: 10 µm.

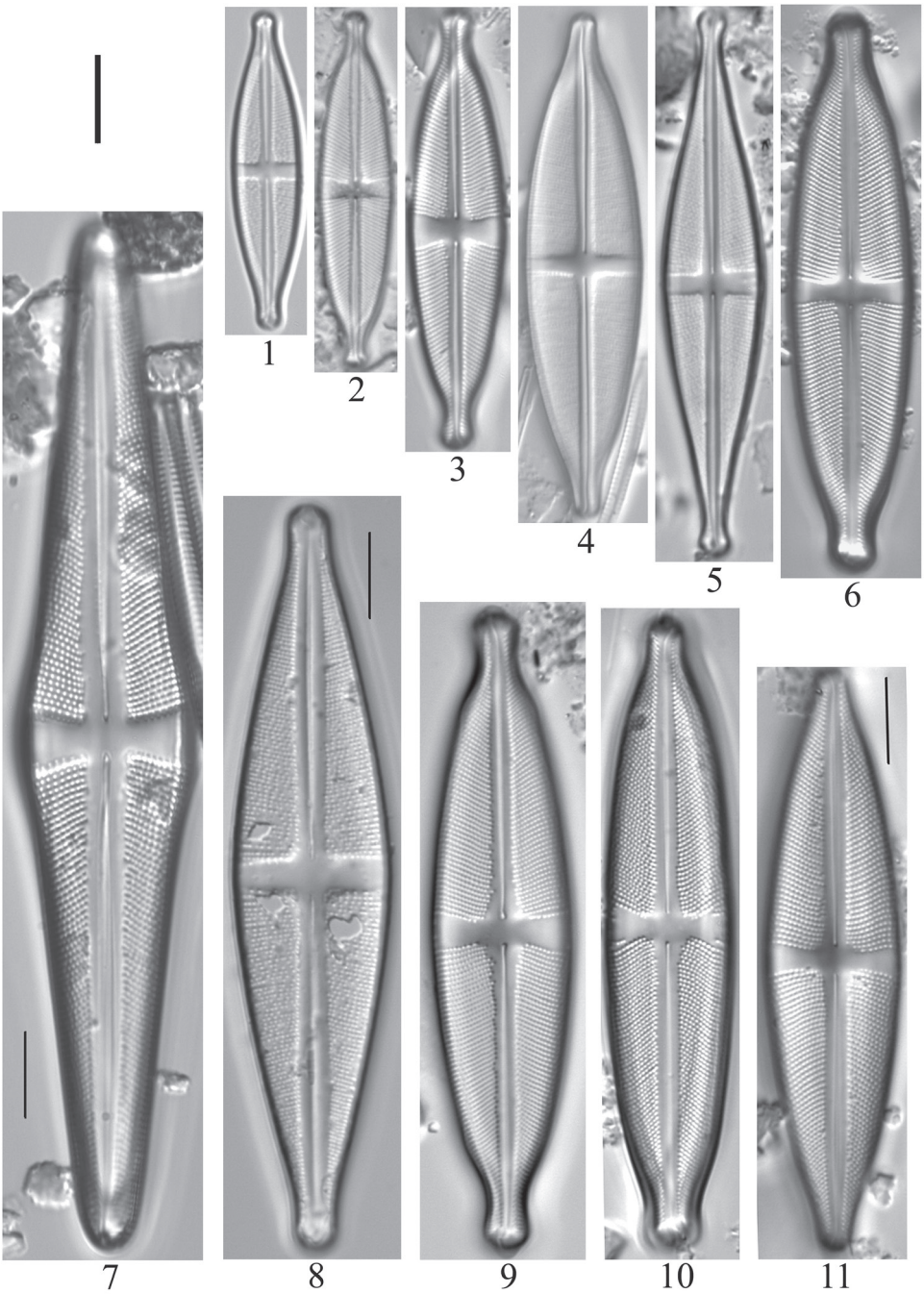

Plate 15. Waterton. **1** *Stauroneis* sp. [cf. *S. silvahassiaca*] (4543) **2** *Stauroneis reichardtii* (4561, 4570) **3** *Stauroneis vandevijveri* (4533, 4534, 4539, 4570) **4** *Stauroneis siberica* (4520) **5** *Stauroneis pikuni* (4532) **6** *Stauroneis jarensis* (4532) **7** *Stauroneis acuta* (4539) **8** *Stauroneis akamina* (4561) **9** *Stauroneis amphicephala* (4542) **10** *Stauroneis pax* (4530, 4547) **11** *Stauroneis conspicua* (4520, 4533, 4534). Scale bars: 10 µm.

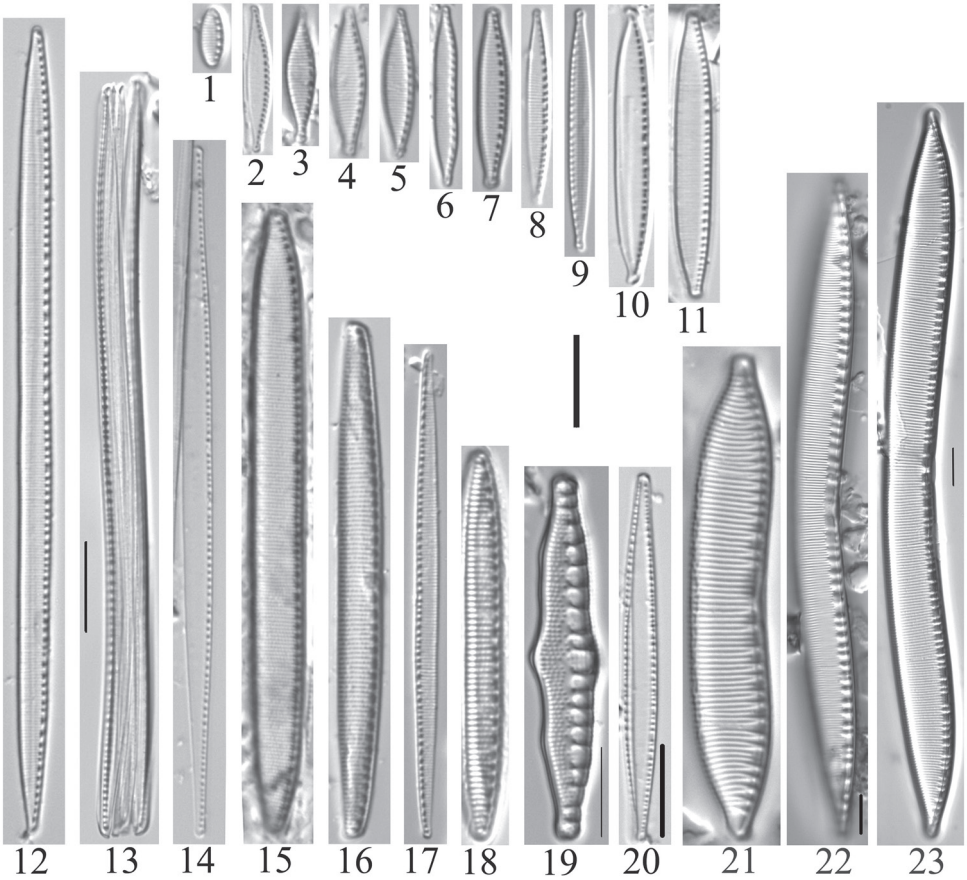

Plate 16. Waterton. **1** *Nitzschia inconspicua* (4520) **2** *Nitzschia lacuum* (4542) **3, 4** *Nitzschia bacillum* (4520, 4533) **5** *Nitzschia fonticola* var. *pelagica* [*Nitzschia bacillum* PH] (4520) **6** *Nitzschia acidoclinata* (4540) **7** *Nitzschia alpina* (4568) **8, 9** *Nitzschia perminuta* (4541, 4542) **10** *Nitzschia* sp. [*Nitzschia palea* sensu lato PH] (4533) **11** *Nitzschia palea* (4520) **12** *Nitzschia diversa* or *N. gessneri* (4536, 4542) **13** *Nitzschia vermicularis* (4562) **14** *Nitzschia gracilis* (4520) **15** *Nitzschia regula* var. *robusta* (4547) **16** *Nitzschia frauenfeldii* (4541) **17** *Nitzschia radicula* (4539) **18** *Nitzschia amphibia* (4541) **19** *Nitzschia sinuata* (4540) **20** *Nitzschia pura* (4520) **21** *Hantzschia abundans* (4531) **22, 23** *Hantzschia elongata* (4531, 4540, 4541). Scale bars: 10 µm. Note different scale for images in figures 22 and 23.

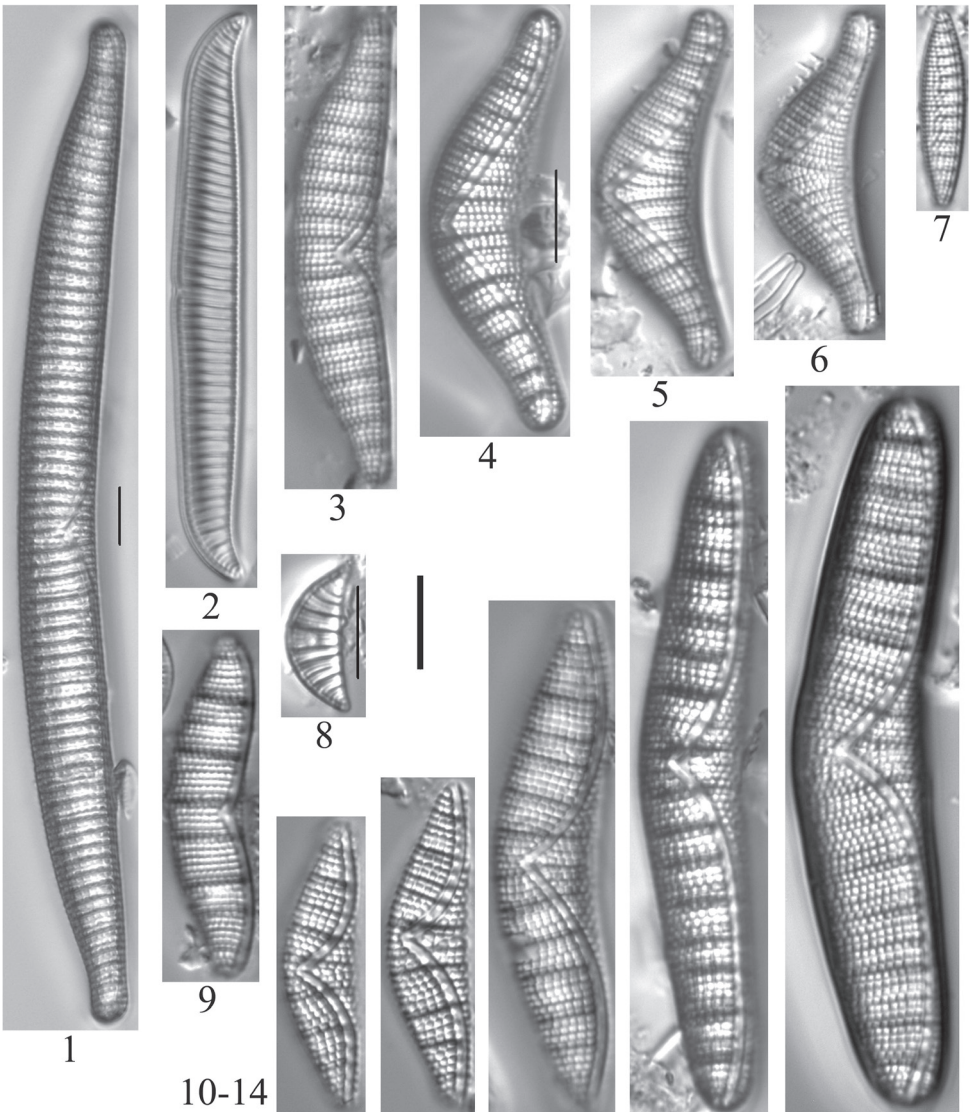

Plate 17. Waterton. **1** *Epithemia turgida* var. *granulata* (4541) **2** *Rhopalodia gibba* (4533) **3** *Epithemia adnata* (4532) **4–6** *Epithemia smithii* (4520, 4535) **7** *Denticula kuetzingii* (4544) **8** *Rhopalodia operculata* (4570) **9** *Epithemia* sp. (4543) **10–14** *Epithemia argus* (4541, 4543). Scale bars: 10 µm.

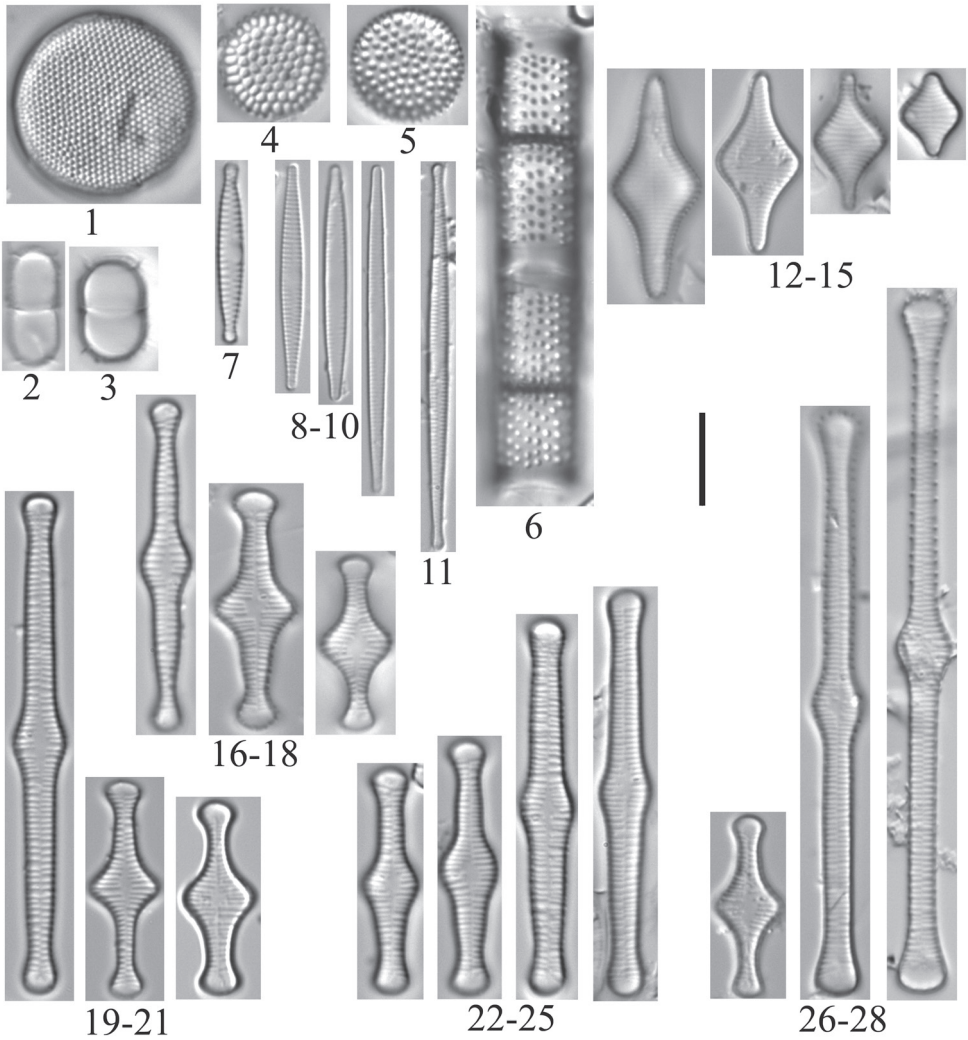

Plate 18. Haida Gwaii. **1** *Thalassiosira* sp.? (6890) **2, 3** *Melosira nummuloides* (6890) **4** *Coscinodiscus* sp. (6890) **5** *Aulacoseira* sp. (5064) **6** *Aulacoseira crassipunctata* (5065) **7** *Fragilaria vaucheriae* (5067) **8–10** *Fragilaria capucina* var. *rumpens* (5063, 5066, 5067) **11** *Fragilaria capucina* (5066) **12–15** *Fragilariforma polygonata* (?) (5064) **16–28** *Tabellaria flocculosa* **16–18** 5066 **19–21** 5063 **22–25** 6890 **26–28** 5064. Scale bar: 10 µm.

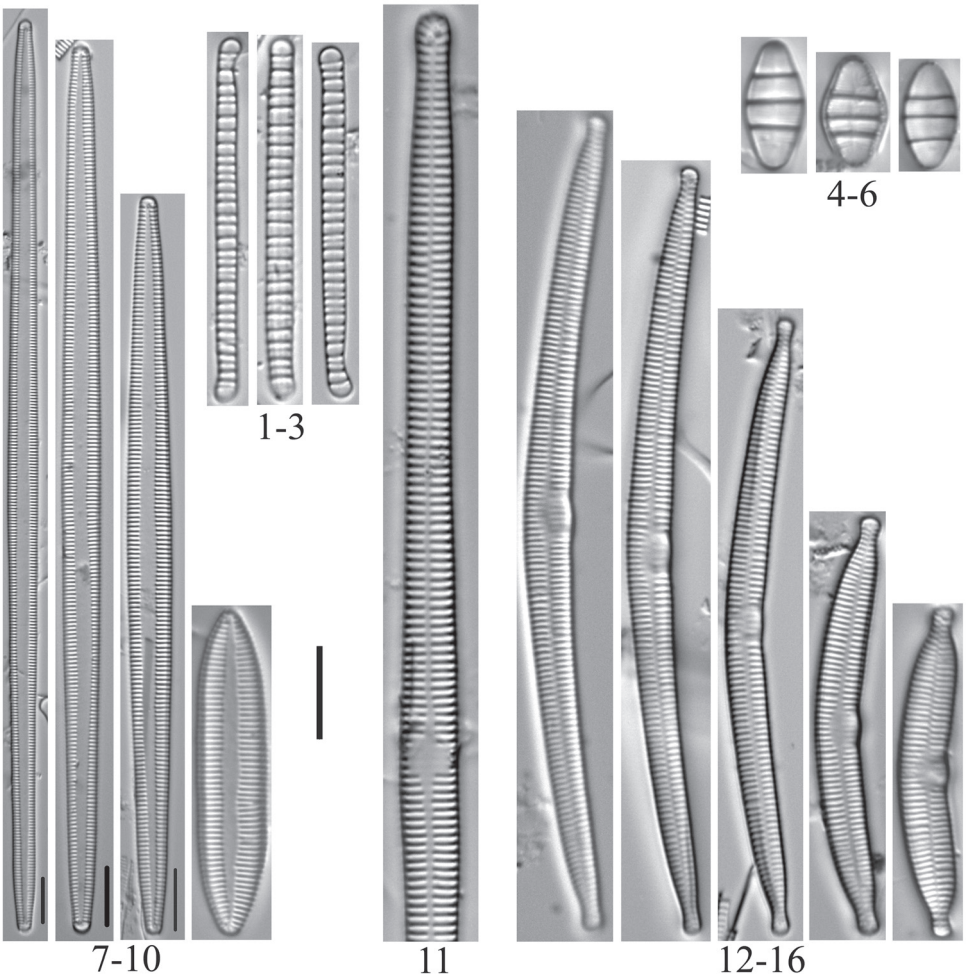

Plate 19. Haida Gwaii. **1–3** *Diatoma tenuis* (5062) **4–6** *Odontidium mesodon* (5066, 6890) **7–10** *Tabularia fasciculata* [Fig. **10** *Tryblionella* sp.? PH] (6890) **11** *Ulnaria* sp. (6890) **12–16** *Hannaea arcus* (6890). Scale bars: 10 µm; scale bar on plate applies to images without scale bars; note different scales of images **7–10**.

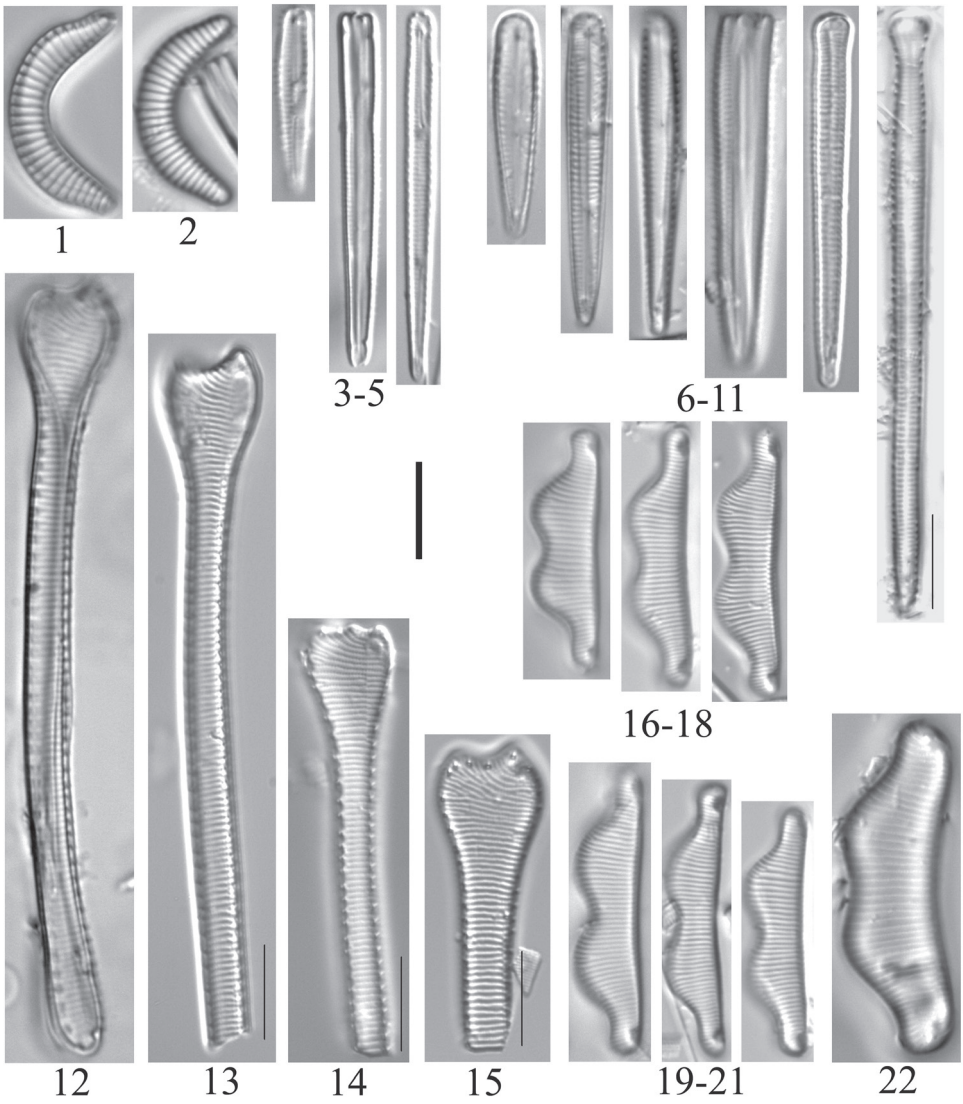

Plate 20. Haida Gwaii. **1, 2** *Semiorbis rotundus* (5064) **3–11** *Peronia fibula* **3–5** 5064 **6–11** 5065 **12–15** *Actinella punctata* (5064) **16–21** *Eunotia bidentula* (5064, 5066) **22** *Eunotia islandica* (5064). Scale bars: 10 μm.

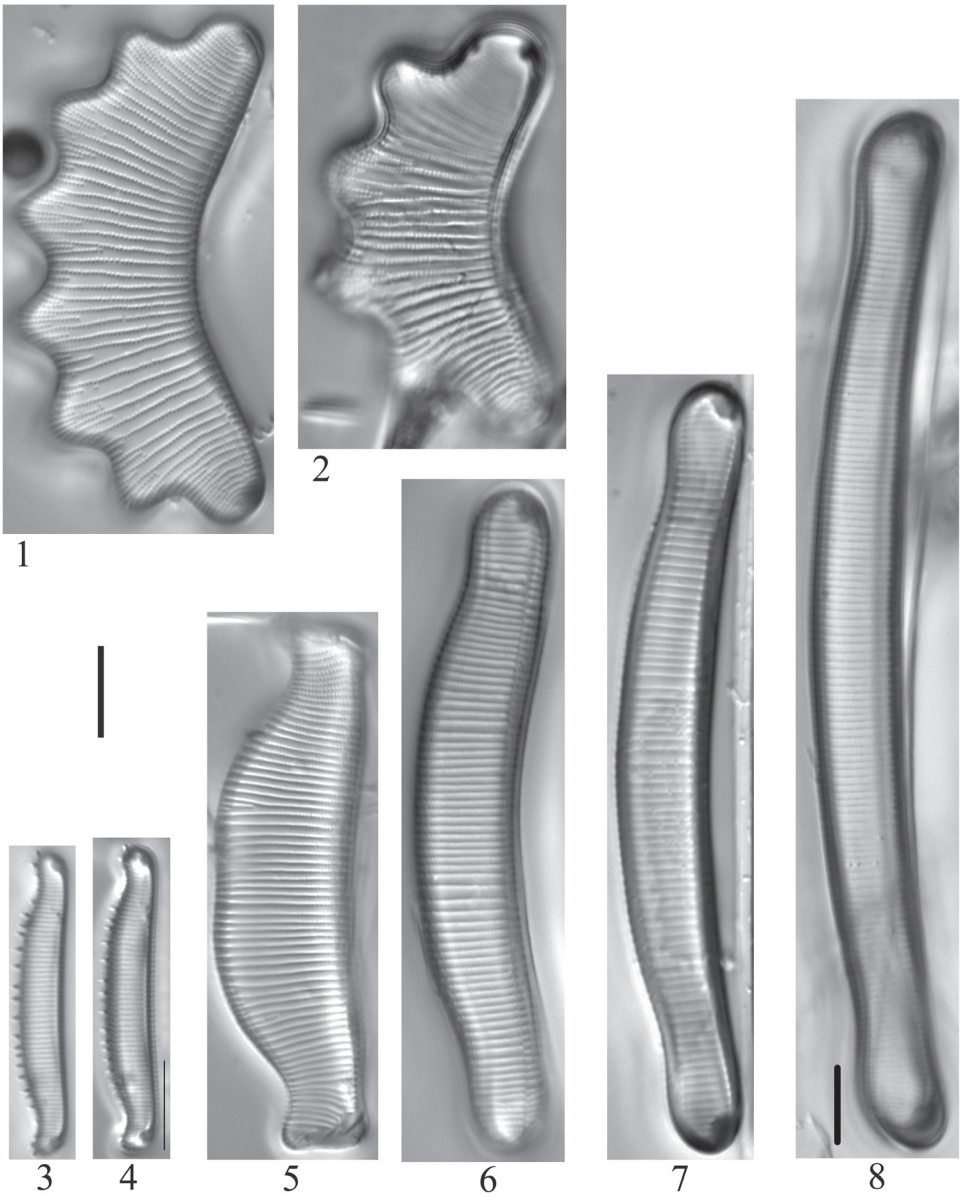

Plate 21. Haida Gwaii. **1** *Eunotia diadema* (5064, 5065, 5067) **2** *E. tetraodon* (5065) **3, 4** *E. neoborealis* [*E. fennica* PH] (5063) **5** *E. superbidens* (5064) **6–8** *E. metamonodon* (5063, 5065, 5067). Scale bars: 10 µm. Note different scales of 7 and 8; scale bar on plate applies to images without scale bars.

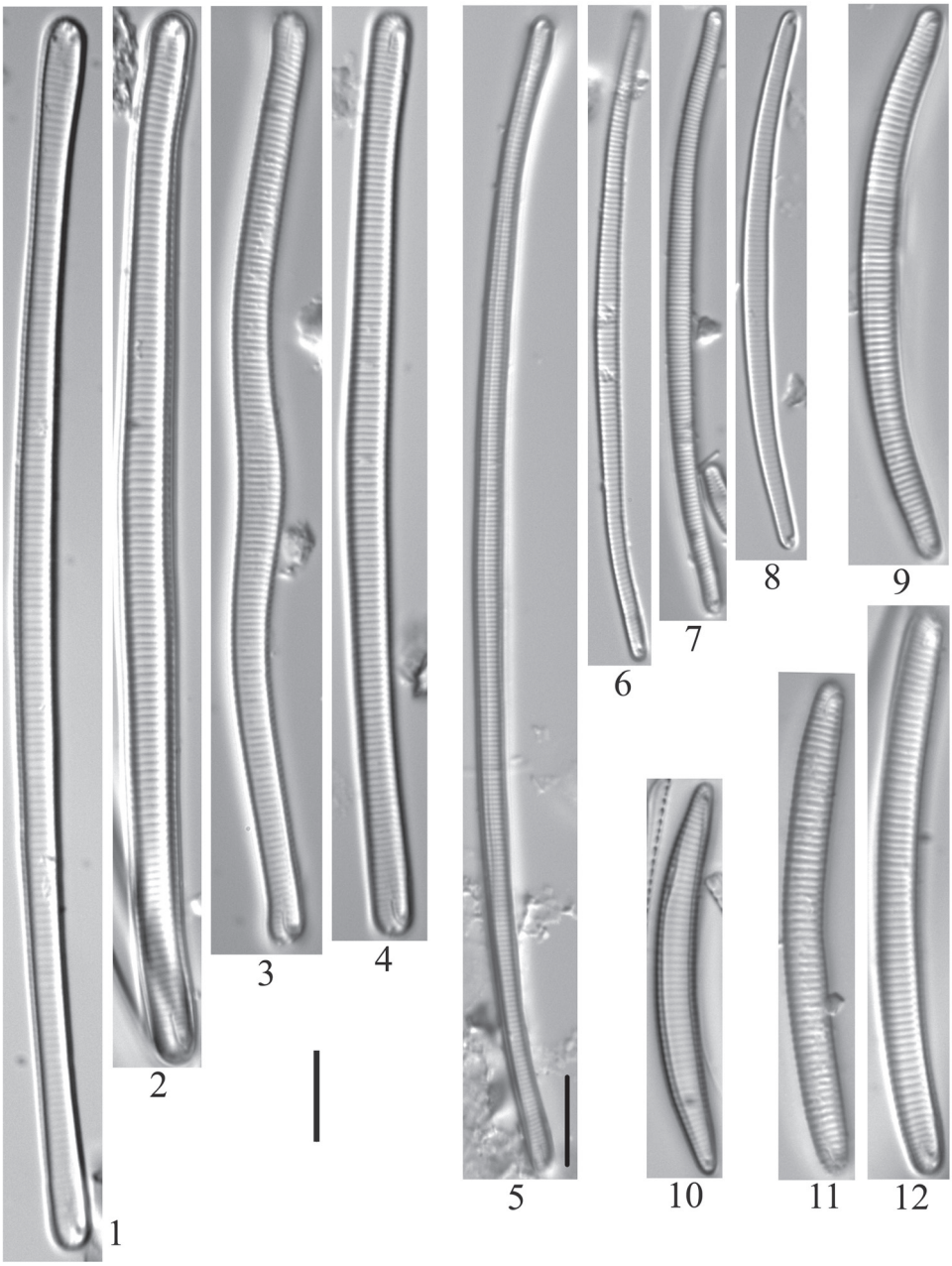

Plate 22. Haida Gwaii. **1–4** *Eunotia flexuosa* (5063, 5066, 5067) **5–8** *E. naegelii* (5063, 5065, 5066, 6890) **9** *E. bilunaris* (5064, 5067) **10** *Eunotia* sp. [cf. *E. mertensiae*] (5062) **11, 12** *Eunotia* sp. [cf. *E. julma*] [cf, *Eunotia furyae* PH] (5063). Scale bar: 10 μm.

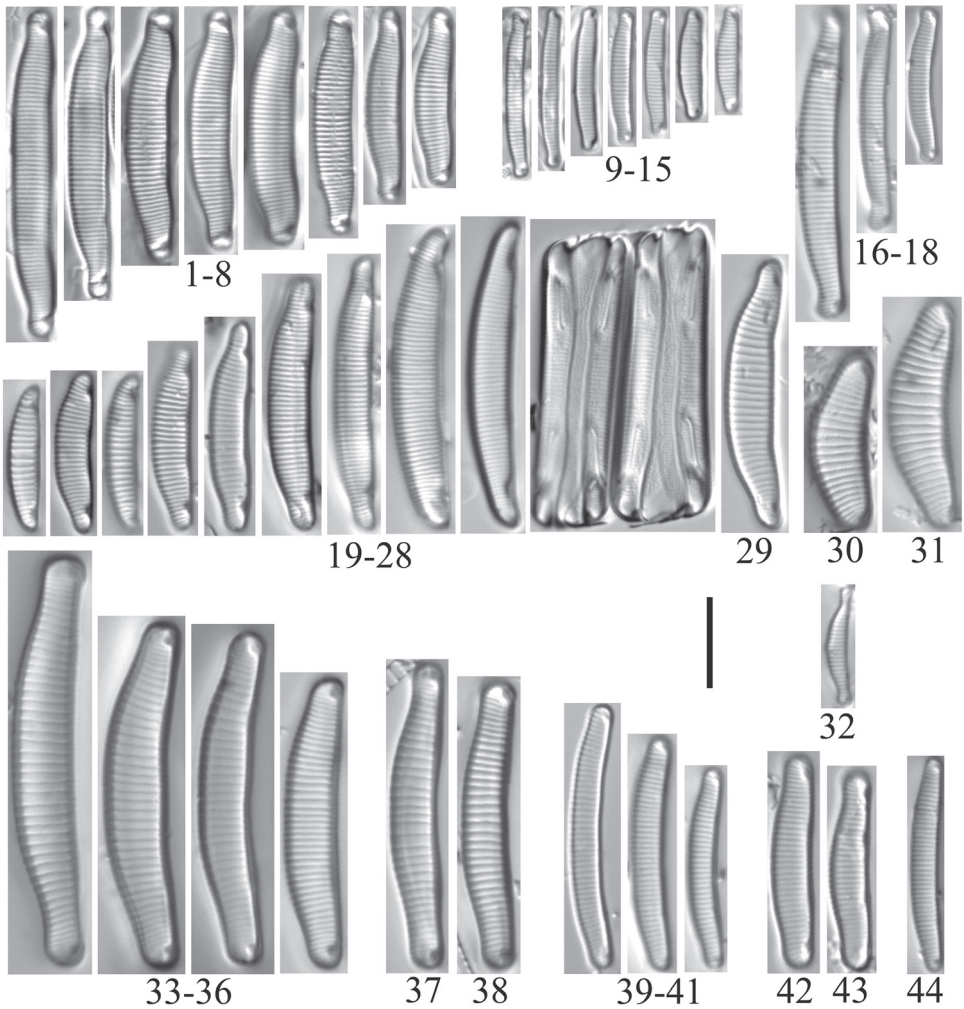

Plate 23. Haida Gwaii. **1–8** *Eunotia lewisii* (5064, 6888) **9–15** *E. paludosa* (5064, 6888) **16–18** *E. superpaludosa* (5064) **19–28** *E. incisa* (5063, 5064, 5066, 5067) **29** *Eunotia* sp. [cf. *E. incisa*] (5064) **30,31** *Eunotia* sp. [cf. *E. boreotenuis*] (5064) **32** *E. arculus* (5064) **33–36** *E. minor* (5063) **37, 38** *Eunotia* sp. [cf. *E. minor*] (5062) **39–41** *E. botuliformis* (5066) **42, 43** *Eunotia* sp. [cf. *E. arcofallax*] [cf. *E. rhomboidea* PH] (5064) **44** *E. subarcuatoides* (5063). Scale bar: 10 μm.

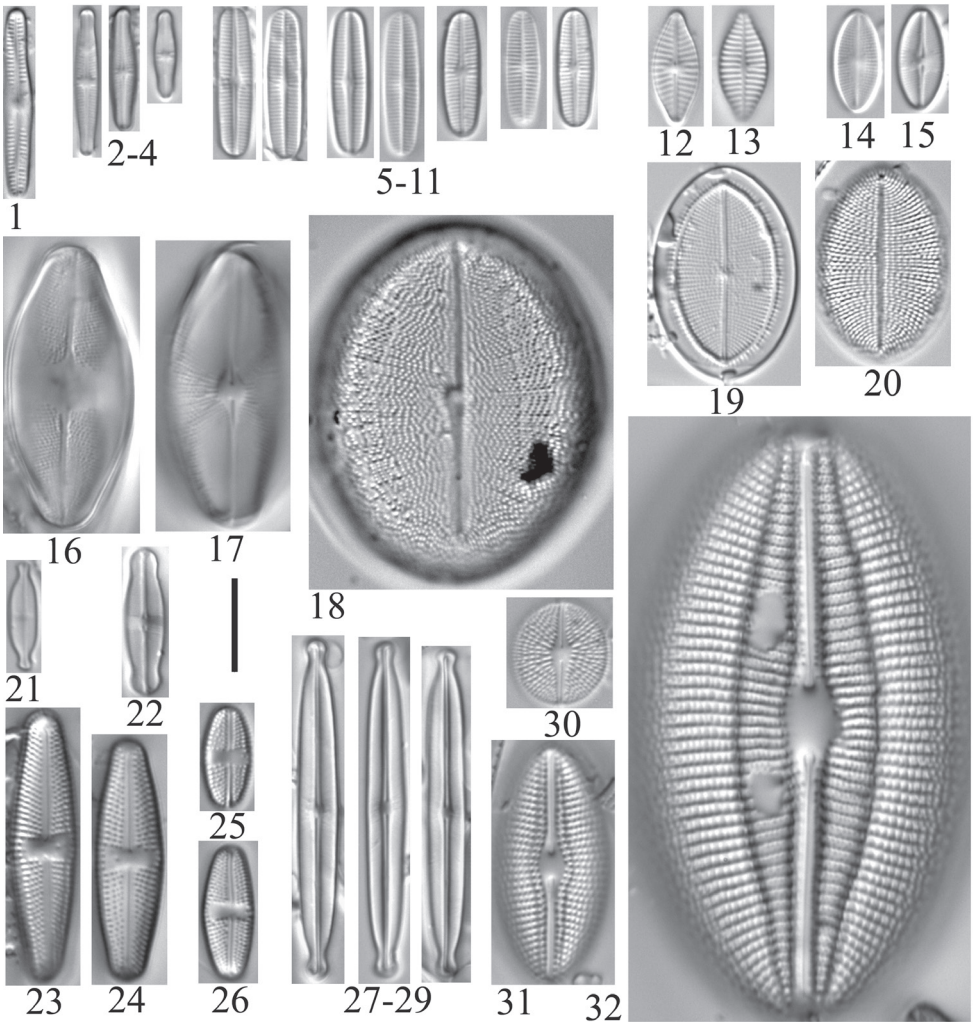

Plate 24. Haida Gwaii. **1** *Achnanthidium kriegeri* (5066) **2–4** *Achnanthidium minutissimum* (5063, 5066, 6890) **5–11** *Rossithidium pusillum* (5063, 5065, 5067) **12, 13** *Planothidium delicatulum* (6890) **14, 15** *Psammothidium nivale* (6890) **16, 17** *Eucocconeis flexella* (5065, 5066) **18** *Cocconeis* sp. (5062) **19, 20** *Cocconeis placentula* (5062) **21** *Nupela tenuicephala* (5064) **22** Unknown genus (5063) **23, 24** *Luticola* sp. (6889) **25, 26** *Luticola mutica* (6890) **27–29** *Kobayasiella parasubtilissima* (5064, 6888) **30** *Cavinula pseudoscutiformis* (5065) **31** *Diploneis elliptica* (5062, 5065) **32** *Diploneis finnica* (5065). Scale bar: 10 µm.

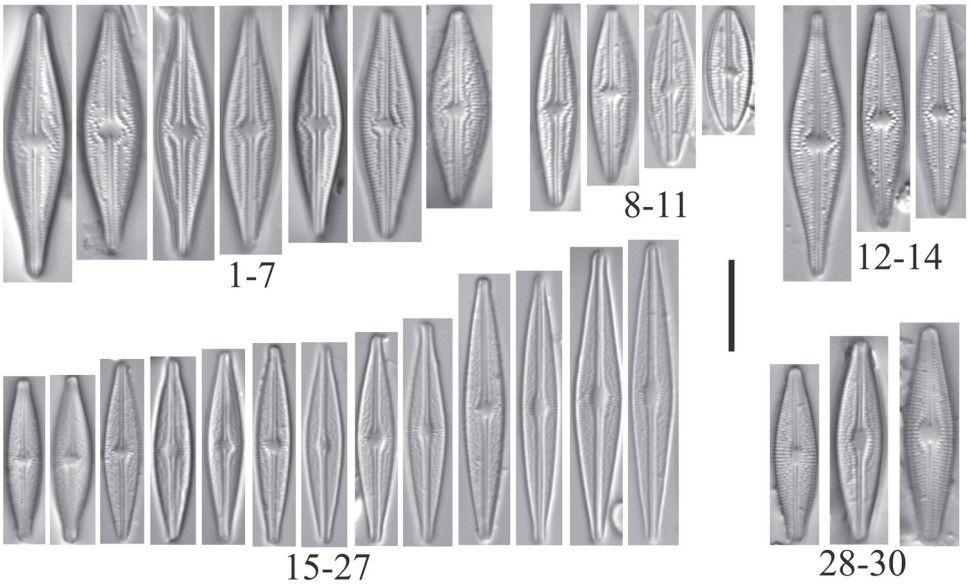

Plate 25. Haida Gwaii. **1–7** *Brachysira* sp. [cf. *B. neoacuta* PH] (5065, 5067) **8–11** *B. brebissonii* (5063, 5064, 5065) **12–14** *B.* sp. [cf. *B. neoacuta* PH] (5065) **15–27** *B. procera* [PH] or *B. ocalanensis* (5063, 5065, 5066, 5067) **28–30** *B.* sp. (5064, 5065). Scale bar: 10 µm.

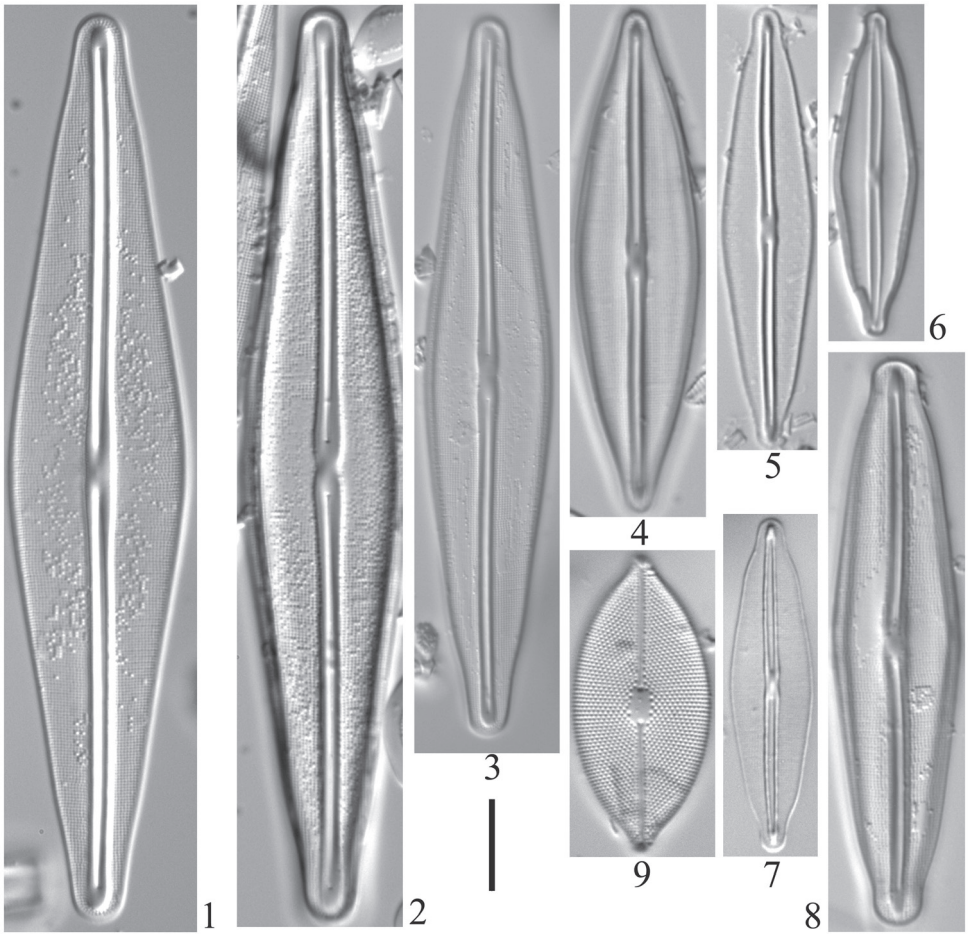

Plate 26. Haida Gwaii. **1** *Frustulia saxonica* (5064, 6888) **2–7** *Frustulia crassinervia* (5063, 5064, 5065, 5066, 5067, 6888) **8** *Frustulia quadrisinuata* (5063) **9** *Decussata placenta* (5067). Scale bar: 10 µm.

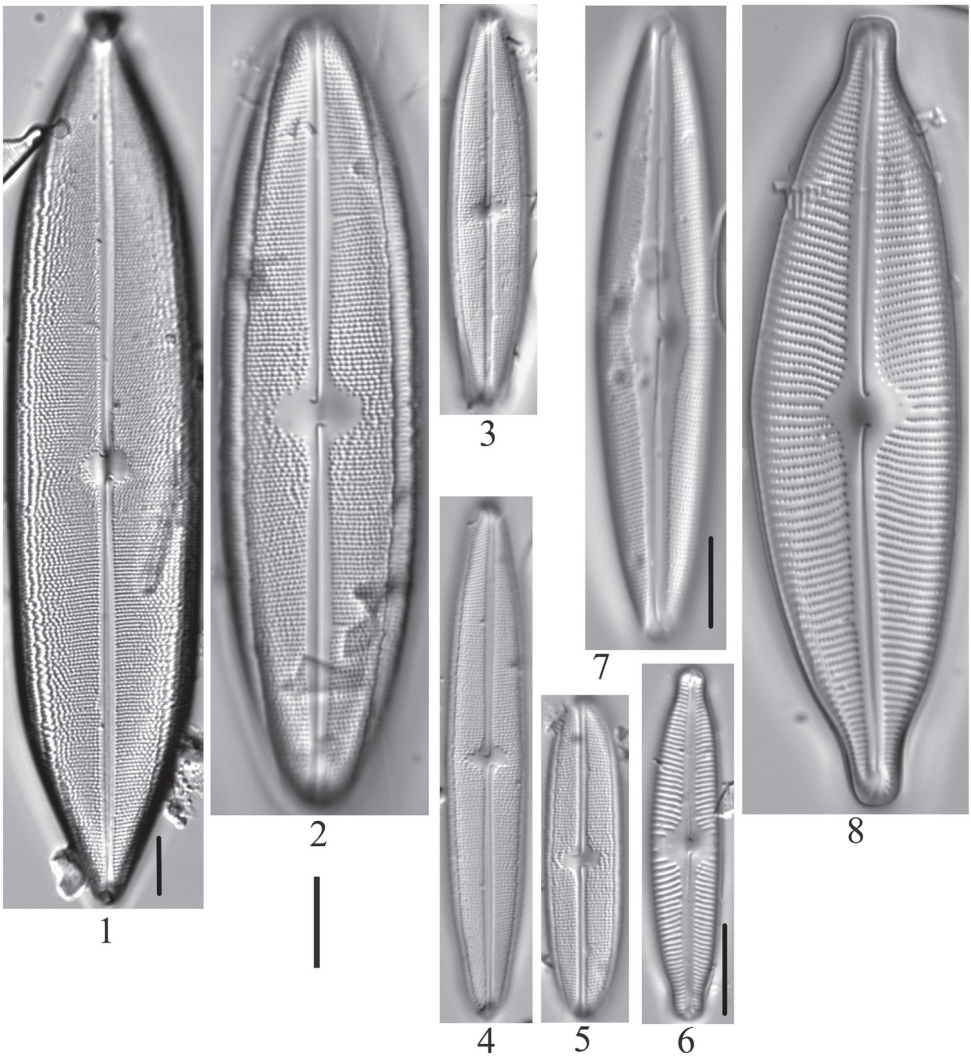

Plate 27. Haida Gwaii. **1** *Neidium amphigomphus* (5064) **2** *Neidium fossum* (6890) **3, 4** *Neidium affine* (5064) **5** *Neidium* sp. [*N. occidentale* PH] (5064) **6** *Cymbopleura fluminea* [*C. hybrida* or *C. lineare* PH] (5063) **7** *Cymbopleura* sp. (5063) **8** *Cymbopleura subcuspidata* (5065). Scale bars: 10 µm.

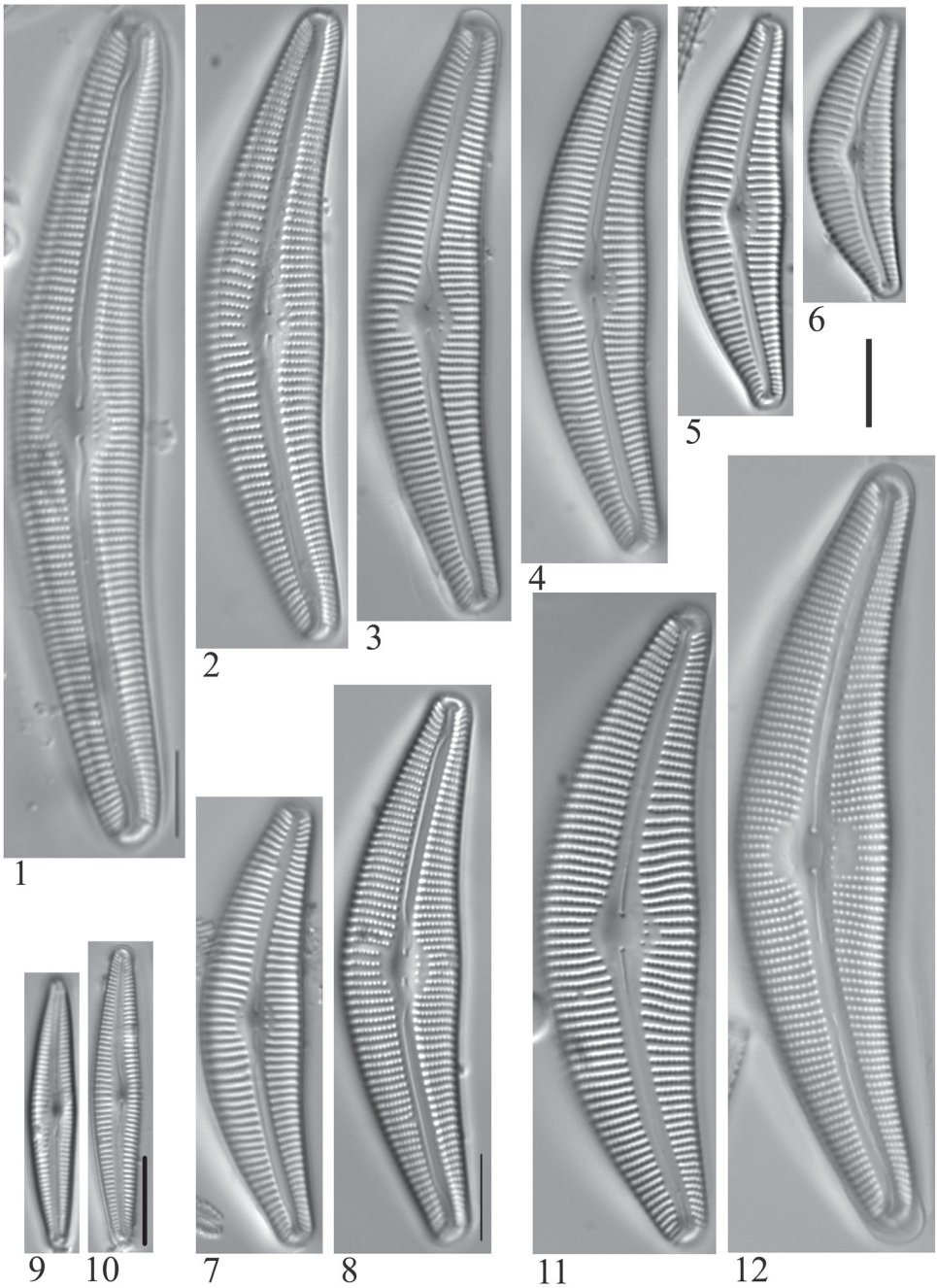

Plate 28. Haida Gwaii. **1–8** *Cymbella neocistula* (5062, 5063, 5066, 6890) **9, 10** *Delicata alpestris* (5063) **11, 12** *Cymbella proxima* (5062, 5063). Scale bars: 10 μm.

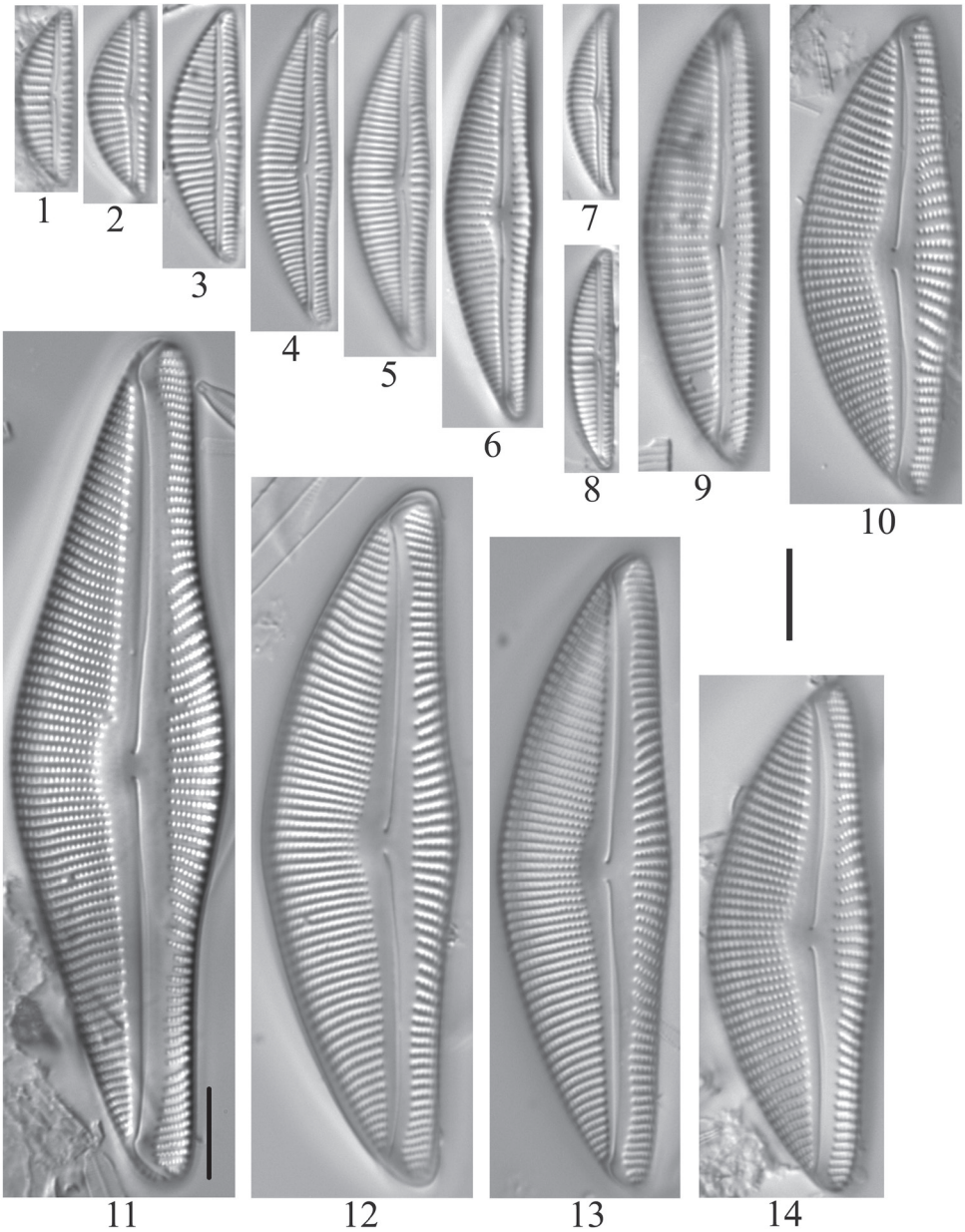

Plate 29. Haida Gwaii. **1–6** *Encyonema silesiacum* (5062, 5065, 5066) **7** *E. fogedii* [*E. silesiacum* var. PH] (5066) **8** *E. minutiforme* [*E. silesiacum* var. PH] (5067) **9** *E. vulgare* (5067) **10–14** *E. latum* (5065). Scale bars: 10 µm.

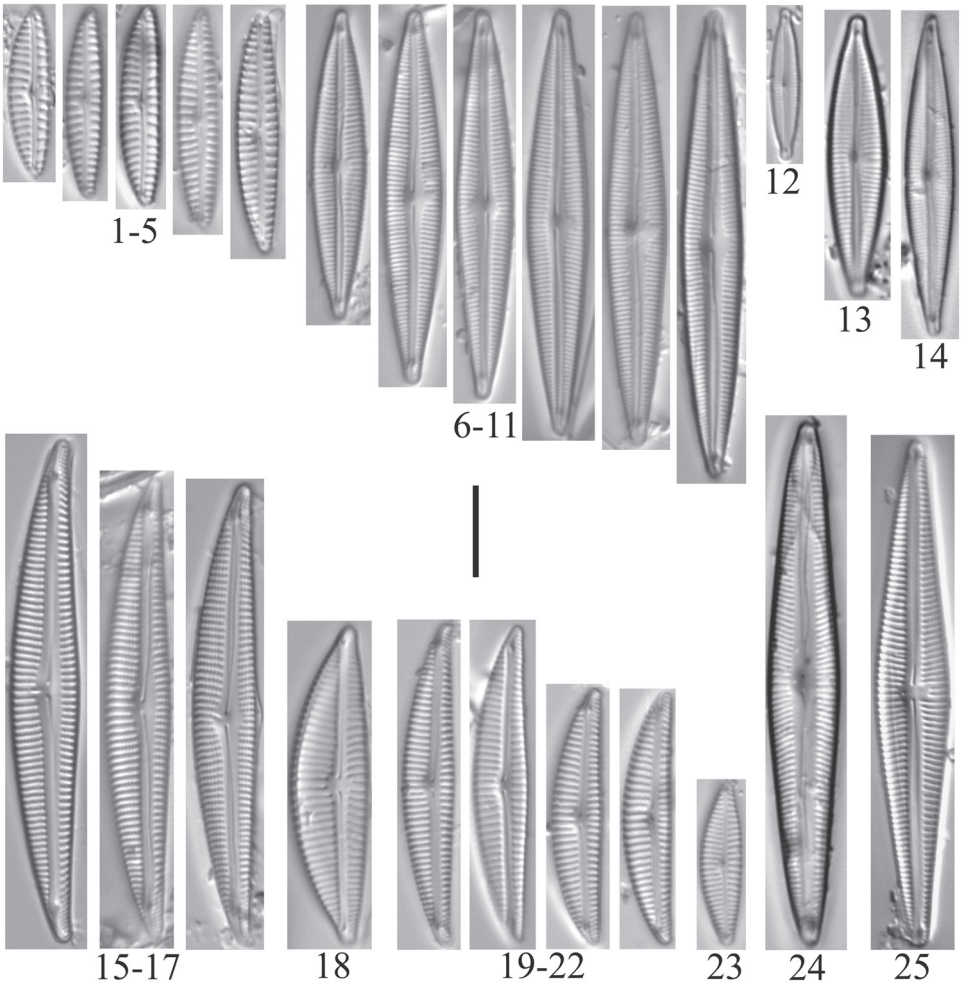

Plate 30. Haida Gwaii. **1–5** *Encyonema perpusillum* (5064) **6–11, 13** *Encyonopsis cesatii* (5062, 5065) **12** *Encyonopsis subminuta* [*E. microcephala* var. PH] (5065) **14** *Encyonopsis stafsholtii* (5063) **15–17** *Encyonema pergracile* (5065) **18** *Encyonema hebridicum* (5064) **19–22** *Encyonema neogracile* (5063, 5067) **23** *Encyonema* sp. (5064) **24** *Kurtkrammeria treinishii* (5065) **25** *Kurtkrammeria lacusglacialis* (5064). Scale bar: 10 µm.

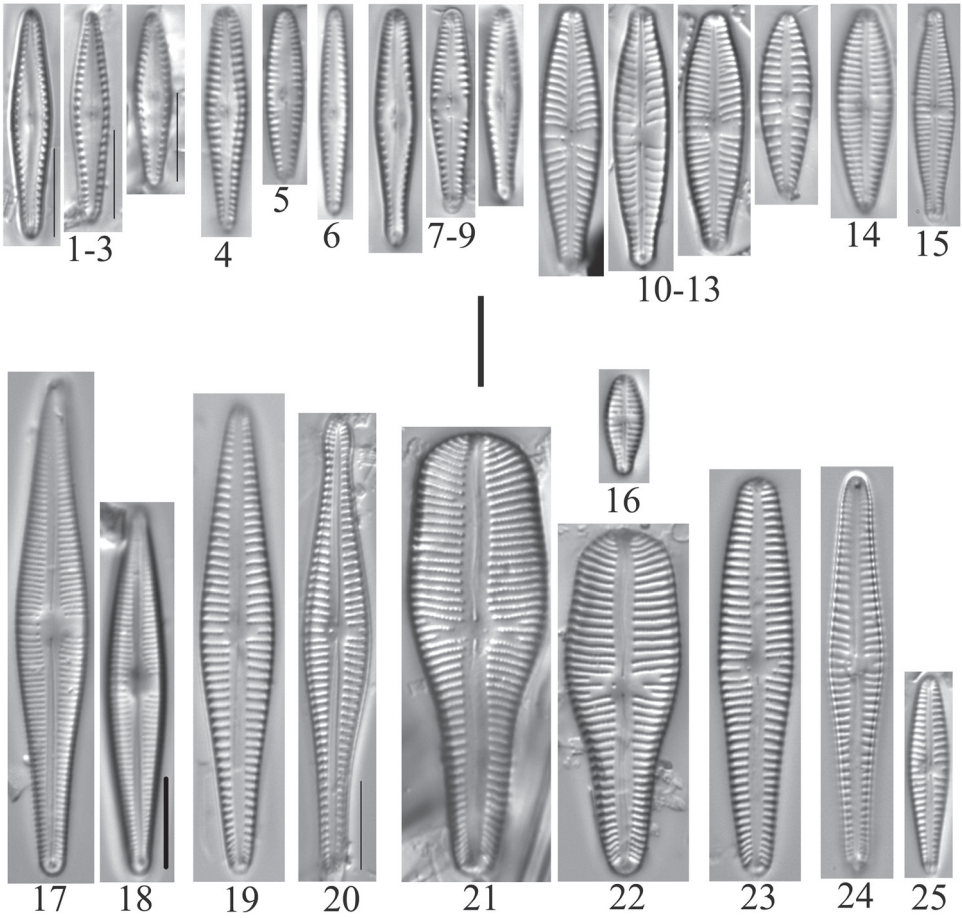

Plate 31. Haida Gwaii. **1–3** *Gomphonema louisiananum* (5065) **4** *G.* sp. [cf. *G. pumilum*] [cf. *G. obstipum* PH] (5065) **5** *G. kobayasii* (5062) **6** *G.* sp. [cf. *G. minusculum*] (5062) **7–9** *G.* sp. (5063, 5067) **10–13** *G. micropus* (5062, 5067) **14** *G.* sp. [cf. *G. citera*] (6890) **15** *G. exilissimum* (5067) **16** *G.* sp. (6890) **17, 18** *G.* sp. (5063) **19** *G. gracile* (5067) **20** *G. procerum* (5065) **21, 22** *G. laticollum* [*G. italicum* sensu stricto PH] (5065) **23** *G. clavatum* (5067) **24, 25** *G. duplipunctatum* (5063, 5066). Scale bars: 10 μm.

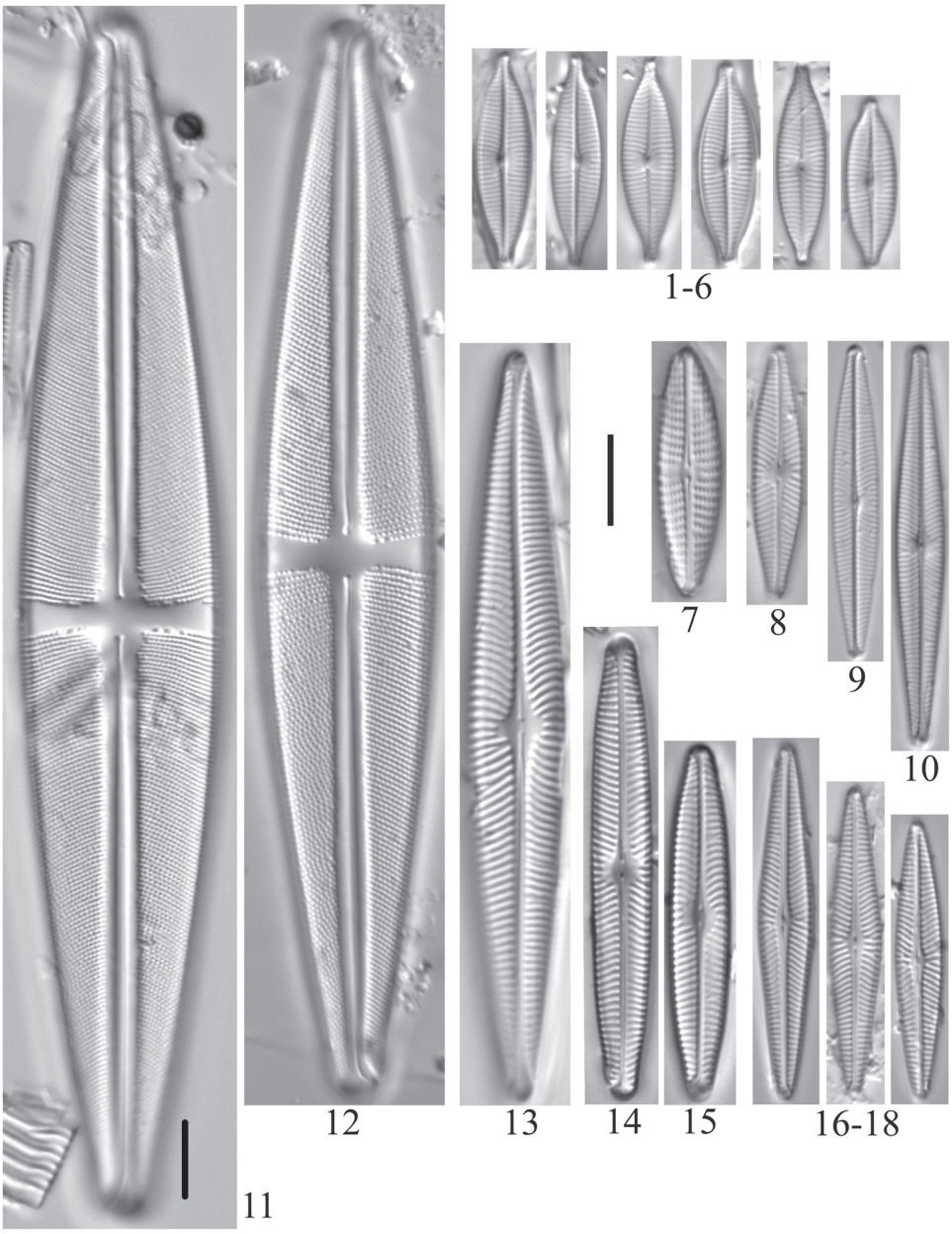

Plate 32. Haida Gwaii. **1–6** *Navicula gregaria* (6888, 6889, 6890) **7** *Navicula eidrigiana* (6890) **8** *Navicula exilis* (6889) **9, 10** *Navicula leptostriata* (5064) **11, 12** *Stauroneis heinii* (5065, 6889) **13** *Navicula radiosa* (5065) **14, 15** *Navicula angusta* (5063) **16–18** *Navicula cryptotenella* (5063, 5065). Scale bars: 10 µm.

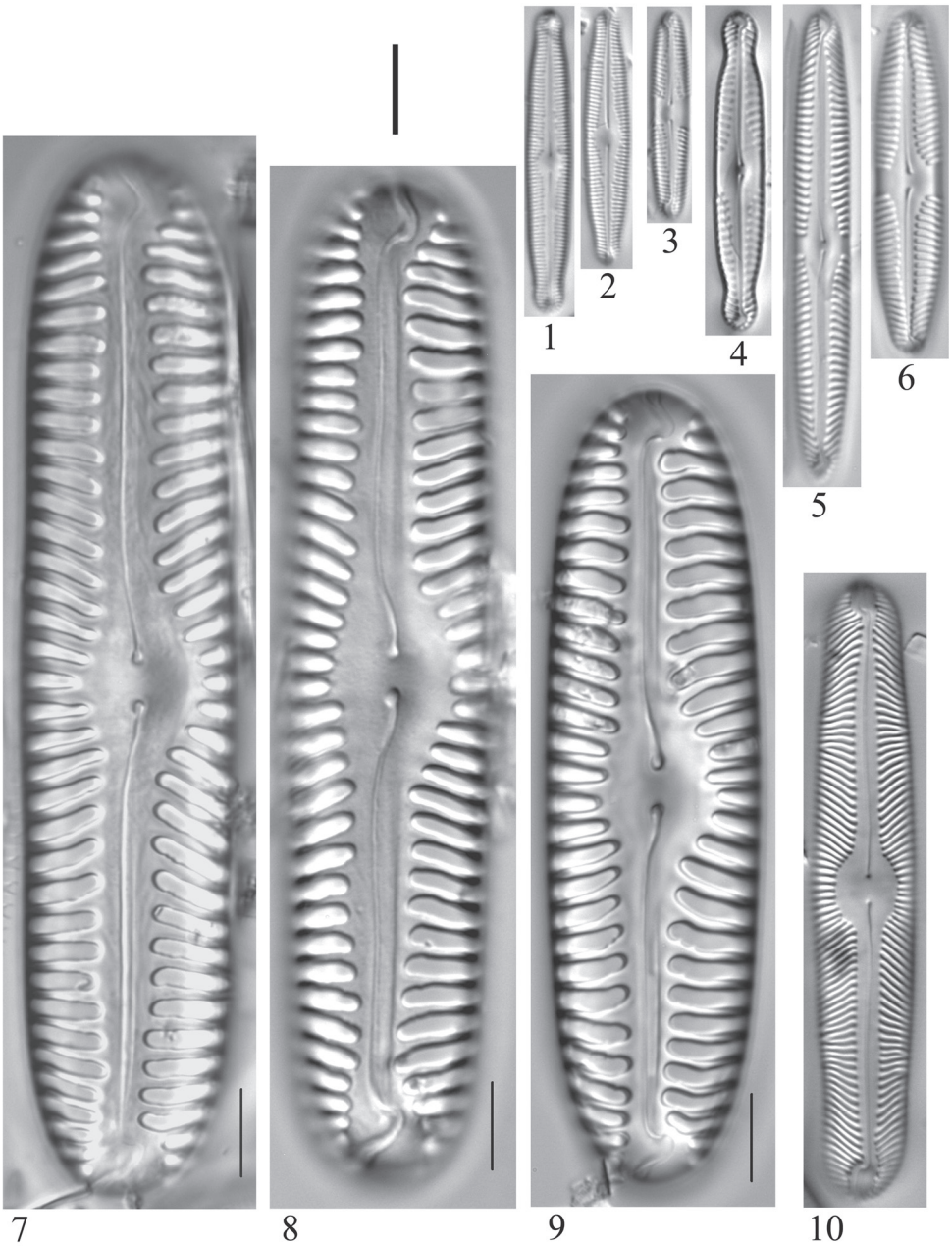

Plate 33. Haida Gwaii. **1, 2** *Caloneis tenuis* (5065, 5067) **3** cf. *Caloneis bacillum* (6890) **4** *Pinnularia subcapitata* (6890) **5** *Pinnularia microstauron* var. *angusta* [*P. submicrostauron* or *P. microstauron* var. *rostrata* PH] (5064) **6** *Pinnularia microstauron* (5064) **7–9** *Pinnularia lata* (5064) **10** *Pinnularia decrescens* [*P. decrescens* var. *rhombarea* PH] (5067). Scale bars: 10 µm.

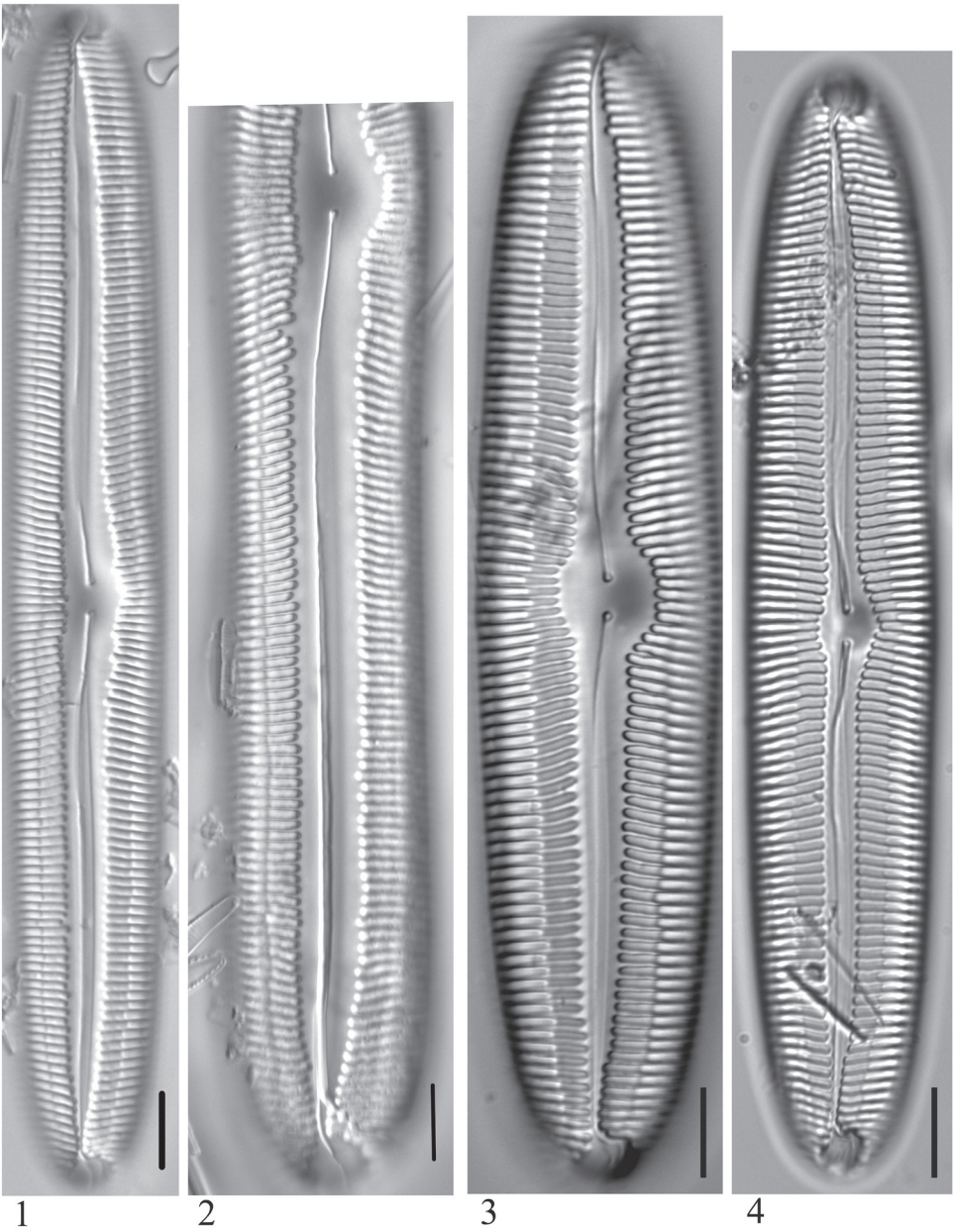

Plate 34. Haida Gwaii. **1, 2** *Pinnularia transversa* [Fig. **1** *P. viridis* morphotype PH] (5064) **3** *P. mesogongyla* [*P. gigas* PH] (5065) **4** *P. viridiformis* [*P. viridis* PH] (5064). Scale bars: 10 µm.

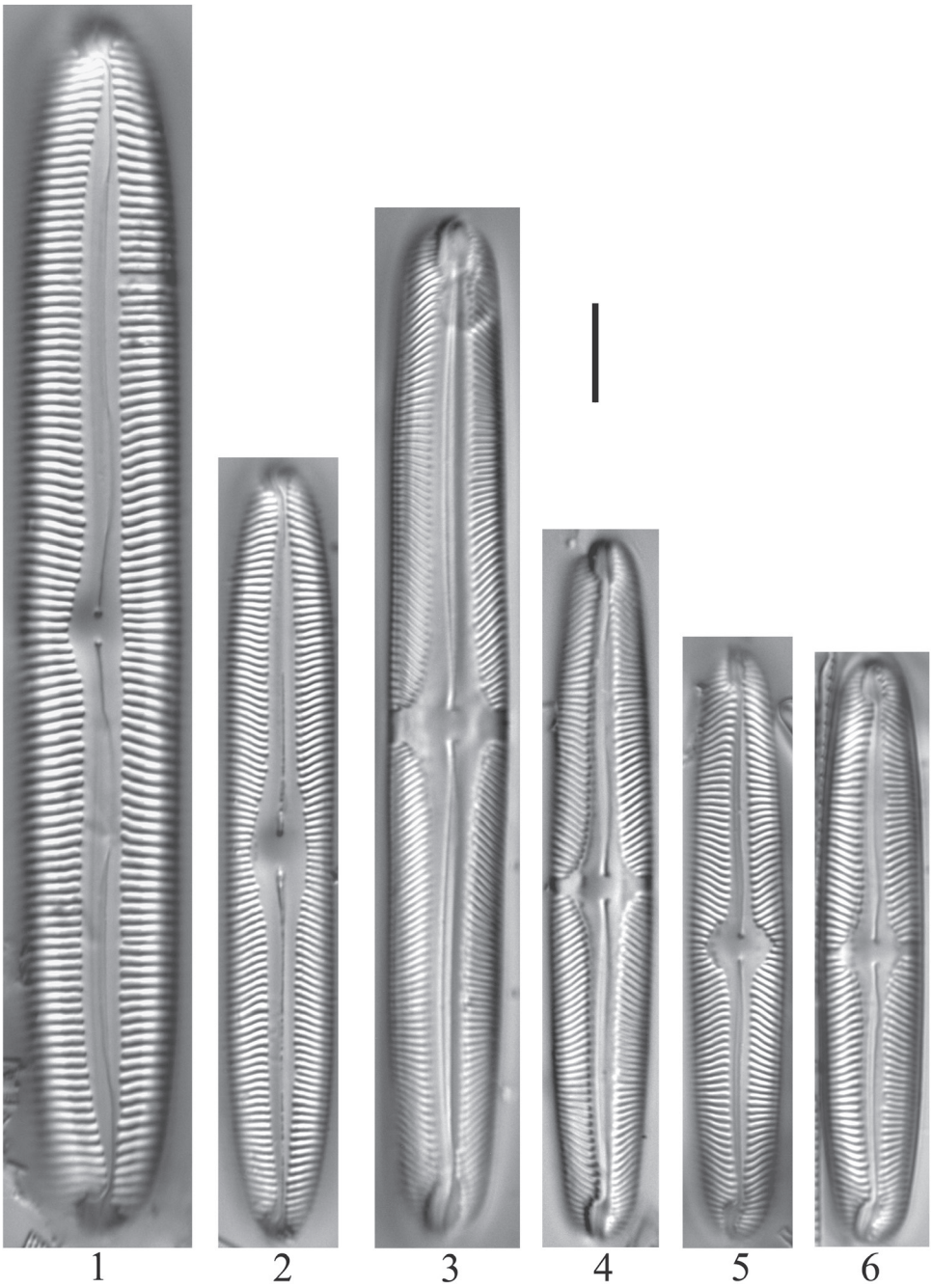

Plate 35. Haida Gwaii. **1** *Pinnularia neomajor* (5065) **2** *P. rupestris* (5064) **3–6** *P. stomatophora* (5062, 5065, 5067). Scale bar: 10 µm.

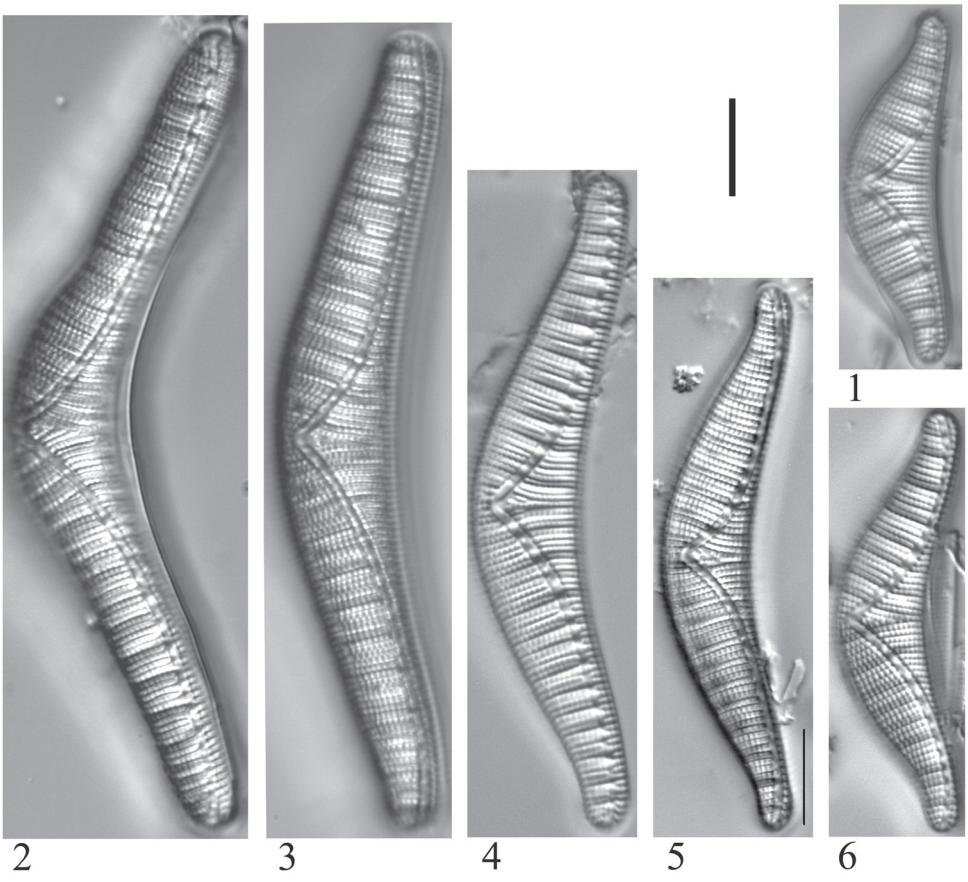

Plate 36. Haida Gwaii. **1–6** *Epithemia smithii* (5065). Scale bars: 10 µm.

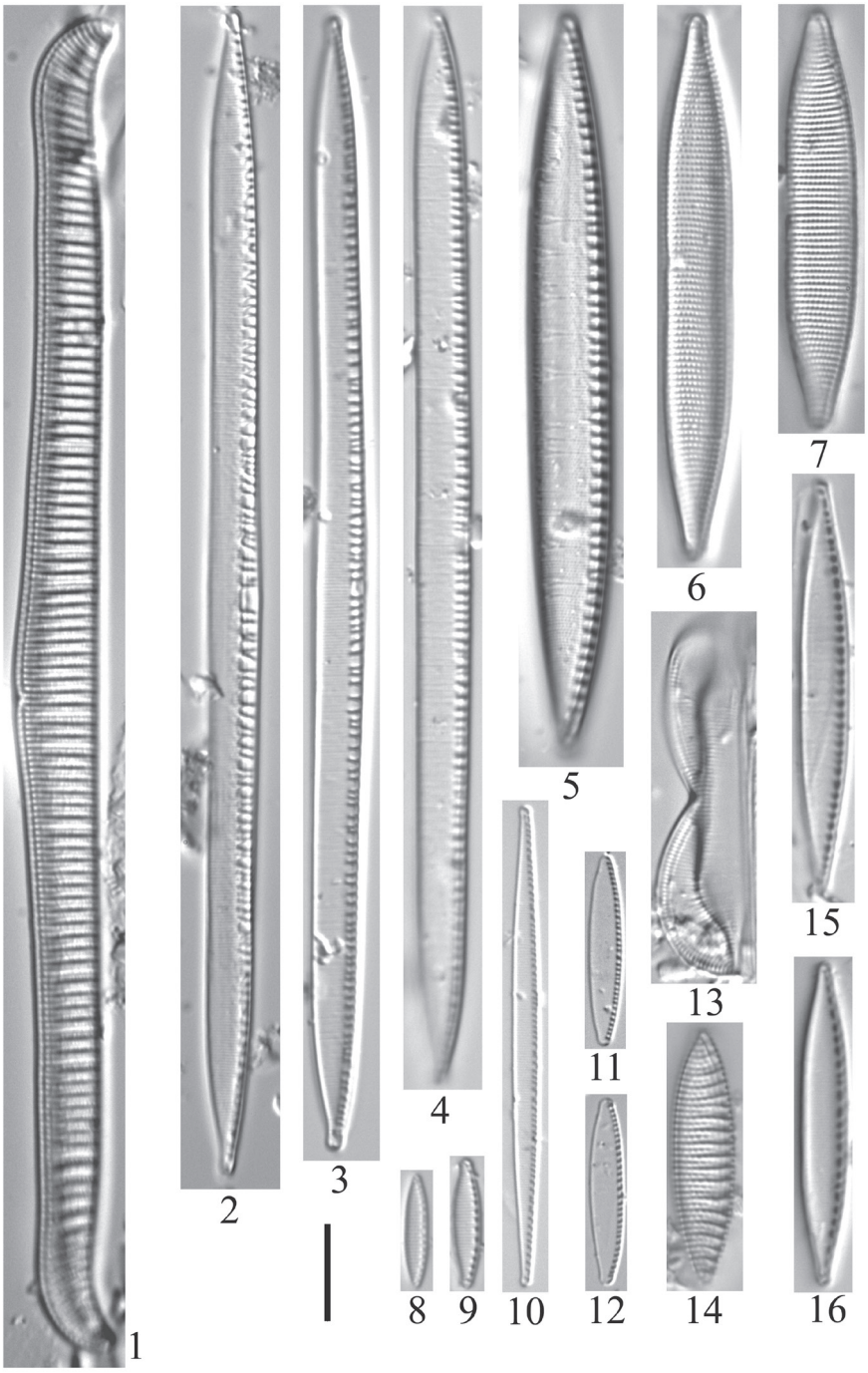

Plate 37. Haida Gwaii. **1** *Rhopalodia gibba* (5065) **2–4** *Nitzschia linearis* (6889) **5** *Nitzschia recta* (6890) **6, 7** *Nitzschia angustata* (5065) **8** *Nitzschia liebetruthii* (6890) **9** *Nitzschia* sp. [cf. *N. microcephala*] [cf. *N. fonticola* PH] (5064) **10** *Nitzschia gracilis* (5064) **11, 12** *Nitzschia pusilla* (6889) **13** *Entomoneis paludosa* (6890) **14** *Denticula kuetzingii* (5065) **15, 16** *Nitzschia pseudofonticola* (5062, 5065). Scale bar: 10 µm.

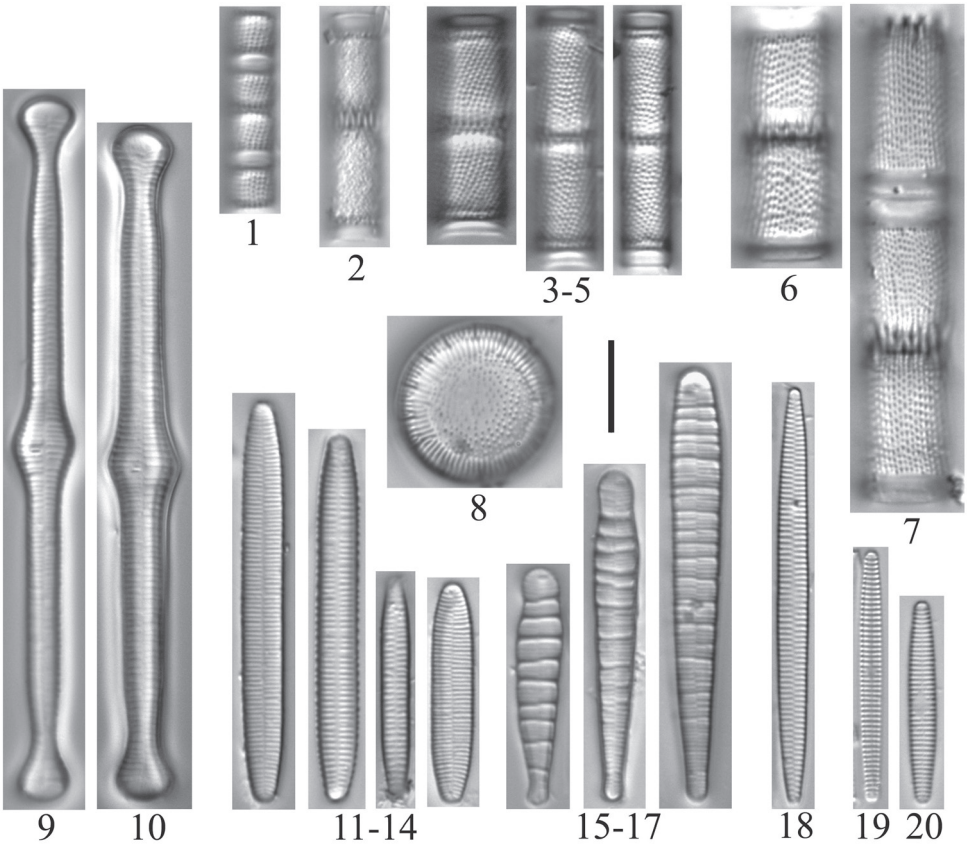

Plate 38. Clearwater. **1** *Aulacoseira alpigena* (6273) **2** *Aulacoseira subarctica* (?) (6276) **3–5** *Aulacoseira ambigua* (6275, 6276) **6, 7** *Aulacoseira italica* (6277) **8** *Lindavia praetermissa* (6277) **9, 10** *Tabellaria flocculosa* (6279) **11–14** *Fragilariforma nitzschioides* (6281) **15–17** *Meridion circulare* (6279, 6281) **18** *Fragilaria* sp. [*Ulnaria* sp. PH] (6281) **19, 20** *Synedra famelica* (?) (6280). Scale bar: 10 μm.

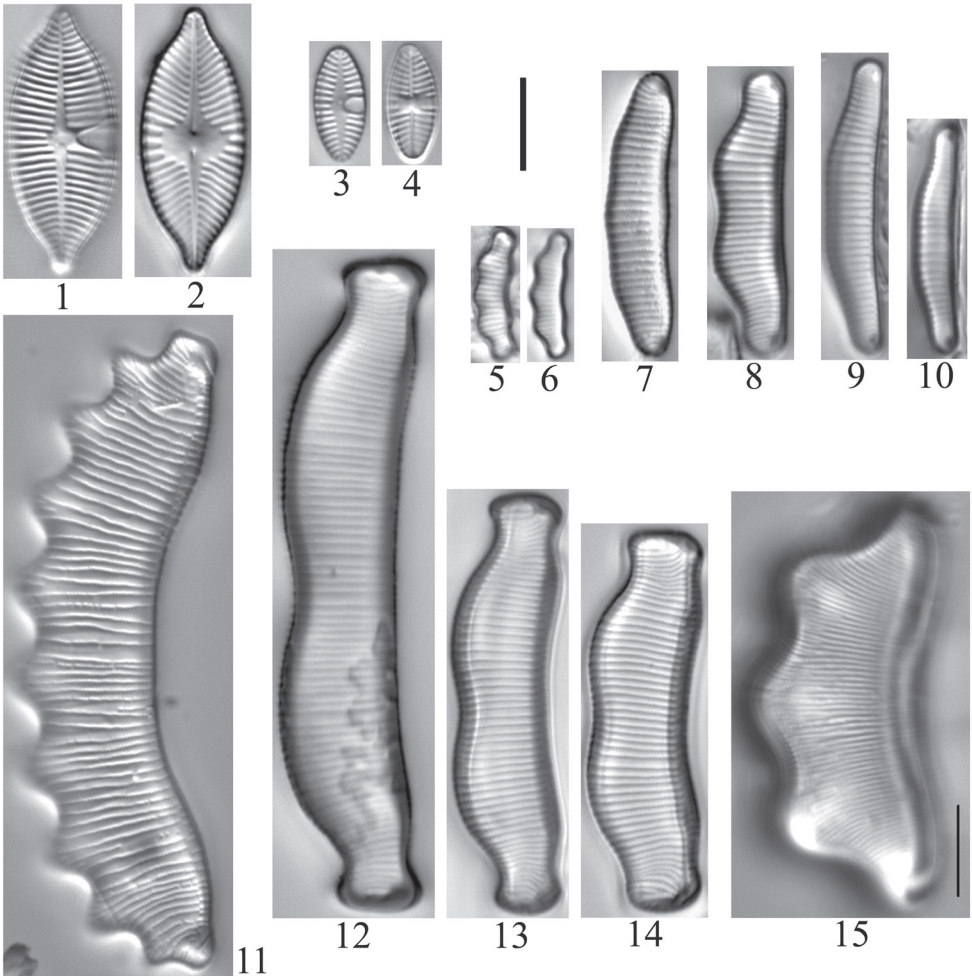

Plate 39. Clearwater. **1, 2** *Planothidium apiculatum* (6277) **3, 4** *Planothidium* sp. (6276) **5, 6** *Eunotia paratridentula* (6279) **7** *Eunotia* sp. (6276) **8** *Eunotia circumborealis* (6279) **9, 10** *Eunotia minor* (6277, 6279) **11** *Eunotia serra* (6276) **12–14** *Eunotia bidens* (6276, 6279) **15** *Eunotia triodon* (6276). Scale bar: 10 μm.

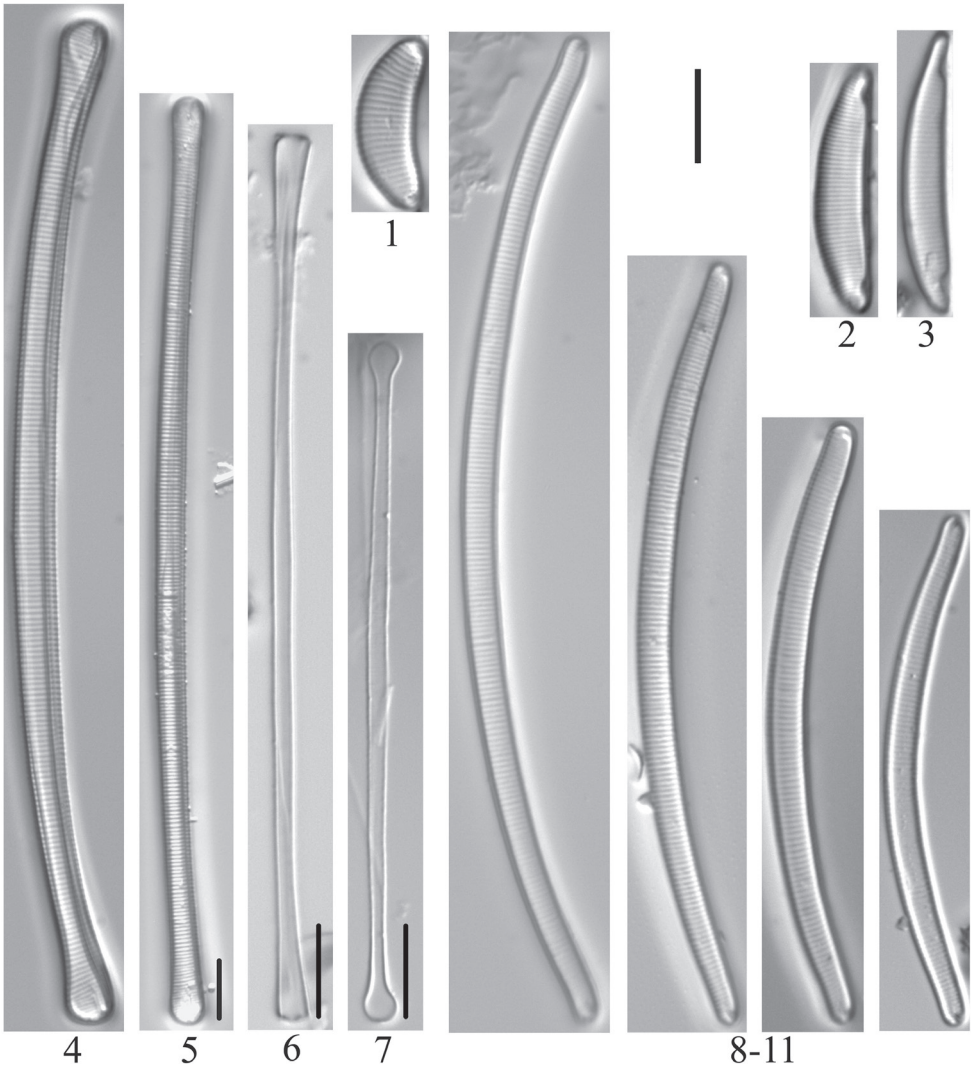

Plate 40. Clearwater. **1** cf. *Eunotia faba* [PH] (6279) **2, 3** *E. incisa* (6275, 6277) **4** *E. flexuosa* (6276) **5** *E. eurycephala* [*E. flexuosa* PH] (6276) **6** *E.* sp. (6277) **7** *E.* sp. (6276) **8–11** *E. ambivalens* (6276, 6278). Scale bars: 10 μm.

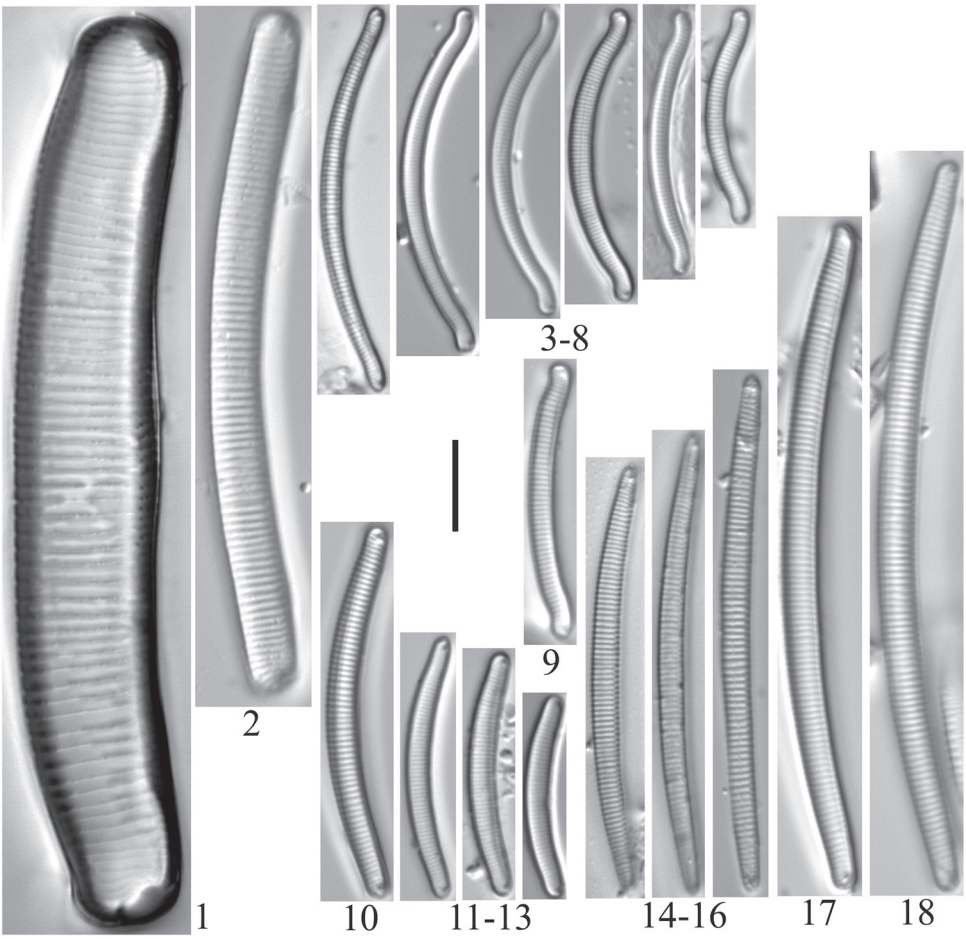

Plate 41. Clearwater. **1** *Eunotia* sp. [cf. *E. dorofeyukae* PH] (6279) **2** *E. julma* (6276) **3–8** *E. nymanniana* [*E. elegans* PH] (6274, 6276, 6279) **9** *E.* sp. [cf. *E. nymanniana*] (6277) **10** *E. monnieri* [*E. sp.* PH] (6279) **11–13** *E. mucophila* (6276) **14–16** *E.* sp. [*E. monnieri* PH] (6276, 6277) **17, 18** *E. ambivalens* [*E. bilunaris* PH] (6279). Scale bar: 10 μm.

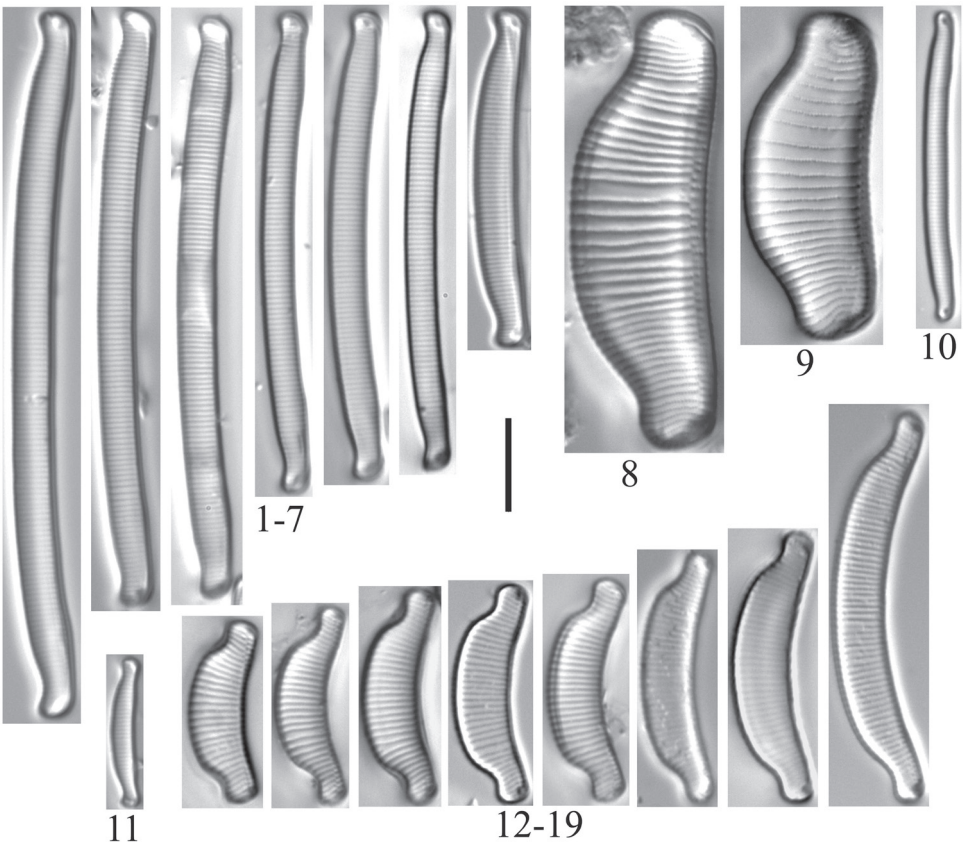

Plate 42. Clearwater. **1–7** *Eunotia superpaludosa* (6274, 6276) **8, 9** *E. praerupta* (6279) **10** *E. groenlandica* [*E. pseudogroenlandica* PH] (6274) **11** *E. fallax* [*E. paludosa* PH] (6279) **12–19** *E. ursamaioris* (6278, 6279). Scale bar: 10 µm.

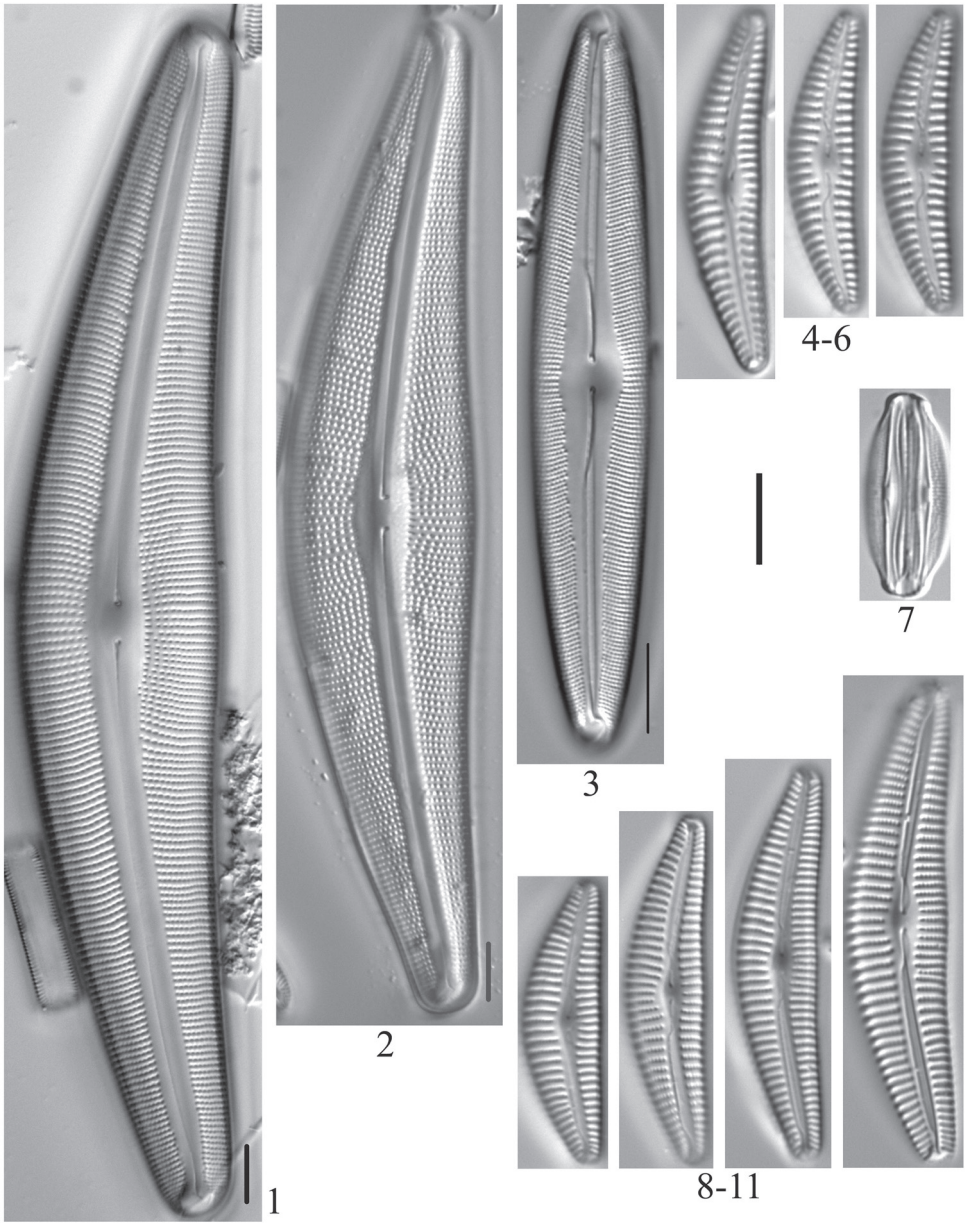

Plate 43. Clearwater. **1, 2** *Cymbella aspera* (6277) **3** *Cymbella* (*Cymbopleura*?) *naviculacea* [syn. *Encyonopsis grunowii*] (6277) **4–6** *Cymbella* sp. (6280) **7** *Halamphora coraensis* [*H. obscura* PH] (6280) **8–11** *Cymbella hantzschiana* (6280). Scale bars: 10 µm (specimens in images 1 and 2 are at a different scale than the others).

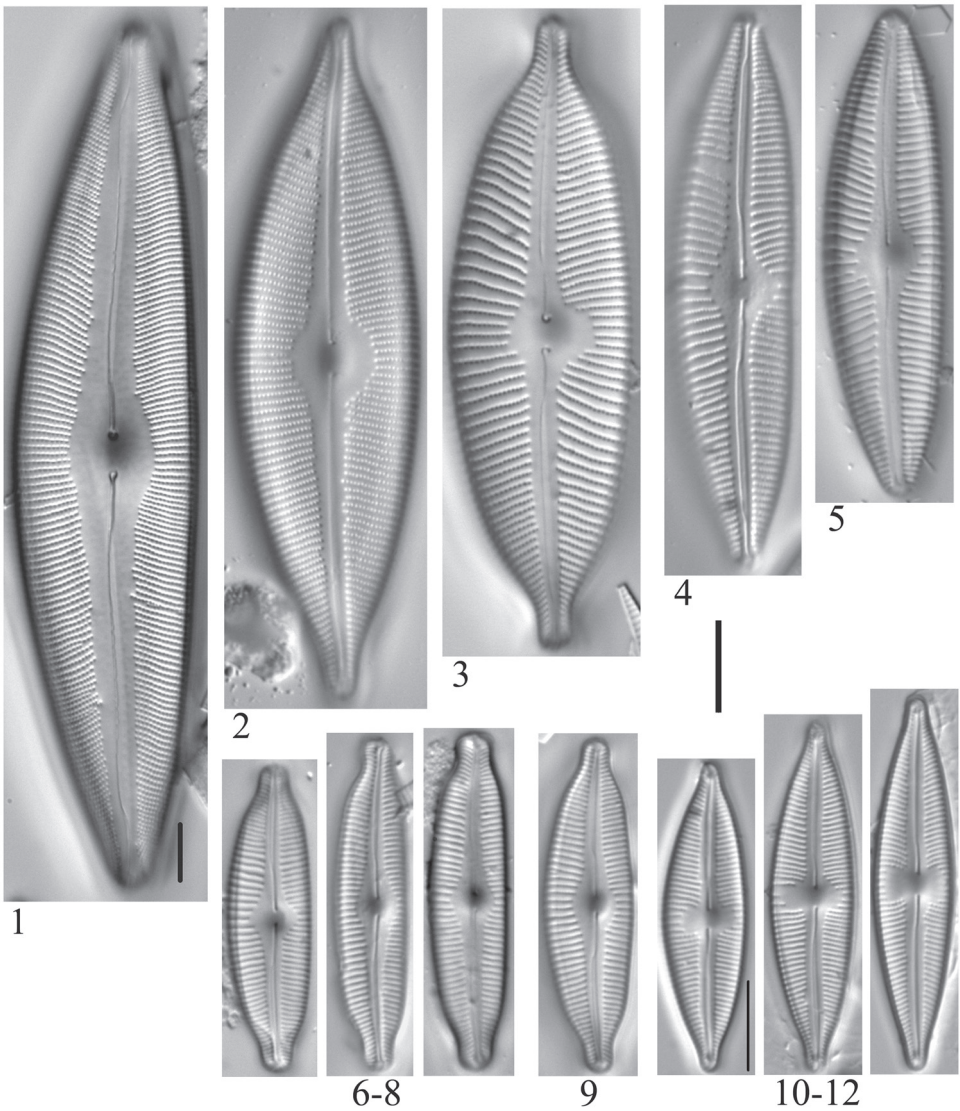

Plate 44. Clearwater. **1** *Cymbopleura crassipunctata* (6277) **2** *C. apiculata* (6277) **3** *C. subcuspidata* (6277) **4, 5** *C. rainierensis* [= *Cymbella gondwana*?] (6277) **6–8** *C. fluminea* (6277) **9** *C. naviculiformis* (6277) **10–12** *C. stauroneiformis* (6277, 6279). Scale bars: 10 µm (specimen in image 1 is at a different scale than the others).

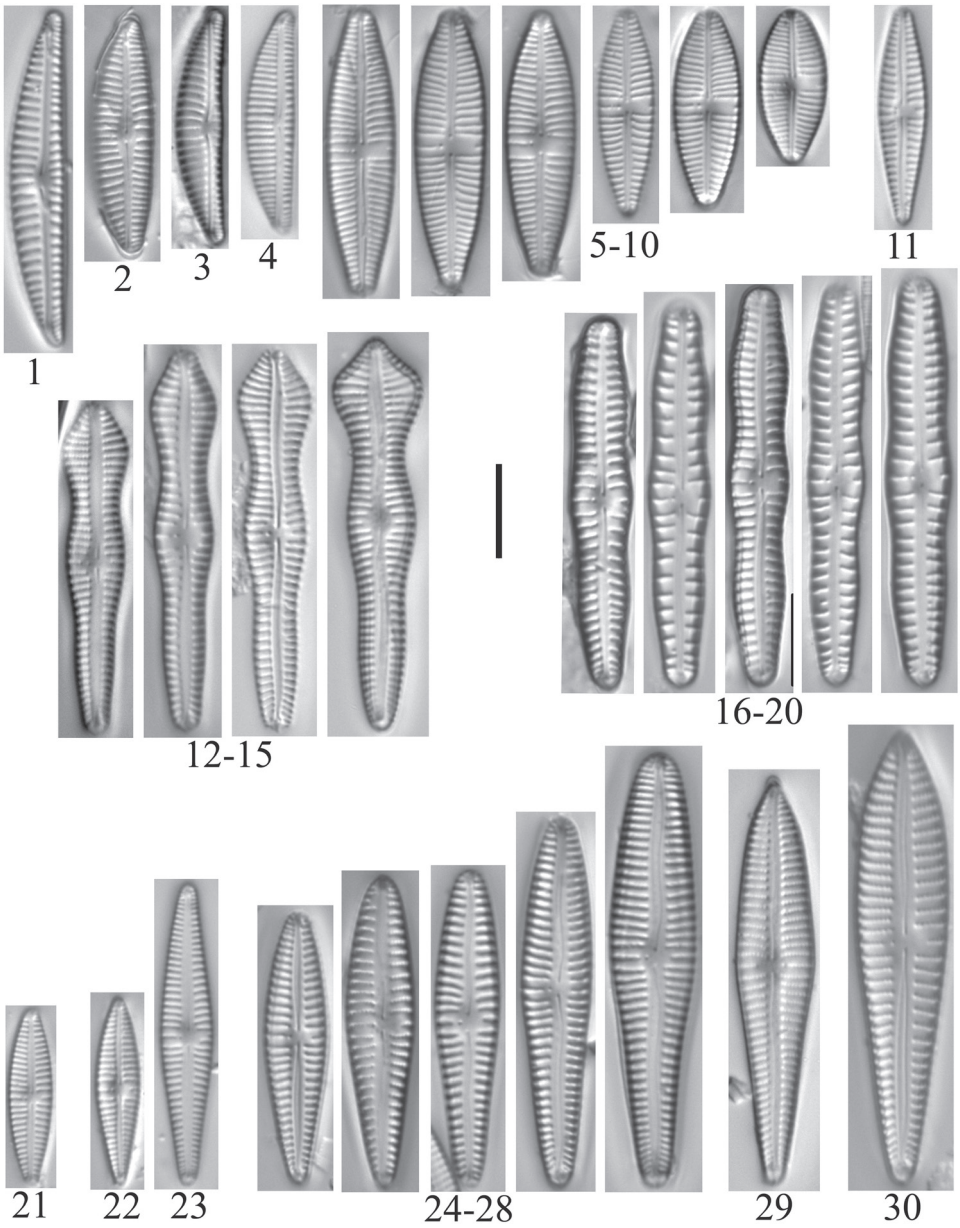

Plate 45. Clearwater. **1** *Encyonema neogracile* (6277) **2** *Encyonema hebridicum* (6273) **3** *Encyonema fogedii* (6279) **4** *Encyonema minutum* (6277) **5–10** *Gomphonema micropus* (6281) **11** *Gomphonema duplipunctatum* (6277) **12–15** *Gomphonema brebissonii* (6276, 6277) **16–20** *Gomphonema distans* (6279) **21** *Gomphonema parvulum* (6277) **22, 23** *Gomphonema auritum* (6276, 6277) **24–28** *Gomphonema subclavatum* (6280) **29** *Gomphonema insigniforme* (6276) **30** *Gomphonema* sp. [cf. *G. bukycanyonum* PH] (6277). Scale bars: 10 μm.

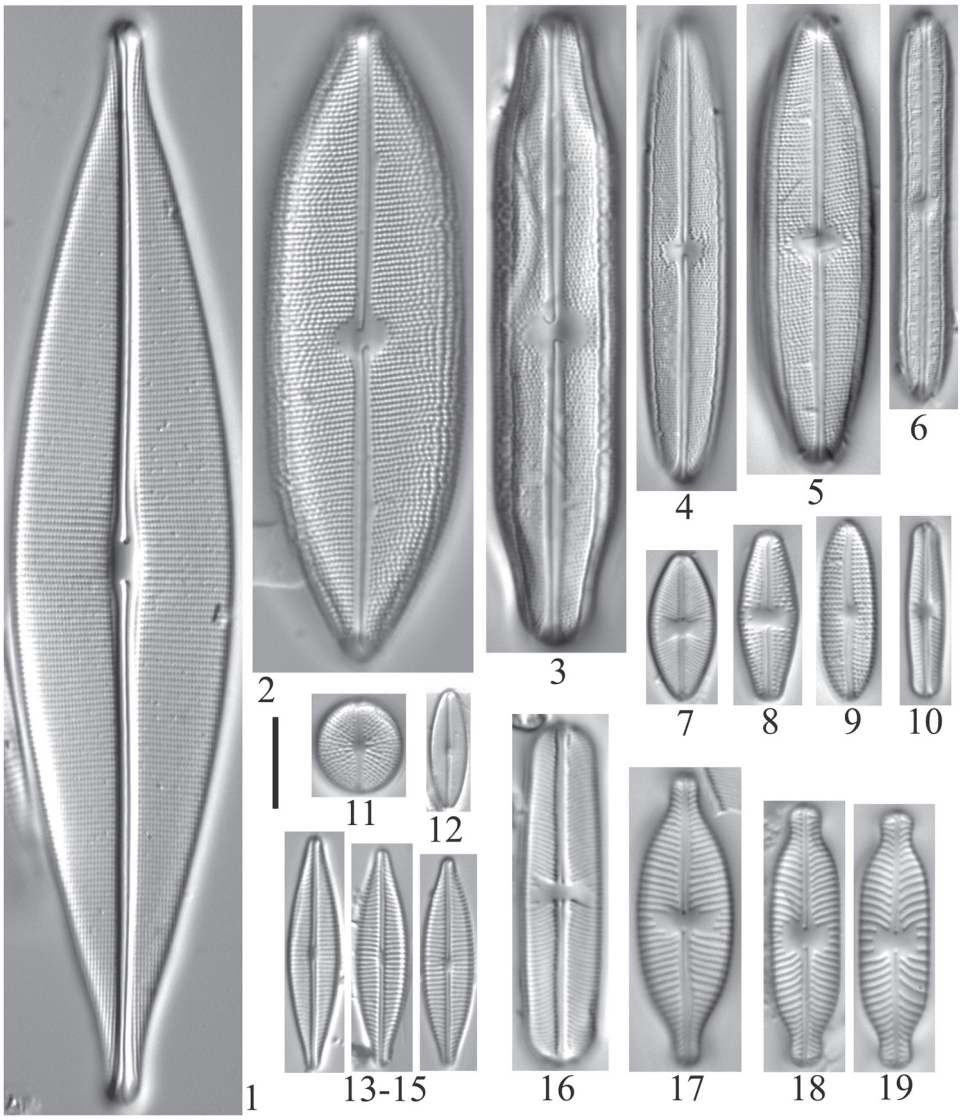

Plate 46. Clearwater. **1** *Craticula cuspidata* (6277) **2** *Neidium amphigomphus* (6276) **3** *Neidium* sp. (6277) **4** *Neidium* sp. (6276) **5** *Neidium ampliatum* [cf. *N. affine* PH] (6277) **6** *Neidium bisulcatum* (6279) **7** *Sellaphora* sp. (6279) **8** *Luticola mutica* (6281) **9** *Boreozonacola olympica* (6277) **10** *Sellaphora* (?) sp. (6281) **11** *Cavinula pseudoscutiformis* (6278) **12** *Adlafia minuscula*? (6277) **13–15** *Craticula buderi* (6280) **16** *Sellaphora rectangularis* (6277) **17** *Placoneis explanata* (6277) **18, 19** *Placoneis elginensis* (6277). Scale bar: 10 µm.

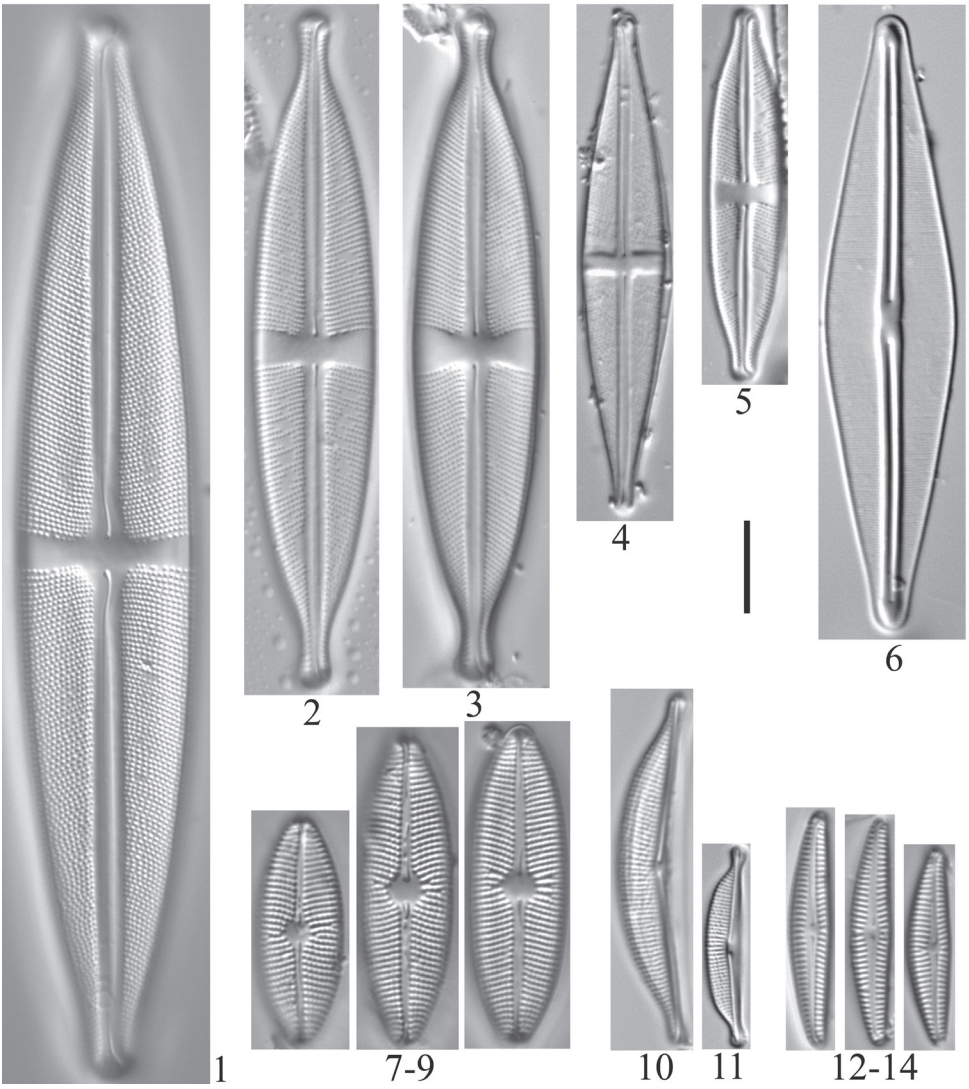

Plate 47. Clearwater. **1** *Stauroneis gracilis* (6276) **2, 3** *Stauroneis amphicephala* (6277) **4** *Stauroneis neohyalina* (6277) **5** *Stauroneis acidoclinata* (6279) **6** *Frustulia saxonica* (6276) **7–9** *Mastogloia elliptica* (6280) **10** *Halamphora* sp., **11** *Halamphora borealis* (6280) **12–14** *Navicymbula pusilla* [*Encyonema* sp.? PH] (6280). Scale bar: 10 μm.

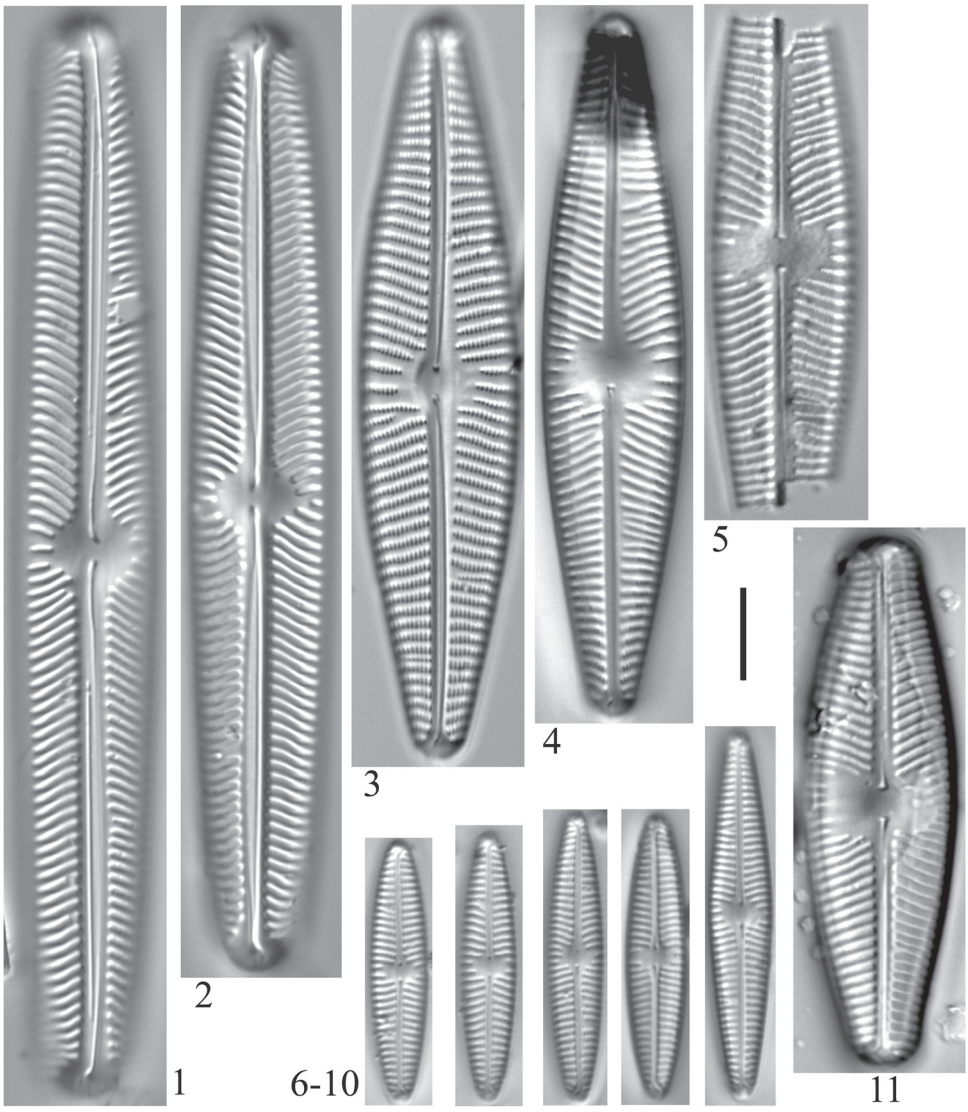

Plate 48. Clearwater. **1, 2** *Navicula oblonga* (6280) **3** *N. peregrina* (6280) **4, 5** *N. kefvingensis* (6280) **6–10** *N. libonensis* (6280) **11** *N. aurora* (6277). Scale bar: 10 μm.

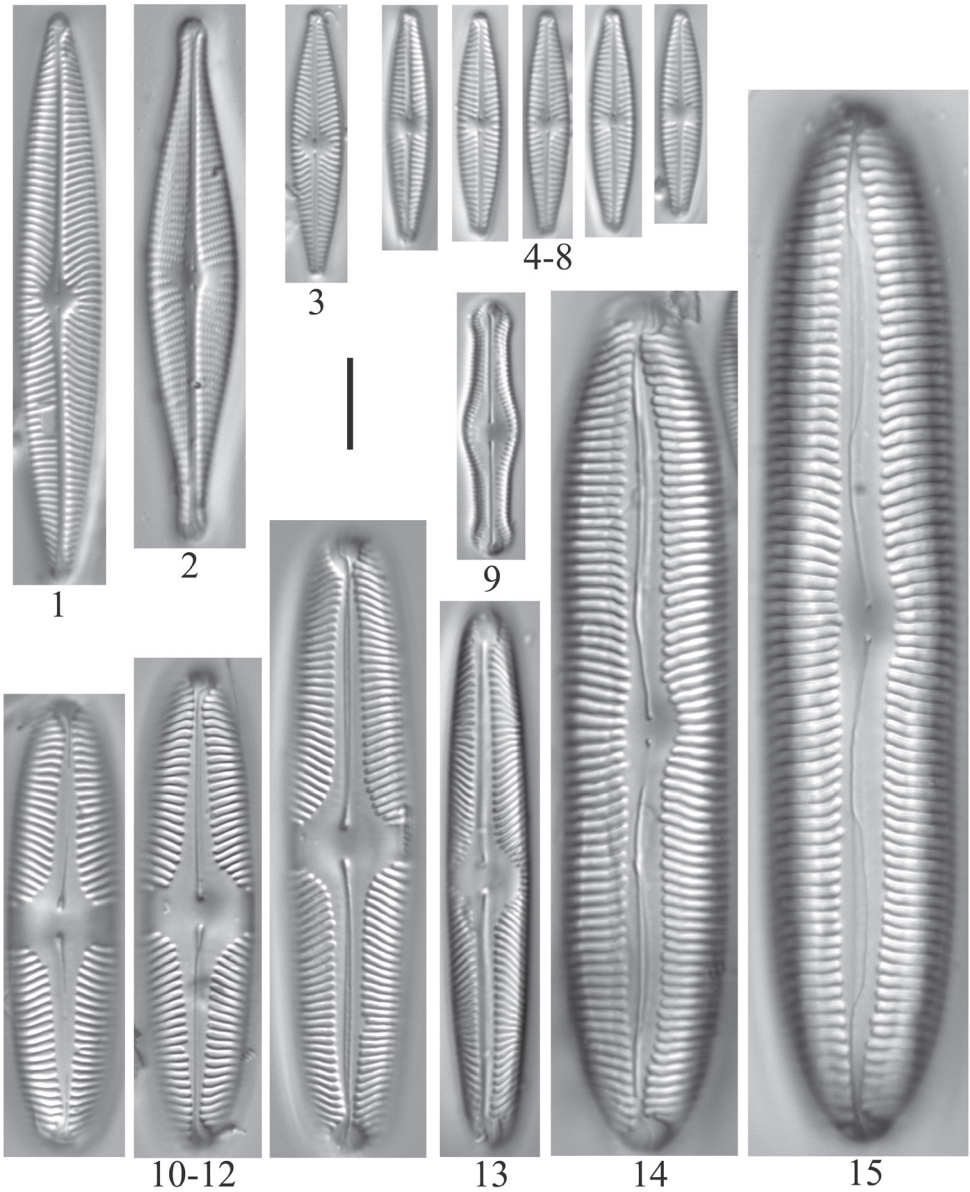

Plate 49. Clearwater. **1** *Navicula radiosa* (6277) **2** *Navicula rhynchocephala* (6277) **3** *Navicula cryptocephala* [cf. *N. cryptocephala* PH] (6277) **4–8** *Navicula trilatera* (6280) **9** *Pinnularia ignobilis* [cf. *Chamaepinnularia krookii* PH] (6280) **10–12** *Pinnularia brebissonii* (6280) **13** *Pinnularia lenticula* [cf. *P. lenticula* PH] (6278) **14, 15** *Pinnularia viridiformis* (6280). Scale bar: 10 µm.

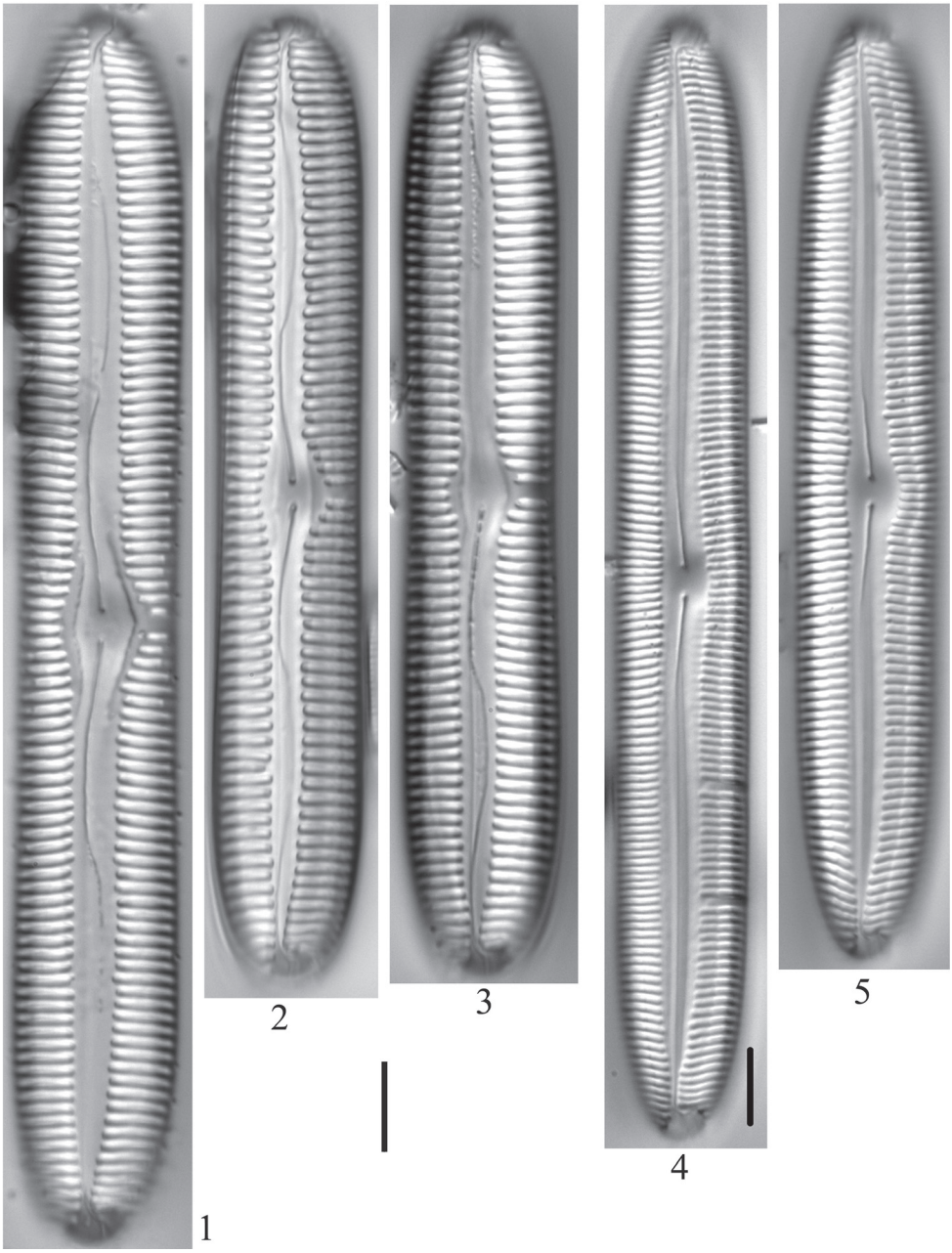

Plate 50. Clearwater. **1–3** *Pinnularia* sp. [cf. *P. genkalii*] (6279) **4, 5** *P. neomajor* (6276, 6277). Scale bars: 10 µm (specimen in image 4 is at a different scale than the others).

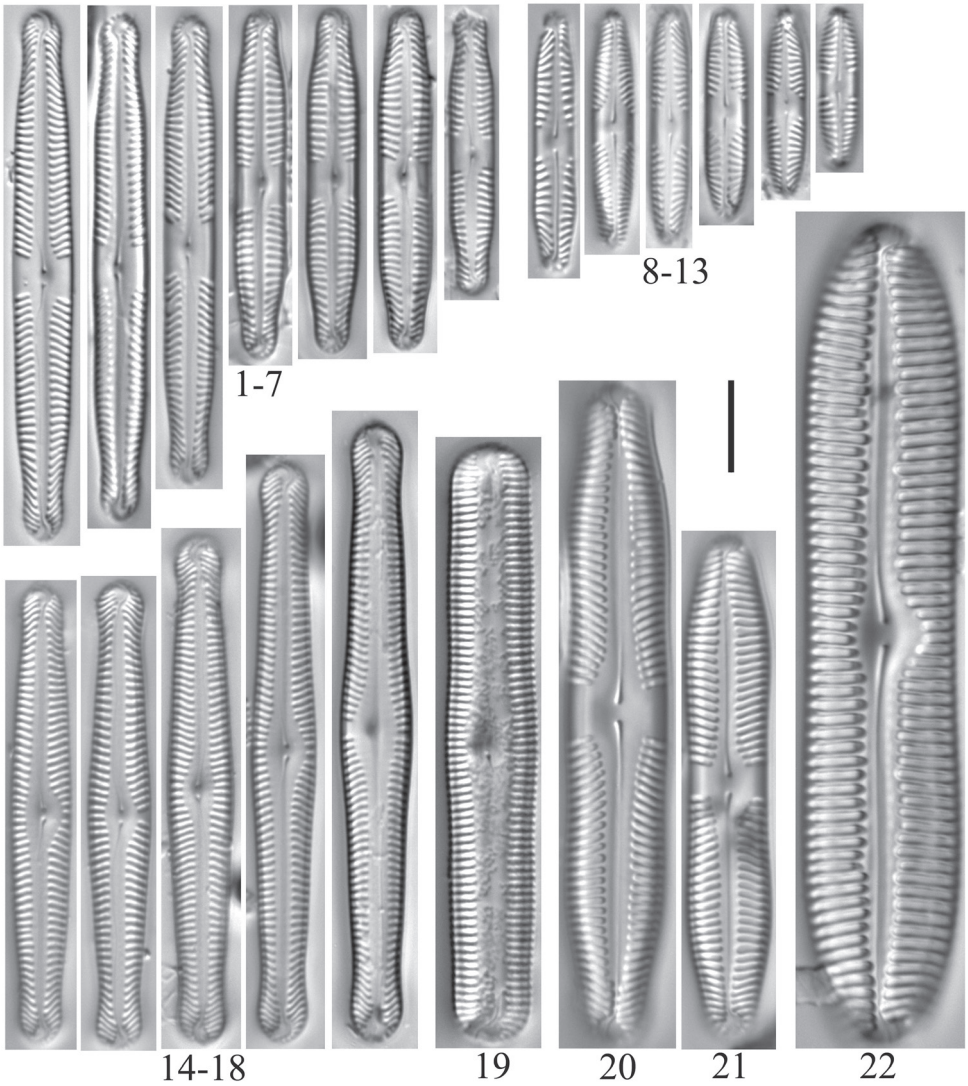

Plate 51. Clearwater. **1–7** *Pinnularia subcapitata* var. *elongata* (6275, 6279) **8–13** *P. obscura* (6279) **14–18** *P. gibbiformis* (6276) **19** *P. acrosphaeria* (6277) **20, 21** *P.* sp. [*P. biceps* sensu lato PH] (6276, 6278) **22** *P.* sp. [*P. viridiformis* sensu lato PH] (6279). Scale bar: 10 μm.

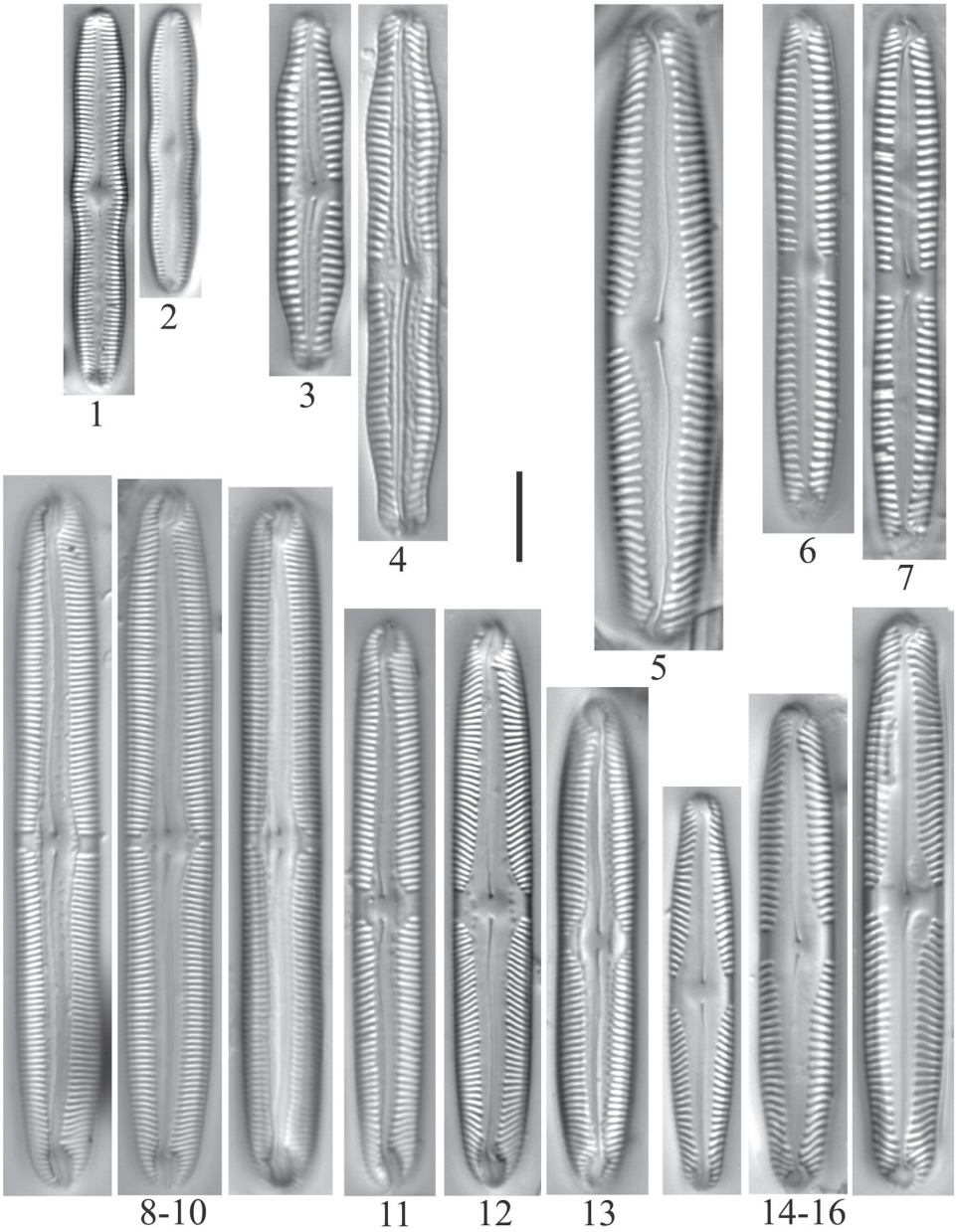

Plate 52. Clearwater. **1, 2** *Pinnularia* sp. [cf. *P. subpulchra*] [cf. *Caloneis arctica* PH] (6277) **3, 4** *P. nodosa* (6279) **5** *P.* sp. [cf. *P. sudetica* or *persudetica* PH] (6279) **6, 7** *P. ivaloensis* (6279) **8–10** *P. spitsbergensis* (6276, 6279) **11** *P.* sp. [cf. *P. spitsbergensis*] (6276) **12, 13** *P. stomatophora* (6277) **14–16** *P.* sp. [cf. *P. graciloides* var. *triundulata*] [cf. *P. subgibba* PH] (6277). Scale bar: 10 µm.

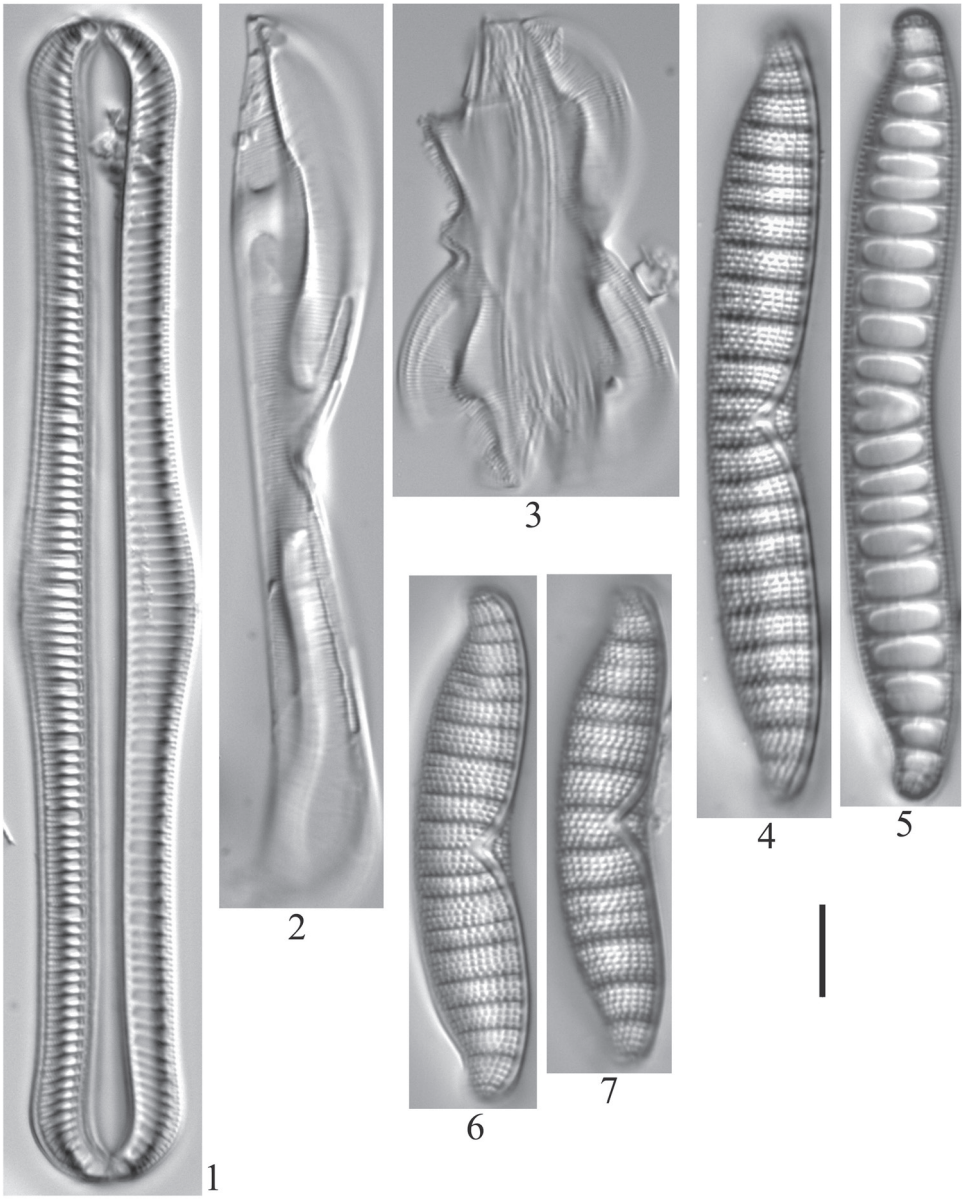

Plate 53. Clearwater. **1** *Rhopalodia gibba* (6277) **2, 3** *Entomoneis paludosa* (6280) **4–7** *Epithemia argus* (6277). Images **4** and **5** are the same specimen at high and low focus. Scale bar: 10 µm.

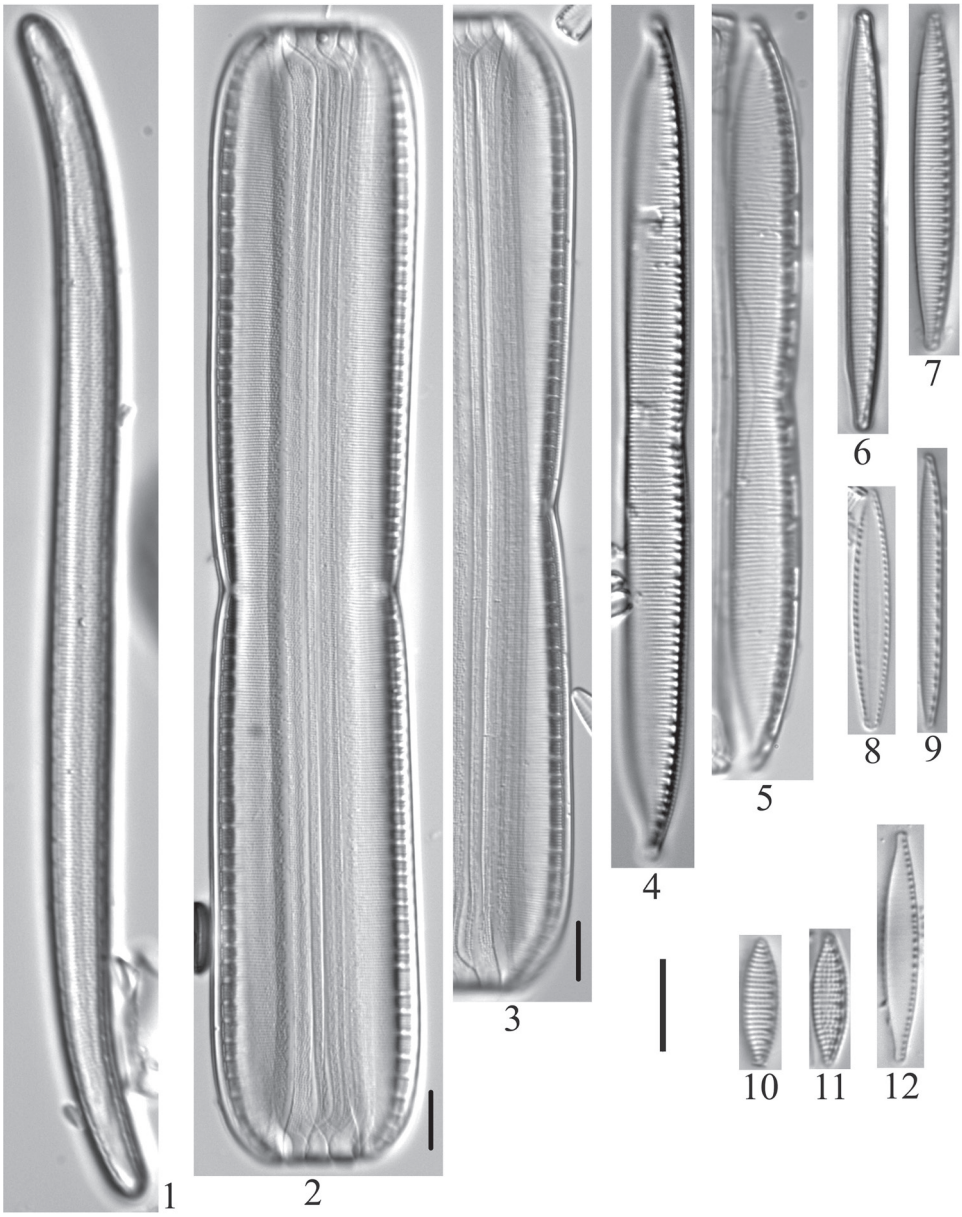

Plate 54. Clearwater. **1** *Stenopterobia curvula* (6276) **2, 3** *Nitzschia kittlii* (6280) **4** *Nitzschia linearis* (6280) **5** *Nitzschia commutata* (6280) **6, 7** *Nitzschia radicula* [*N. fossilis* PH] (6280) **8** *Nitzschia perspicua* [cf. *N. bergii* PH] (6280) **9** *Nitzschia perminuta* (6277) **10, 11** *Nitzschia amphibia* (6280) **12** *Nitzschia palea* (6277). Scale bars: 10 µm (images 2 and 3 are at different scales than the others).

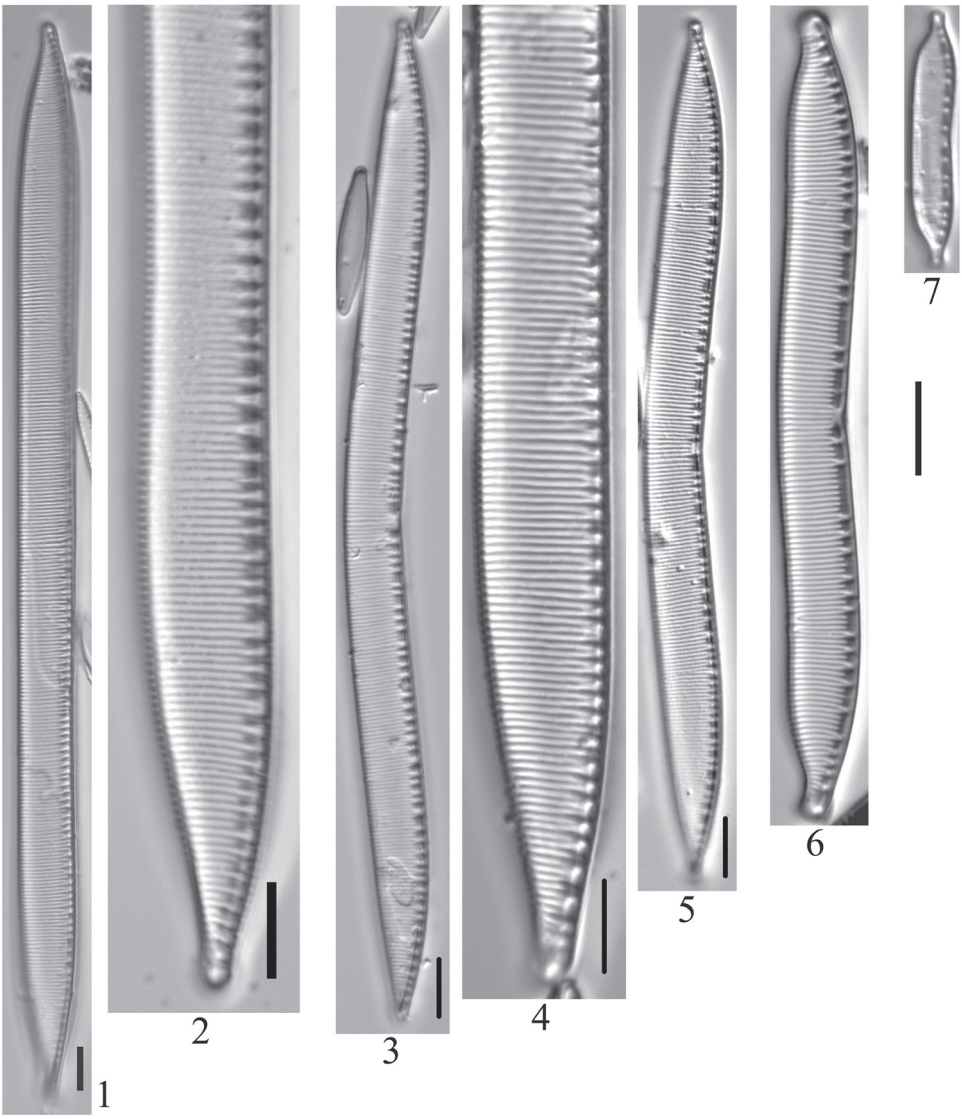

Plate 55. Clearwater. **1, 2** *Hantzschia elongata* (6280) **3–5** *H. vivacior* (6280) **6** *H.* sp. (6279) **7** *H. amphioxys* [*H. amphioxys* sensu lato PH] (6278). Scale bars: 10 µm (images **1, 3** and **5** are at different scales than the others).

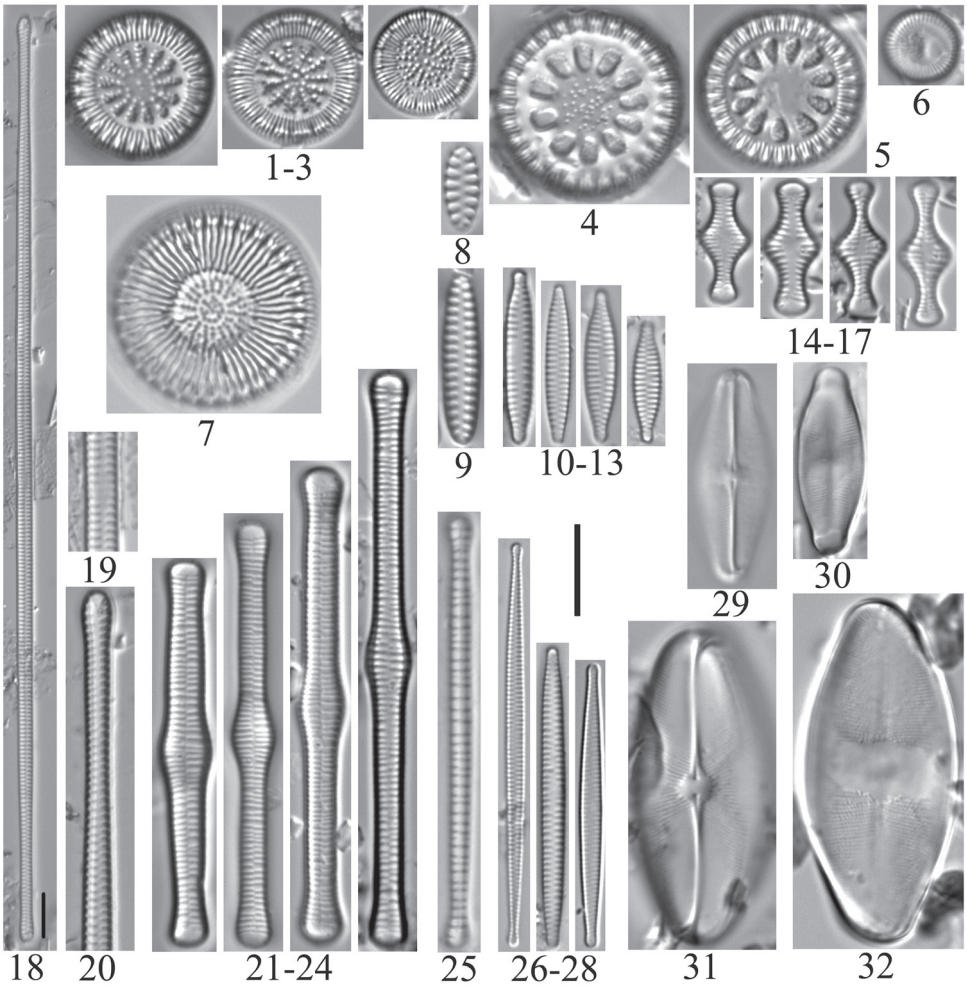

Plate 56. Coppermine. **1–3** *Lindavia radiosa* [*L. antiqua* PH] (6830, 6831) **4, 5** *Lindavia antiqua* (6830, 6831) **6** *Lindavia michiganiana* (6832) **7** *Lindavia intermedia* (6830) **8, 9** *Staurosirella* sp. [cf. *S. pinnata*] (6832) **10–13** *Fragilaria* spp. [cf. *F. vaucheriae*] [*F. capucina* PH] (6832, 6833) **14–17** *Tabellaria flocculosa* (6830, 6831, 6832) **18–20** *Ulnaria* sp. (6832) (all three images are of the same specimen; image **18** is at a different scale) **21–24** *Tabellaria fenestrata* [*T. flocculosa* var. *linearis* PH] (6828, 6830, 6831, 6832) **25** *Diatoma tenuis* (6832) **26–28** *Fragilaria* spp. [cf. *F. capucina*] (6832, 6833) **29, 30** *Eucocconeis laevis* (6826, 6830, 6833) **31, 32** *Eucocconeis flexella* (6827, 6831, 6833). Scale bars: 10 μm.

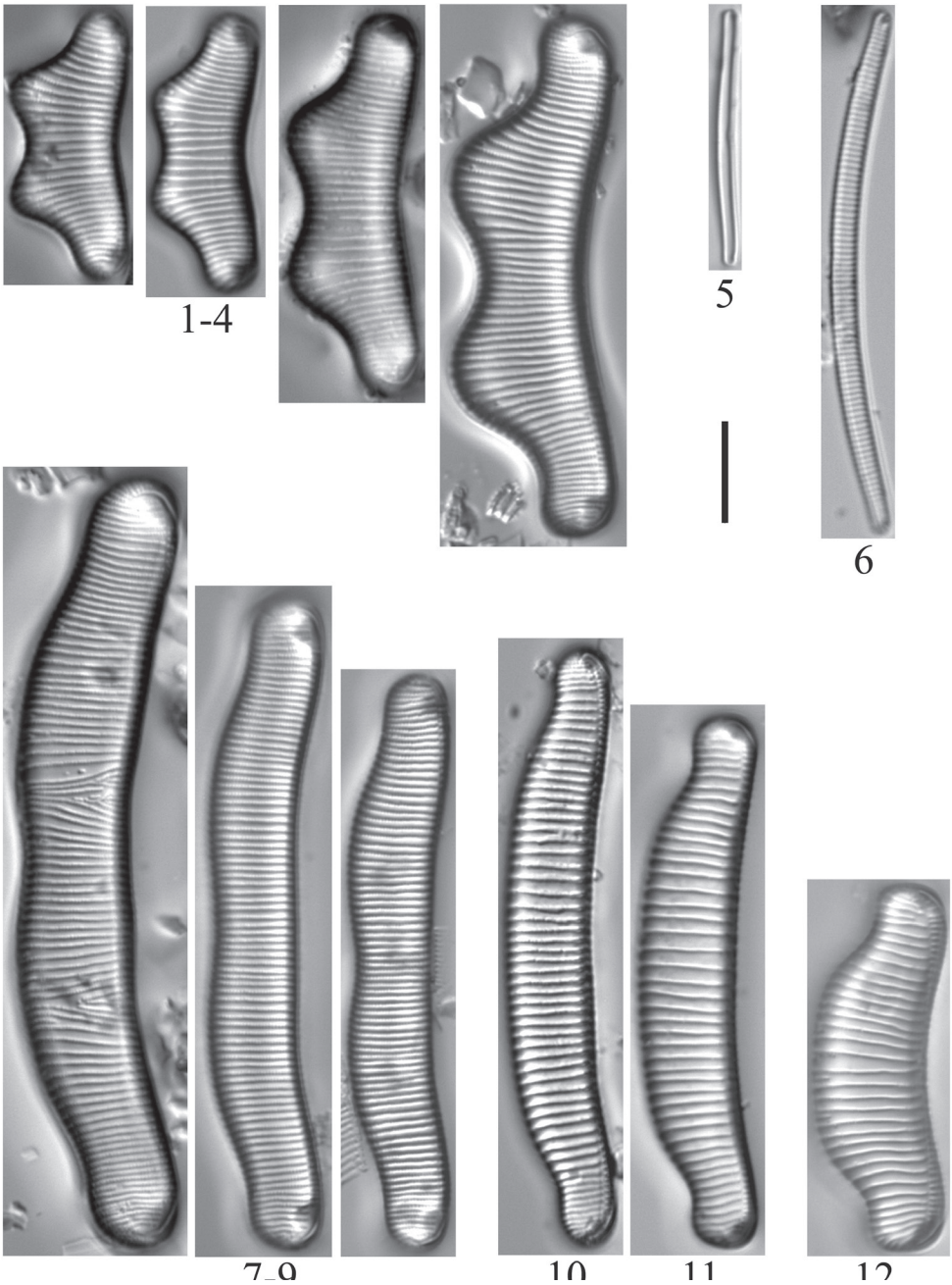

Plate 57. Coppermine. **1–4** *Eunotia islandica* (6828) **5** *E.* sp. (6833) **6** *E. mucophila* (6833) **7–9** *E. altimontana* (6828, 6830, 6831) **10, 11** *E. arcus* (6833) **12** *E. ursamaioris* [*E. praerupta* PH] (6824). Scale bar: 10 µm.

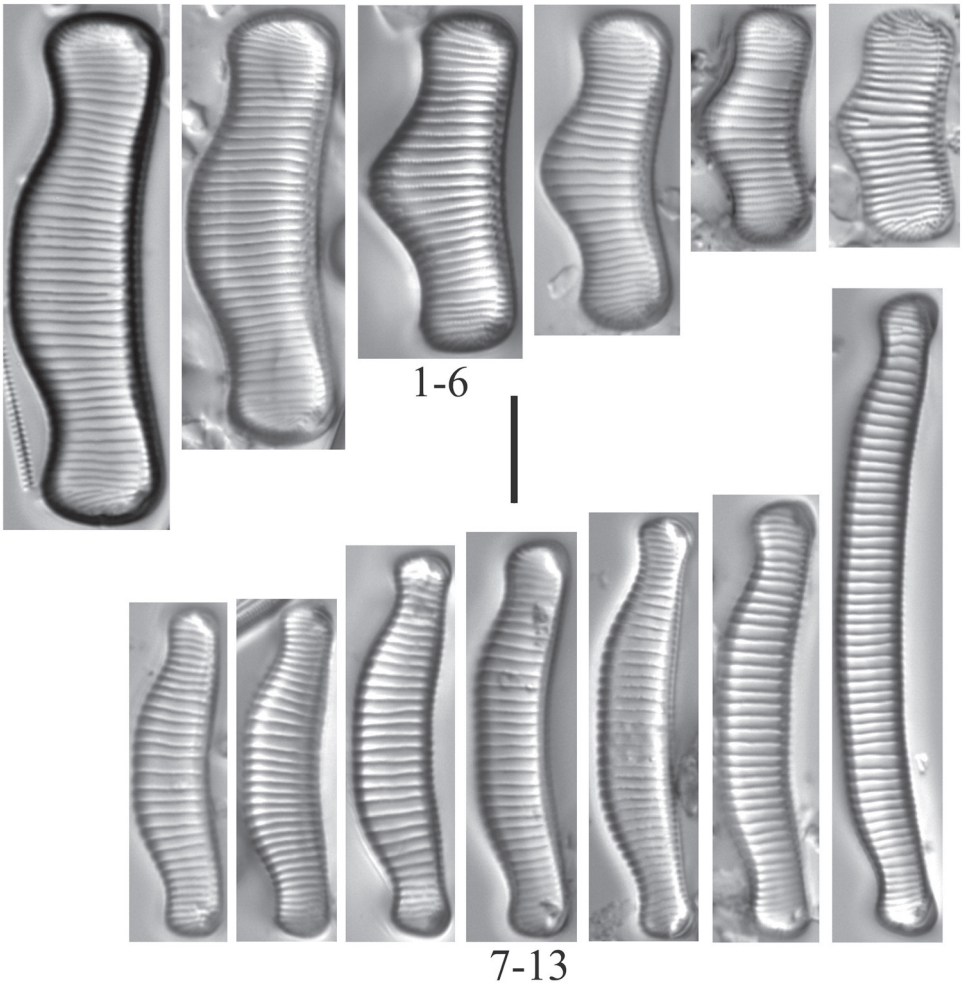

Plate 58. Coppermine. **1–6** *Eunotia excelsa* (6826, 6828) **7–13** *E. arcubus* [*E. arcus* PH (small forms only)] (6831, 6833). Scale bar: 10 μm.

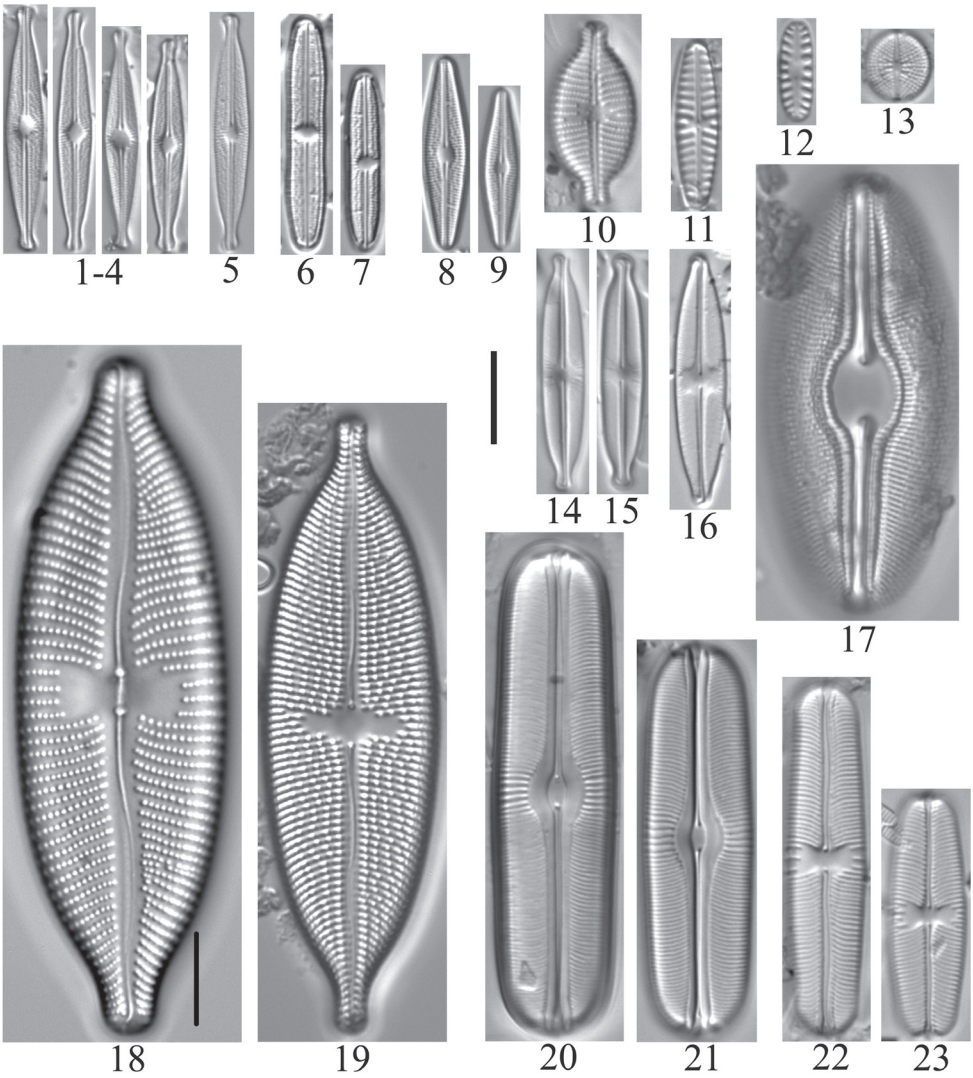

Plate 59. Coppermine. **1–4** *Brachysira* sp. [cf. *B. microcephala*] (6830) **5** *Brachysira* sp. [cf. *B. microcephala* (6827) **6, 7** *Brachysira zellensis* (6830) **8, 9** *Brachysira* sp. [*B. microcephala* form 1 PH] (6830) **10** *Placoneis* (?) sp. (6832) **11** *Hippodonta hungarica* (6832) **12** *Hygroptera balfouriana* (6827) **13** *Cavinula pseudoscutiformis* (6832) **14, 15** *Kobayasiella micropunctata* [cf. *K. subtilissima* PH] (6827, 6830, 6831) **16** *Kobayasiella jaagii* (6830) **17** *Diploneis krammeri* (6833) **18** *Placoneis amphibola* (6828) **19** *Aneumastus tusculus* (6830, 6831) **20, 21** *Sellaphora alastos* (6832) **22, 23** *Sellaphora* sp. [*S. rectangularis* PH] (6832). Scale bar: 10 µm.

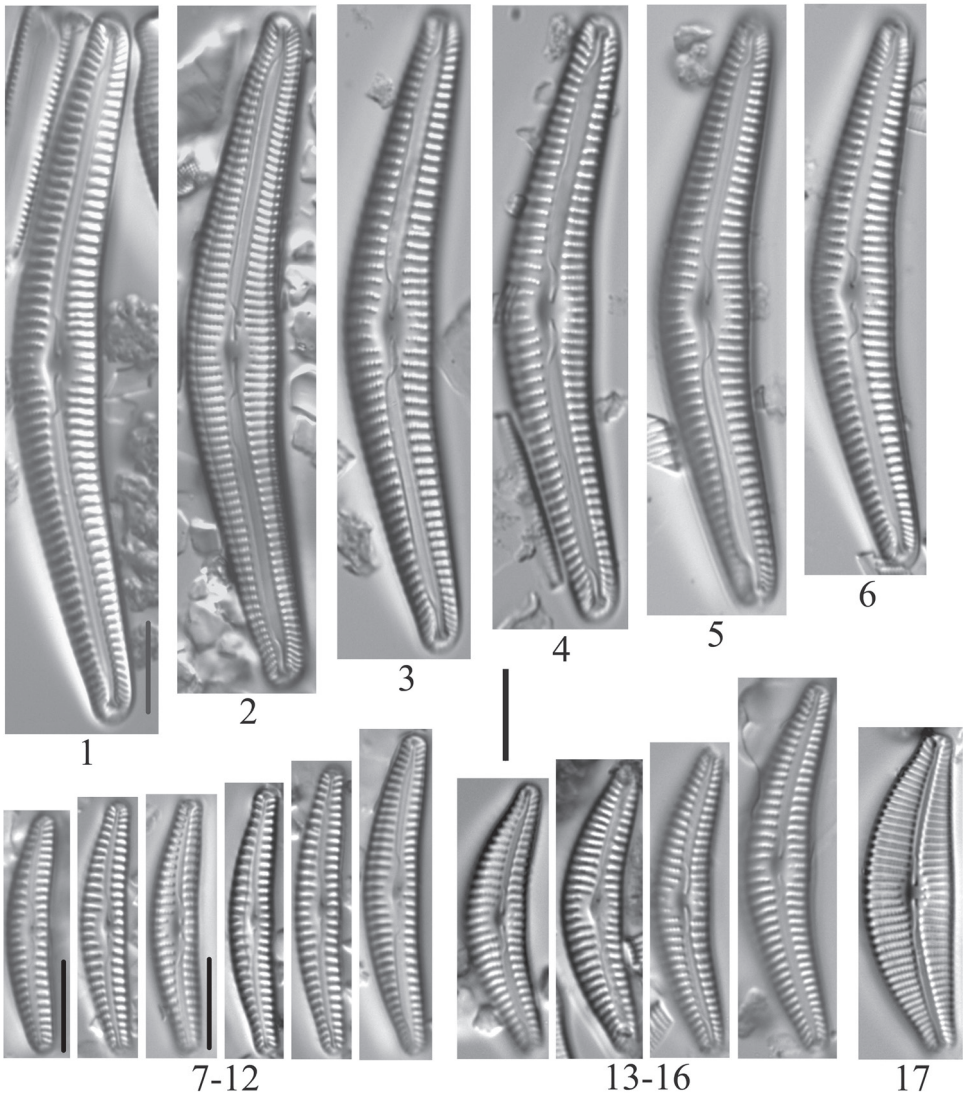

Plate 60. Coppermine. **1–6** *Cymbella* sp. [cf. *C. cleve-eulerae*] [*C. neocistula* var. PH] (6830, 6831, 6833) **7–12** *C. botellus* (6826, 6829, 6830) **13–16** *C. cleve-eulerae* (6826, 6828, 6830, 6831, 6833) **17** *C. subturgidula* (6833). Scale bars: 10 µm.

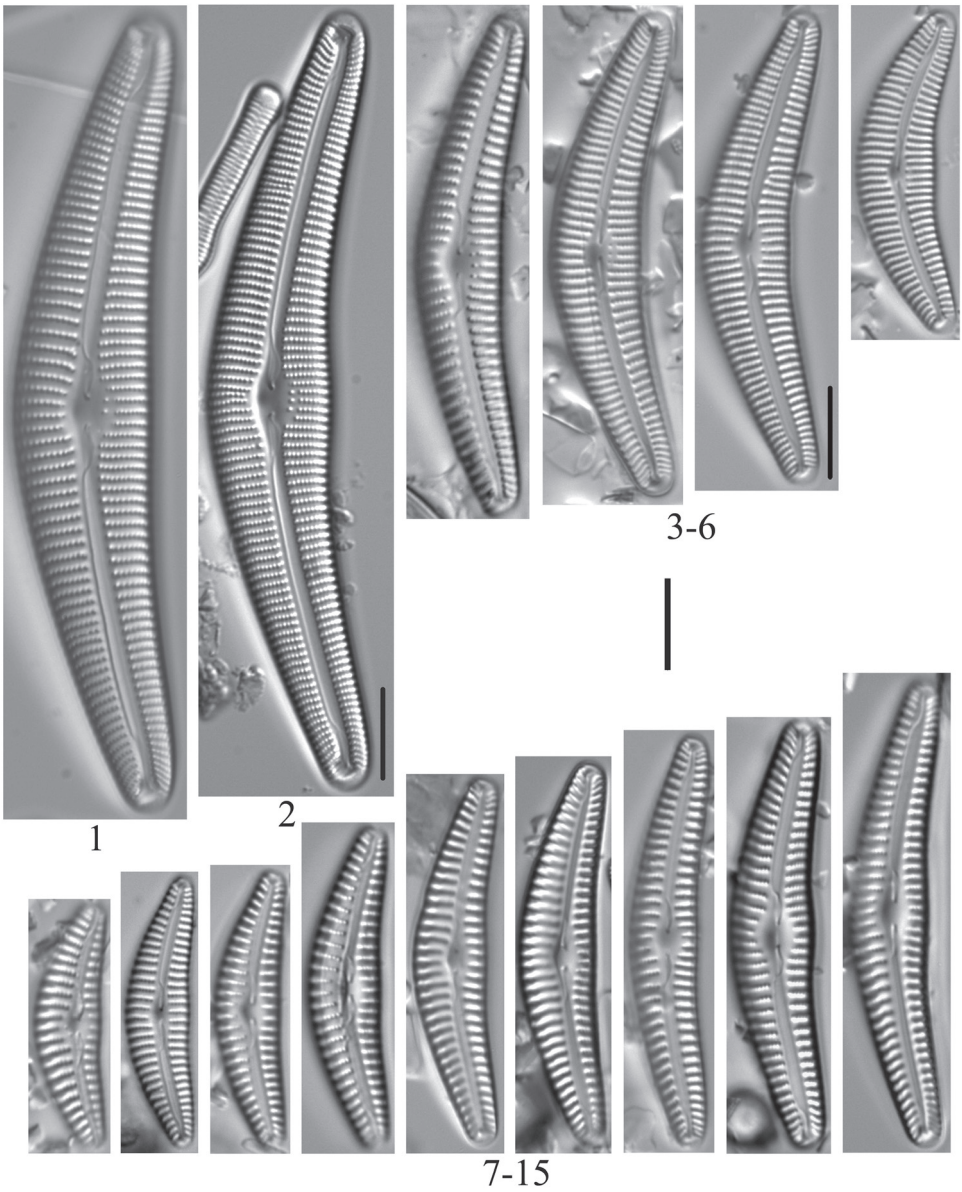

Plate 61. Coppermine. **1, 2** *Cymbella neocistula* (6824, 6831) **3–6** *C. krammeri* (6826, 6827, 6829, 6830, 6833) **7–15** *C. cleve-eulerae* (6826, 6828, 6830, 6831, 6833). Scale bars: 10 µm.

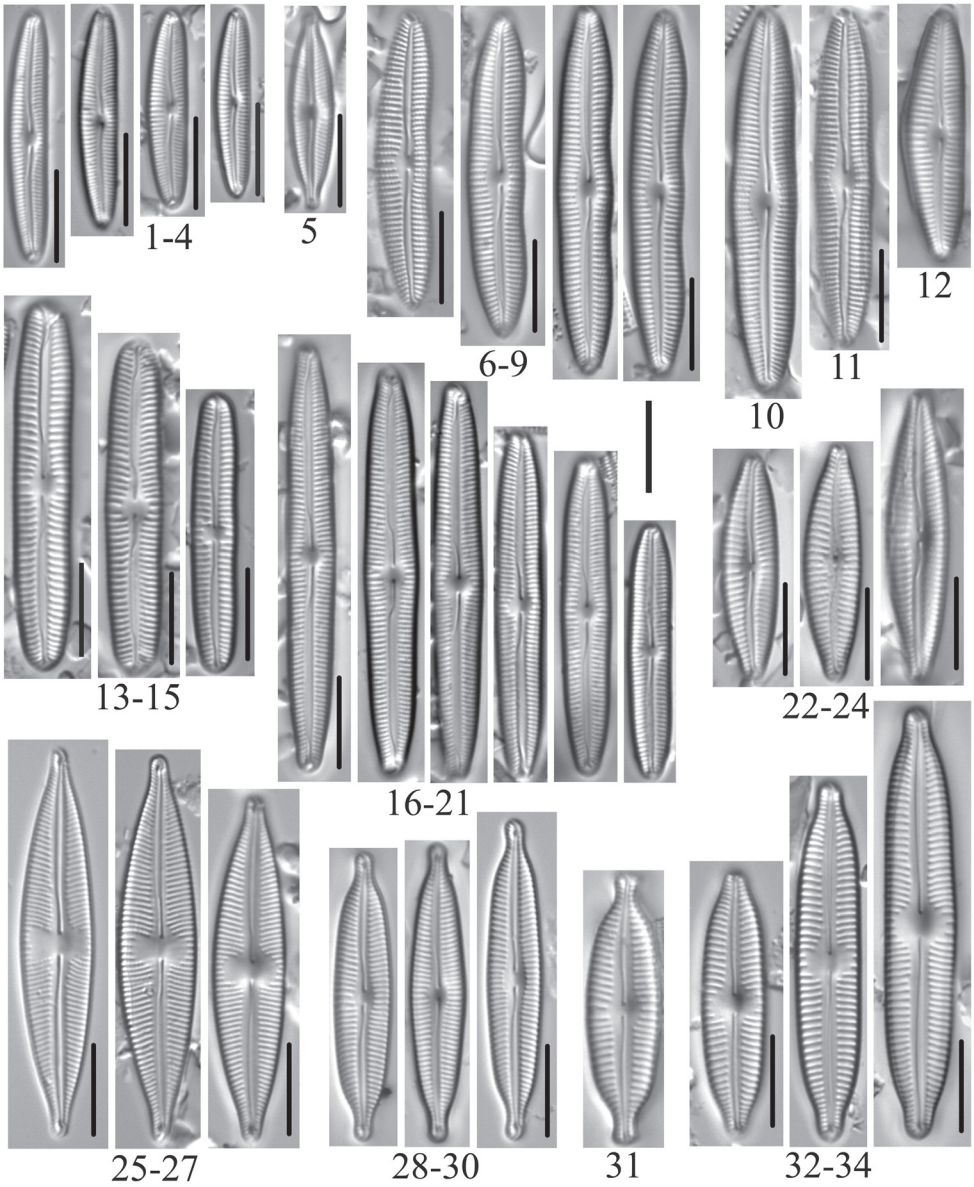

Plate 62. Coppermine. **1–4** *Cymbopleura tundraphila* (6830, 6833) **5** *C. geofriedii* [cf. *C. geofriedii* PH] (6830) **6–9** *C. incerta* var. *spitsbergensis* (6830, 6831, 6833) **10–12** *C. incerta* (6826, 6829, 6831) **13–15** *C. oblongata* (6828, 6830, 6833) **16–21** *C. incertiformis* var. *linearis* (6830, 6833) **22–24** *C. rupicola* (6830) **25–27** *C. stauroneiformis* (6828, 6830, 6833) **28–30** *C. angustata* (6829, 6830, 6831, 6833) **31** *C. amphicephala* (6833) **32–34** *C. hybrida* (6833). Scale bars: 10 μm.

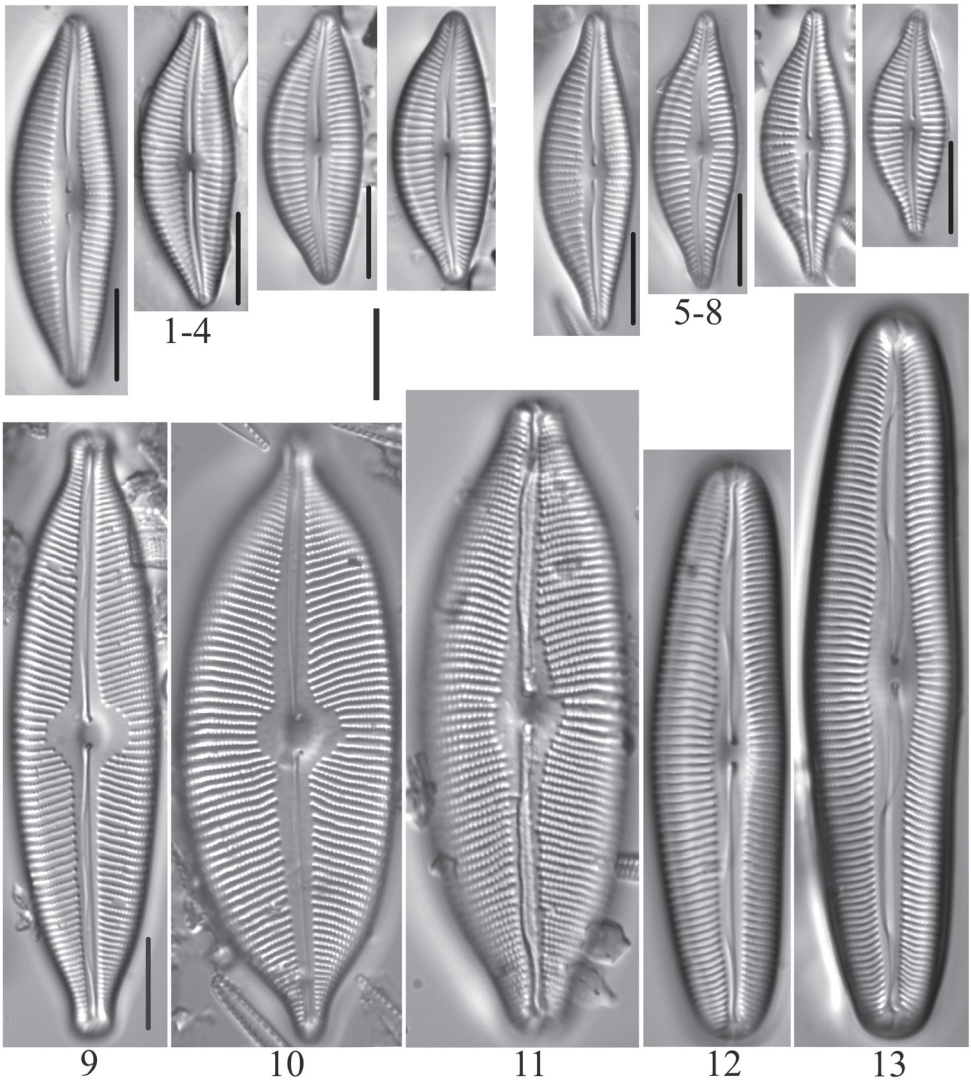

Plate 63. Coppermine. **1–4** *Cymbopleura heilprinensis* (6828, 6829, 6831, 6833) **5–8** *Cymbella designata* [syn. *Cymbopleura citriformis*] (6829, 6830, 6831) **9** *Cymbopleura tynnii* (6828, 6831) **10** *Cymbopleura apiculata* (6832) **11** *Cymbopleura lata* (6830) **12, 13** *Cymbopleura austriaca* (6824). Scale bars: 10 µm.

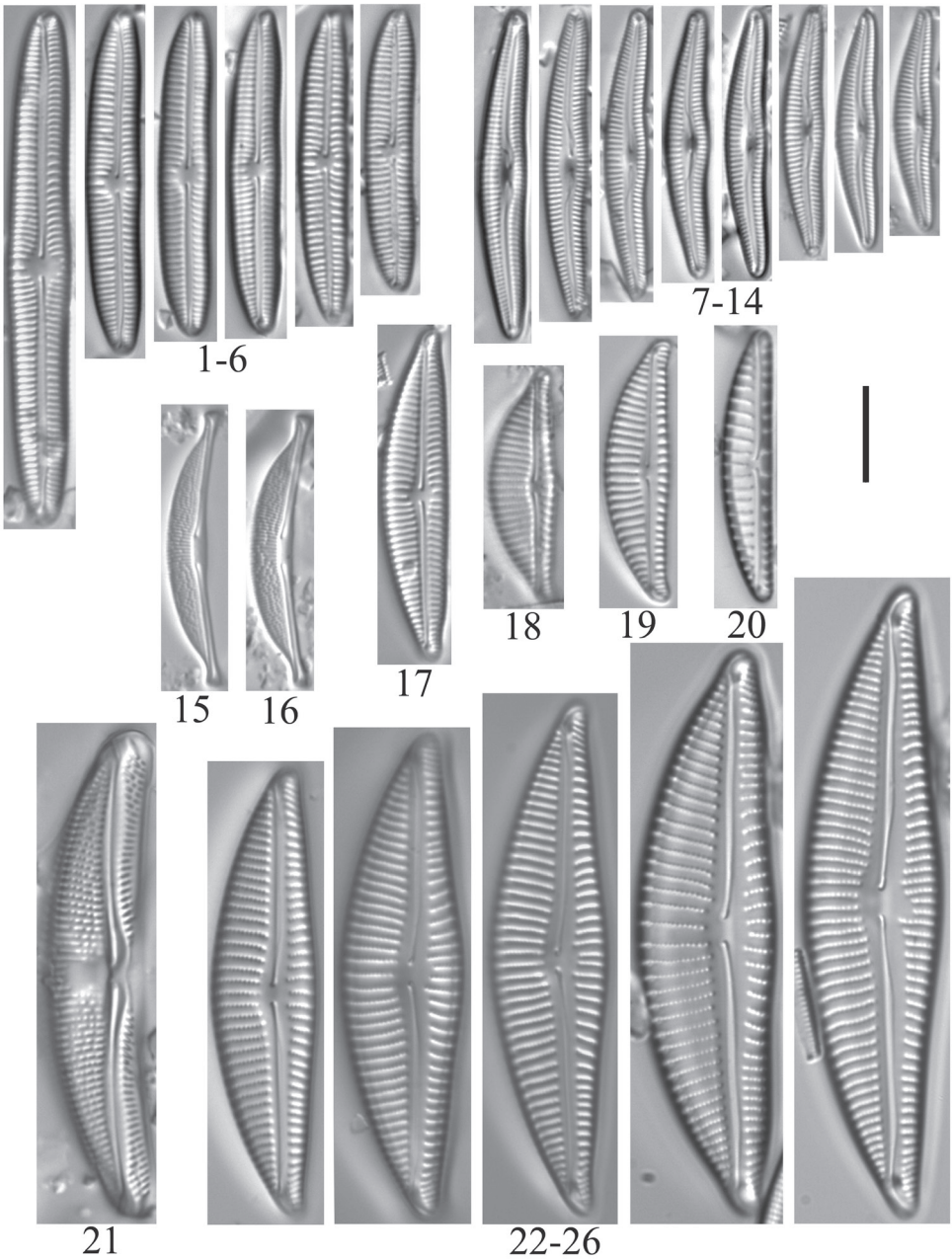

Plate 64. Coppermine. **1–6** *Encyonema norvegicum* (6829, 6830, 6833) **7–14** *Delicata canadensis* (6829, 6830, 6833) **15, 16** *Halamphora coraensis* (6829, 6831) **17** *Encyonema hebridicum* (6829) **18** *Encyonema ventricosum* (6832) **19** *Encyonema silesiacum* (6831) **20** *Encyonema paucistriatum* (6833) **21** *Amphora lange-bertalotii* (6826) **22–26** *Encyonema hintzii* or *Encyonema vulgare* (6827, 6830, 6831, 6832, 6833). Scale bar: 10 µm.

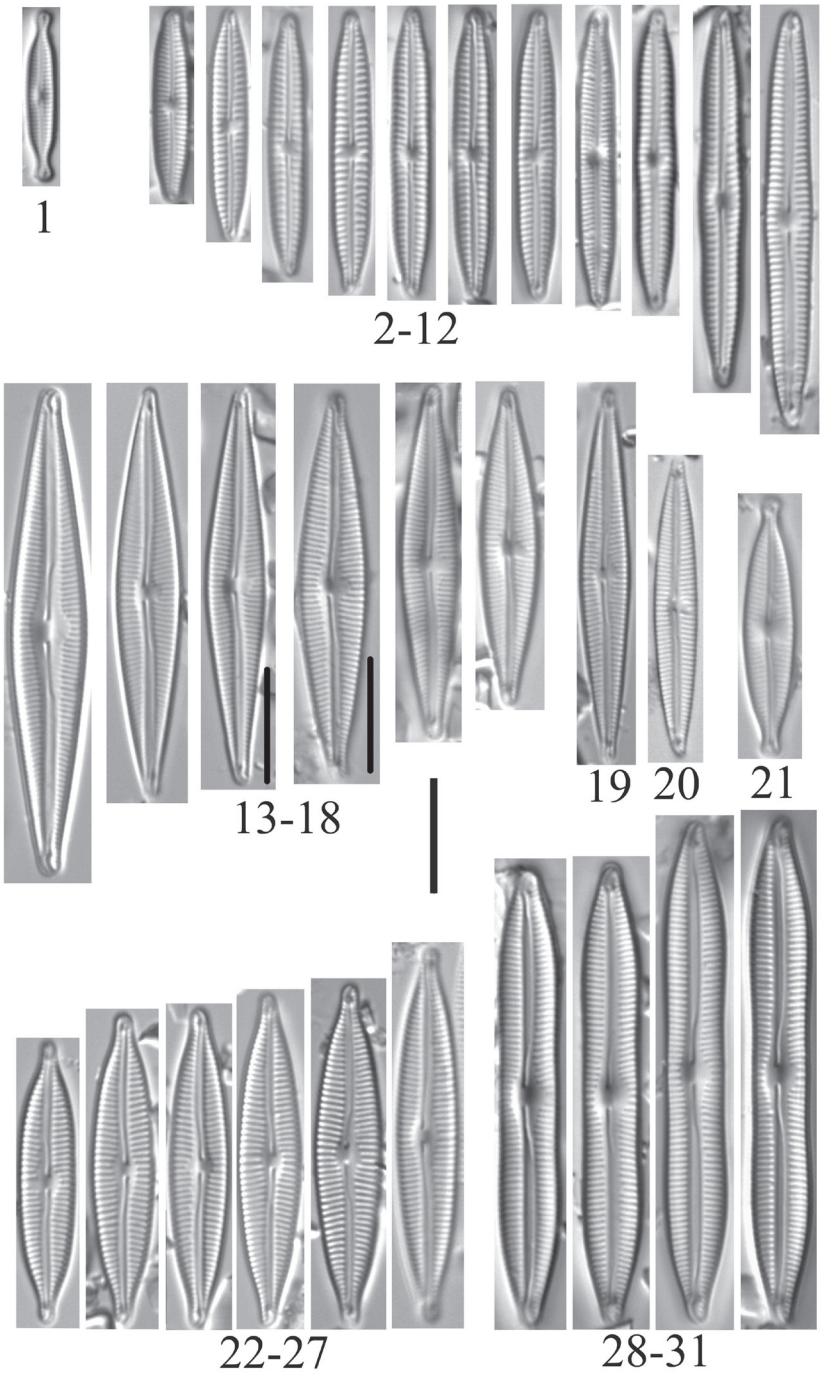

Plate 65. Coppermine. **1** *Encyonopsis* sp. [cf. *E. angusta*] (6830) **2–12** *E. inuitorum* (6830, 6831, 6833) **13–18** *E. stafsholtii* (6827, 6829, 6830, 6831, 6833) **19, 20** *E.* sp. [cf. *E. neerlandica*] (6831, 6833) **21** *E.* sp. [cf. *E. descripta*] (6833) **22–27** *E. cesatiformis* [*E. cesatii* sensu stricto PH] (6826, 6830, 6831, 6833) **28–31** *E. lacuscaerulei* (6829, 6830). Scale bars: 10 µm.

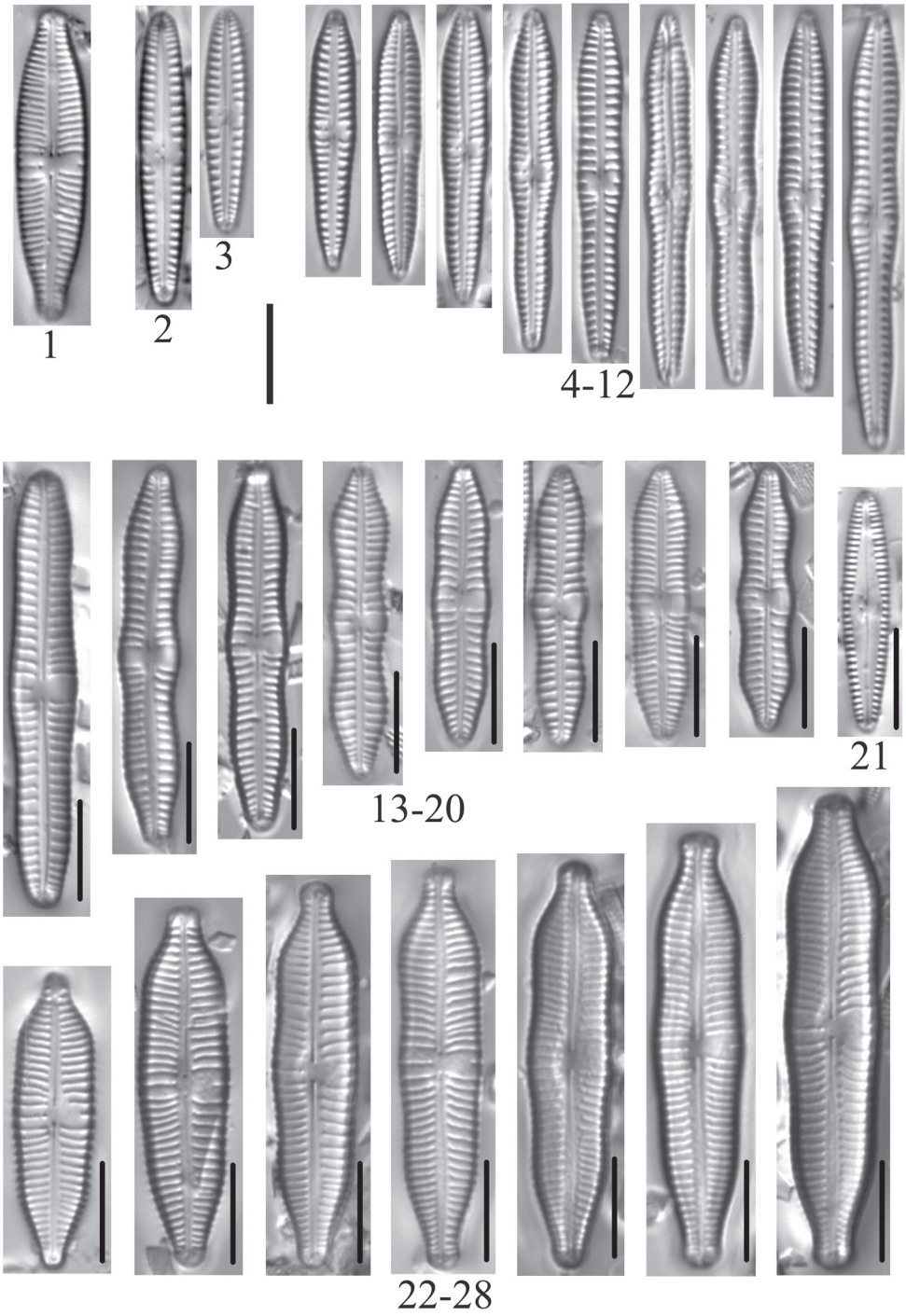

Plate 66. Coppermine. **1** *Gomphonema micropus* (6828) **2, 3** *G. lateripunctatum* (6826, 6833) **4–12** *G. lagerheimii* (6830, 6831, 6833) **13–20** *G. distans* (6828, 6830) **21** *G. caperatum* (6828) **22–28** *G. nathorstii* [*G. angustatum* var. *undulatum* sensu Foged PH] (6828). Scale bars: 10 μm.

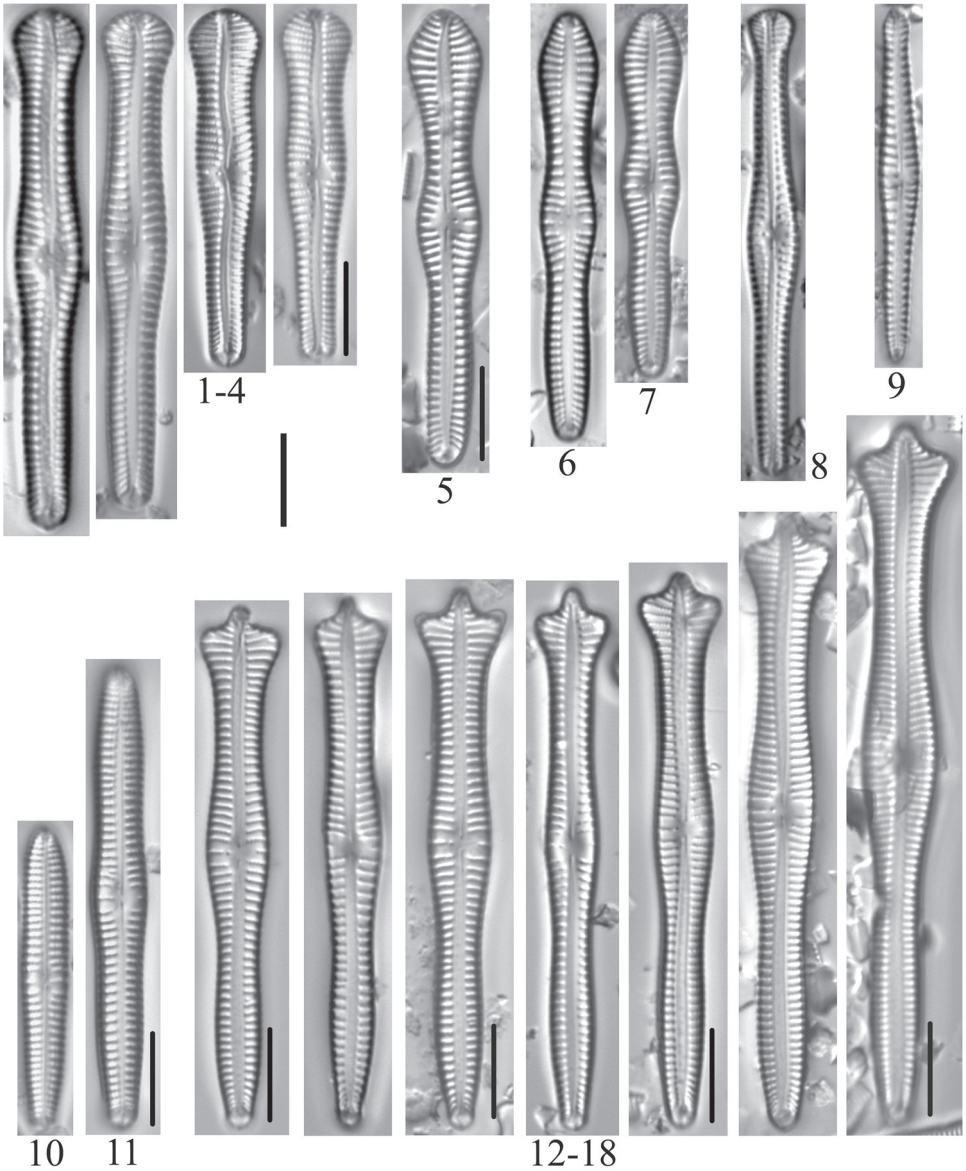

Plate 67. Coppermine. **1–4** *Gomphonema* sp. [cf. *G. capitatum*] (6833) **5** *G. brebissonii* (6830) **6, 7** *G.* sp. [cf. *G. interpositum*] (6832, 6833) **8** *G. subtile* (6833) **9** *G. subtile* var. *sagitta* (6833) **10, 11** *G.* sp. (6830, 6831) **12–18** *G. coronatumaceum* (6830, 6831). Scale bars: 10 µm.

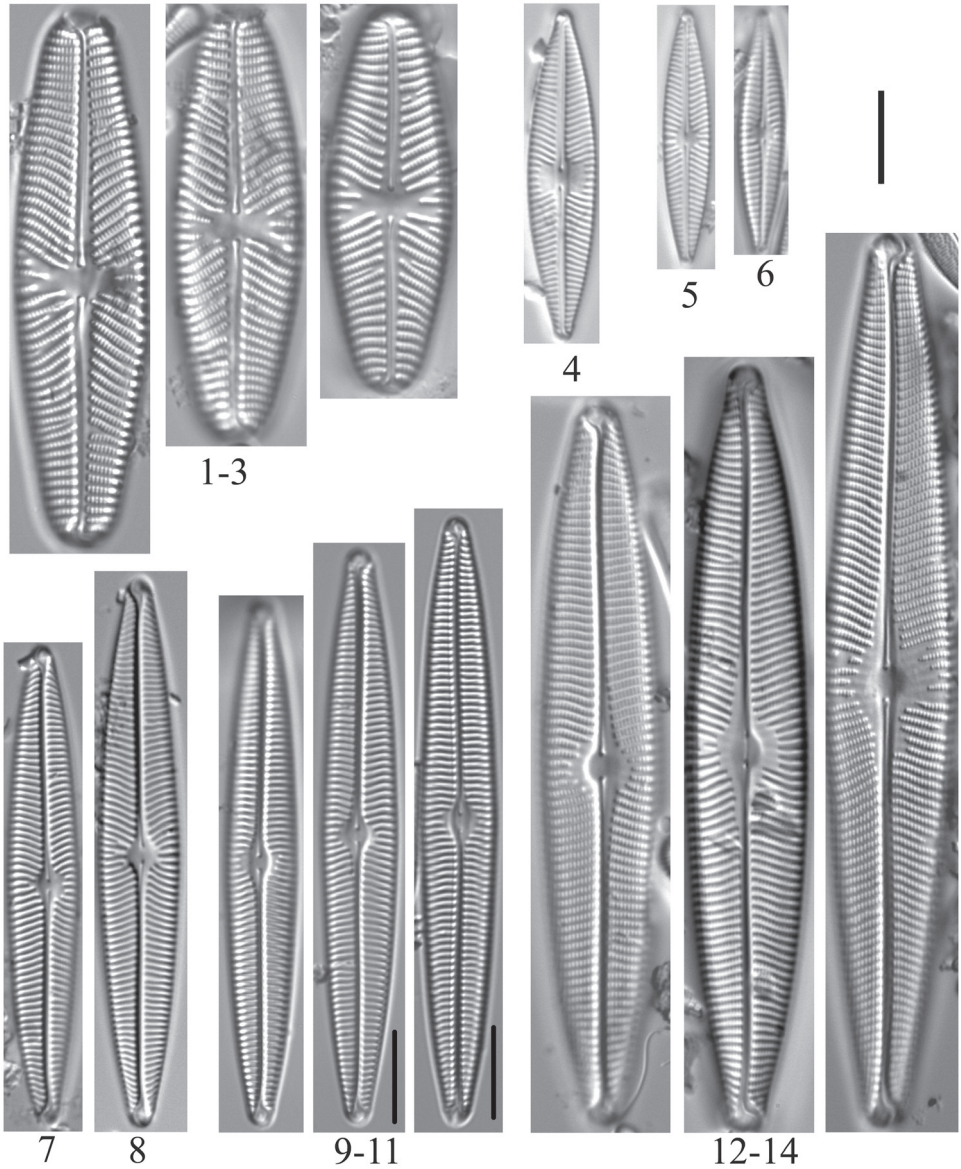

Plate 68. Coppermine. **1–3** *Navicula reinhardtii* (6832) **4** *N. sieminskiae* [cf. *N. sieminskiae* PH] (6833) **5, 6** *N. notha* (6830, 6833) **7, 8** *N. radiosa* (6832, 6833) **9–11** *N. tripunctata* var. *arctica* (6830, 6831, 6832) **12–14** *N. vulpina* (6831, 6833). Scale bars: 10 µm.

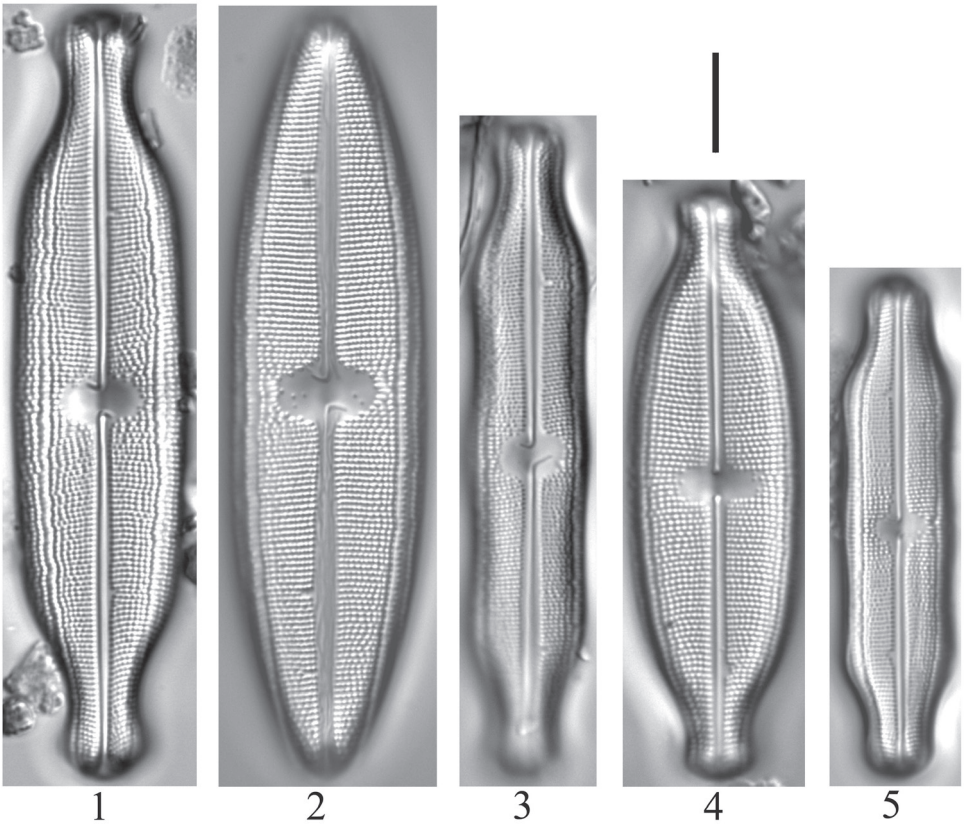

Plate 69. Coppermine. **1** *Neidium productum* (6828, 6833) **2** *N. fossum* (6828, 6831) **3, 5** *N. affine* var. *undulatum* (6832) **4** *N. temperei* (6831, 6833). Scale bar: 10 μm.

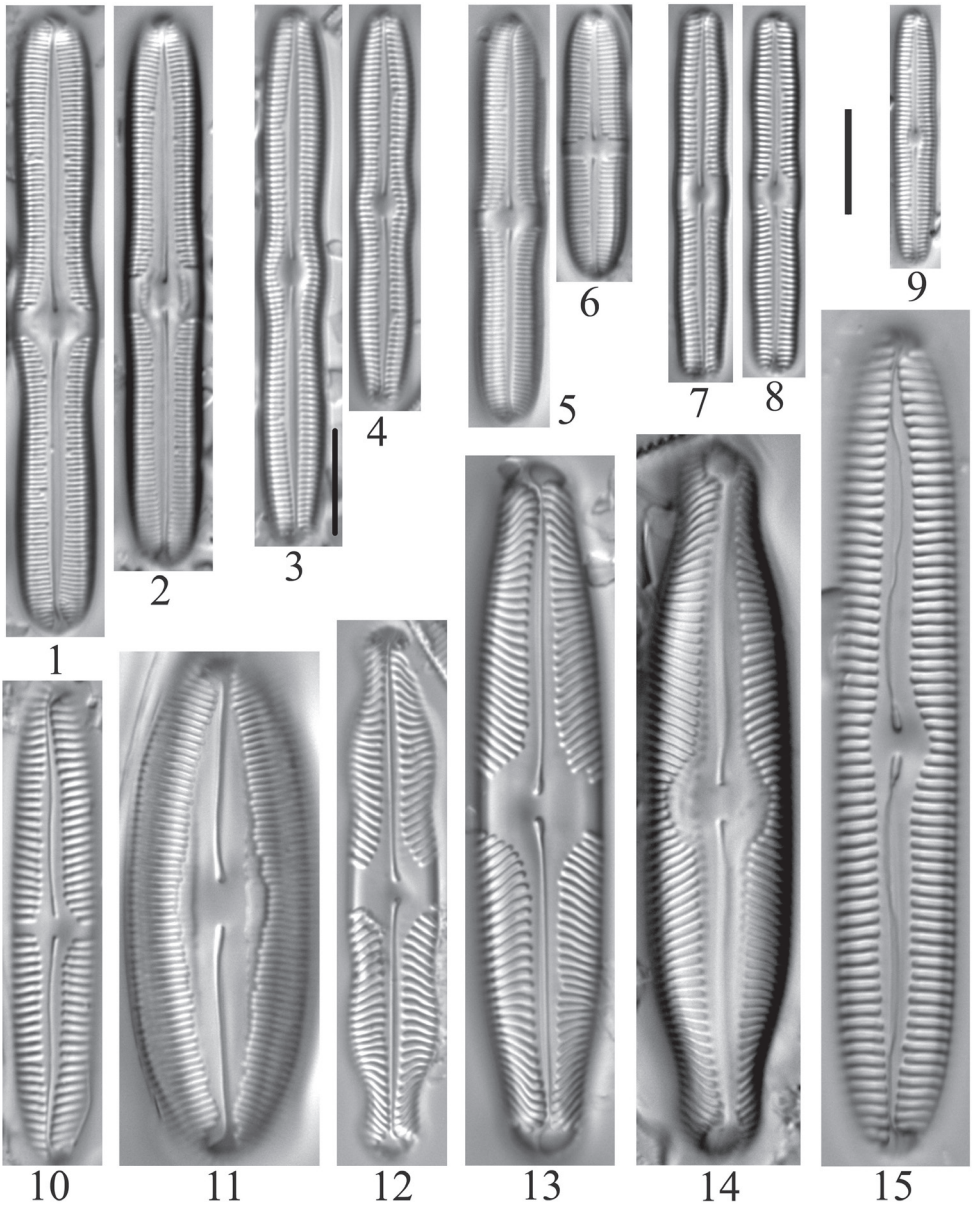

Plate 70. Coppermine. **1–2** *Caloneis* sp. [cf. *C. falcifera*] [*C. falcifera* PH] (6828, 6831) **3, 4** *Caloneis fusus* (6828) **5, 6** *Caloneis* sp. [cf. *C. fasciata*] (6831, 6832) **7, 8** *Caloneis* (*Pinnularia*?) sp. [*Chamaepinnularia* sp.? PH] (6828) **9** *Caloneis tenuis* (6830) **10** *Pinnularia* sp. [cf. *P. pseudogibba*] (6828) **11** *Caloneis obtusa* [*C. obtusa* sensu lato PH] (6824) **12** *Pinnularia grunowii* (6833) **13** *Pinnularia pseudosuchlandtii* [*P. brebissonii* PH] (6826, 6831, 6833) **14** *Pinnularia decrescens* (6832) **15** *Pinnularia* sp. (6828). Scale bars: 10 µm.

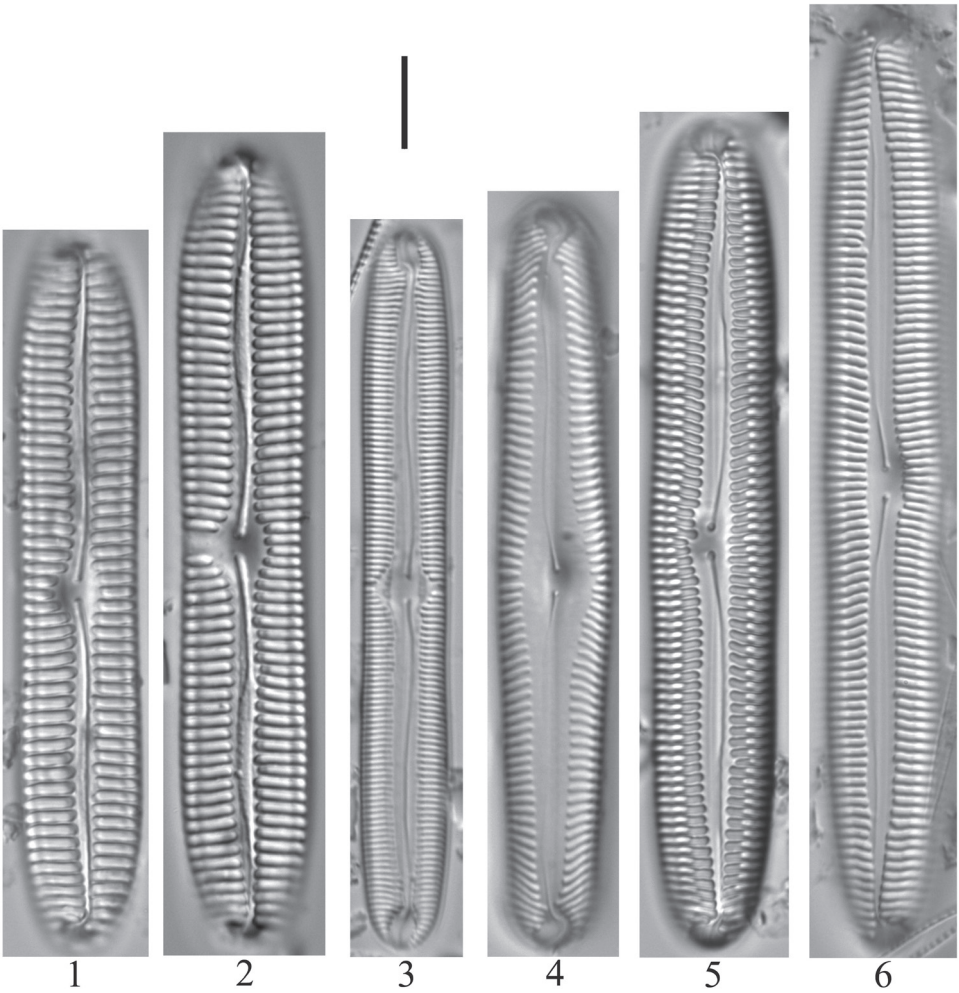

Plate 71. Coppermine. **1, 2** *Pinnularia genkalii* (6833) **3** *P. spitsbergensis* (6833) **4** *P.* sp. [cf. *P. lokana*] (6832) **5** *P. viridiformis* (6832) **6** *P. rupestris* [cf. *P. rupestris* PH] (6832). Scale bar: 10 µm.

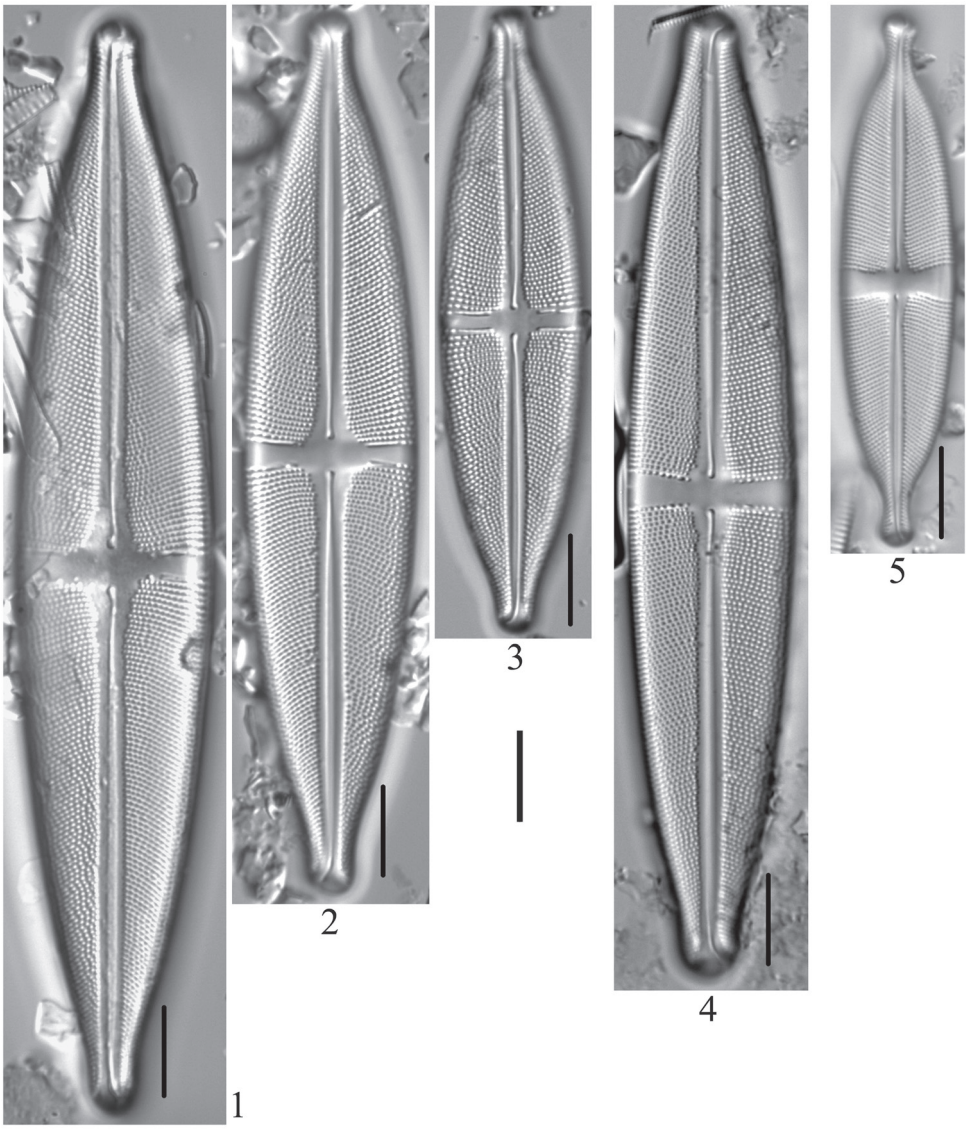

Plate 72. Coppermine. **1–3** *Stauroneis kuelbsii* or *S. superkuelbsii* [*S. gracilis* sensu lato PH] (6828, 6830, 6833) **4** *S. gracilis* (6832) **5** *S. reichardtii* [*S. anceps* PH] (6833). Scale bars: 10 µm.

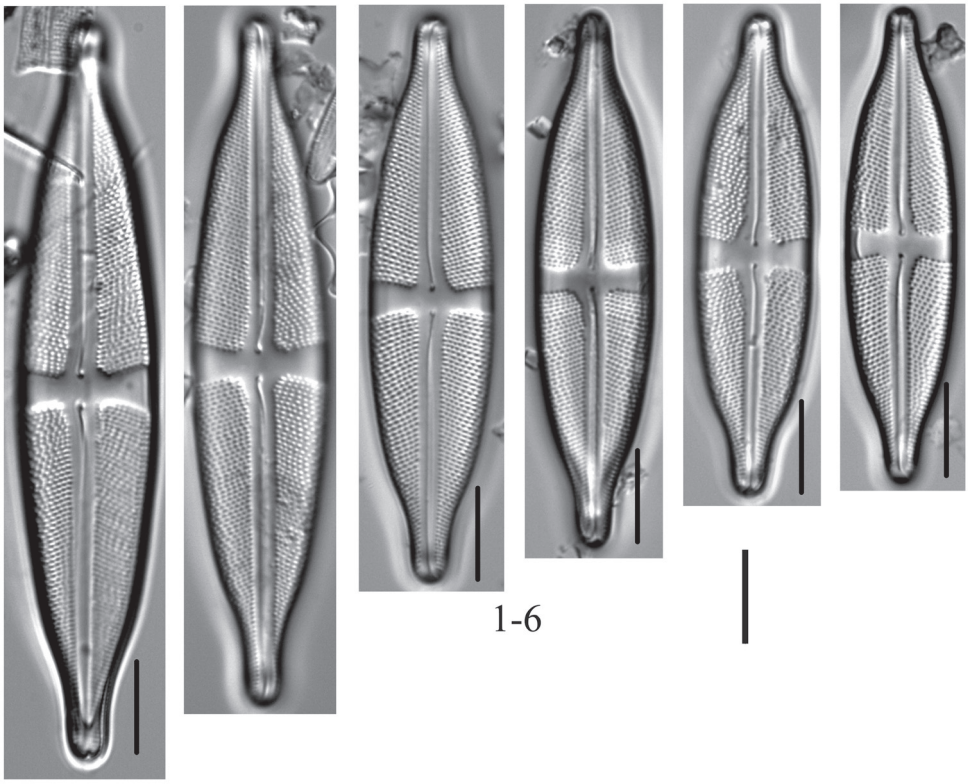

Plate 73. Coppermine. **1–6** *Stauroneis hyperborea* (6831, 6833). Scale bars: 10 µm.

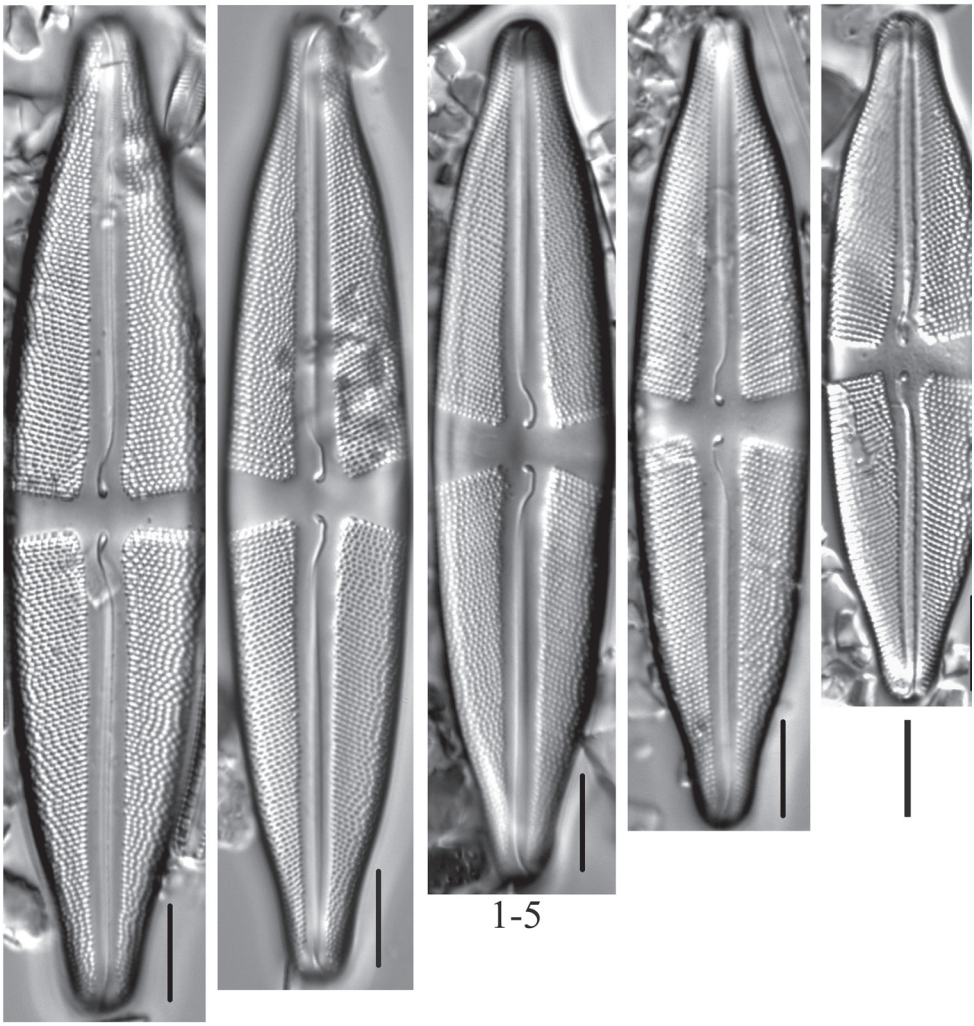

Plate 74. Coppermine. **1–5** *Stauroneis superhyperborea* [syn. *S. obtusa* var. *lapponica* Hustedt PH] (6828). Scale bars: 10 µm.

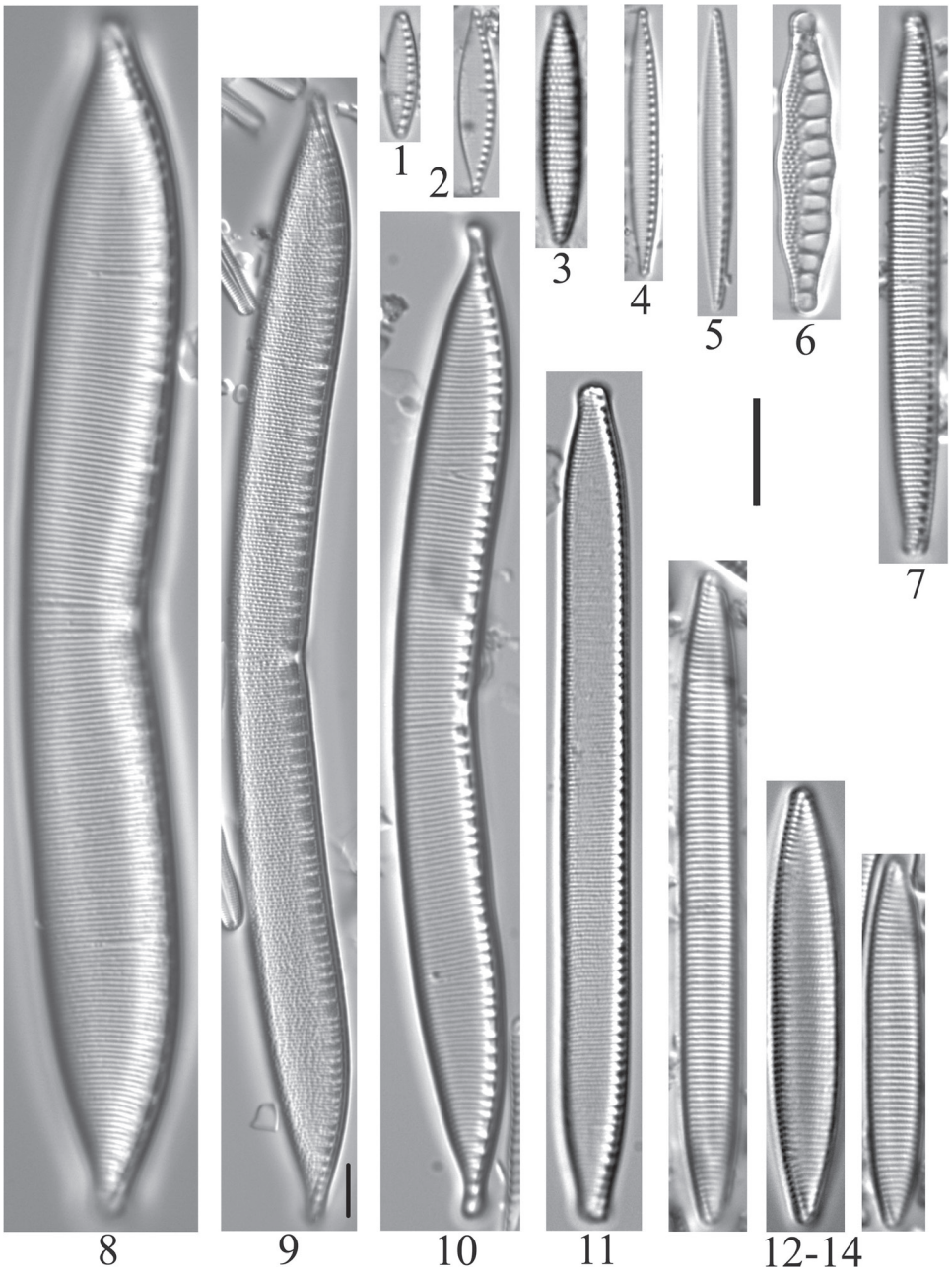

Plate 75. Coppermine. **1** *Nitzschia frustulum* [*N. alpina* PH] (6832) **2** *Nitzschia* sp. [cf. *N. lanceolata*] (6830) **3** *Nitzschia amphibia* (6832) **4** *Nitzschia perminuta* (6831) **5** *Nitzschia radicula* (6832) **6** *Nitzschia sinuata* (6828) **7** *Nitzschia fossilis* [cf. *N. fossilis* PH] (6831) **8** *Hantzschia hyperborea* (6828) **9** *Hantzschia elongata* (6828) (note different scale) **10** *Hantzschia vivacior* (6828) **11** *Nitzschia regula* var. *robusta* (6831) **12–14** *Nitzschia angustata* (6831, 6833). Scale bars: 10 μm.

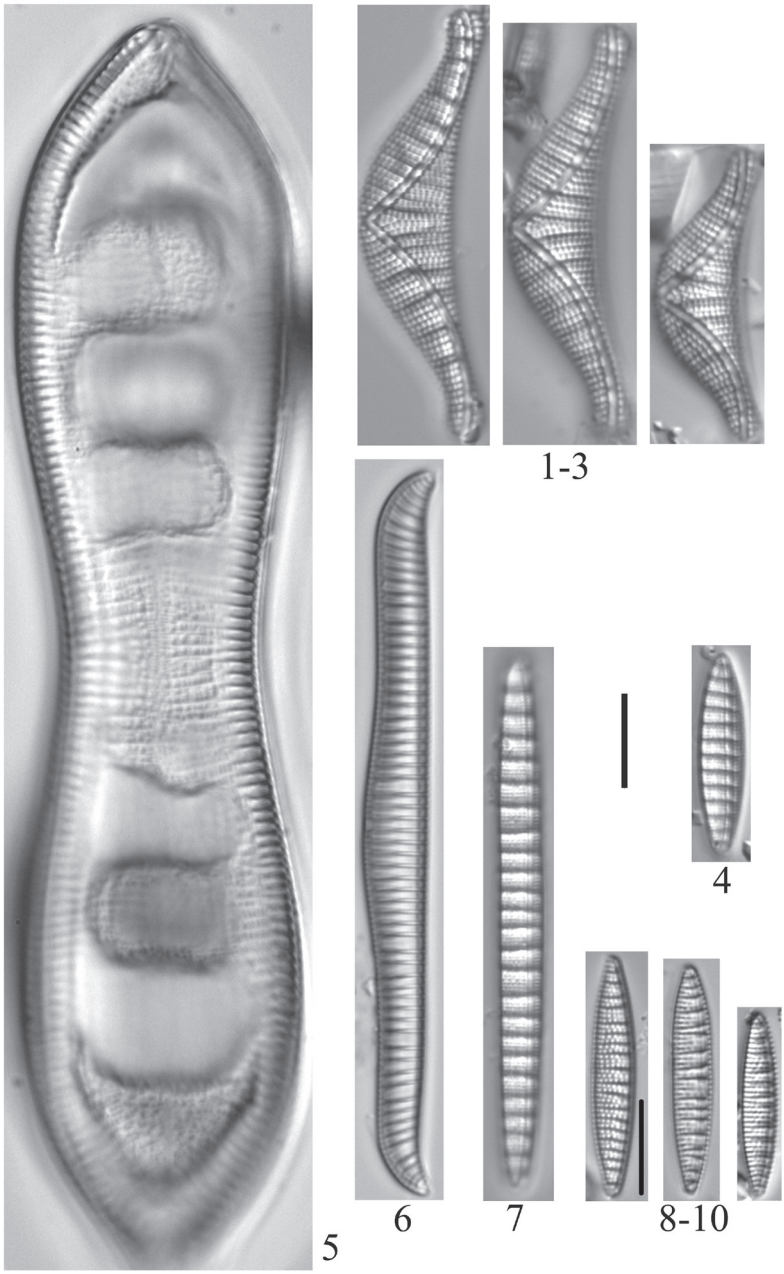

Plate 76. Coppermine. **1–3** *Epithemia smithii* (6826, 6827) **4** *Denticula tenuis* (6830) **5** *Cymatopleura solea* (6832) **6** *Rhopalodia gibba* (6832) **7** *Denticula* sp. [cf. *D. valida*] (6831) **8–10** *Denticula kuetzingii* (6830, 6833). Scale bars: 10 μm.

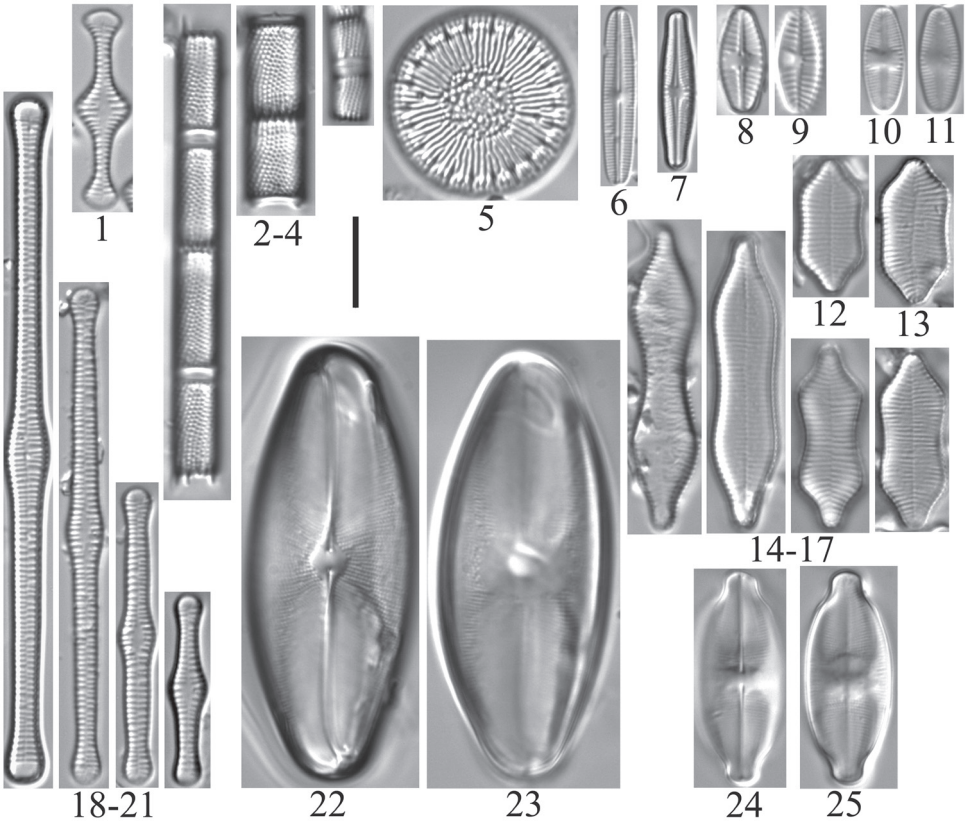

Plate 77. Baillie-Back. **1** *Tabellaria flocculosa* (6864) **2–4** *Aulacoseira subarctica* (6858, 6864) **5** *Lindavia intermedia* (6858) **6** *Rossithidium petersenii* (6859) **7** *Achnanthidium* sp. (6858) **8, 9** *Planothidium frequentissimum* (6856) **10, 11** *Psammothidium marginulatum* (6864) **12–17** *Fragilariforma constricta* (6864) **18–21** *Tabellaria fenestrata* [*T. flocculosa* planktonic form sensu Koppen PH] (6857, 6858, 6859) **22, 23** *Eucocconeis flexella* (6857) **24, 25** *Eucocconeis depressa* (6857). Scale bar: 10 µm.

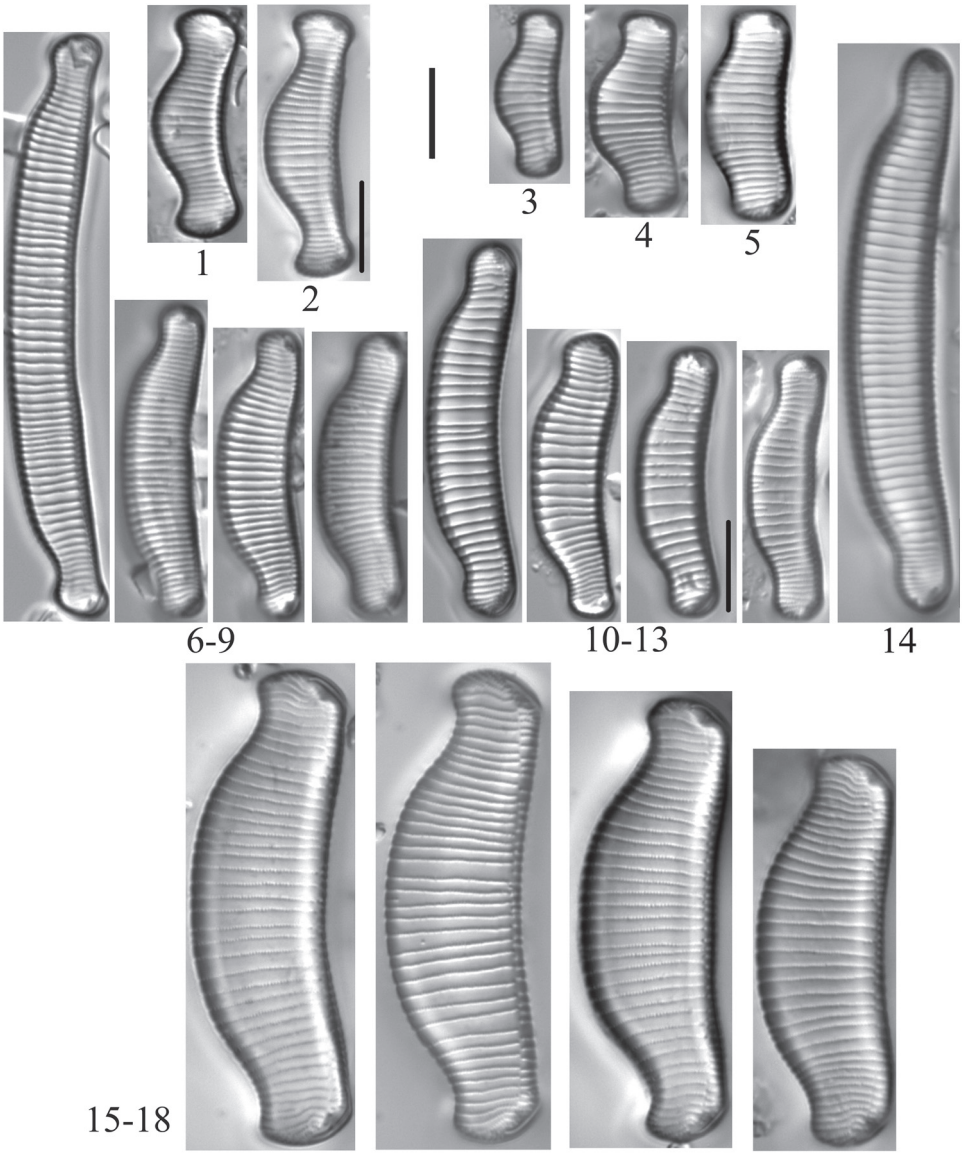

Plate 78. Baillie-Back. **1, 2** *Eunotia curtagrunowii* morphotype I [*E. praerupta* var. *laticeps* = *E. laticeps* PH] (6861) **3–5** *E. curtagrunowii* morphotype II (6856, 6857) **6–9** *E. arcus* (6858, 6863) **10–13** *E. arcubus* (6856, 6857, 6858) **14** *E.* sp. [cf. *E. soleirolii*] (6857) **15–18** *E. praerupta* or *E. mayamae* (6866). Scale bars: 10 µm.

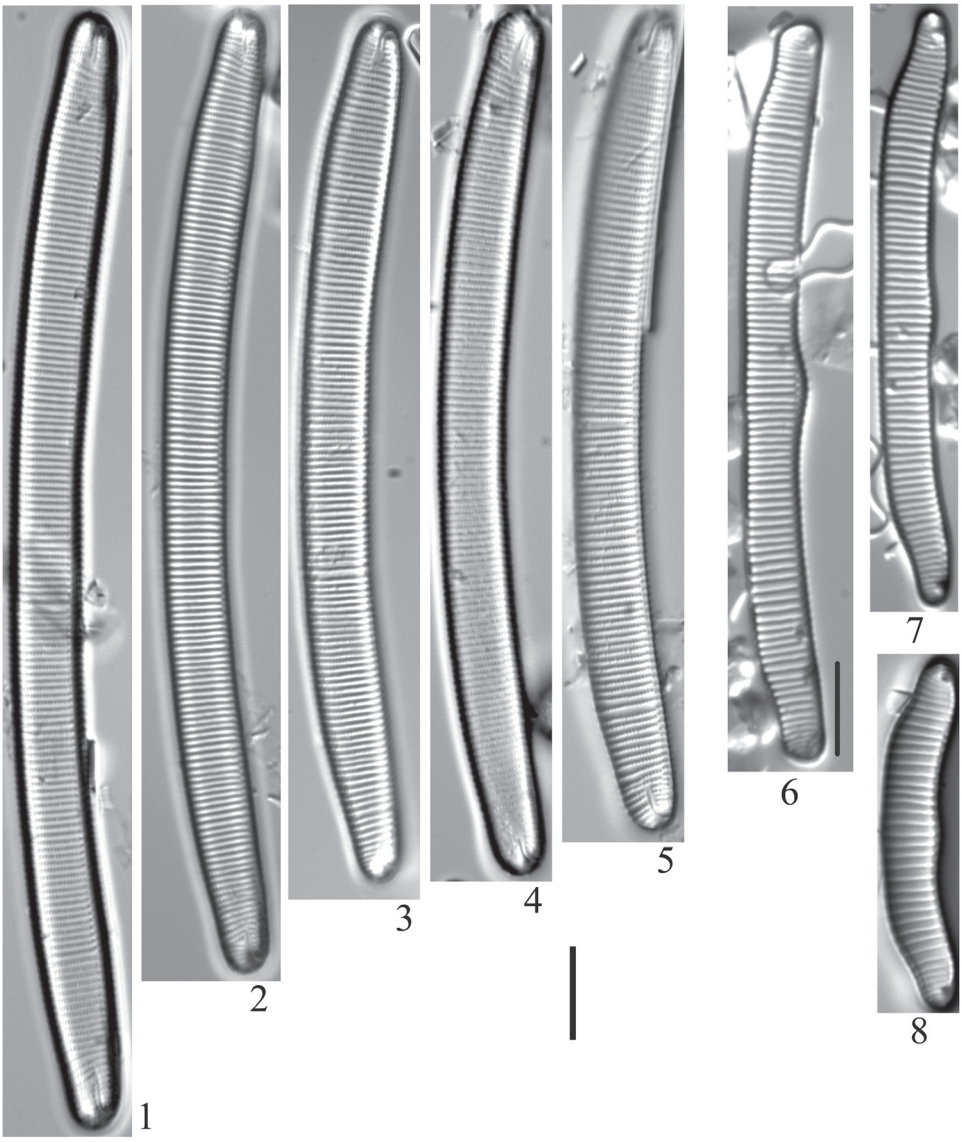

Plate 79. Baillie-Back. **1–5** *Eunotia pseudopectinalis* (6856, 6857, 6859, 6865) **6–8** *E. pectinalis* (6862). Scale bars: 10 µm.

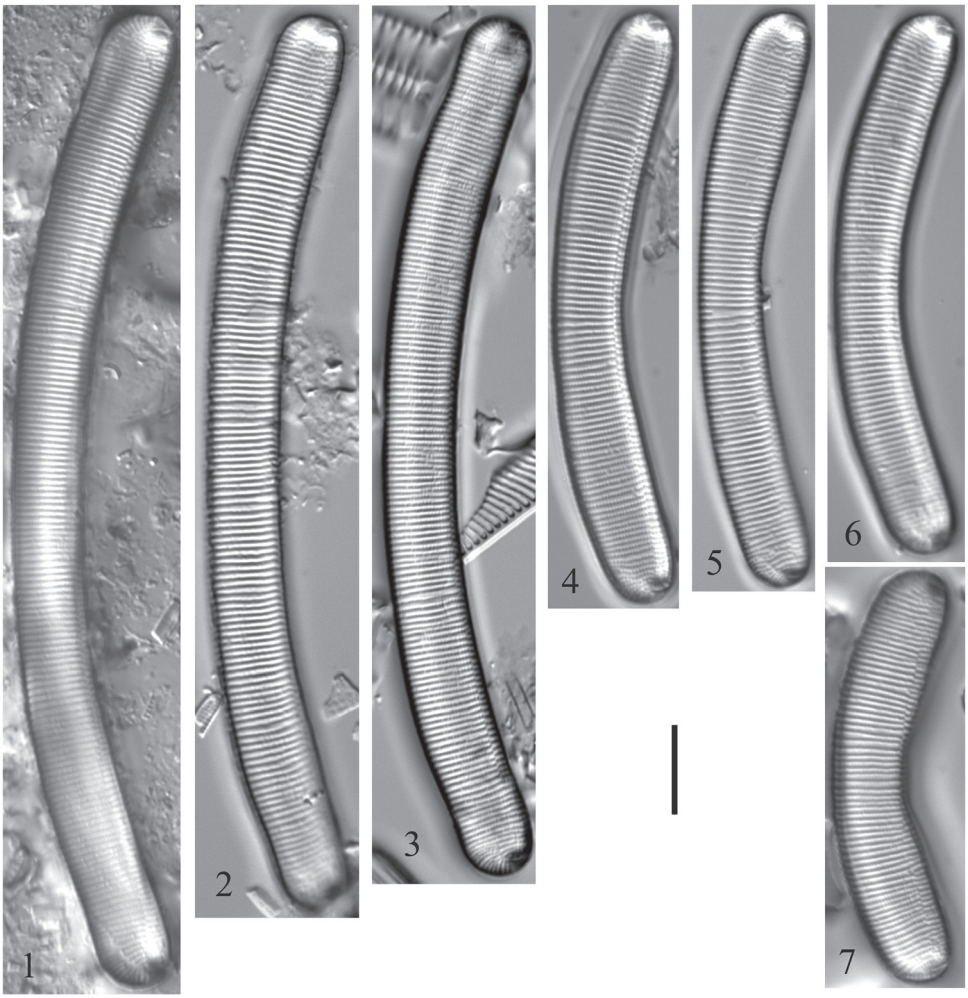

Plate 80. Baillie-Back. **1–7** *Eunotia paralleladubia* (6857, 6861, 6864, 6865). Scale bar: 10 µm.

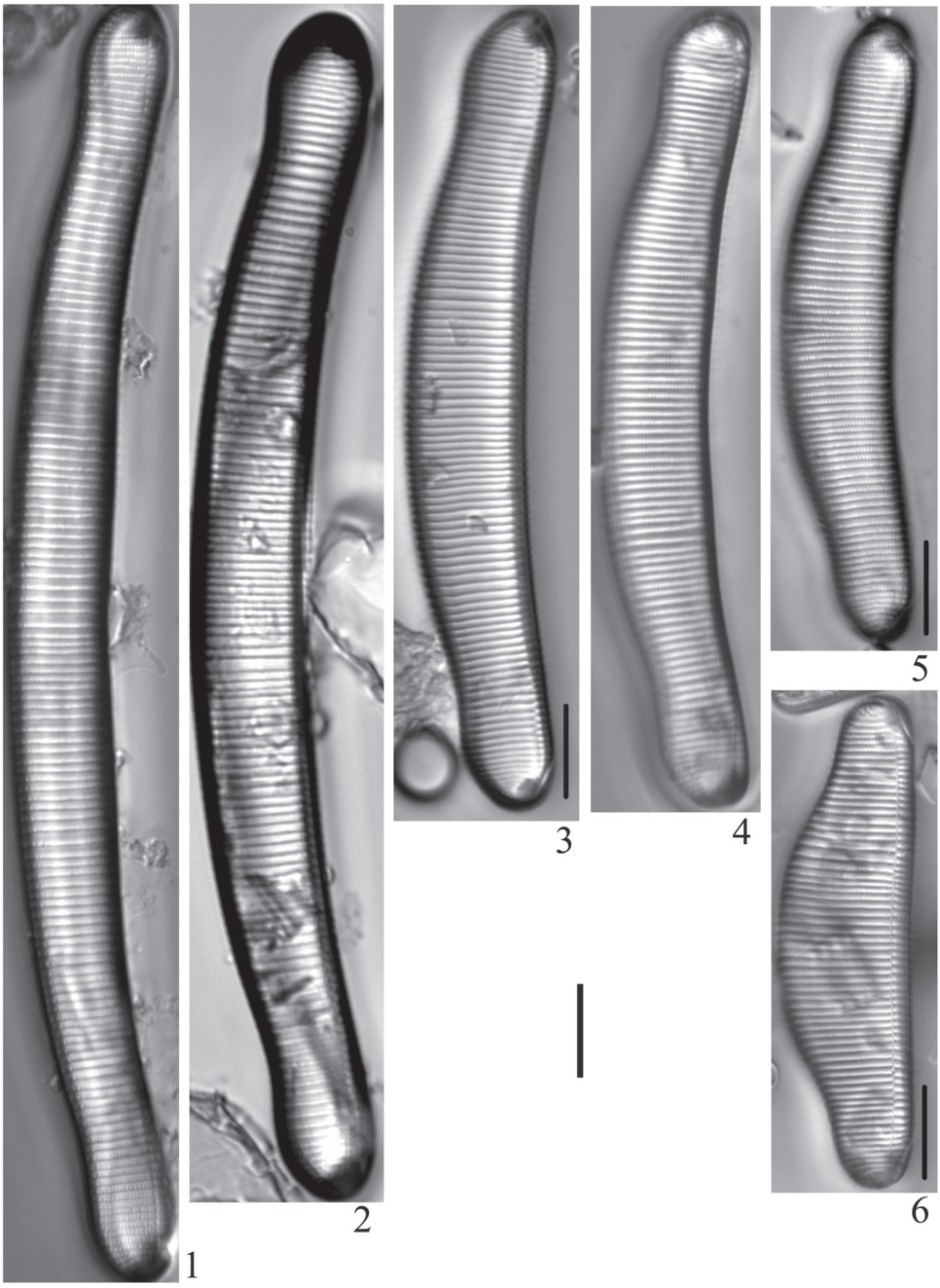

Plate 81. Baillie-Back. **1–5 (6?).** *Eunotia metamonodon* (6856, 6857, 6860, 6862, 6865). Scale bars: 10 μm.

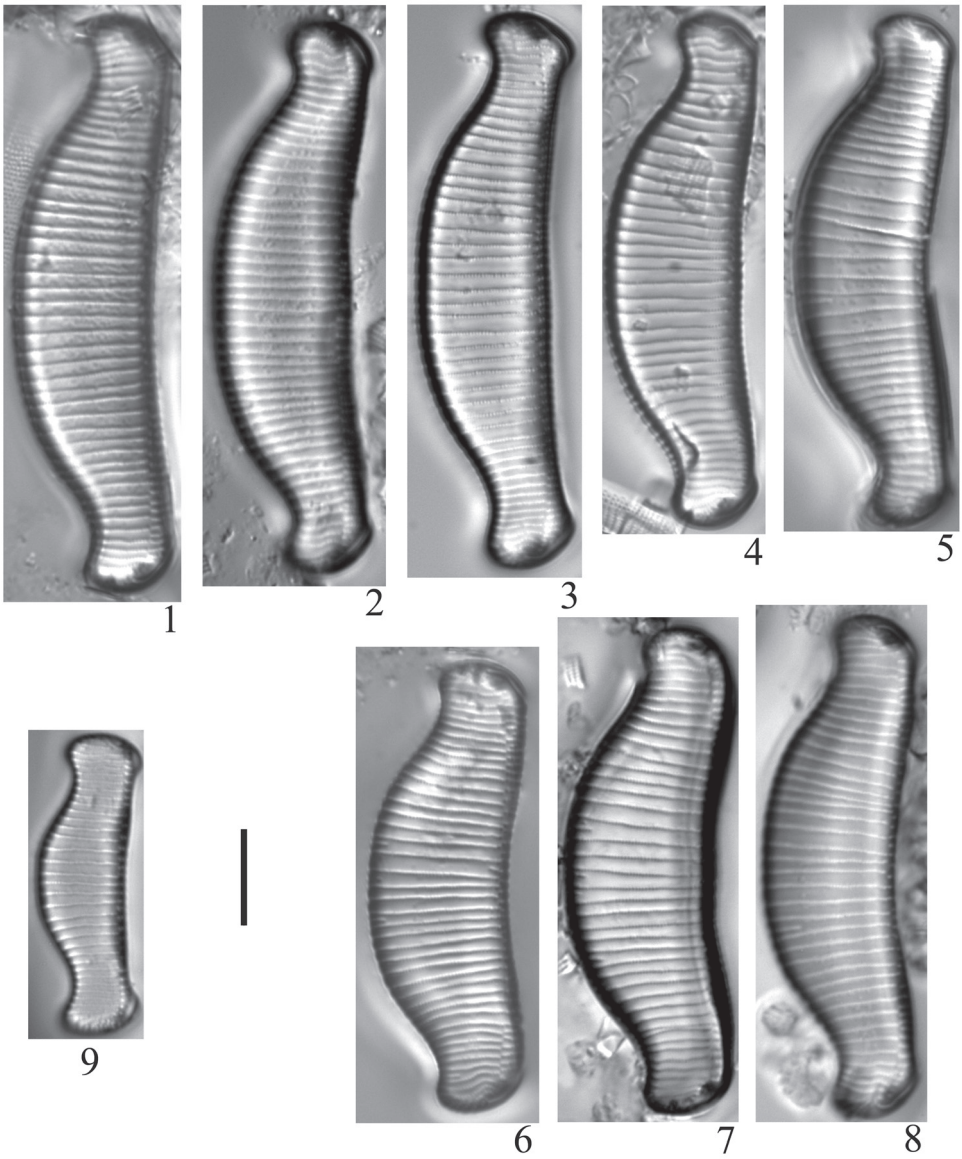

Plate 82. Baillie-Back. **1–8** *Eunotia mayamae* (6856) **9** *E. curtagrunowii* morphotype I [*E. praerupta* var. *laticeps* = *E. laticeps* PH] (6866). Scale bar: 10 µm.

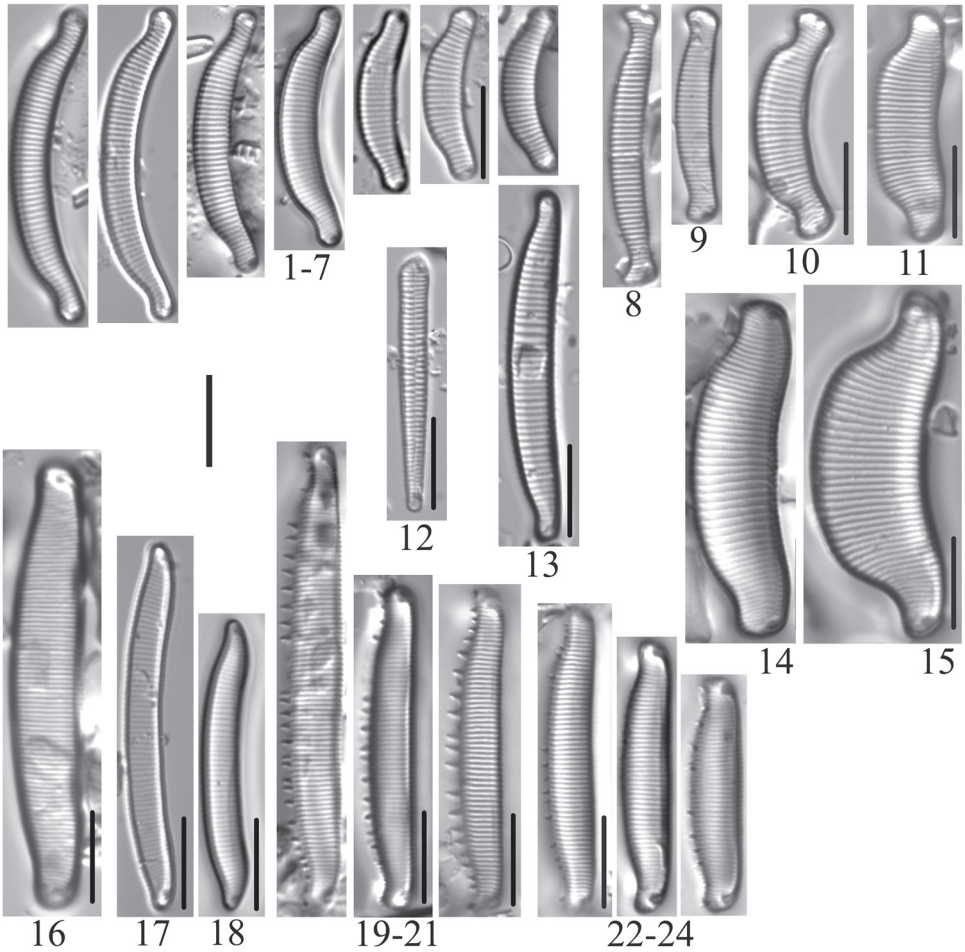

Plate 83. Baillie-Back. **1–7** *Eunotia elegans* [*E. nymanniana* sensu lato PH] (6856, 6857, 6860) **8, 9** *Eunotia neocompacta* (6859, 6864) **10** *Eunotia septentrionalis* (6858) **11** *Eunotia ursamaioris* [*E. ursamaioris* sensu lato PH] (6862) **12** *Peronia fibula* (6865) **13** *Eunotia minor* (6862, 6865) **14** *Eunotia braendlei* (6862) **15** *Eunotia* sp. [cf. *E. ursamaioris*] (6862) **16** *Eunotia lapponica* (6862) **17, 18** *Eunotia silesioscandica* (6858, 6862) **19–21** *Eunotia neoborealis* (6864, 6865) **22–24** *Eunotia denticulata* (6857). Scale bars: 10 µm.

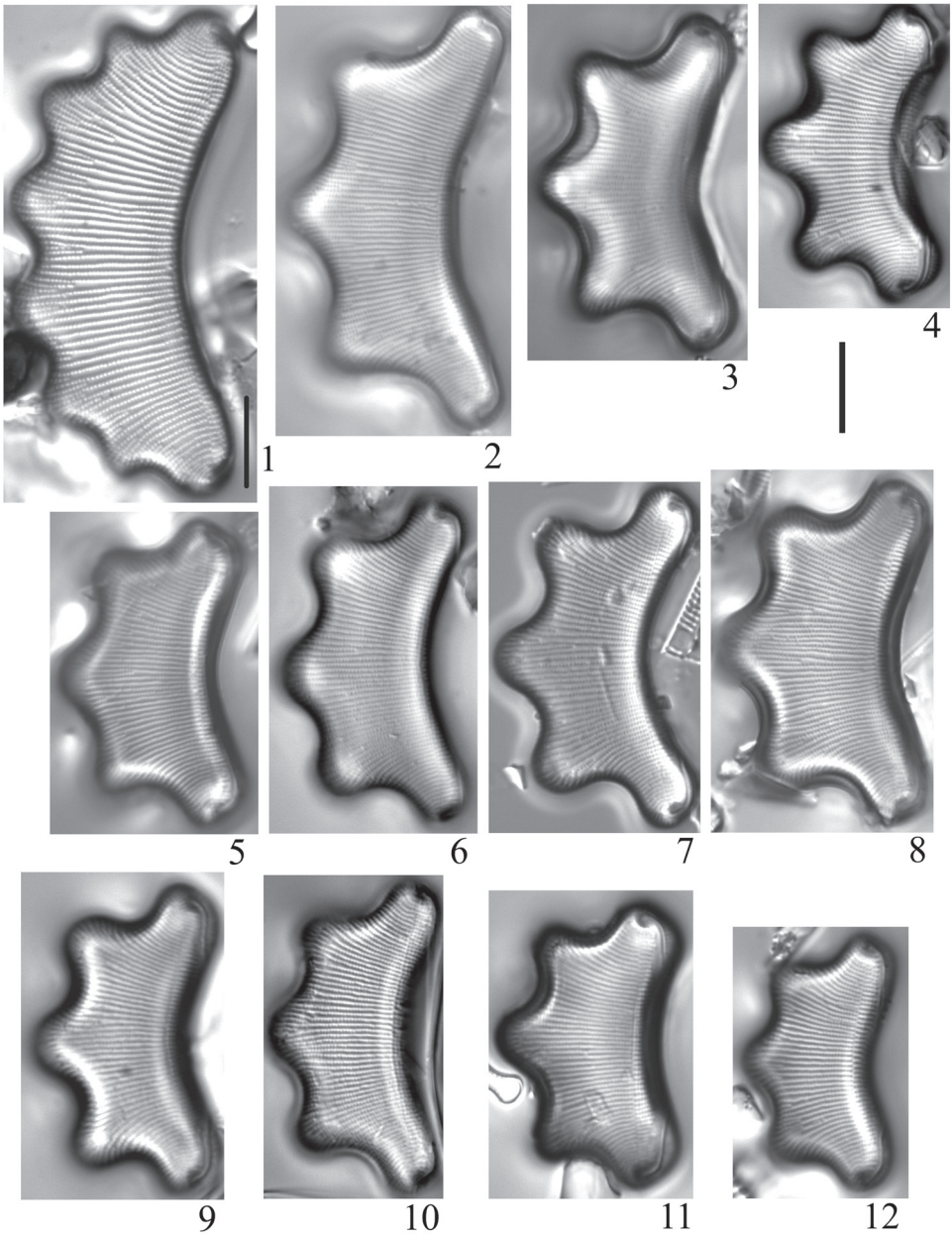

Plate 84. Baillie-Back. **1** *Eunotia diadema* (6862) **2–12** *E. semicircularis* [*E. triodon* var. *semicircularis* PH] (6857, 6859, 6865). Scale bars: 10 µm.

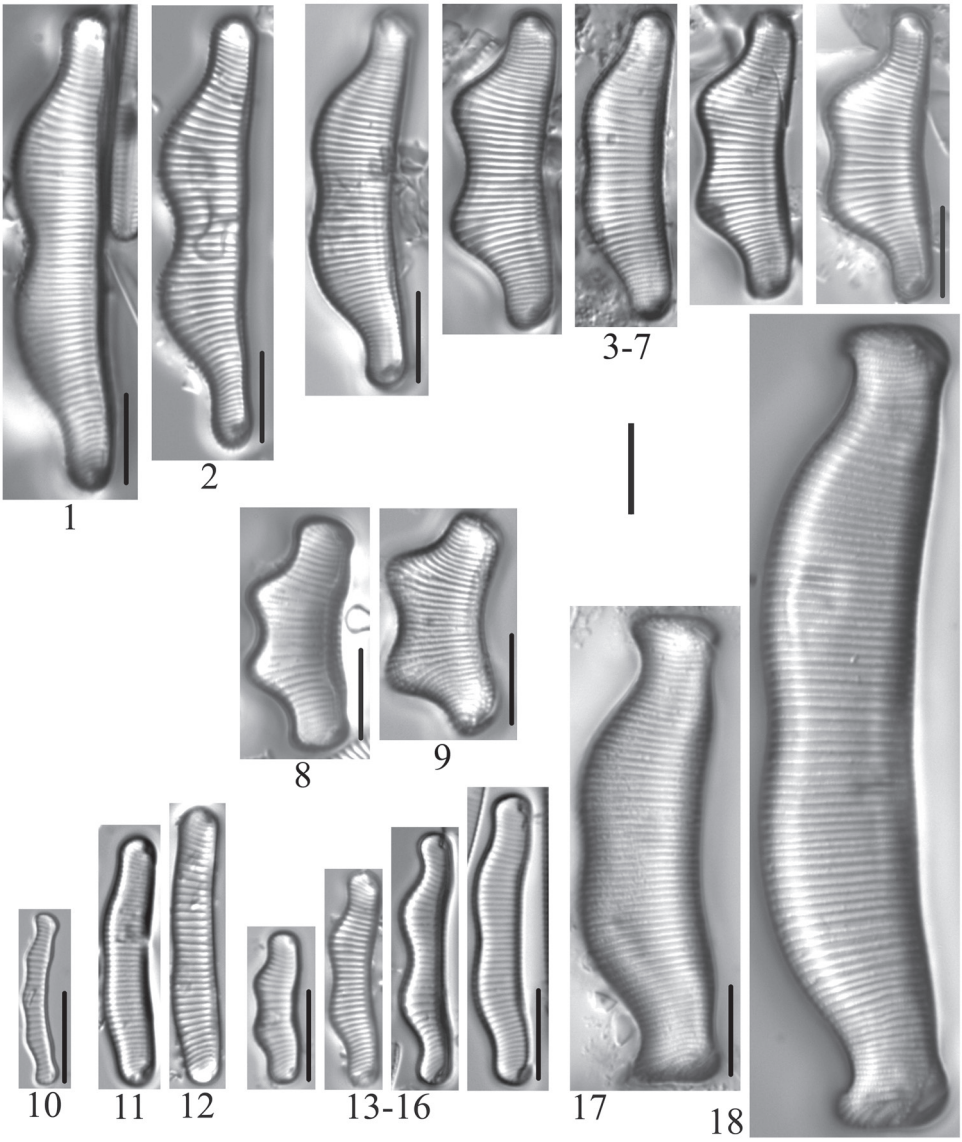

Plate 85. Baillie-Back. **1, 2** *Eunotia diodon* (6865) **3–7** *E. islandica* (6861, 6864) **8, 9** *E. suecica* [Fig. **9** *E. bigibboidea* PH](6861) **10** *E. perminuta* (6861) **11, 12** *E.* sp. (6859, 6865) **13–16** *E. circumborealis* (6856, 6859, 6860, 6865) **17, 18** *E. superbidens* (6861, 6866). Scale bars: 10 µm.

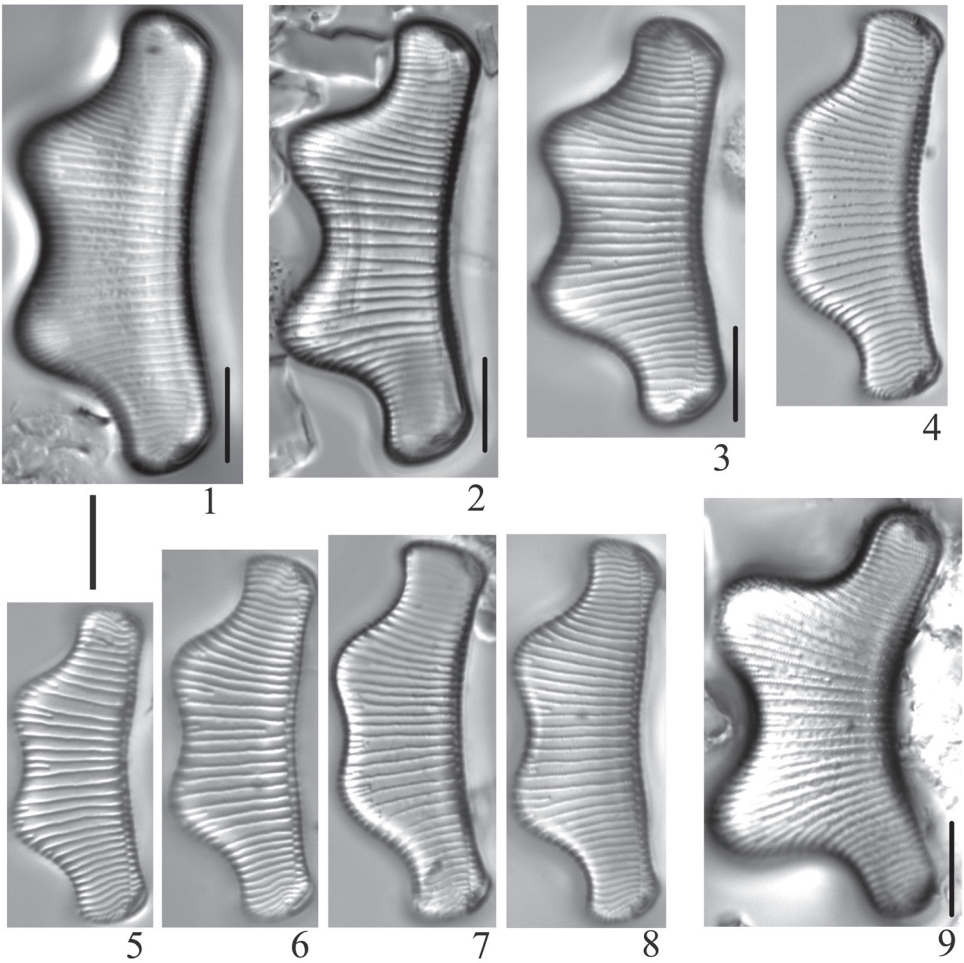

Plate 86. Baillie-Back. **1–8** *Eunotia sarek* (6856, 6863, 6866) **9** *E. pseudopapilio* (6861). Scale bars: 10 µm.

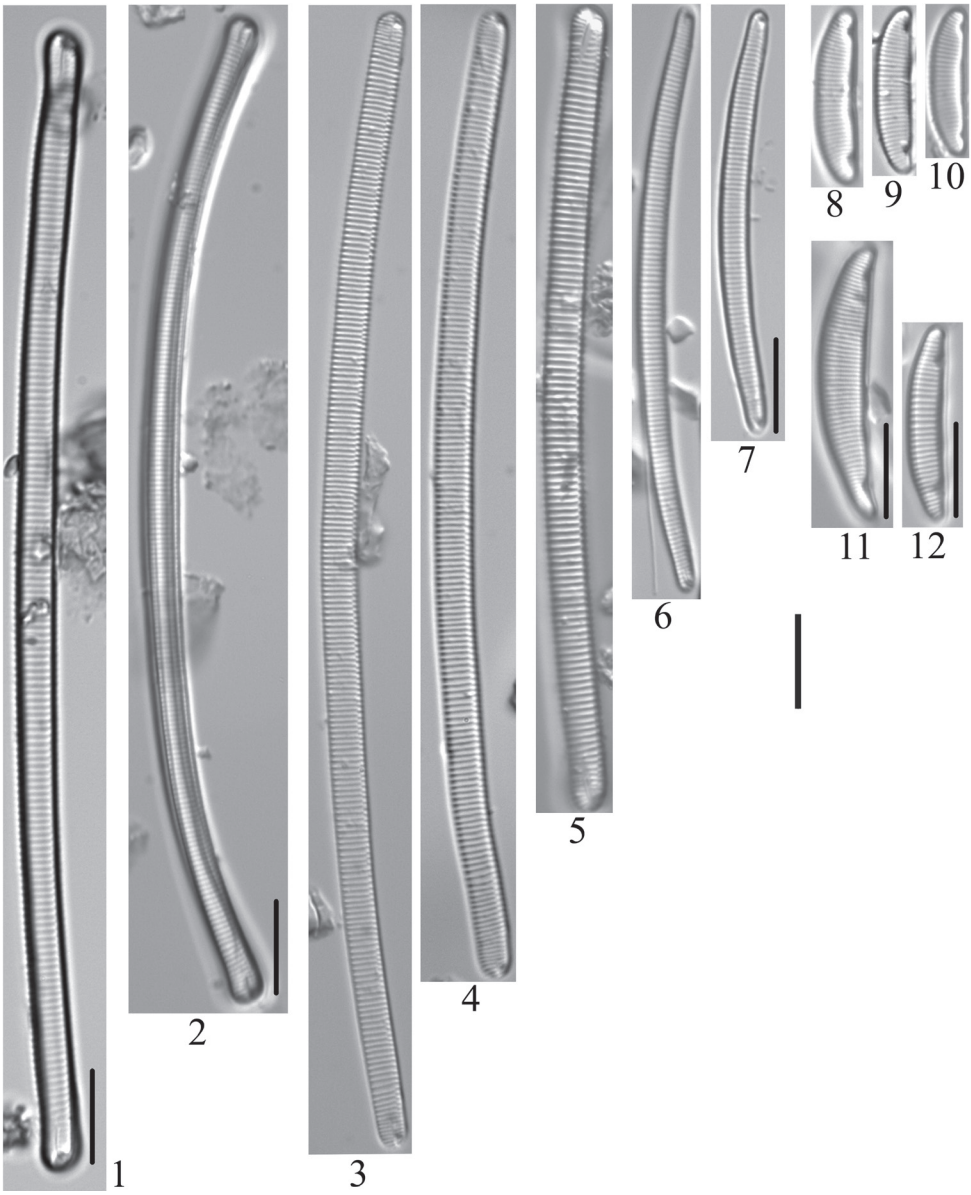

Plate 87. Baillie-Back. **1** *Eunotia pseudoflexuosa* (6860) **2** *E. eurycephala* (6860) **3, 4** *E. ambivalens* (6866) **5** *E. latitaenia* (6859) **6, 7** *E. juettnerae* [*E. bilunaris* PH] (6860, 6864) **8–10** *E. boreoalpina* (6859) **11, 12** *E. incisa* (6862). Scale bars: 10 µm.

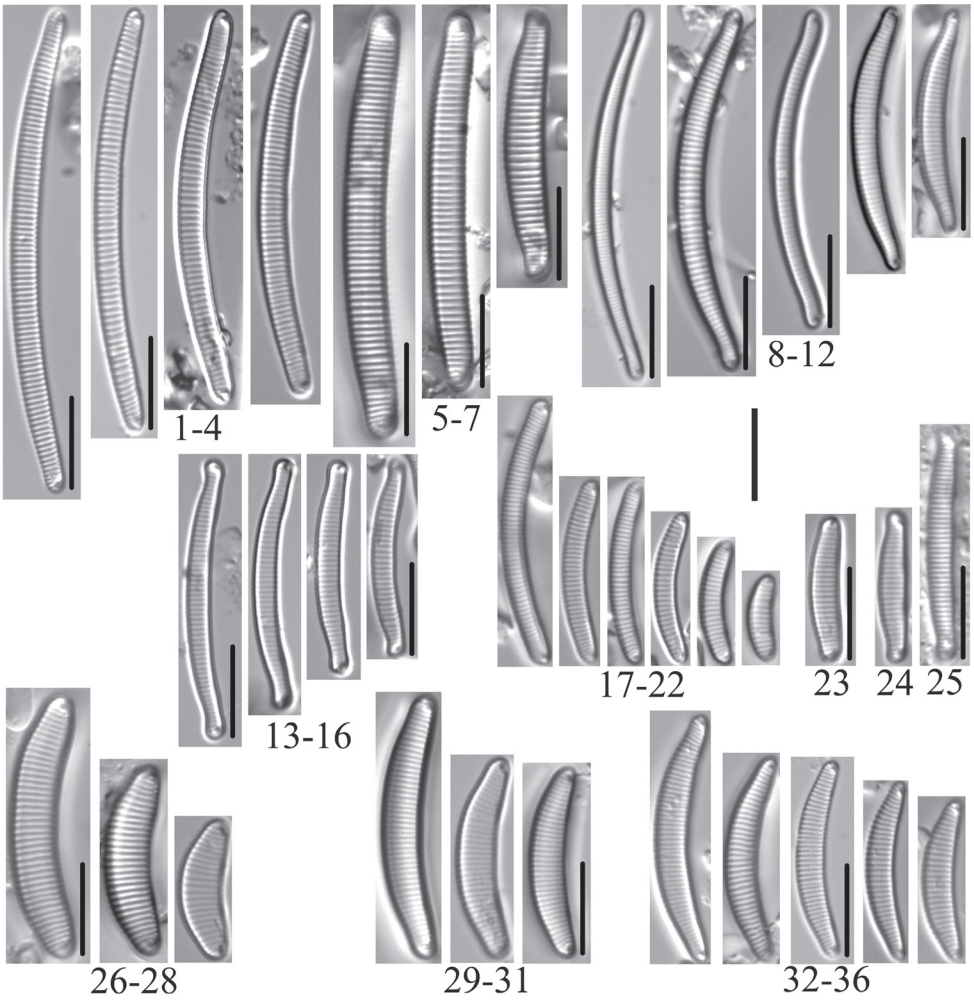

Plate 88. Baillie-Back. **1–4** *Eunotia bilunaris* (6856, 6860, 6863) **5–7** *E. valida* (6856, 6862) **8–12** *E. naegelii* (6860, 6861, 6862) **13–16** *E. pseudogroenlandica* (6860, 6862) **17–22** *E. botuliformis* (6857, 6864) **23** *E. rhomboidea* [*E. paludosa* PH] (6860) **24, 25** *E. paludosa* (6861, 6864) **26–28** *E. scandiorussica* (6856, 6860) **29–31** *E. boreotenuis* [*E. subarcuatoides* PH] (6865) **32–36** *E. subarcuatoides* (6856, 6857, 6860, 6864). Scale bars: 10 μm.

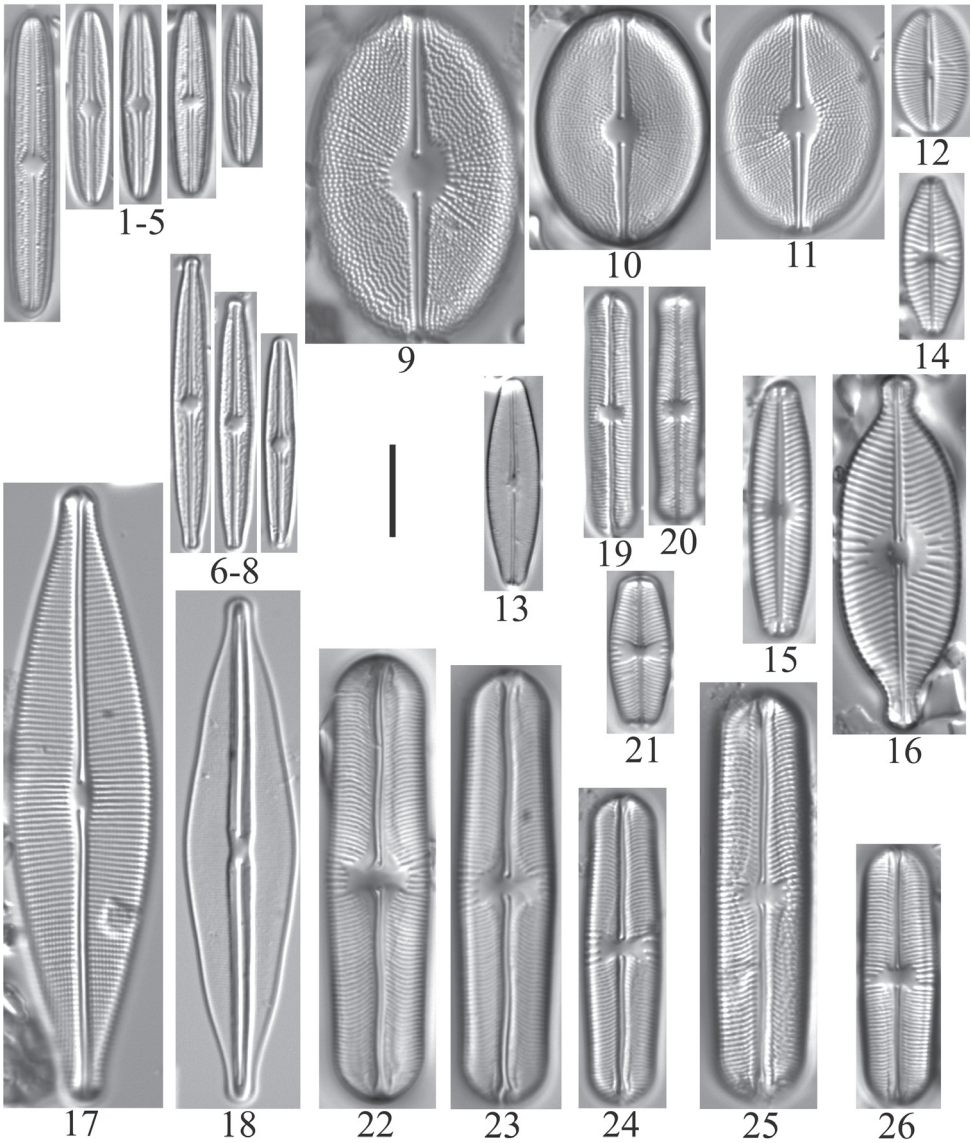

Plate 89. Baillie-Back. **1–5** *Brachysira* sp. (6863, 6864, 6865) **6–8** *Brachysira* sp. (6862, 6865) **9–11** *Cavinula scutiformis* (6862, 6863) **12** *Cavinula jaernefeltii* (6863) **13** *Fallacia* (?) sp. [*Sellaphora* (?) sp. PH] (6862) **14** *Geissleria schoenfeldii* (6862) **15** *Geissleria* sp. [cf. *G. moseri*] (6862) **16** *Geissleria tectissima* (6862) **17** *Craticula* sp. (6862) **18** *Frustulia crassinervia* (6857) **19, 20** *Sellaphora* sp. (6862) **21** *Sellaphora* sp. (6862) **22, 23** *Sellaphora parapupula* (6856, 6860) **24** *Sellaphora* sp. [*S. rectangularis* PH] (6856) **25** *Sellaphora* sp. (6858) **26** *Sellaphora* sp. (6862). Scale bar: 10 µm.

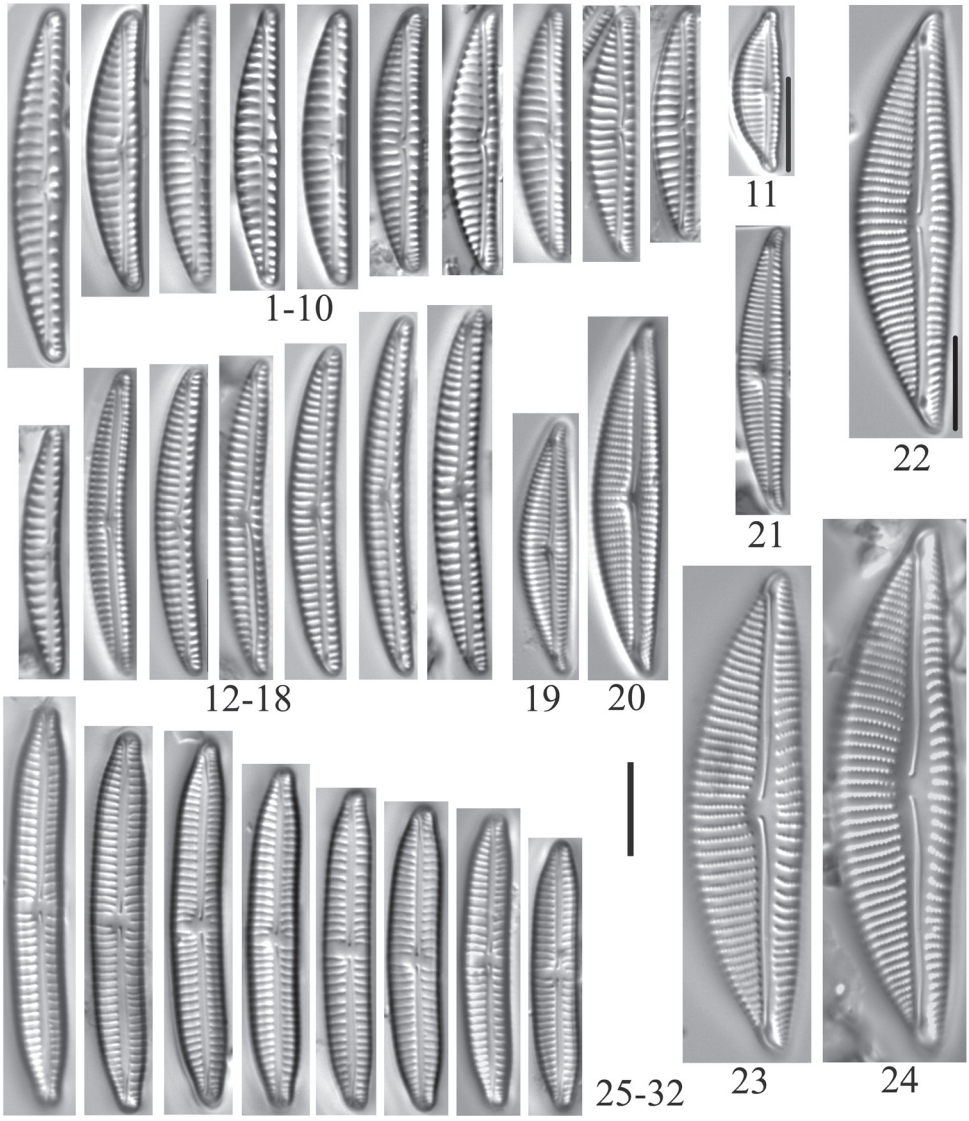

Plate 90. Baillie-Back. **1–10** *Encyonema paucistriatum* (6856, 6857) **11** *E. ventricosum* (6858) **12–18** *E. lunatum* [*E. lunatum* var. *alaskensis* PH] (6857, 6860, 6863) **19, 20** *E. willeyorum* (6858) **21** *E. neogracile* (6864) **22–24** *E. hintzii* or *E. vulgare* [*E. vulgare* PH] (6858, 6862, 6866) **25–32** *E. sibericum* (6857, 6860, 6865). Scale bars: 10 µm.

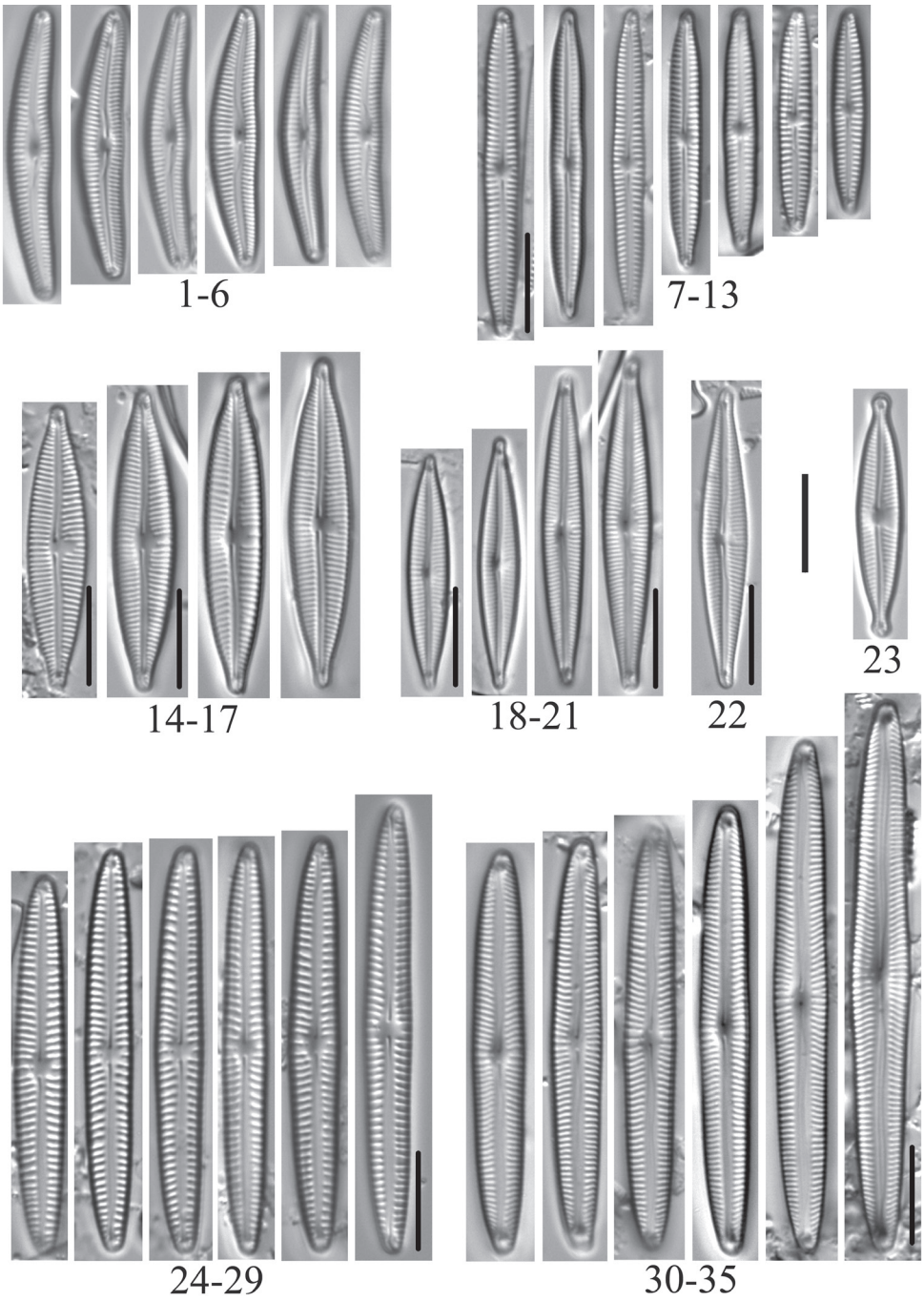

Plate 91. Baillie-Back. **1–6** *Delicata canadensis* (6857, 6858) **7–13** *Encyonopsis inuitorum* (6856, 6857) **14–17** *Encyonopsis cesatiformis* [*E. cesatii* PH] (6856, 6857, 6865, 6866) **18–21** *Encyonopsis cesatii* (6857) **22** *Encyonopsis stafsholtii* (6856) **23** *Encyonopsis* sp. [cf. *E. czarneckii*] (6858) **24–29** *Kurtkrammeria pseudoamphioxys* (6856) **30–35** *Kurtkrammeria neoamphioxys* (6856, 6857). Scale bars: 10 µm.

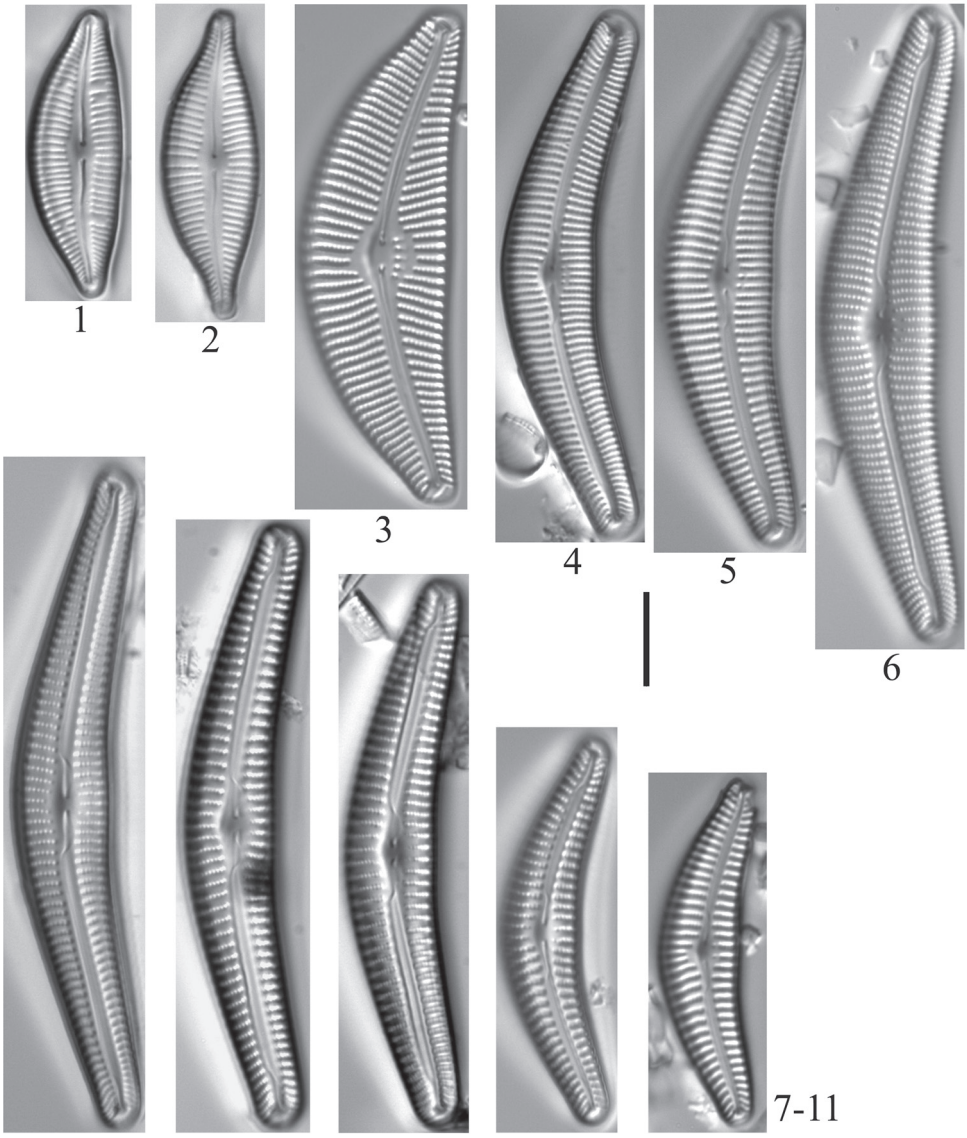

Plate 92. Baillie-Back. **1** *Cymbopleura heilprinensis* [*Cymbella* (*Cymbopleura*) *designata* = *Cymbopleura citriformis* PH] (6857) **2** *Cymbella* (*Cymbopleura*) *designata* = *Cymbopleura citriformis* (6857) **3** *Cymbella proxima* (6858) **4** *Cymbella krammeri* or *C. neocistula* var. *lunata* [? PH] (6857) **5, 6** *Cymbella neocistula* (6857, 6858) **7–11** *Cymbella cleve-eulerae* [*C. neocistula* var. PH] (6857, 6862). Scale bar: 10 μm.

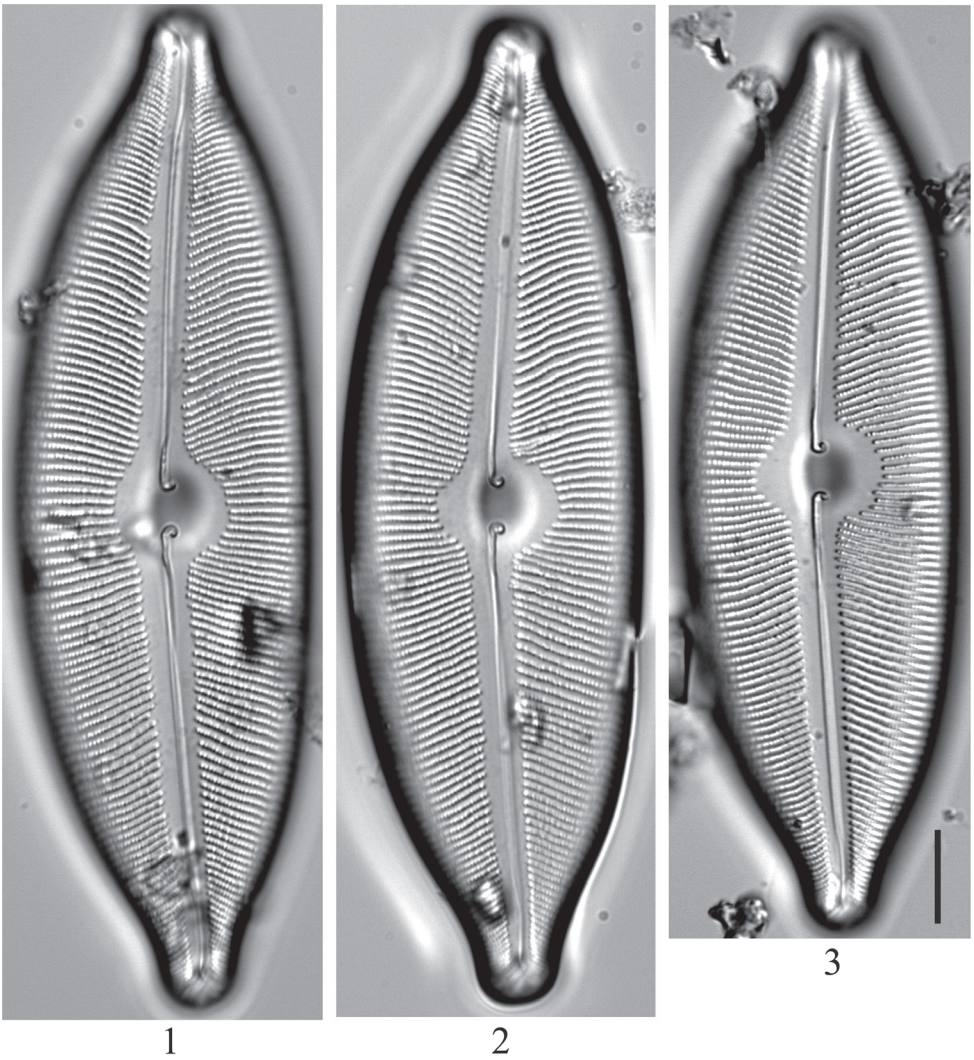

Plate 93. Baillie-Back. **1–3** *Cymbopleura neoheteropleura* (6860). Scale bar: 10 µm.

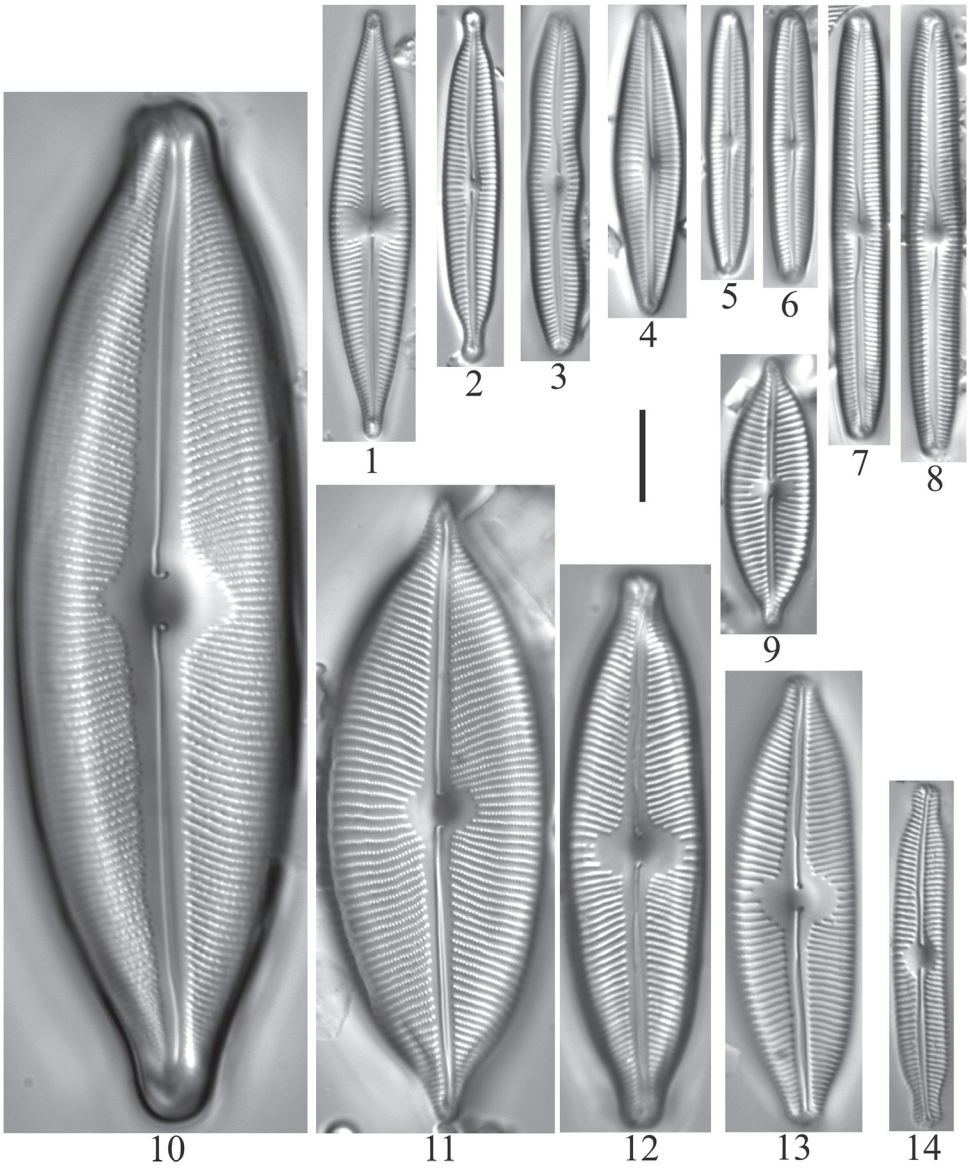

Plate 94. Baillie-Back. **1** *Cymbopleura stauroneiformis* (6857) **2** *C. angustata* (6857) **3** *C. incerta* var. *spitsbergensis* (6857) **4** *C.* sp. (6862) **5–8** *C. incertiformis* var. *linearis* (6856) **9** *C. anglica* (6862) **10** *C. neoheteropleura* (6857) **11** *C. apiculata* (6858) **12, 13** *C. tynnii* (6856, 6857, 6859, 6863) **14** *C. fluminea* (6858, 6866). Scale bar: 10 µm.

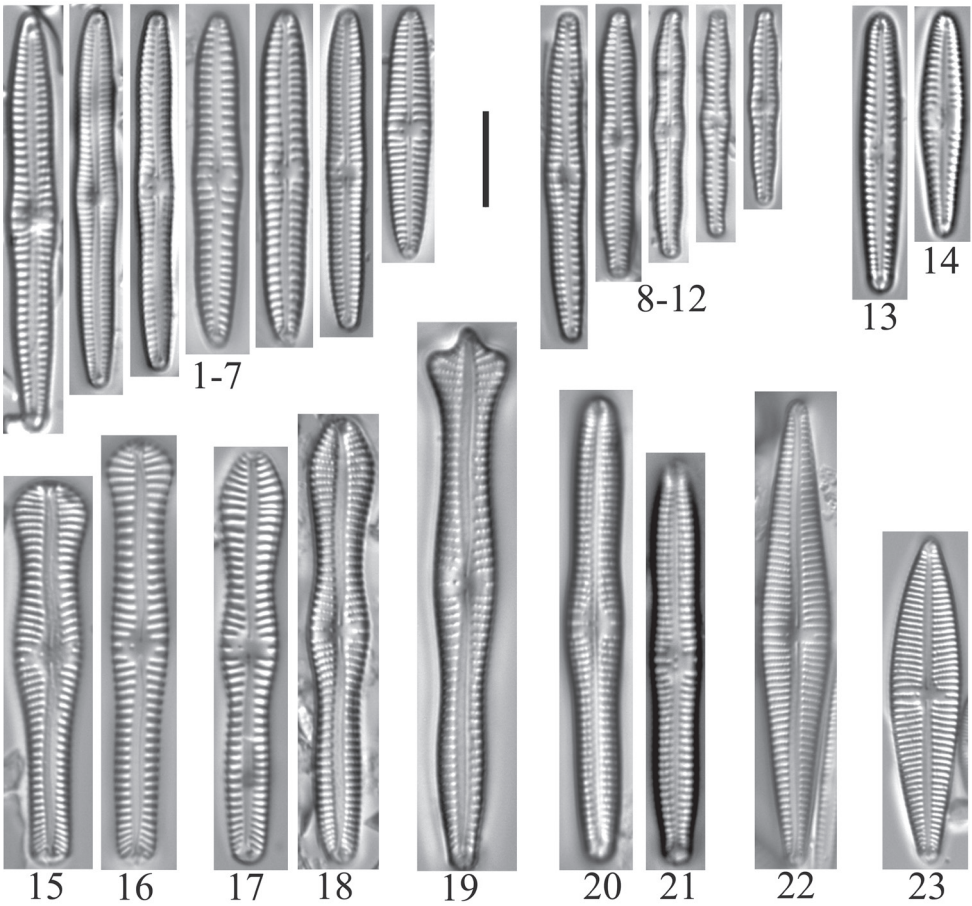

Plate 95. Baillie-Back. **1–7** *Gomphonema lagerheimii* sensu lato (6856, 6857, 6860, 6862) **8–12** *G. astridae* (6856, 6860) **13, 14** *G. lateripunctatum* (6858) **15, 16** *G.* sp. [cf. *G. capitatum*] (6857, 6858) **17, 18** *G. brebissonii* (6856, 6863) **19** *G. coronatumaceum* (6857) **20, 21** *G.* sp. (6857) **22** *G. gracile* (6856) **23** *G.* sp. (6862). Scale bar: 10 μm.

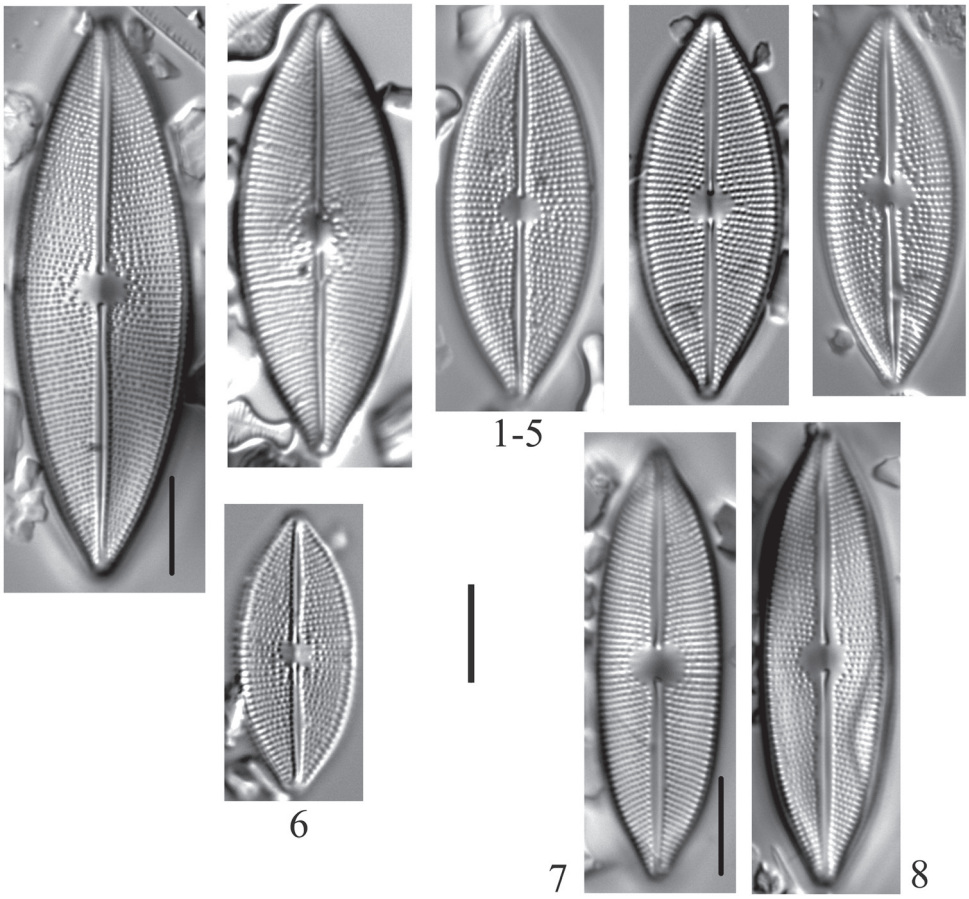

Plate 96. Baillie-Back. **1–6** *Lacustriella lacustris* (6862) **7, 8** *Lacustriella* sp. (6862). Scale bars: 10 µm.

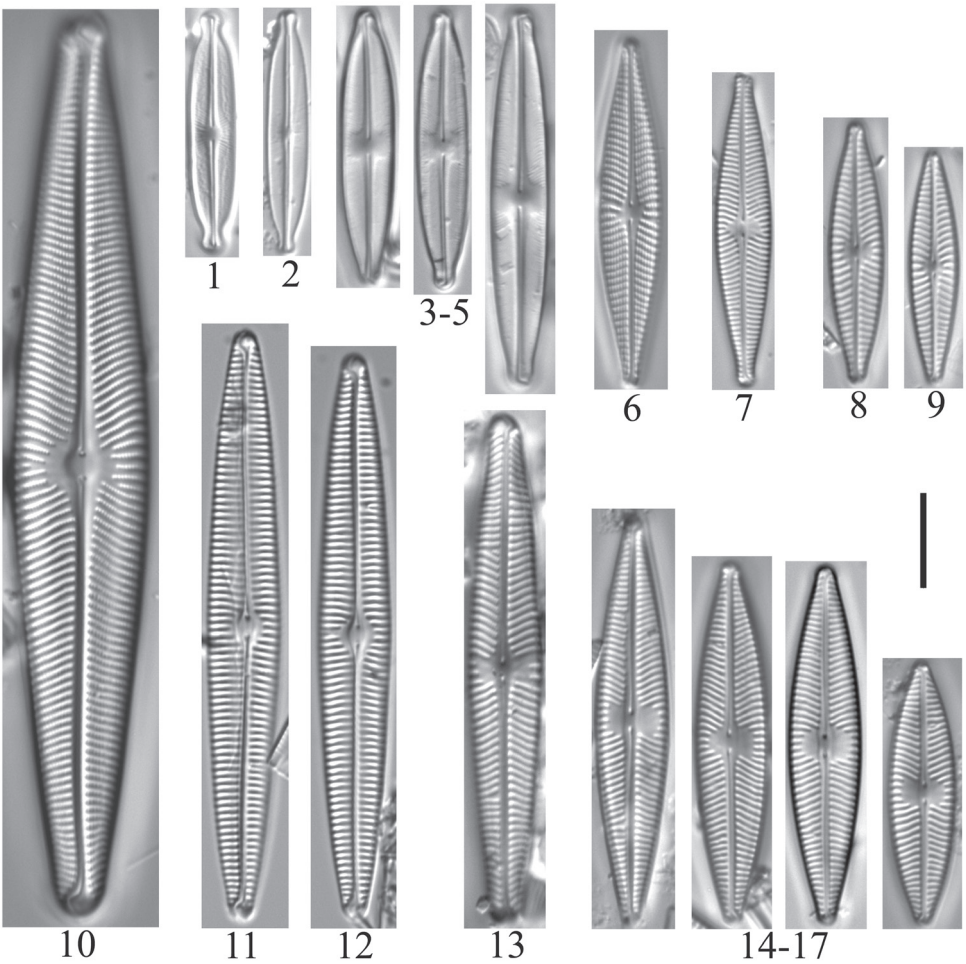

Plate 97. Baillie-Back. **1** *Kobayasiella okadae* (6857) **2** *Kobayasiella micropunctata* (6859) **3–5** *Kobayasiella jaagii* [*K. jaagii* sensu lato PH] (6857) **6** *Navicula subconcentrica* [cf. *N. cryptocephala* sensu lato PH] (6858) **7** *Navicula cryptocephala* [cf. *N. cryptocephala* PH] (6856) **8, 9** *Navicula notha* (6857) **10** *Navicula vulpina* (6857) **11, 12** *Navicula tripunctata* var. *arctica* (6857) **13** *Navicula venerablis* (6862) **14–17** *Navicula exilis* (6856, 6857). Scale bar: 10 μm.

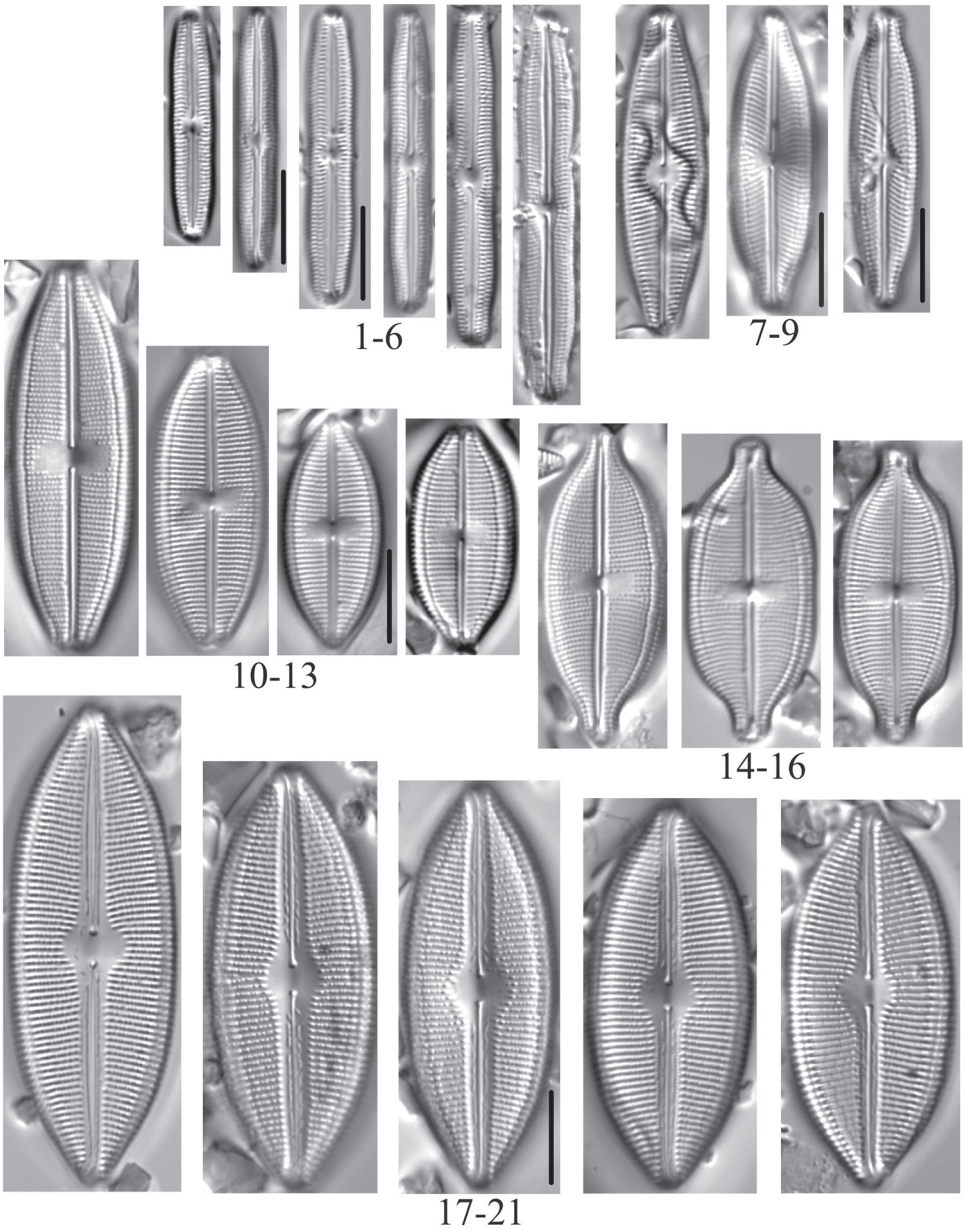

Plate 98. Baillie-Back. **1–6** *Neidiopsis vekhovii* (6856, 6858, 6859, 6862, 6865) **7–9** *Neidiopsis wulffii* (6862) **10–13** *Neidium ladogensis* (6862) **14–16** *Neidium alaskaense* (6862) **17–21** *Neidium holstii* (6858, 6862). Scale bars: 10 μm.

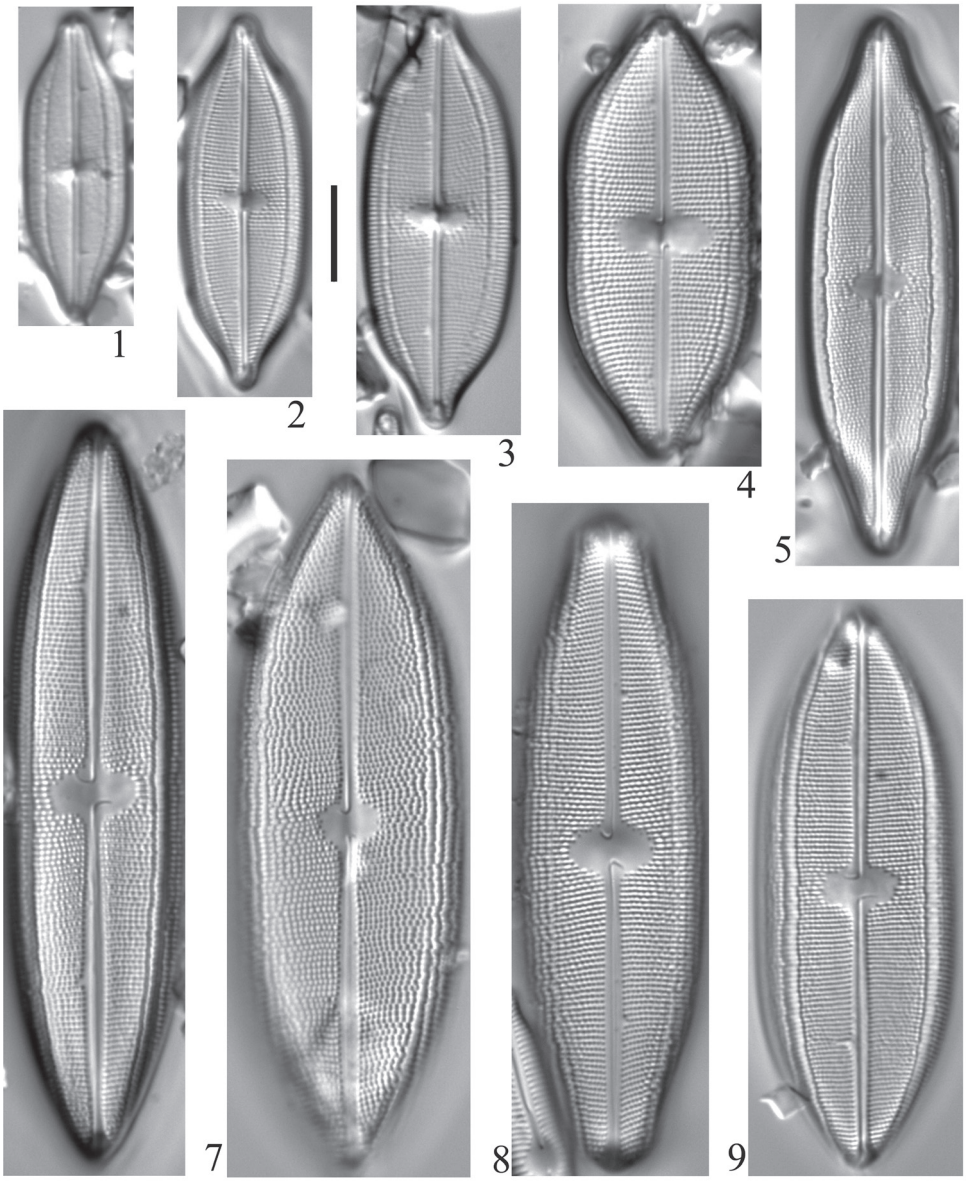

Plate 99. Baillie-Back. **1** *Neidium* sp. (6862) **2, 3** *N. apiculatum* (6862) **4** *N. fossum* [*N.* sp. PH] (6862) **5** *N. affine* var. *humerus* (6862) **6** *N. fossum* (6858) **7** *N. amphigomphus* (6863) **8** *N. ampliatum* [*N. ampliatum* sensu lato PH] (6856, 6864) **9** *N. fossum* (6863). Scale bar: 10 µm.

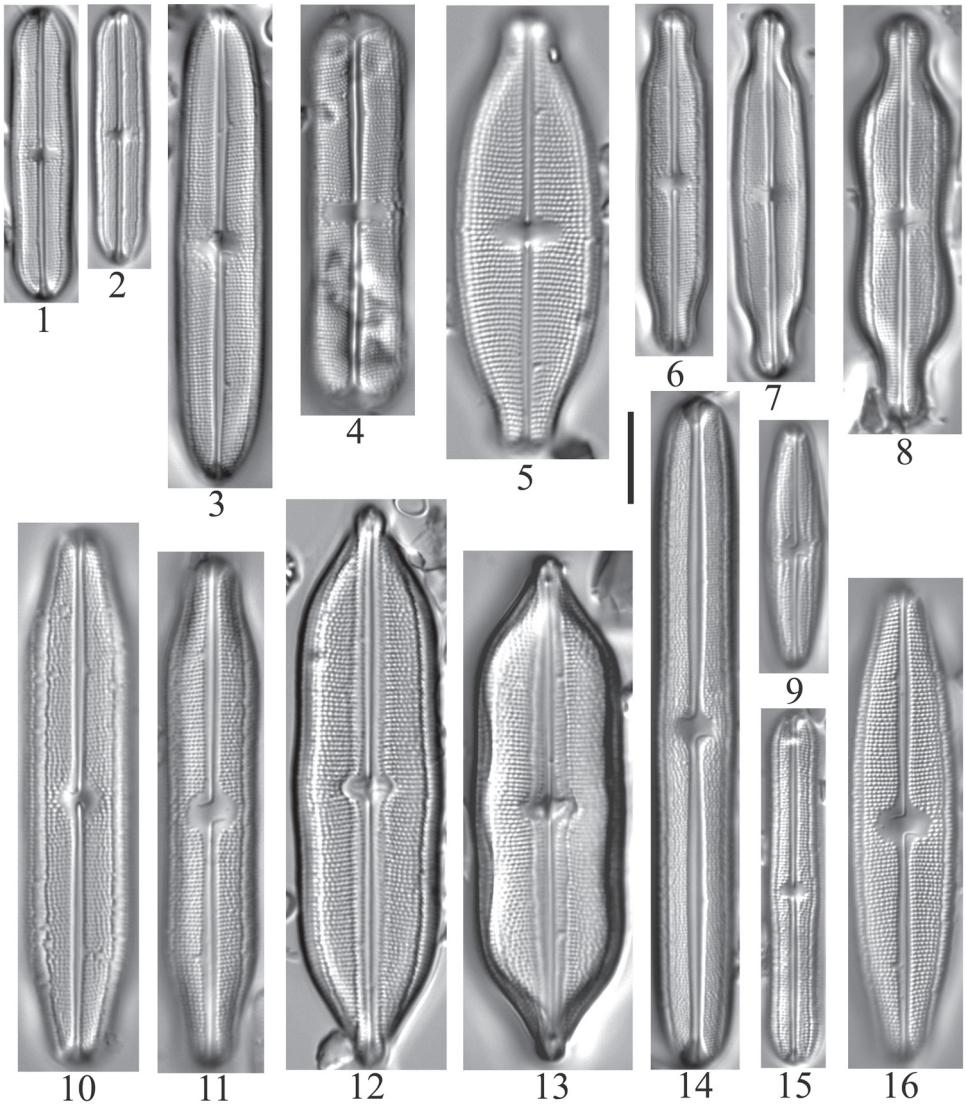

Plate 100. Baillie-Back. **1, 2** *Neidium* sp. (6858, 6862) **3** *N.* sp. [cf. *N. bisulcatum* var. *baicalense* PH] (6862) **4** *N.* sp. (6862) **5** *N. temperei* (6863) **6, 7** *N. affine* var. *longiceps* [Fig. **6** *N. longiceps*. Fig. **7** *N.* sp. PH] (6858, 6862) **8** *N. affine* (6858) **9** *N. bergii* (6862) **10, 11** *N.* sp. (6859, 6860, 6863) **12, 13** *N. hitchcockii* (6862, 6863) **14, 15** *N. bisulcatum* [Fig. **15** cf. *N. bisulcatum* PH] (6856, 6862, 6864, 6865, 6866) **16** *N. ampliatum* [*N. ampliatum* sensu lato PH] (6856, 6864). Scale bar: 10 μm.

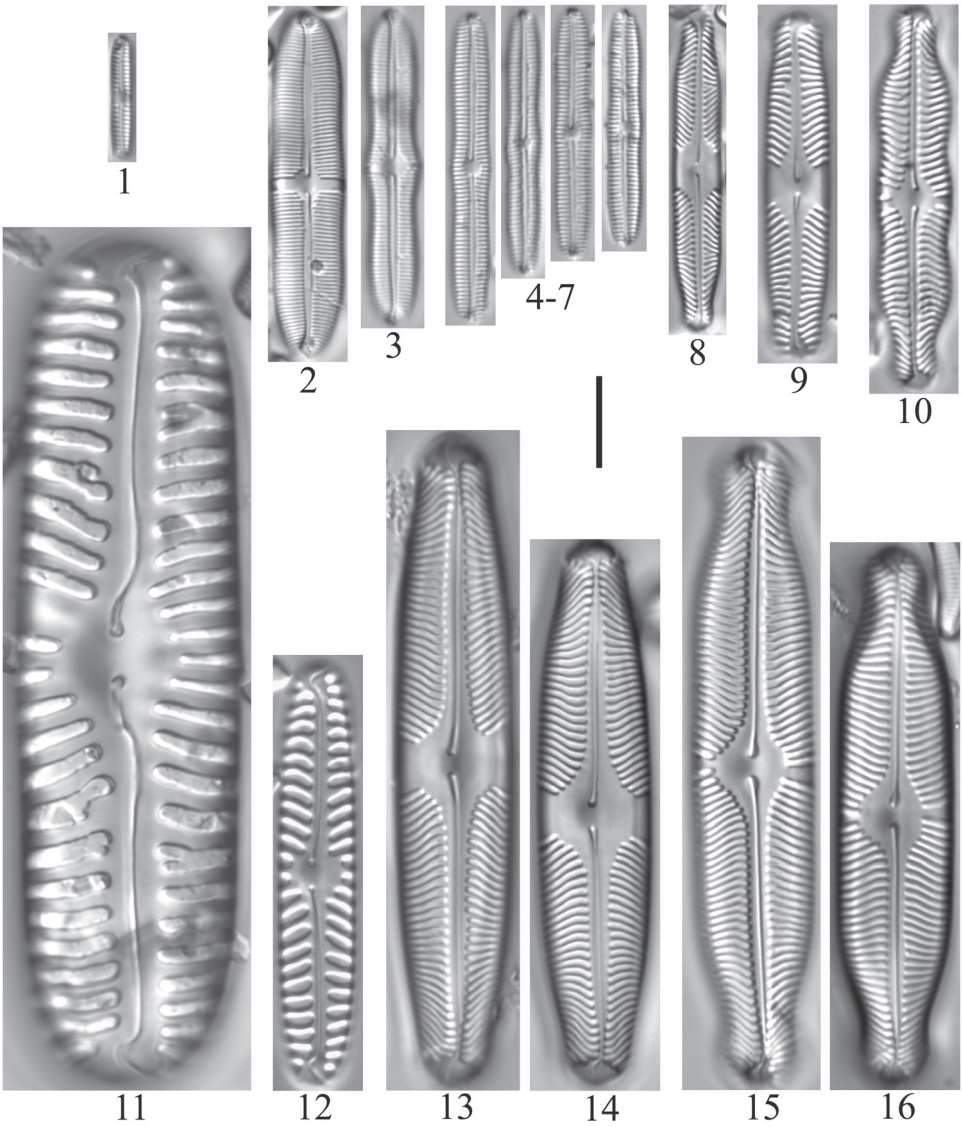

Plate 101. Baillie-Back. **1** *Chamaepinnularia bergeri* (6857) **2** *Caloneis* sp. (6862) **3** *Caloneis silicula* (6866) **4–7** *Caloneis fusus* (6866) **8** *Pinnularia marchica* (6862) **9** *Pinnularia krammeri* (6856) **10** *Pinnularia grunowii* (6863) **11** *Pinnularia lata* (6863) **12** *Pinnularia borealis* [cf. *P. rabenhorstii* PH] (6862) **13, 14** *Pinnularia* sp. [cf. *P. microstauron*] (6857) **15, 16** *Pinnularia biceps* (6857). Scale bar: 10 µm.

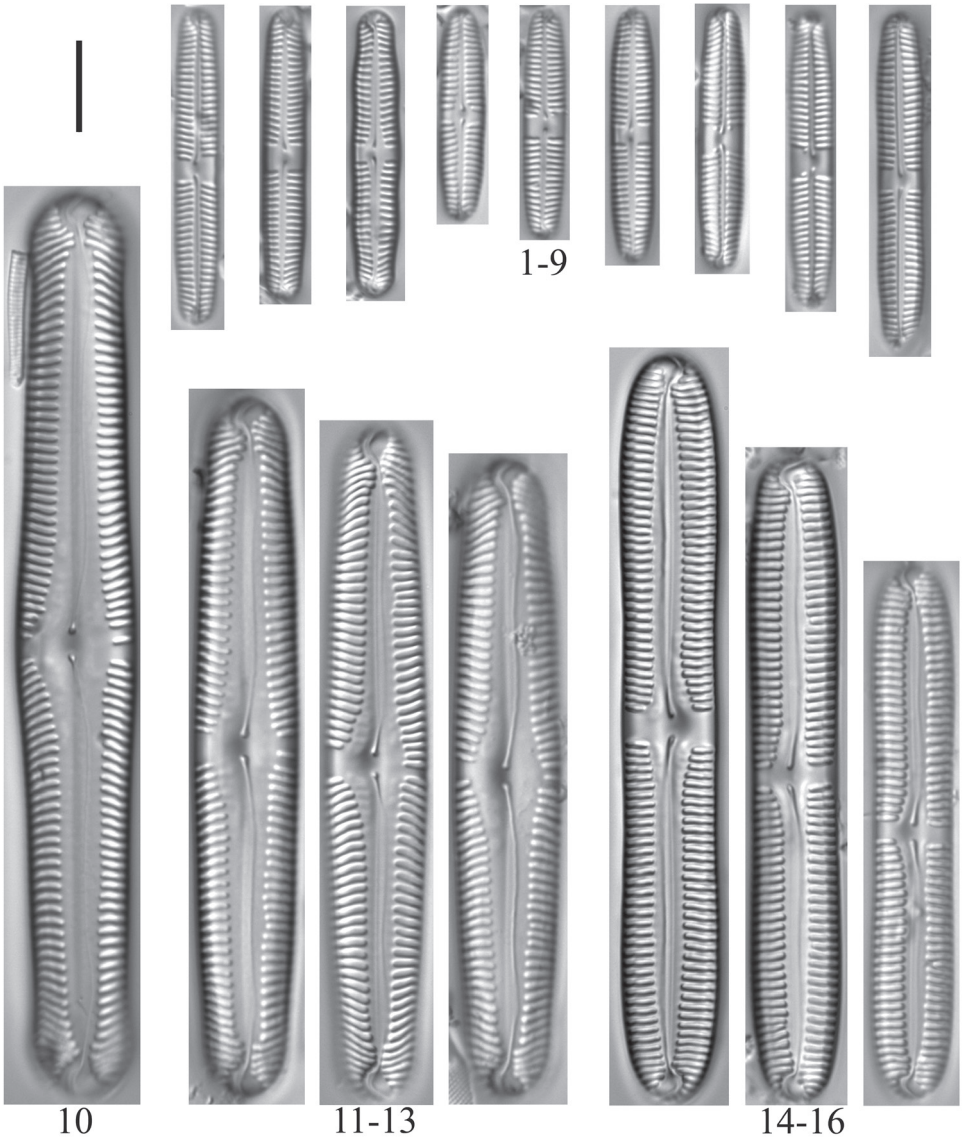

Plate 102. Baillie-Back. **1–9** *Pinnularia* sp. [cf. *P. sinistra*] [*P. sinistra* PH] (6856, 6857, 6864) **10** *P. macilenta* (6857, 6858) **11–13** *P. subgibba* (6856, 6857, 6859) **14–16** *P. crucifera* (6856, 6857, 6859). Scale bar: 10 µm.

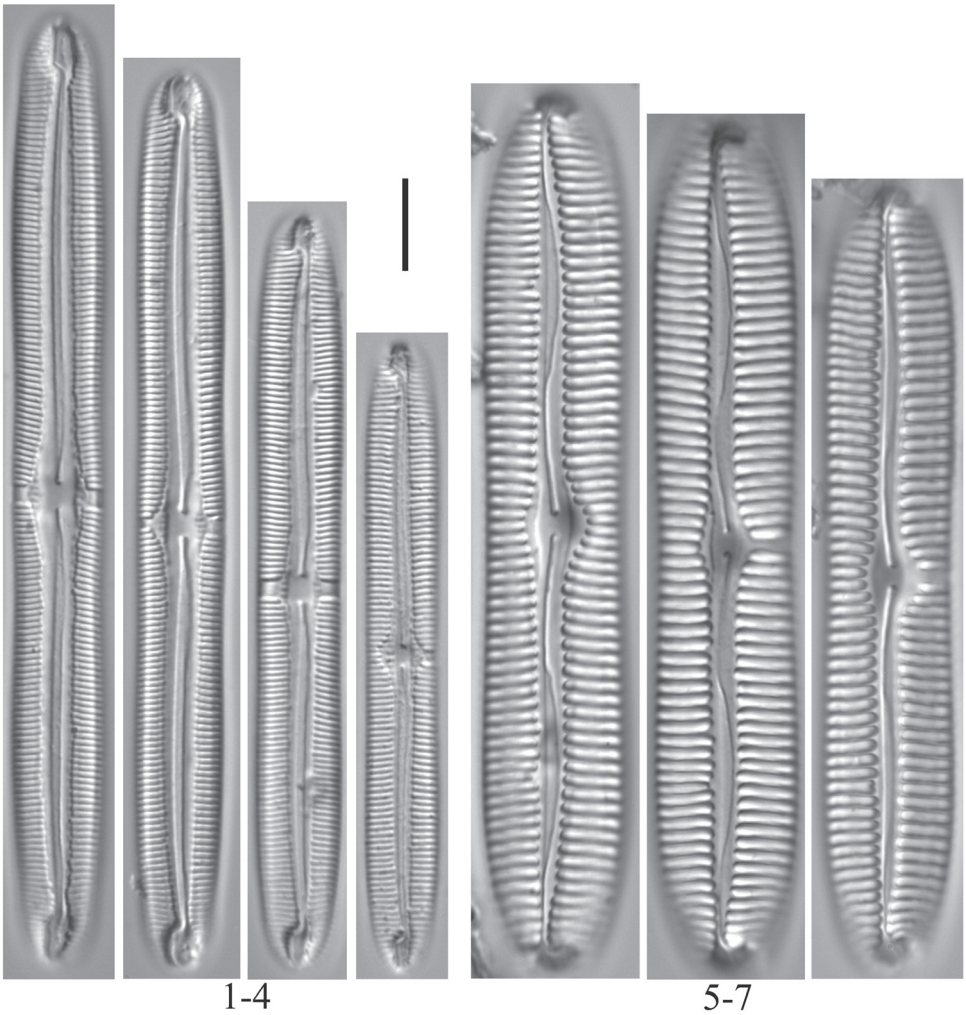

Plate 103. Baillie-Back. **1–4** *Pinnularia spitsbergensis* (6866) **5–7** *P. genkalii* (6866). Scale bar: 10 µm.

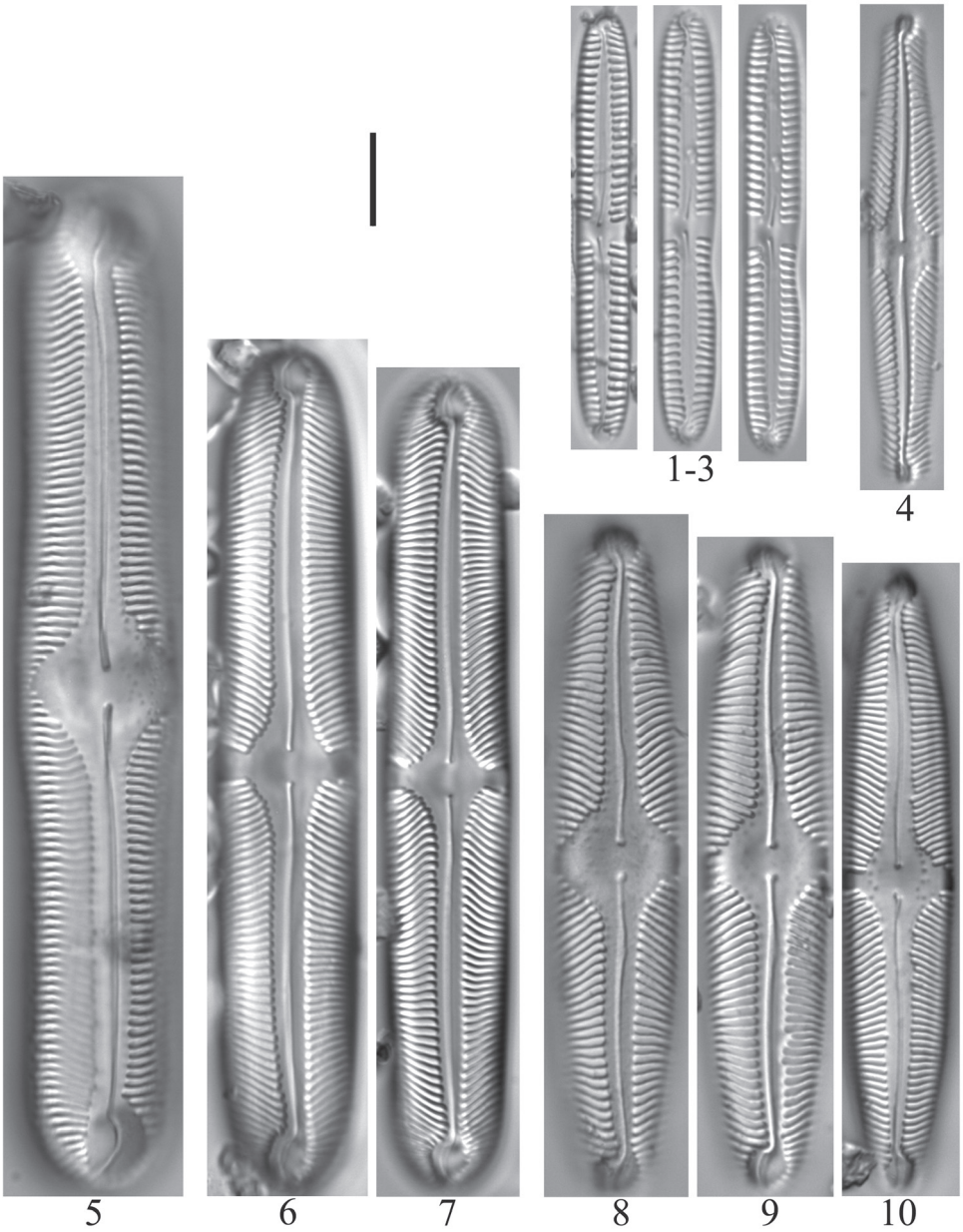

Plate 104. Baillie-Back. **1–3** *Pinnularia sinistra* (6859) [Figs 2 and 3 are the same specimen] **4** *P.* sp. [cf. *P. similiformis* PH] (6866) **5** *P. lailaensis* [cf. *P. lailaensis* PH] (6866) **6, 7** *P. divergens* var. *sublinearis* (6862) **8–10** *P.* sp. [cf. *P. decrescens*] (6866). Scale bar: 10 µm.

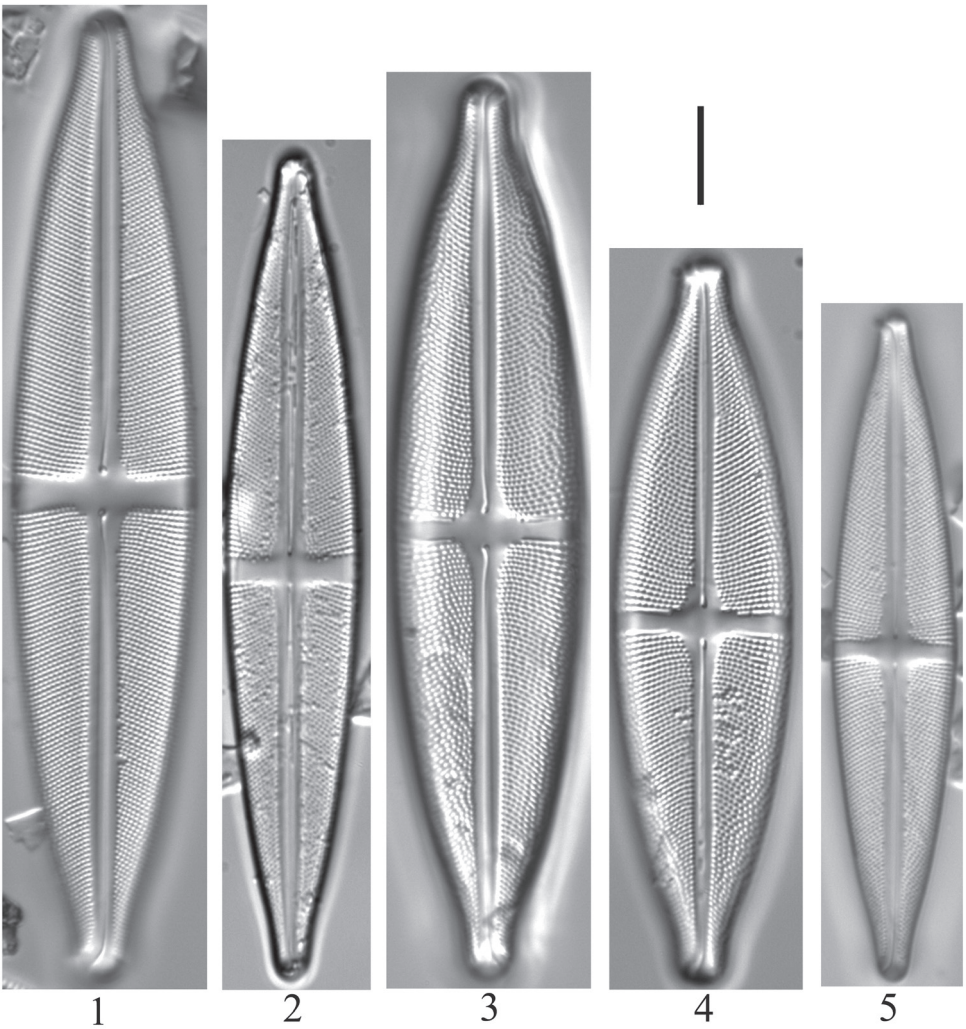

Plate 105. Baillie-Back. **1** *Stauroneis heinii* (6863) **2** *S. angustilancea* (6858) **3, 4** *S. kuelbsii* (6857, 6858) **5** *S. anceps* (6864). Scale bar: 10 µm.

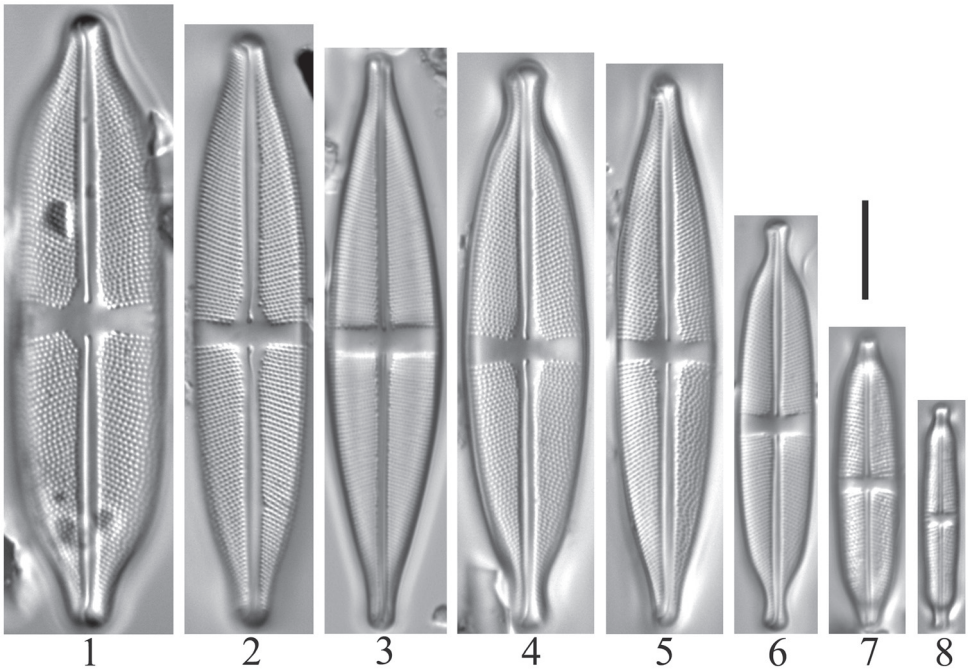

Plate 106. Baillie-Back. **1** *Stauroneis fluminea* (6863) **2** *S. gracilis* (6856) **3** *S. boyntoniae* (6862) **4** *S. amphicephala* (6856) **5** *S. anceps* [*S. anceps* sensu lato PH] (6856) **6** *S. reichardtii* (6856, 6864) **7** *S. livingstonii* (6862) **8** *S. prominula* [= *S. ignorata* = *S. biundulata* PH] (6862). Scale bar: 10 µm.

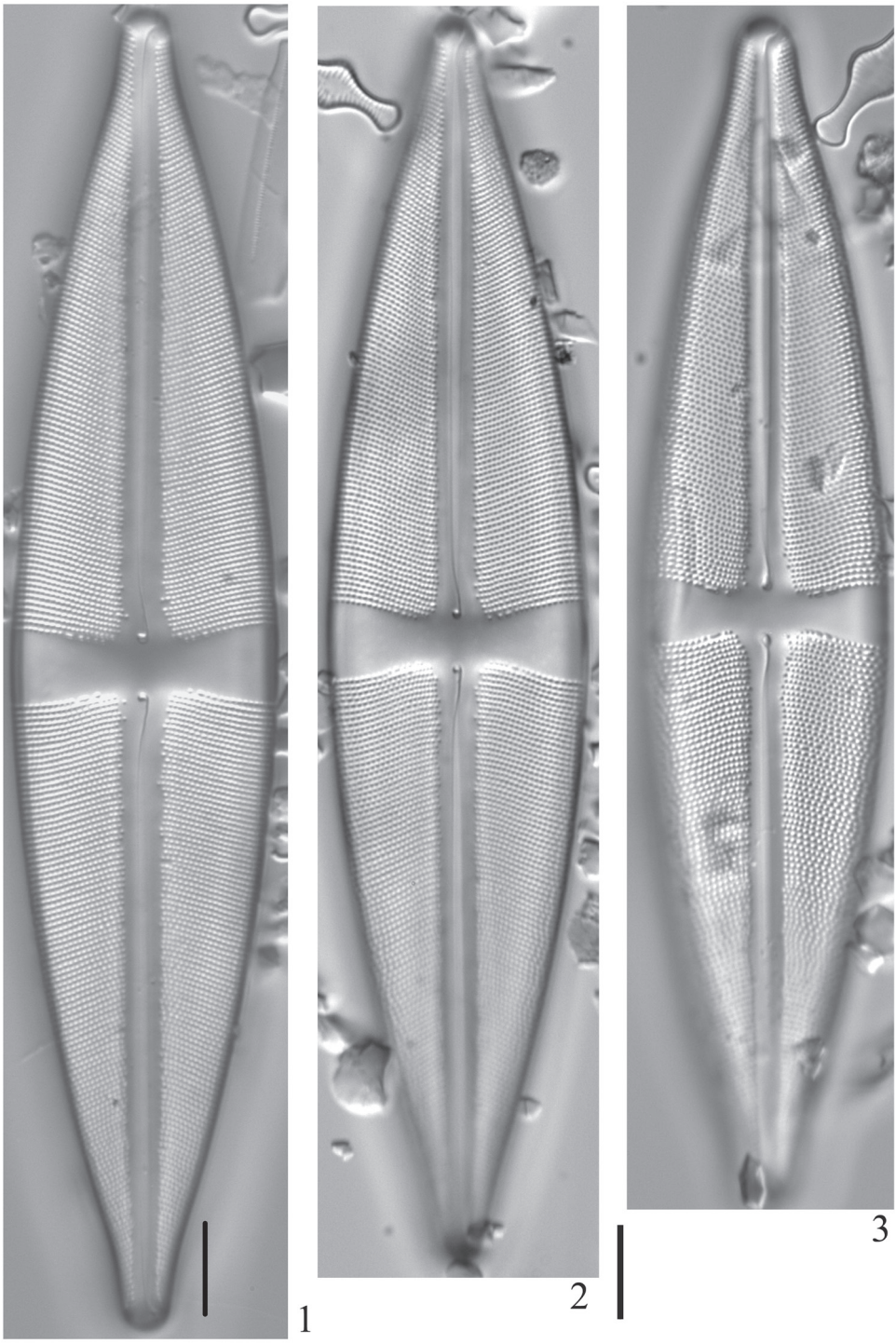

Plate 107. Baillie-Back. **1–3** *Stauroneis circumborealis* (6856, 6864). Scale bars: 10 µm.

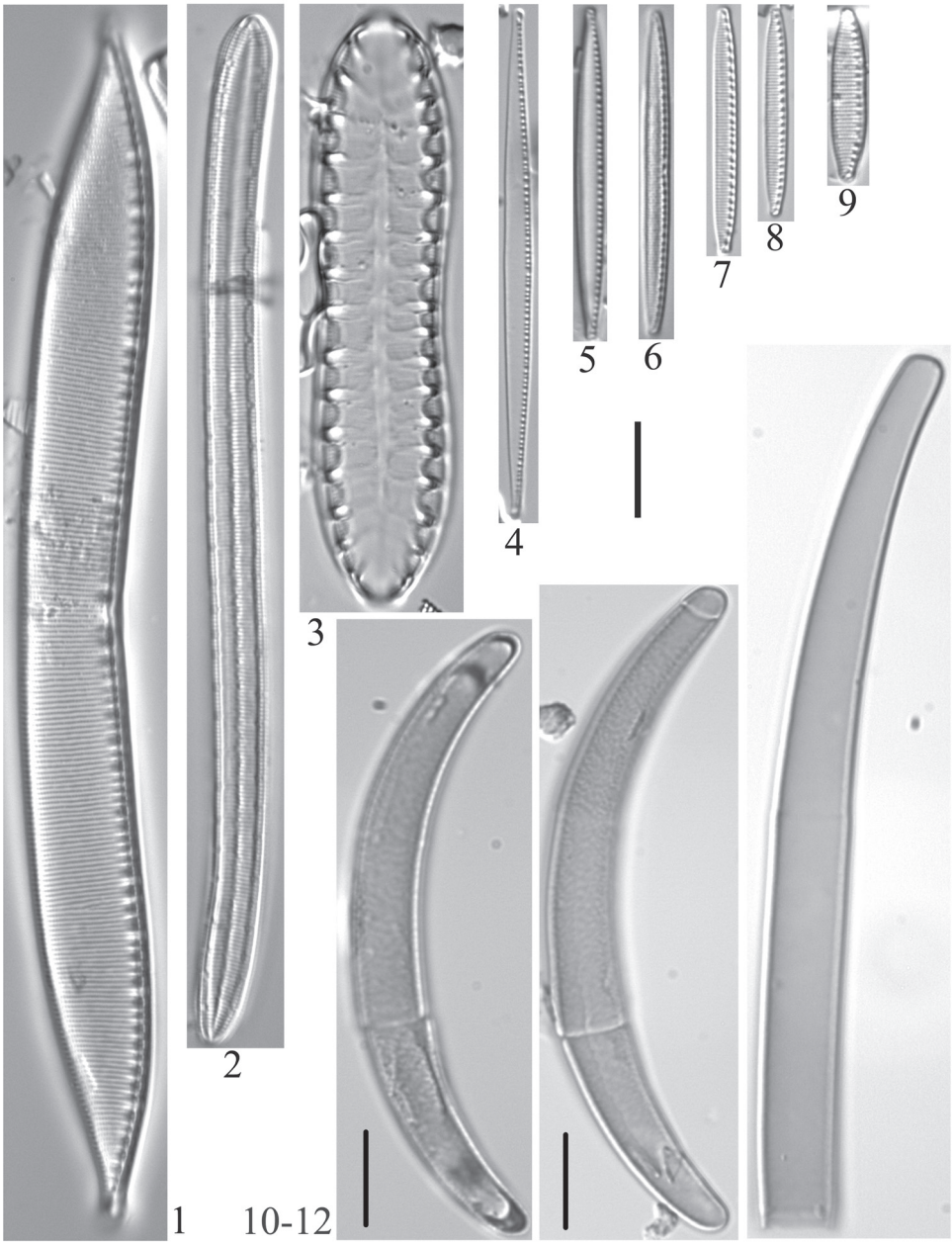

Plate 108. Baillie-Back. **1** *Hantzschia elongata* or *H. vivacior* (6856) **2** *Stenopterobia anceps* (6860) **3** *Surirella linearis* (6858) **4** *Nitzschia gracilis* (6862) **5** *Nitzschia palea* var. *tenuirostris* [*N. palea* var. *tenuirostris* sensu lato PH] (6857) **6** *Nitzschia acidoclinata* (6856) **7, 8** *Nitzschia perminuta* (6856, 6865) **9** *Nitzschia alpina* (6858) **10–12** UFOs (unidentified floating objects; desmids? *Closterium*?) (6860). Scale bar: 10 µm.

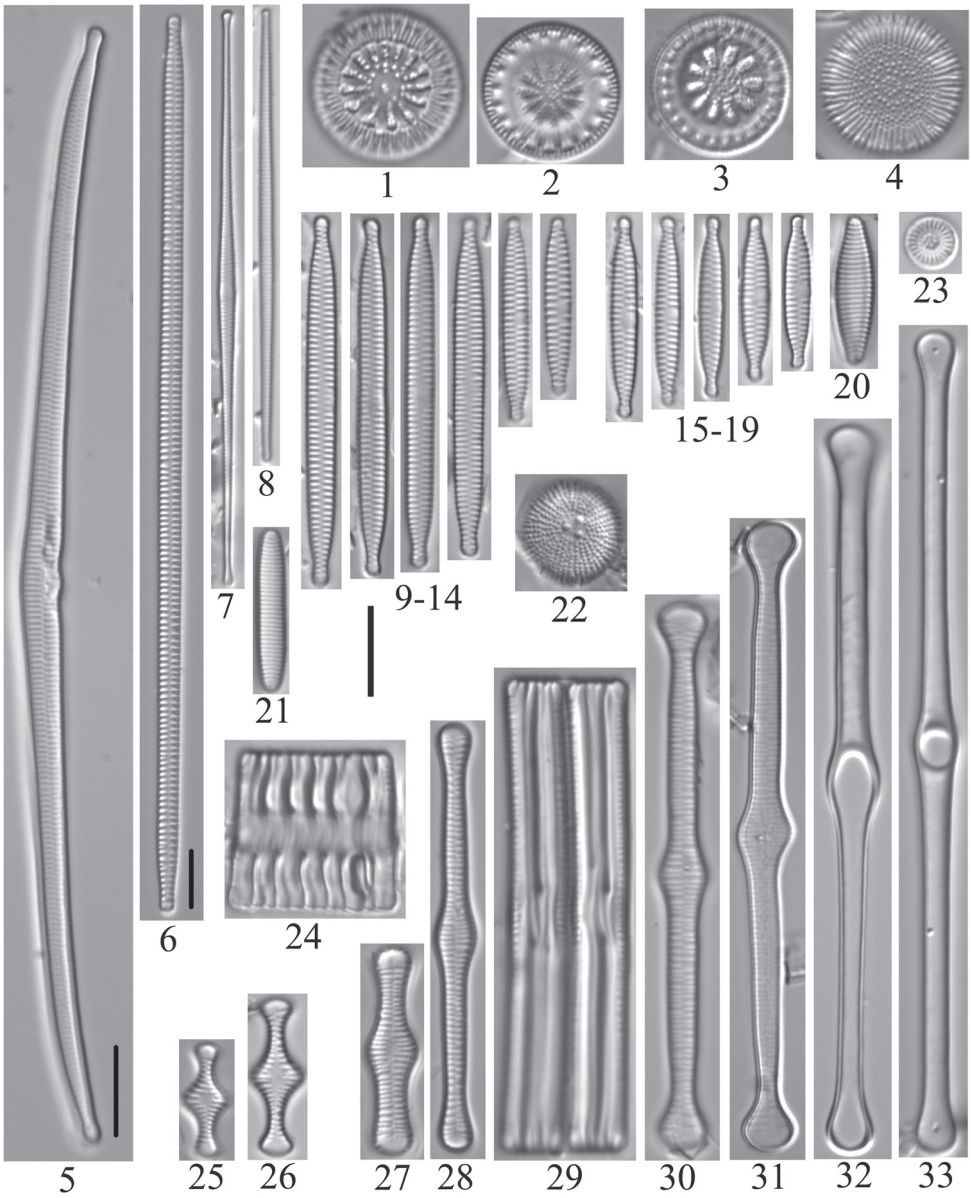

Plate 109. Hood. **1, 2** *Lindavia radiosa* (6898) **3** *Lindavia antiqua* (6898) **4** *Lindavia affinis* (6904) **5** *Hannaea superiorensis* (6906) **6** *Ulnaria* sp. (6907) **7** *Fragilaria crotonensis* (6908) **8** *Fragilaria sepes* (6898) **9–14** *Fragilaria* sp. (6900, 6904, 6909) **15–19** *Fragilaria* sp. [*F. vaucheriae* sensu Tuji PH] (6900) **20** *Stauroforma exiguiformis* (6905) **21** *Stauroforma* sp. (6912) **22** *Orthoseira roeseana* (6904) **23** *Discostella pseudostelligera* (6908) **24–26** *Tabellaria flocculosa* (6898, 6900) **27–33** *Tabellaria fenestrata* [Figs **27–29** *T. flocculosa* PH] (6898, 6906). Scale bars: 10 μm.

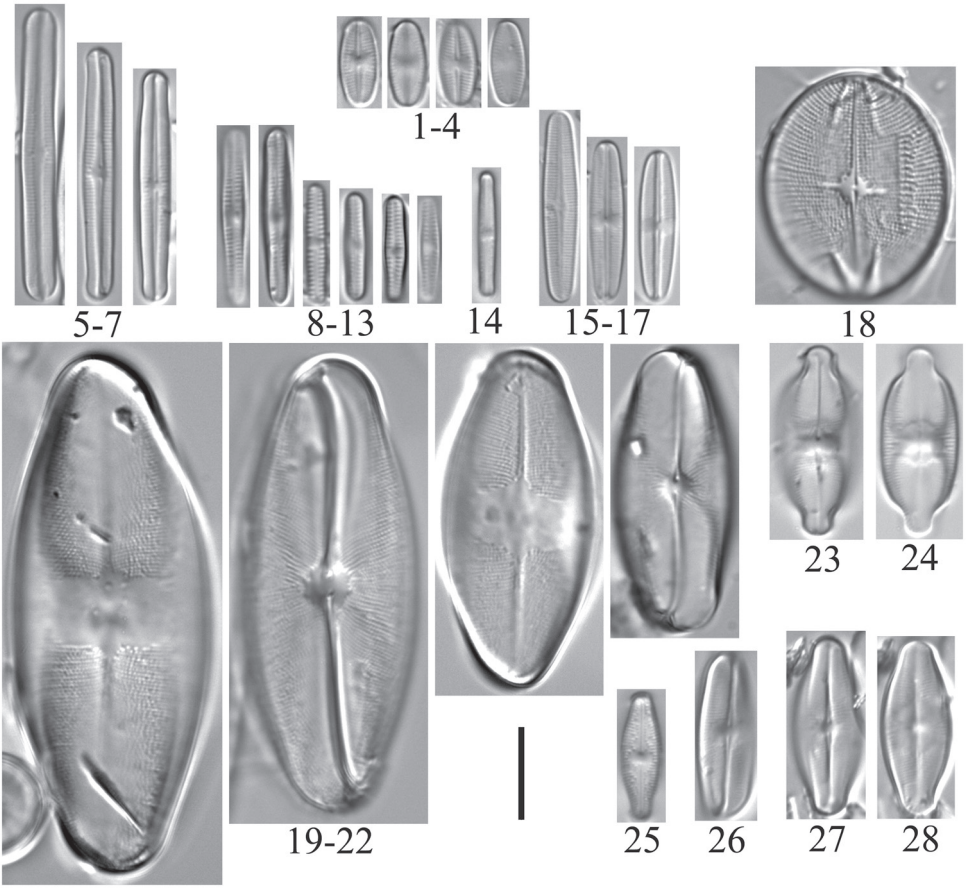

Plate 110. Hood. **1–4** *Psammothidium marginulatum* (6900) **5–7** *Achnanthidium duthiei* [*A,* sp. PH] (6904) **8–13** *Achnanthidium kriegeri* (6900) **14** *Achnanthidium minutissimum* (6912) **15–17** *Rossithidium petersenii* (6900) **18** *Cocconeis rugosa* (6898) **19–22** *Eucocconeis flexella* (6898, 6907) **23, 24** *Eucocconeis depressa* (6907) **25** *Nupela* (?) sp. (6899) **26** *Eucocconeis alpestris* (6909) **27, 28** *Eucocconeis laevis* (6909). Scale bar: 10 μm.

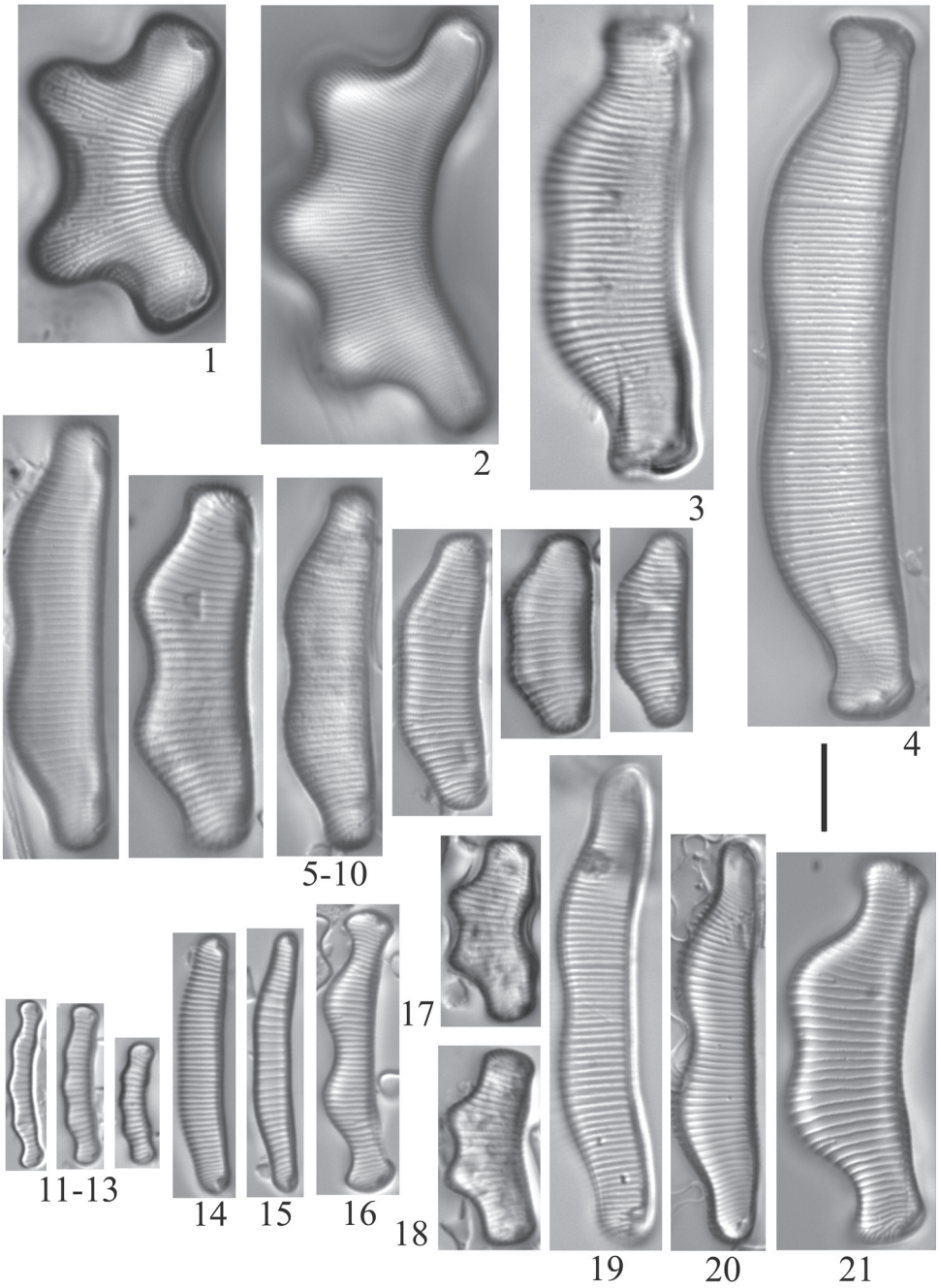

Plate 111. Hood. **1** *Eunotia pseudopapilio* (6898) **2** *E. semicircularis* (6899) **3** *E. bidens* (6898) **4** *E. superbidens* (6908) **5–10** *E. mihoi* [*E.* sp. PH] (6900) **11–13** *E. perminuta* (6900) **14** *E. circumborealis* [*E. rhomboidea* PH] (6900) **15** *E. implicata* (6900) **16** *E. herkiniensis* (6905) **17, 18** *E. suecica* (6900) **19** *E. dorofeyukae* (6898) **20** *E. diodon* (6905) **21** *E. sarek* (6901). Scale bar: 10 μm.

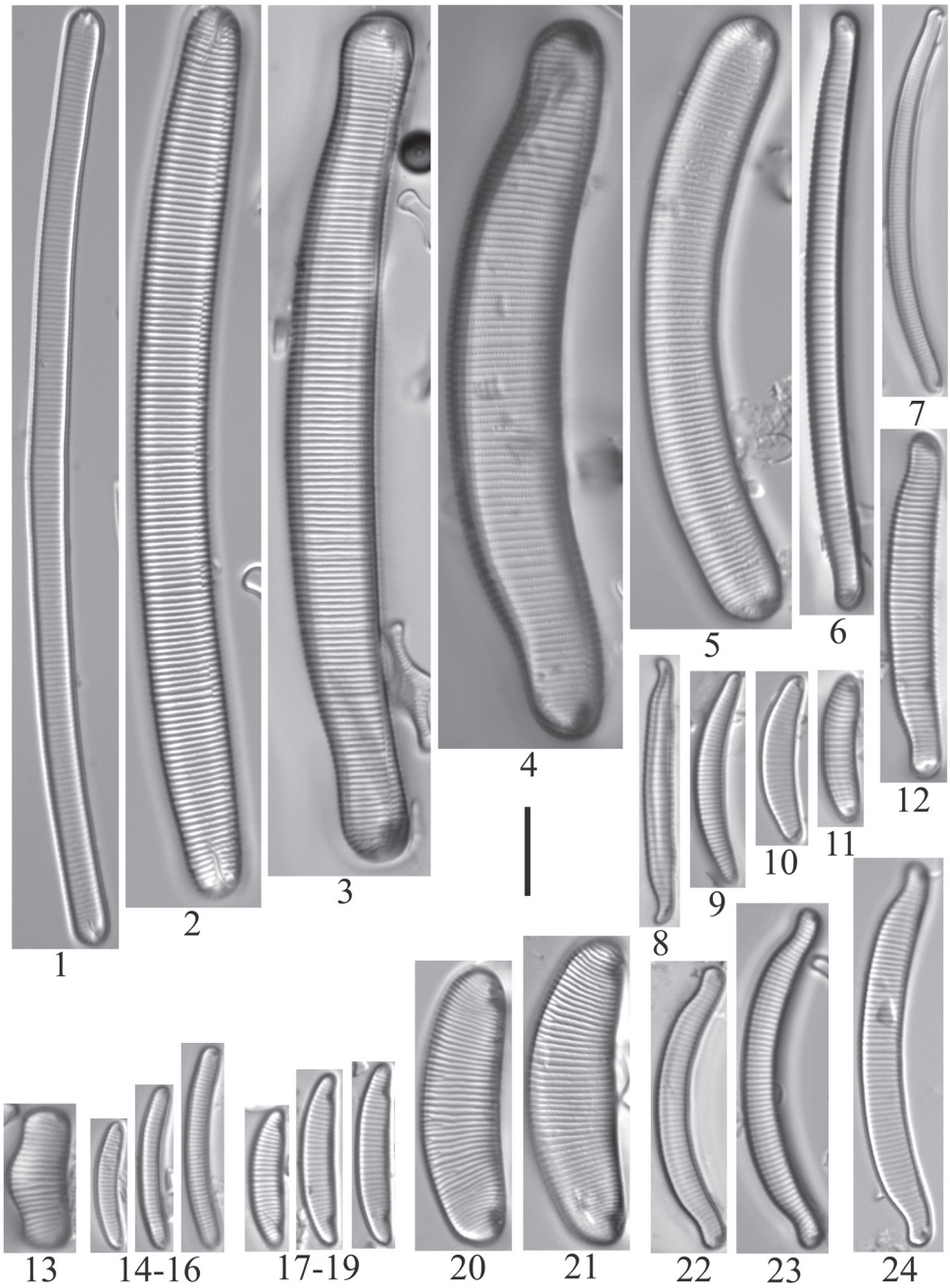

Plate 112. Hood. **1** *Eunotia julma* (6898) **2** *E. pseudopectinalis* (6898) **3** *E. maior* [or *E. metamonodon* PH] (6905) **4** *E. metamonodon* (6898) **5** *E. paralleladubia* (6899) **6** *E. pseudoflexuosa* (6898) **7** *E. mucophila* (6905) **8** *E. fallax* (6898) **9, 10** *E. boreotenuis* [Fig. **9** *E.* sp. PH] (6900, 6907) **11** *E. intermedia* (6900) **12** *E. glacialis* [*E. minor* PH] (6907) **13** *E. curtagrunowii* (6900) **14–16** *E. botuliformis* (6900) **17–19** *E. incisa* (6900) **20, 21** *E. faba* (6905) **22, 23** *E. nymanniana* (6898, 6905) **24** *E. exigua* [*E.* sp. PH] (6900). Scale bar: 10 μm.

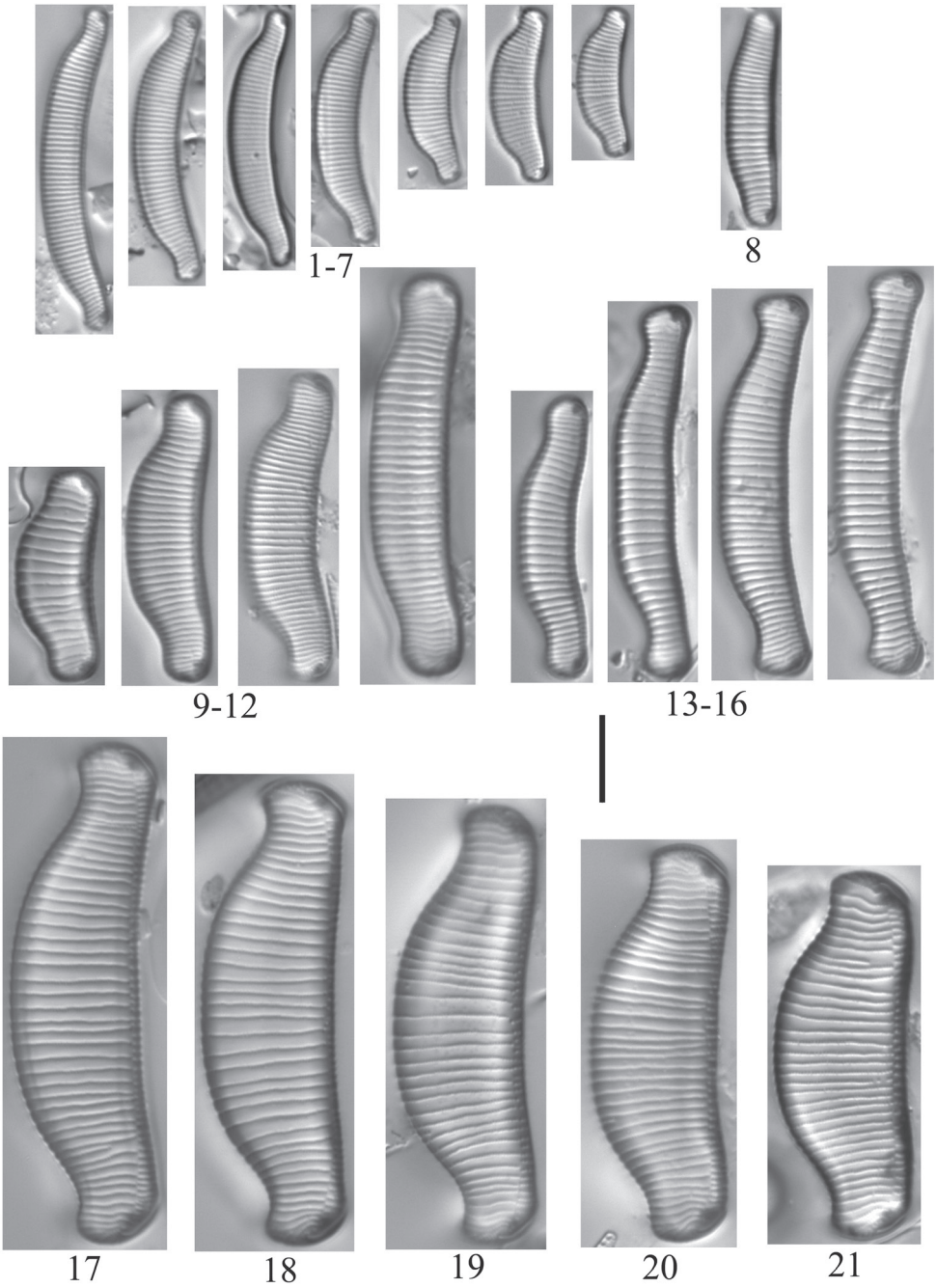

Plate 113. Hood. **1–7** *Eunotia ursamaioris* (6900) **8** *E. minor* [or *E. rhomboidea* PH] (6900) **9–12** *E. arcus* (6898, 6899, 6907) **13–16** *E. arcubus* (6898, 6907) **17–21** *E. praerupta* (6901, 6903). Scale bar: 10 μm.

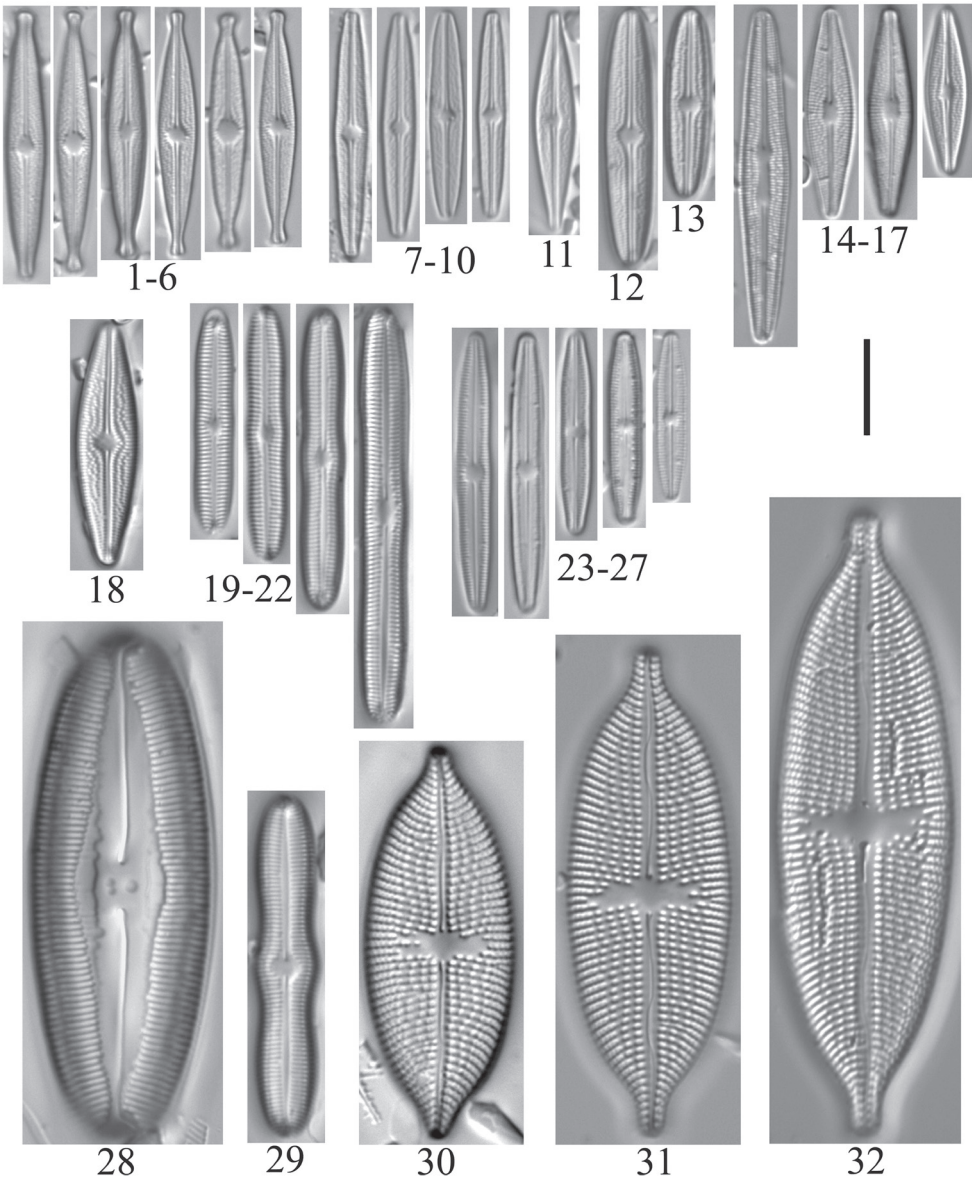

Plate 114. Hood. **1–6** *Brachysira* sp. (6898, 6904, 6908) **7–10** *Brachysira* sp. (6905) **11** *Brachysira microcephala* (6913) **12, 13** *Brachysira* sp. [cf. *Brachysira calcicola*] (6900) **14–17** *Brachysira styriaca* (6898, 6908) **18** *Brachysira arctoborealis* (6905) **19–22** *Caloneis fusus* (6898, 6904, 6906, 6912) **23–27** *Caloneis tenuis* [? PH] (6904, 6908) **28** *Caloneis obtusa* (6908) **29** *Caloneis silicula* (6912) **30–32** *Aneumastus tusculus* (6906, 6909). Scale bar: 10 μm.

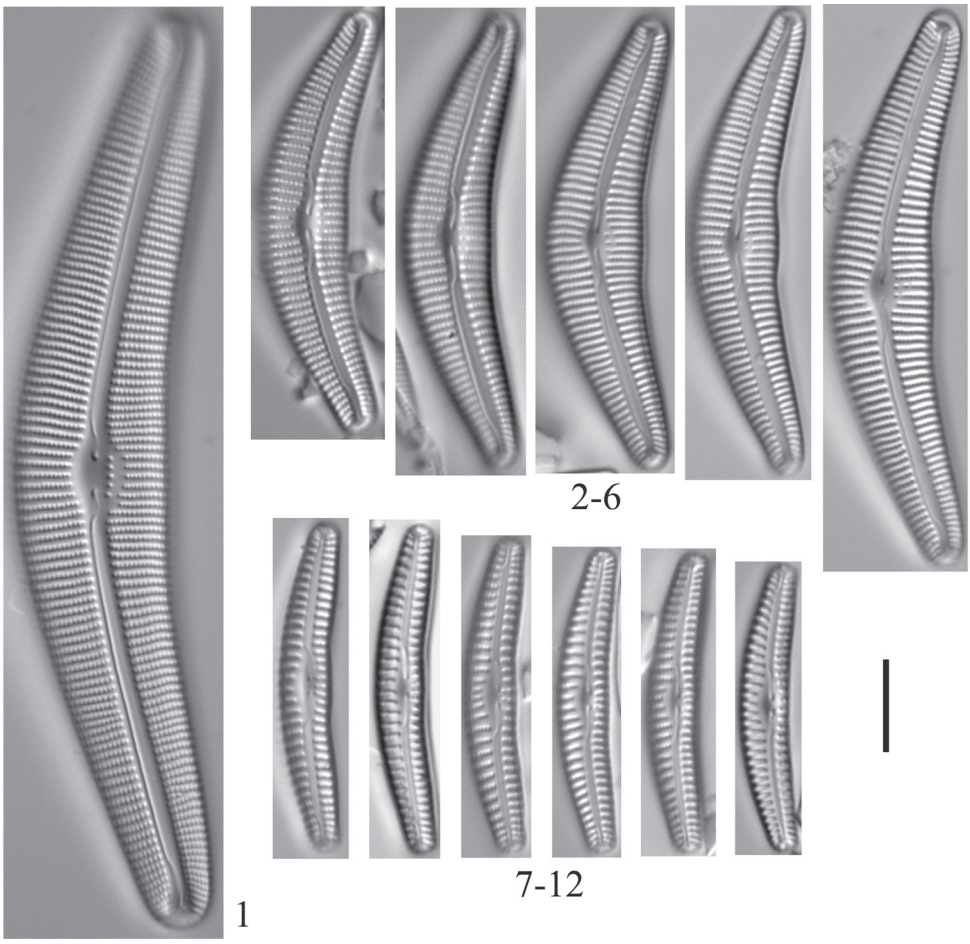

Plate 115. Hood. **1** *Cymbella arctica* (6904) **2–6** *C. krammeri* (6898, 6904, 6906, 6909) **7–12** *C. botellus* (6904, 6906). Scale bar: 10 µm.

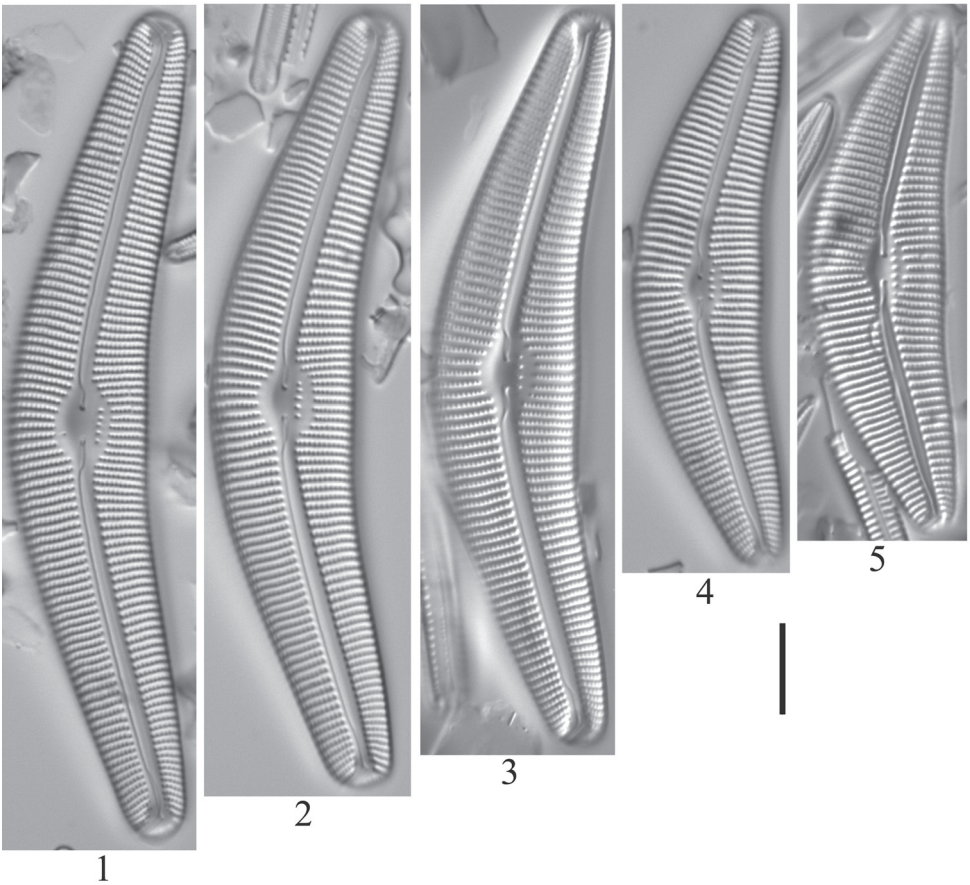

Plate 116. Hood. **1–5** *Cymbella arctica* (6904). Scale bar: 10 µm.

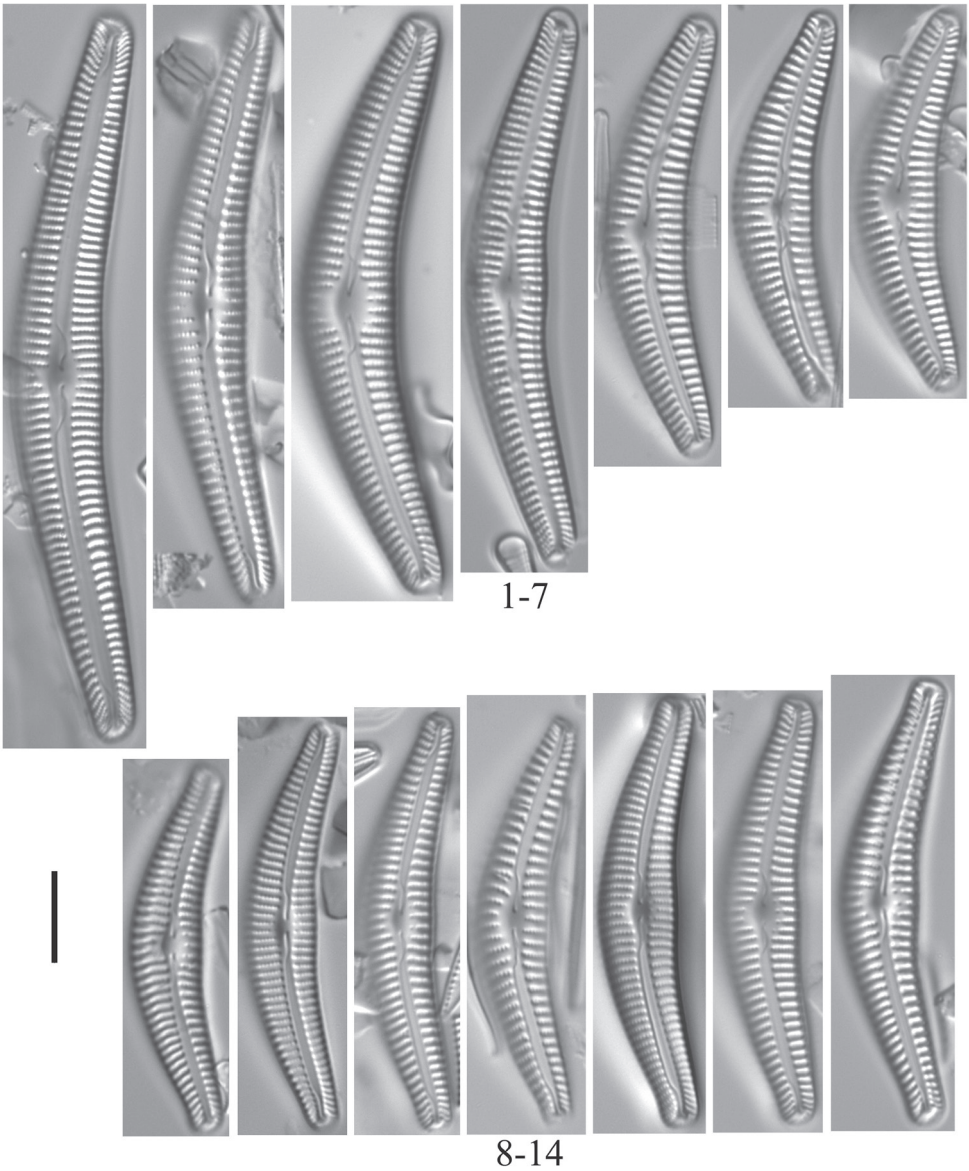

Plate 117. Hood. **1–14** *Cymbella cleve-eulerae* (6898, 6905, 6909). Scale bar: 10 µm.

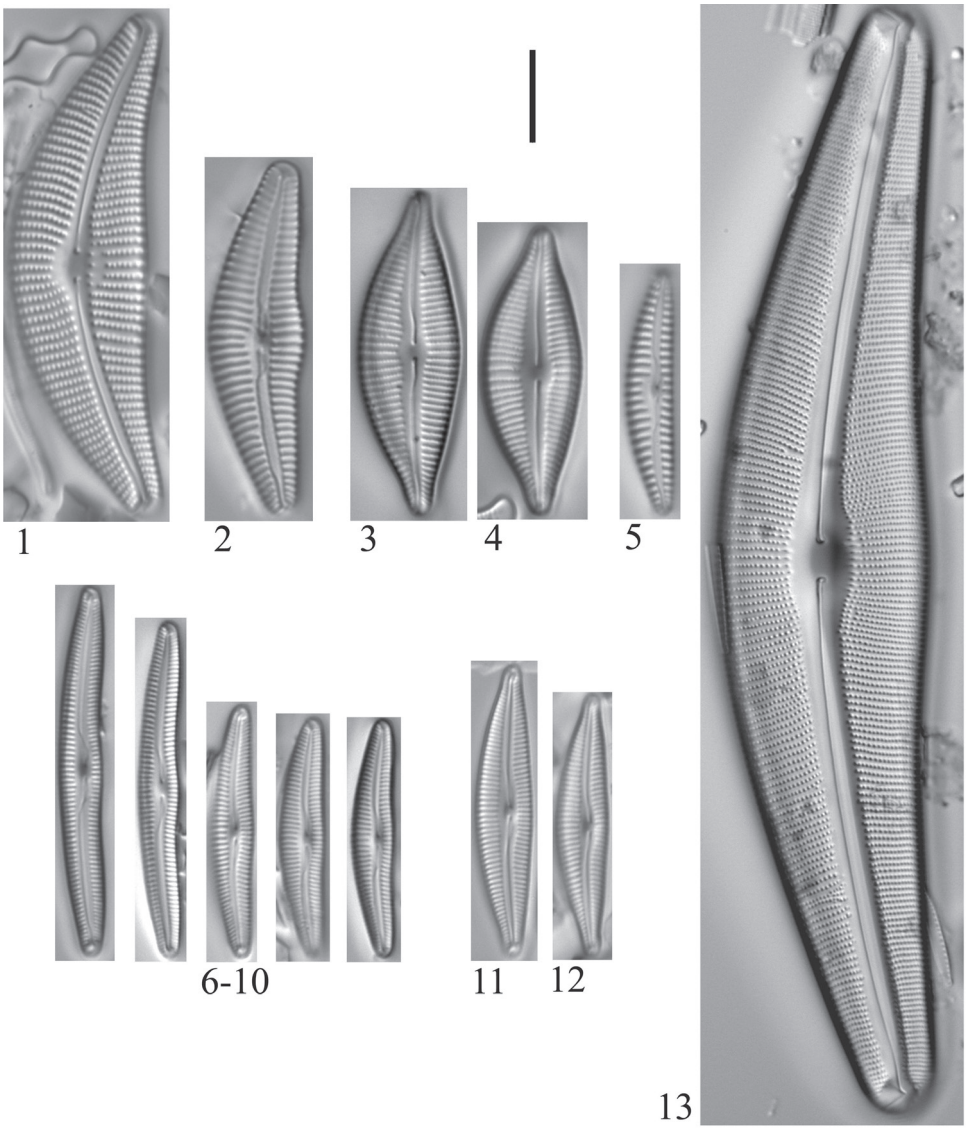

Plate 118. Hood. **1** *Cymbella proxima* (6904) **2** *Cymbella hantzschiana* (6898) **3, 4** *Cymbella designata* (6898, 6906) [= *Cymbopleura citriformis*] **5** *Cymbella* sp. (6904) **6–10** *Delicata canadensis* (6898, 6904) **11, 12** *Delicata delicatula* (6904) **13** *Cymbella aspera* (6912). Scale bar: 10 µm.

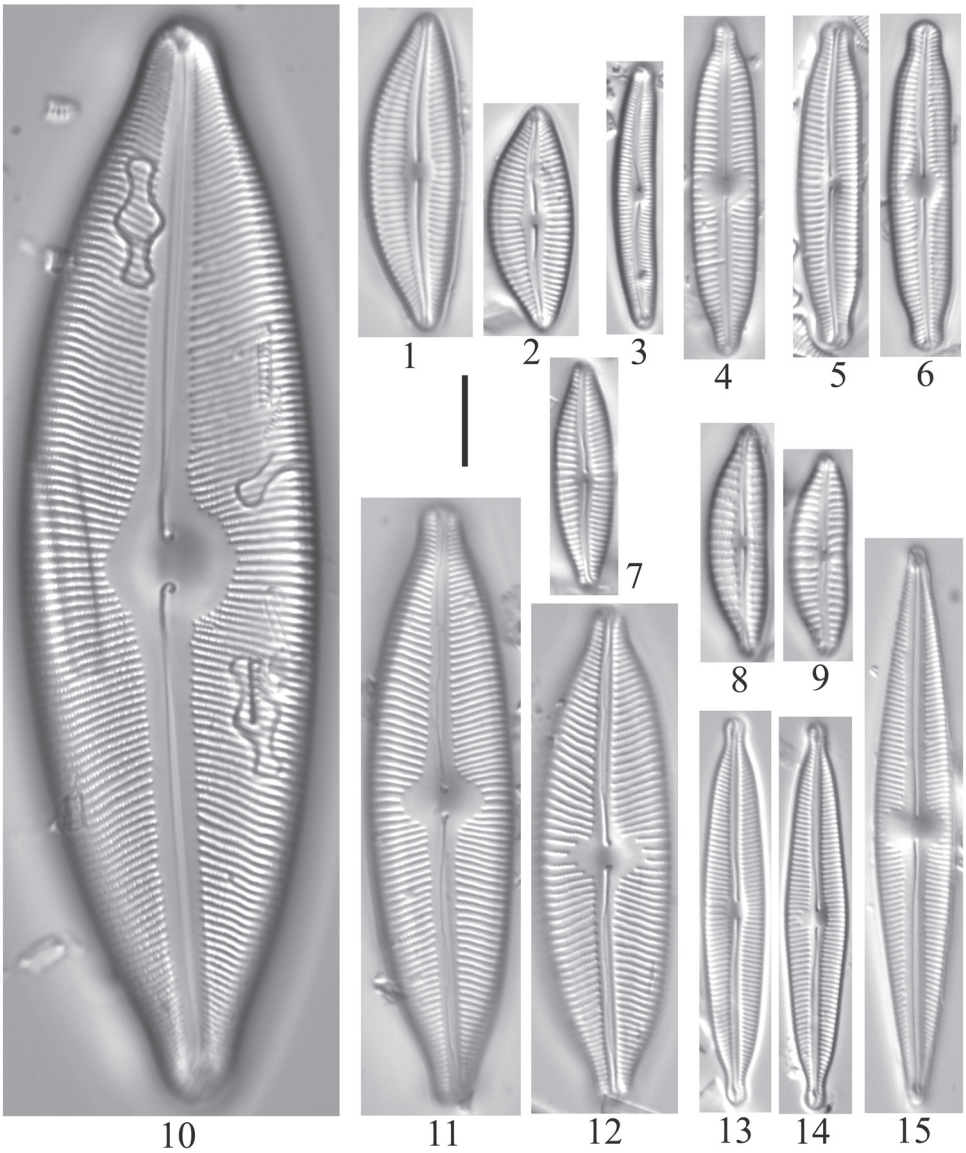

Plate 119. Hood. **1, 2** *Cymbopleura heilprinensis* (6907, 6909) **3** *C. tundraphila* (6904) **4** *C. hybrida* (6908) **5, 6** *C. fluminea* (6905, 6912) **7** *C. rupicola* (6909) **8, 9** *C.* sp. (6909) **10** *C. neoheteropleura* (6898) **11, 12** *C. tynnii* (6907, 6912) **13, 14** *C. angustata* (6900, 6904) **15** *C. stauroneiformis* (6898). Scale bar: 10 µm.

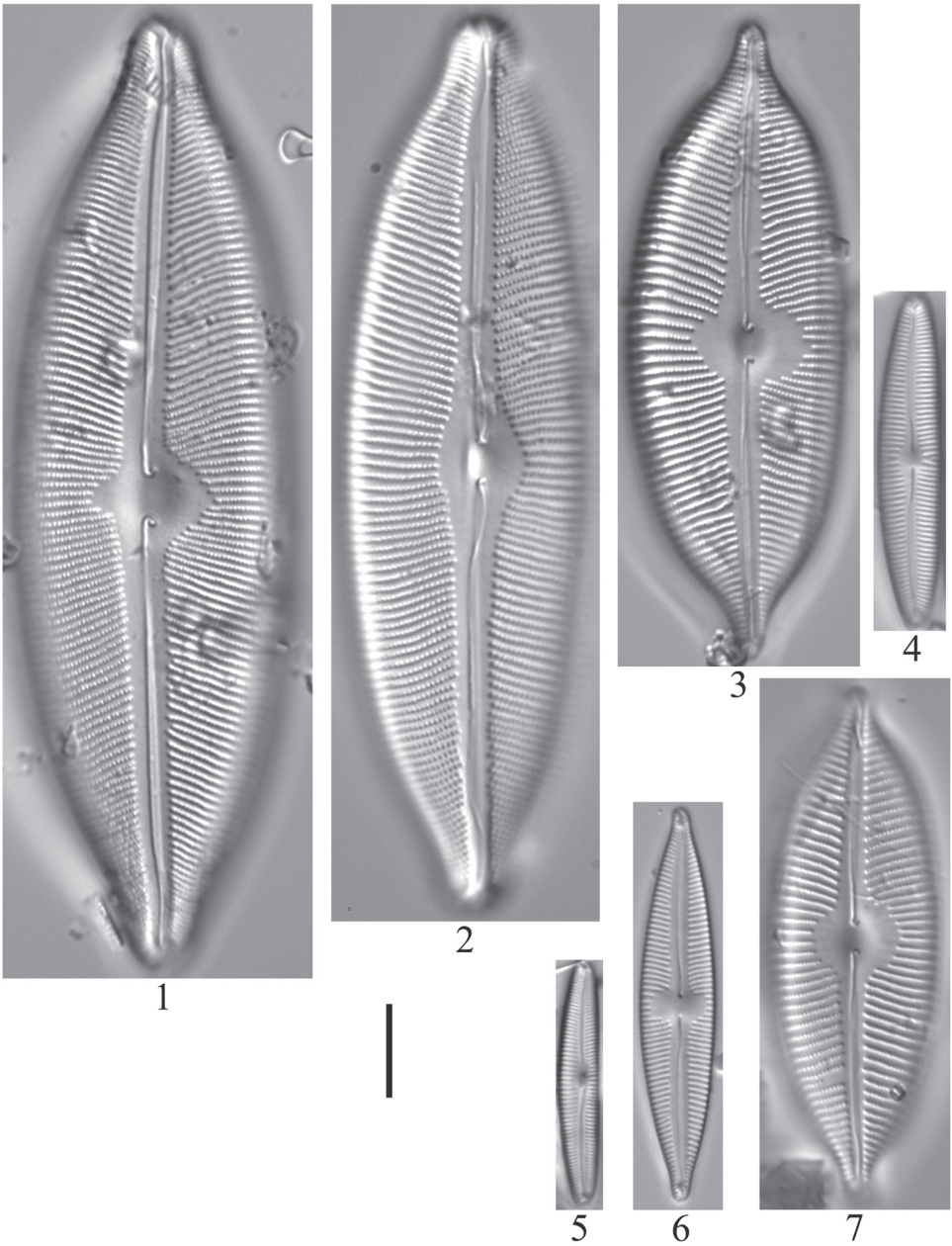

Plate 120. Hood. **1, 2** *Cymbopleura neoheteropleura* (6907) **3, 7** *C. apiculata* (6906, 6907) **4** *C. incerta* var. *spitsbergensis* [*C.* sp. PH] (6904) **5** *C. tundraphila* (6904) **6** *C. stauroneiformis* (6905). Scale bar: 10 µm.

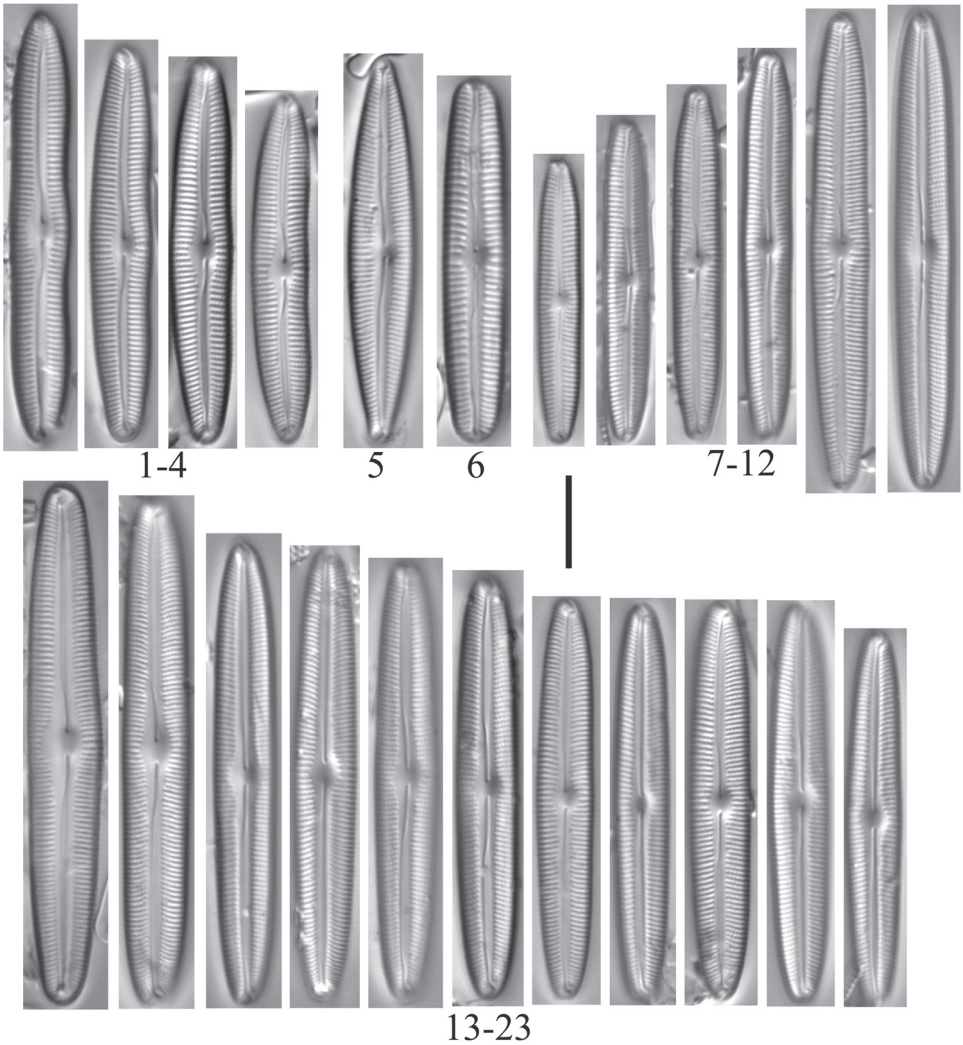

Plate 121. Hood. **1–4** *Cymbopleura incerta* var. *spitsbergensis* (6904, 6907, 6912) **5** *Cymbopleura incertiformis* (6905) **6** *Cymbopleura oblongata* (6907). **7–10** (**11, 12**?). *Cymbopleura incertiformis* var. *linearis* (6898, 6903, 6906, 6907, 6908) **13–23** *Encyonopsis* (*Cymbopleura*?) *grunowii* [= *Cymbella naviculacea*] (6899, 6904). Scale bar: 10 µm.

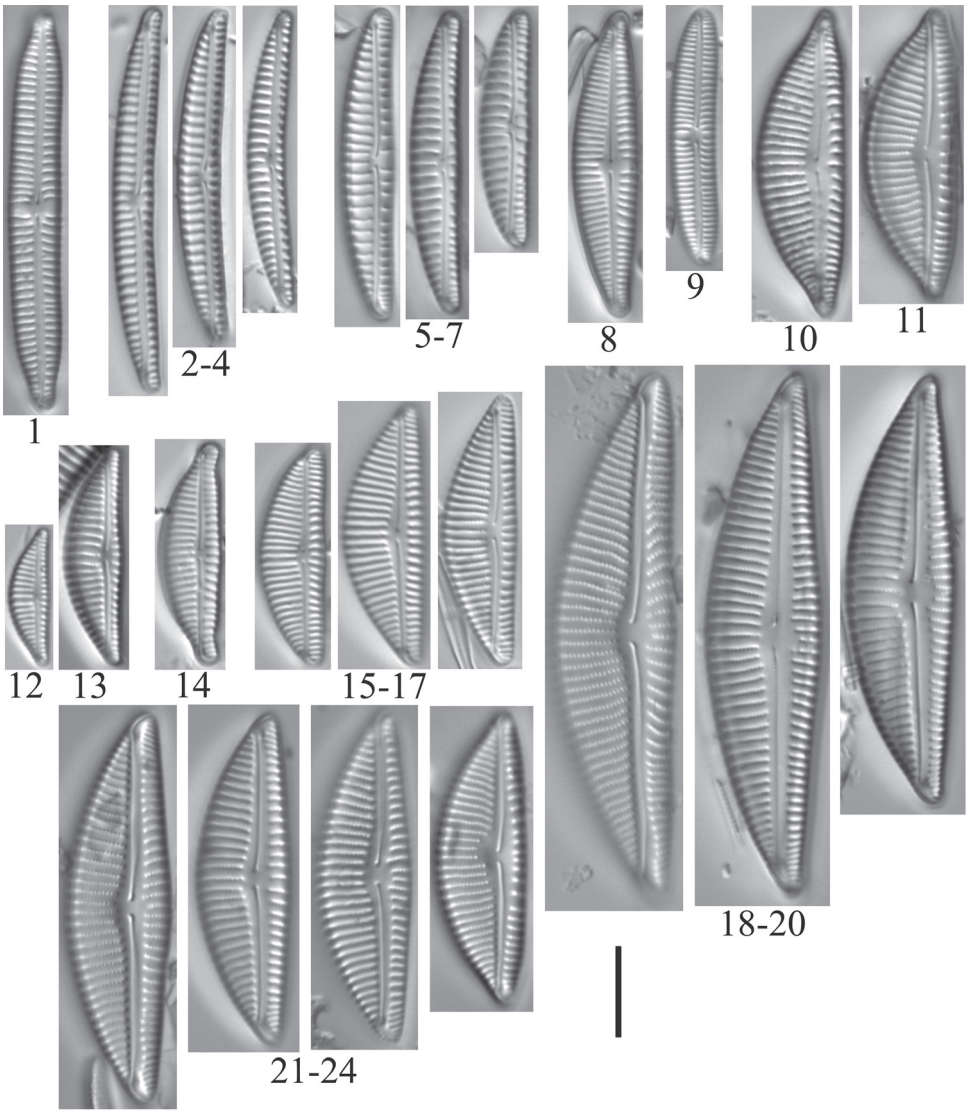

Plate 122. Hood. **1** *Encyonema sibericum* (6903, 6906) **2–4** *E. lunatum* (6898, 6907, 6912) **5–7** *E. paucistriatum* (6899, 6900, 6912) **8** *E. hebridicum* [*E. hebridicum* sensu lato PH] (6905) **9** *E. norvegicum* (6907, 6909) **10, 11** *E. elginense* (6907, 6908, 6909) **12, 13** *E. perminutum* (6898, 6902) **14** *E. ventricosum* **15–17** *E. silesiacum* (6902). (6898, 6904, 6913) **18–24** *E. hintzii* (6898, 6906, 6907, 6908, 6909, 6912). Scale bar: 10 μm.

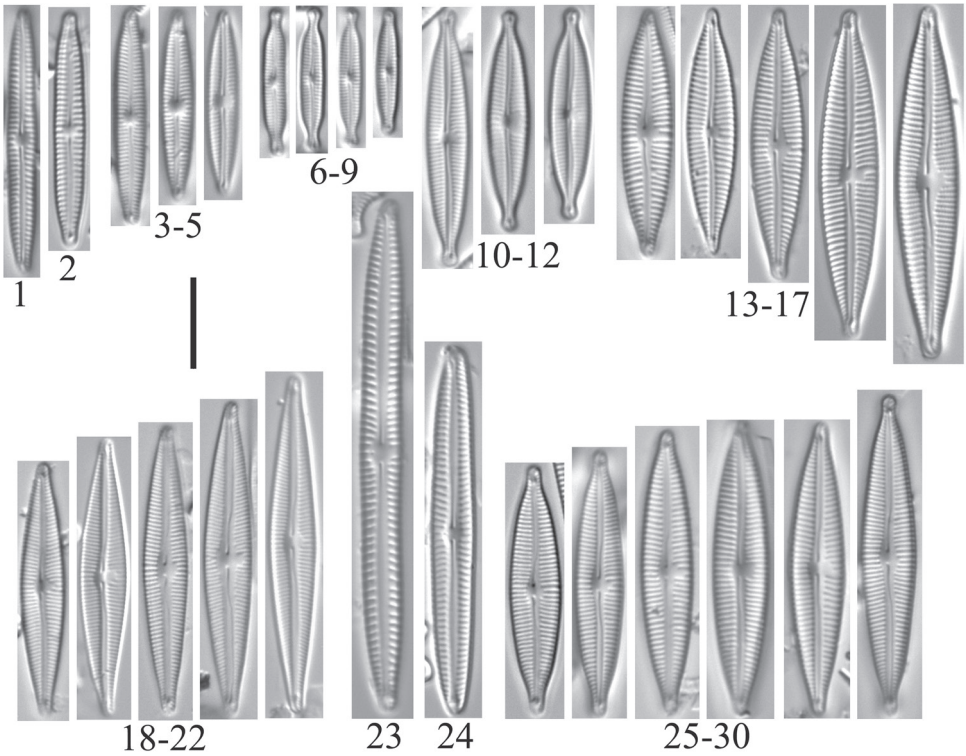

Plate 123. Hood. **1, 2** *Encyonopsis inuitorum* (6898, 6904) **3–5** *Encyonopsis falaisensis* (6904, 6909) **6–9** *Encyonopsis* sp. (6898, 6904) **10–12** *Encyonopsis descripta* (6904, 6909) **13–17** *Encyonopsis cesatiformis* (6899, 6904, 6905, 6907, 6912) **18–22** *Encyonopsis stafsholtii* (6904, 6905, 6907, 6908) **23** *Kurtkrammeria pseudoamphioxys* (6905) **24** *Kurtkrammeria neoamphioxys* (6905) **25–30** *Encyonopsis cesatii* (6904, 6905, 6907, 6912). Scale bar: 10 μm.

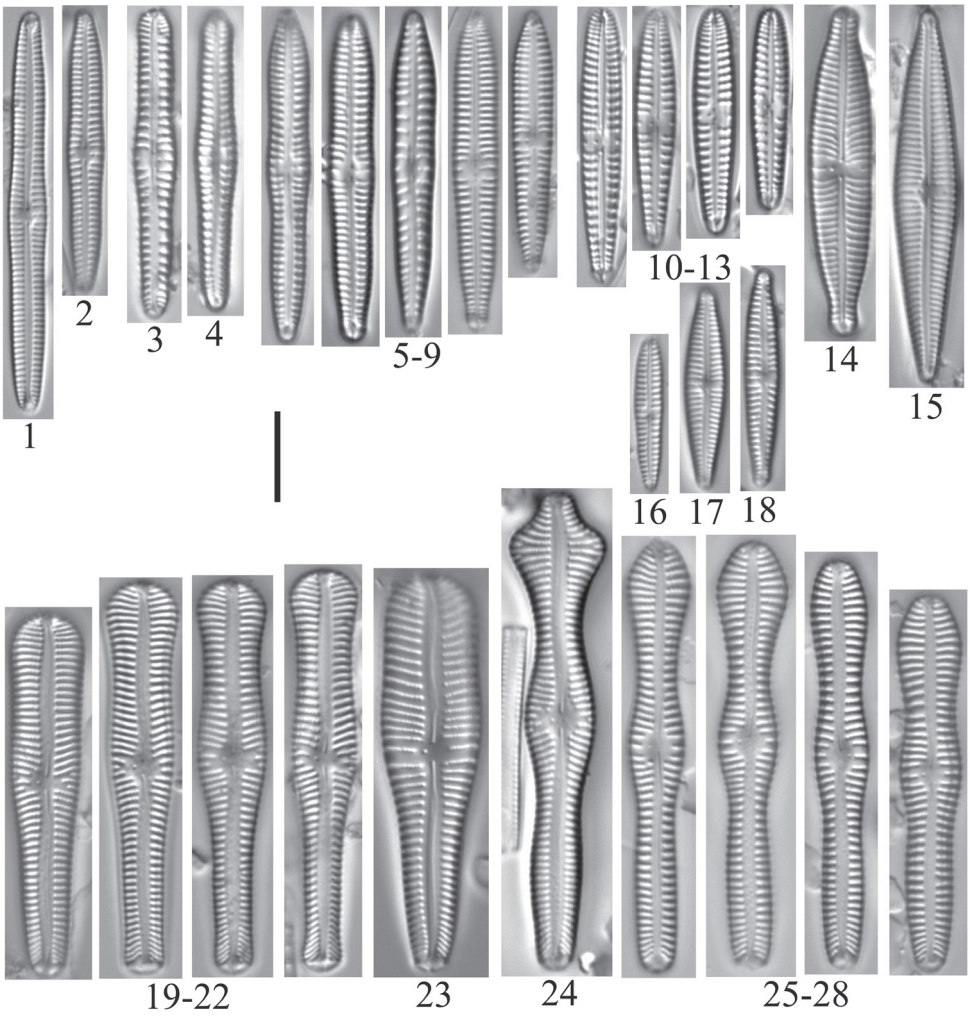

Plate 124. Hood. **1, 2** *Gomphonema astridae* (6906) **3, 4** *G.* sp. (6907) **5–9** *G. lagerheimii* sensu lato (6898, 6905, 6906, 6907, 6908, 6912) **10–13** *G. lateripunctatum* (6904) **14** *G. sarcophagus* [*G.* sp. PH] (6904) **15** *G. gracile* (6907) **16** *G.* sp. [cf. *G. pygmaeum*] (6912) **17** *G. exilissimum* (6913) **18** *G.* sp. [cf. *G. minusculum*] (6900) **19–22** *G.* sp. [cf. *G. capitatum*] (6904, 6906, 6913) **23** *G. laticollum* (6898) **24** *G. acuminatum* (6904) **25–28** *G.* sp. [cf. *G. interpositum*] [cf. *G. montanum* PH] (6907, 6908, 6909). Scale bar: 10 μm.

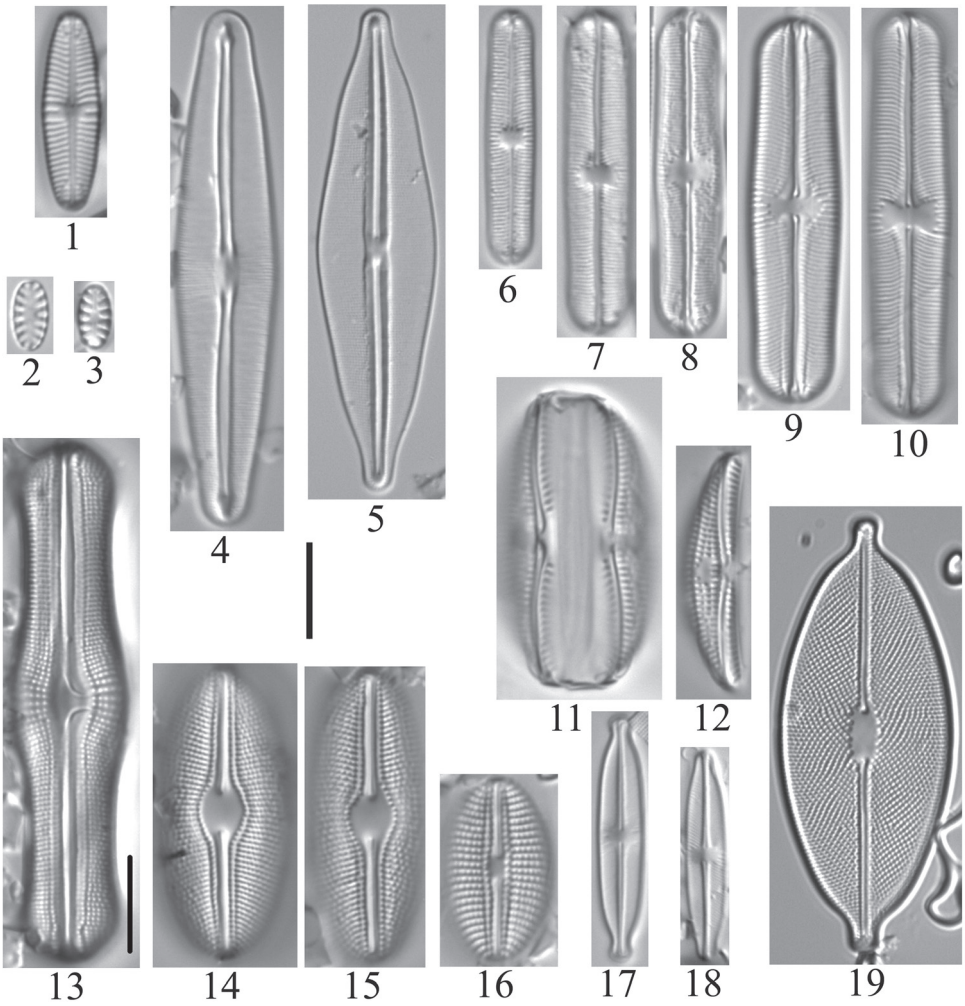

Plate 125. Hood. **1** *Geissleria moseri* (6898) **2, 3** *Hygropetra balfouriana* (6904) **4** *Frustulia vulgaris* (6913) **5** *Frustulia crassinervia* (6899, 6900, 6905) **6** *Sellaphora* sp. (6909) **7** *Sellaphora rectangularis* (6909) **8** *Sellaphora pupula* (6909) **9, 10** *Sellaphora parapupula* (6903, 6907, 6909) **11, 12** *Amphora copulata* (6908, 6912) **13** *Muelleria bachmannii* (6908) **14, 15** *Diploneis arctica* [*D. ovalis* ssp. *arctica* PH] (6907, 6908) **16** *Diploneis parma* (6908) **17** *Kobayasiella micropunctata* (6903, 6905) **18** *Kobayasiella jaagii* [*K. micropunctata* PH] (6907) **19** *Decussata placenta* (6898). Scale bars: 10 µm.

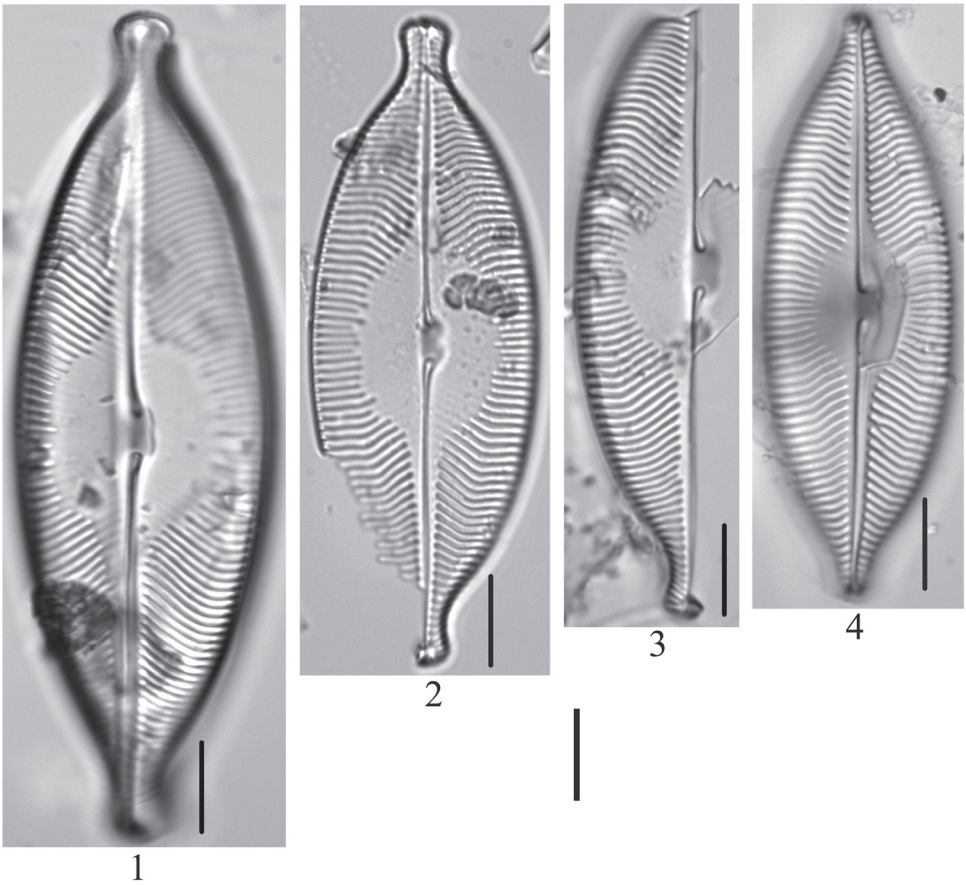

Plate 126. Hood. **1–4** *Pinnuavis* sp. [cf. *Pinnuavis elegans* f. *crowbillensis* PH] (6912). Scale bars: 10 µm.

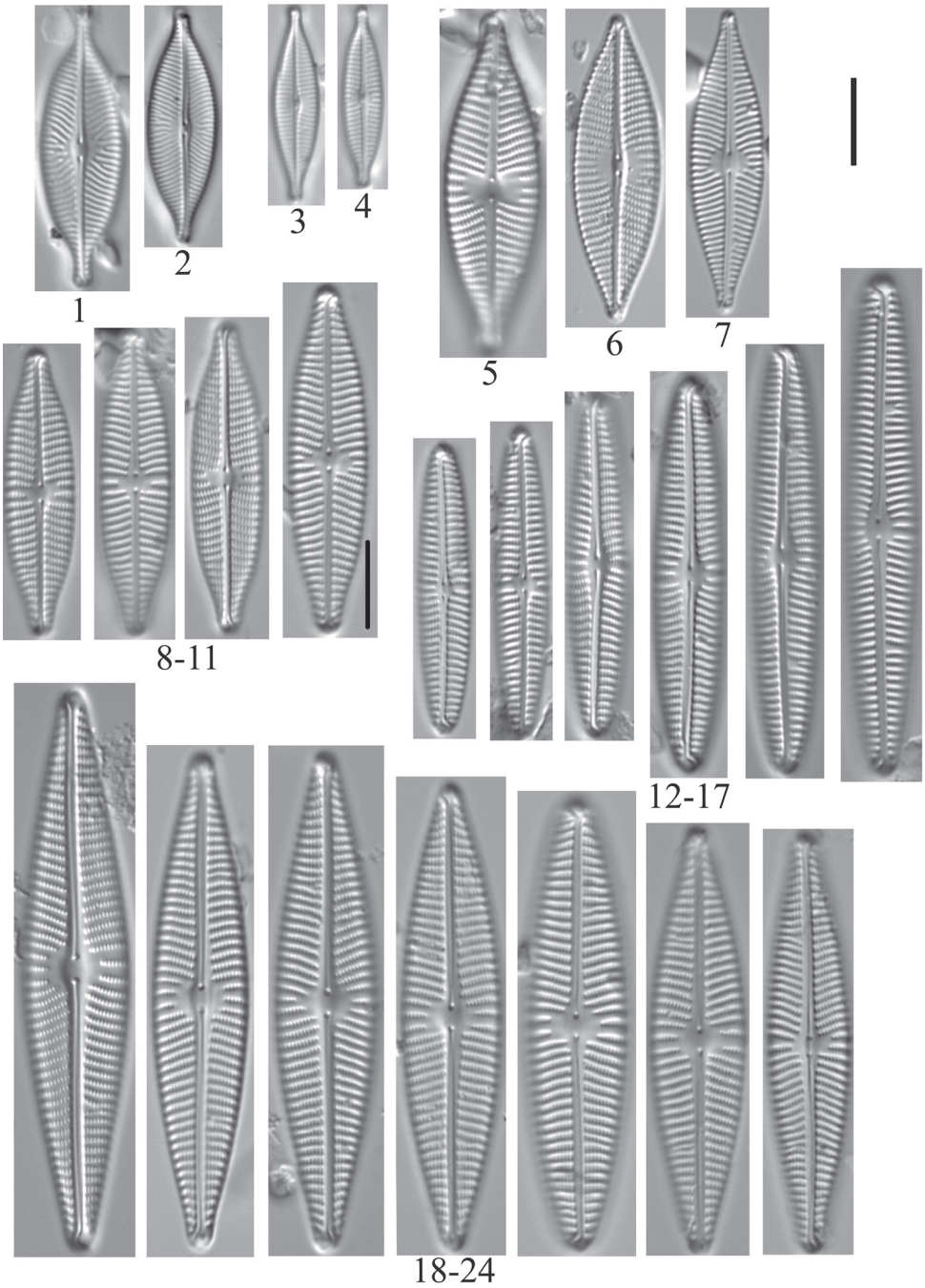

Plate 127. Hood. **1, 2** *Navicula salinarum* (6912, 6913) **3** *N. gregaria* (6913) **4** *N. vandamii* (6913) **5** *N. hanseatica* subsp. *hanseatica* (6911) **6** *N. hanseatica* subsp. *circumarctica* (6912) **7** *N. trivialis* (6913) **8–11** *N. slesvicensis* (6912, 6913) **12–17** *N. eidrigiana* (6906, 6912) **18–24** *N. vaneei* (6904, 6906, 6912). Scale bars: 10 μm.

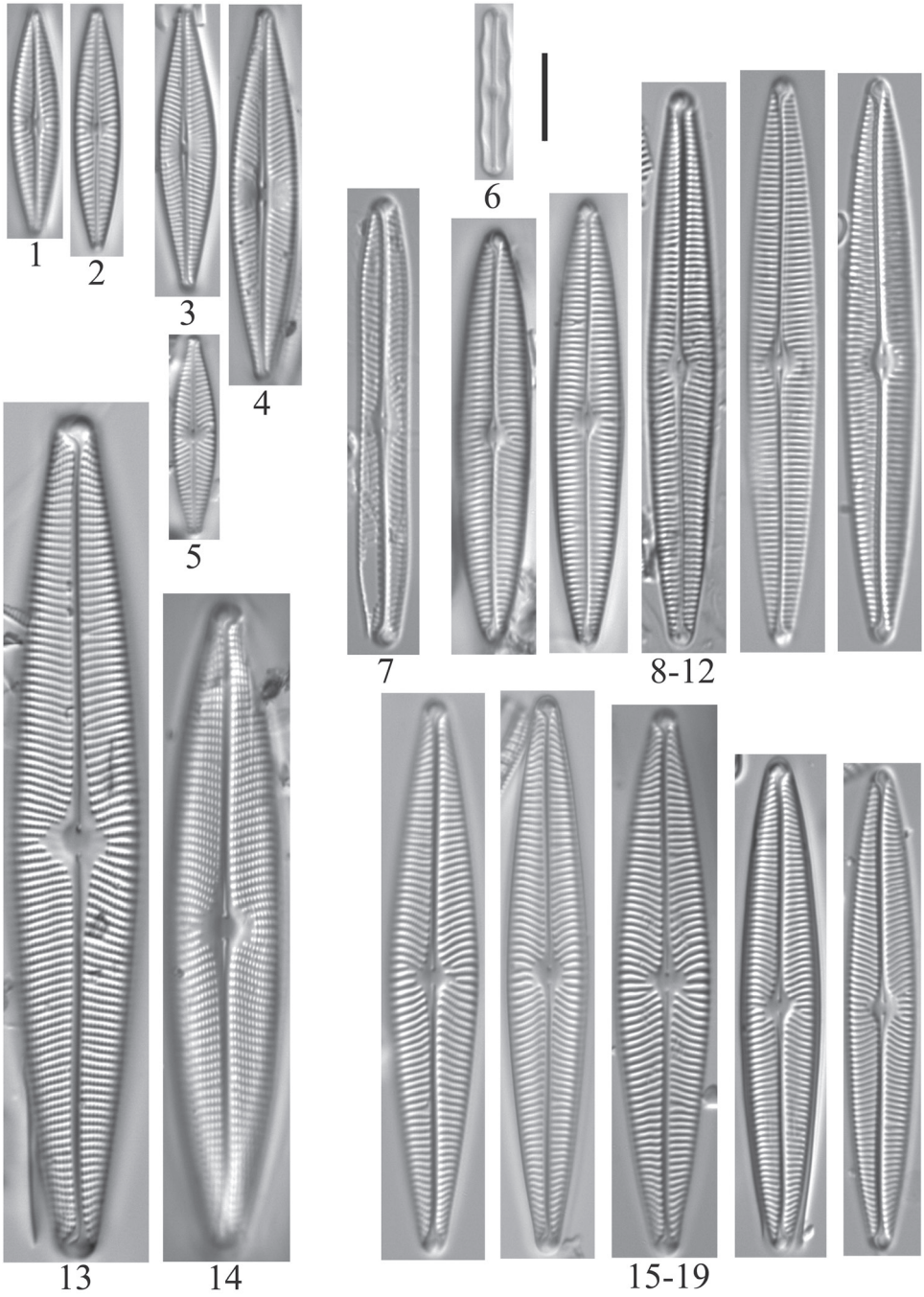

Plate 128. Hood. **1, 2** *Navicula notha* (6898, 6909) **3–5** *N. cryptocephala* (6898, 6906, 6912, 6913) **6** *N. tridentula* (6909) **7** *N. angusta* (6906) **8–12** *N. tripunctata* var. *arctica* (6898, 6906, 6907, 6912, 6908) **13, 14** *N. vulpina* (6898, 6906) **15–19** *N. radiosa* (6904, 6906, 6912, 6913). Scale bar: 10 μm.

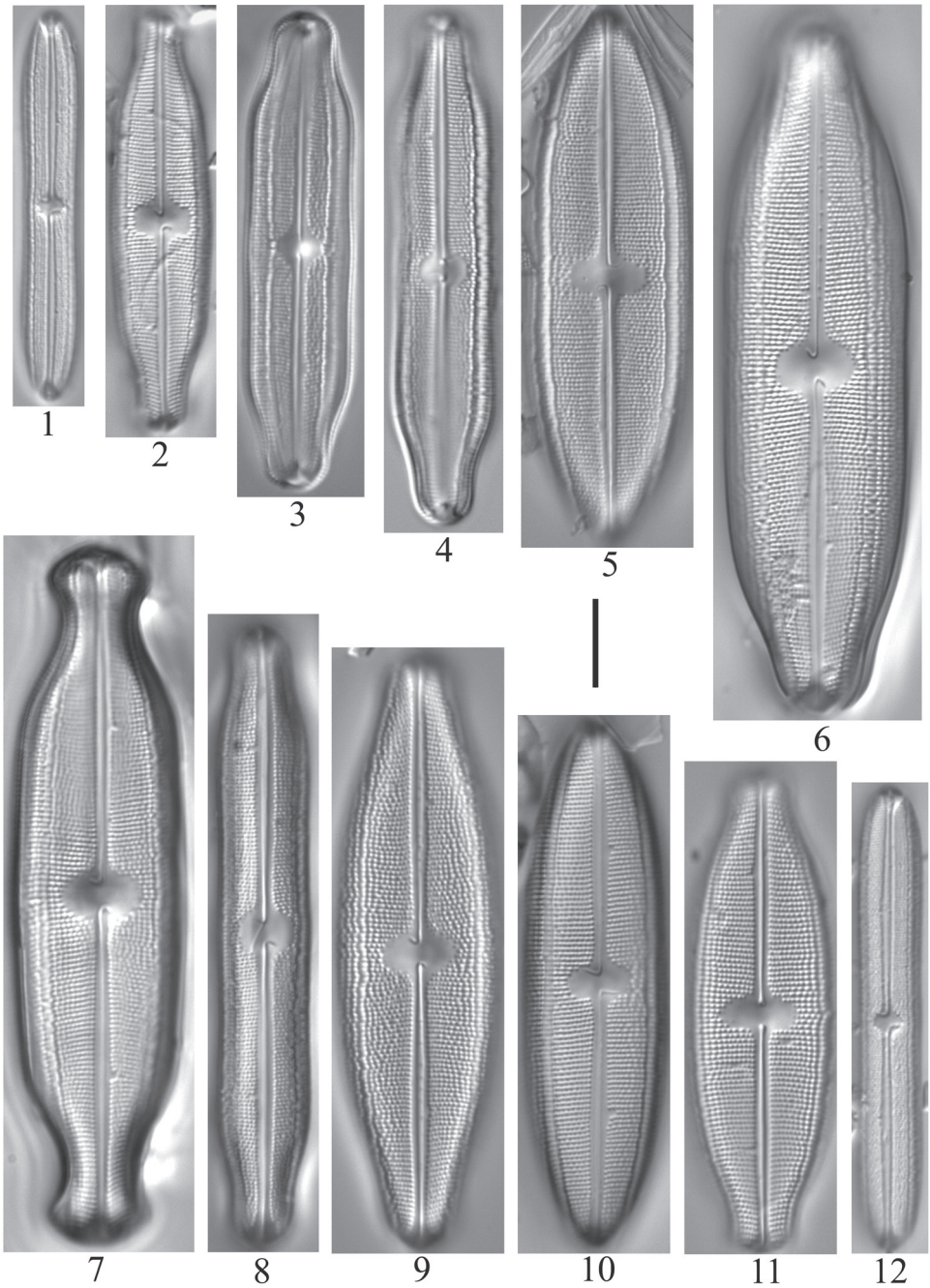

Plate 129. Hood. **1, 12** *Neidium bisulcatum* (6899, 6908, 6912) **2** *N. affine* [*N. potapovae* PH] (6908) **3, 4** *N.* sp. [cf. *N. septentrionale*] (6902, 6912) **5, 10** *N. fossum* (6905, 6908) **6, 9** *N. ampliatum* [*N.* sp. PH] (6899, 6906) **7** *N. productum* (6898) **8** *N.* sp. [cf. *N. septentrionale*] (6907) **11** *N. temperei* (6907, 6909). Scale bar: 10 µm.

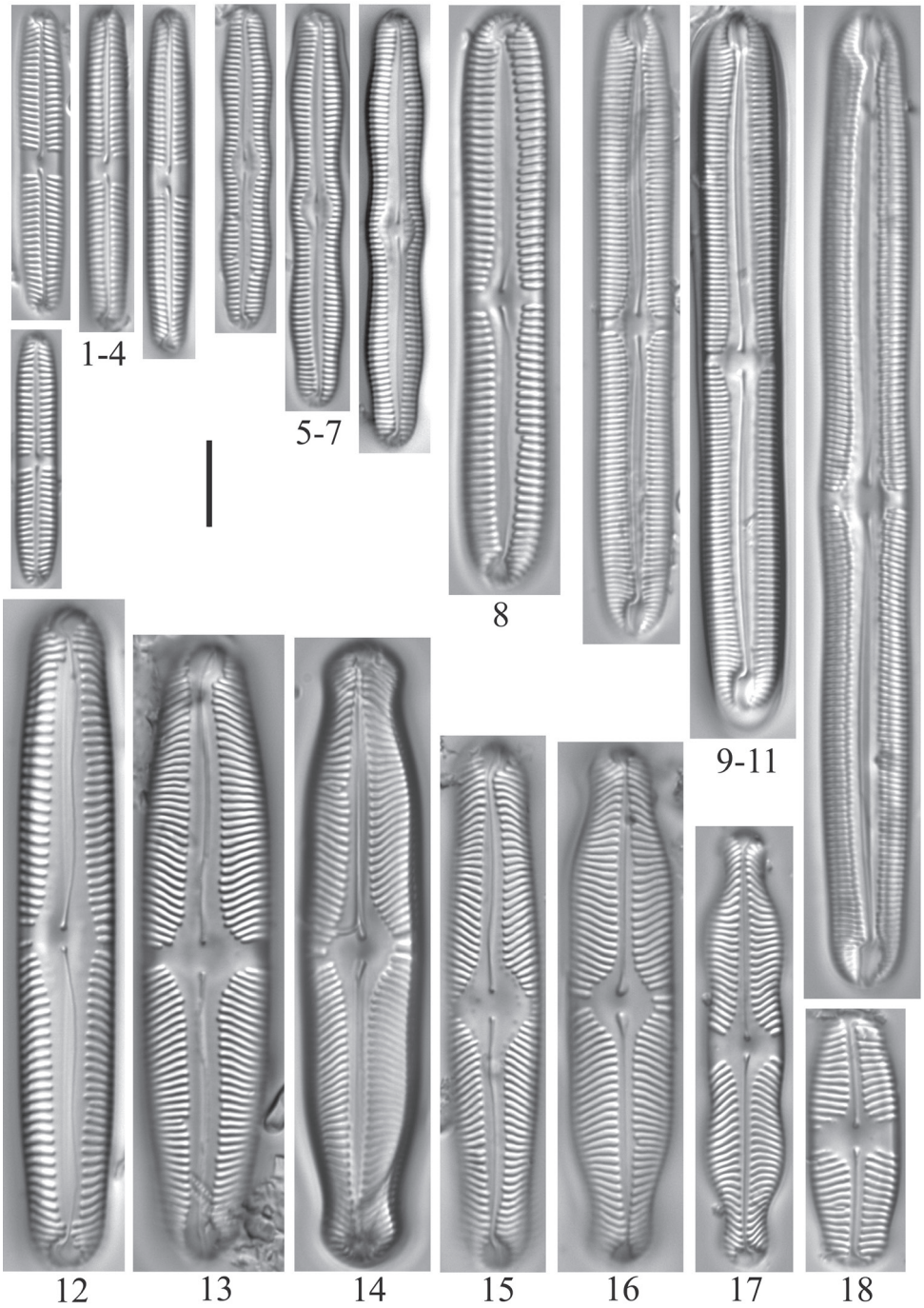

Plate 130. Hood. **1–4** *Pinnularia* sp. [cf. *P. sinistra*] (6898, 6899, 6901, 6903, 6906) **5–7** *P. subpulchra* (6899) **8** *P. crucifera* (6909) **9–11** *P. spitsbergensis* (6898, 6906, 6907, 6908) **12** *P.* sp. [cf. *P. lokana*] [cf. *P. gibba* sensu lato PH] (6906, 6907, 6912) **13** *P. divergens* (6899) **14** *P. biceps* (6898) **15** *P. decrescens* (6899, 6907) **16** *P. anglica* (6906, 6907) **17** *P. grunowii* (6906, 6907) **18** *P. birnirkiana* (6912). Scale bar: 10 µm.

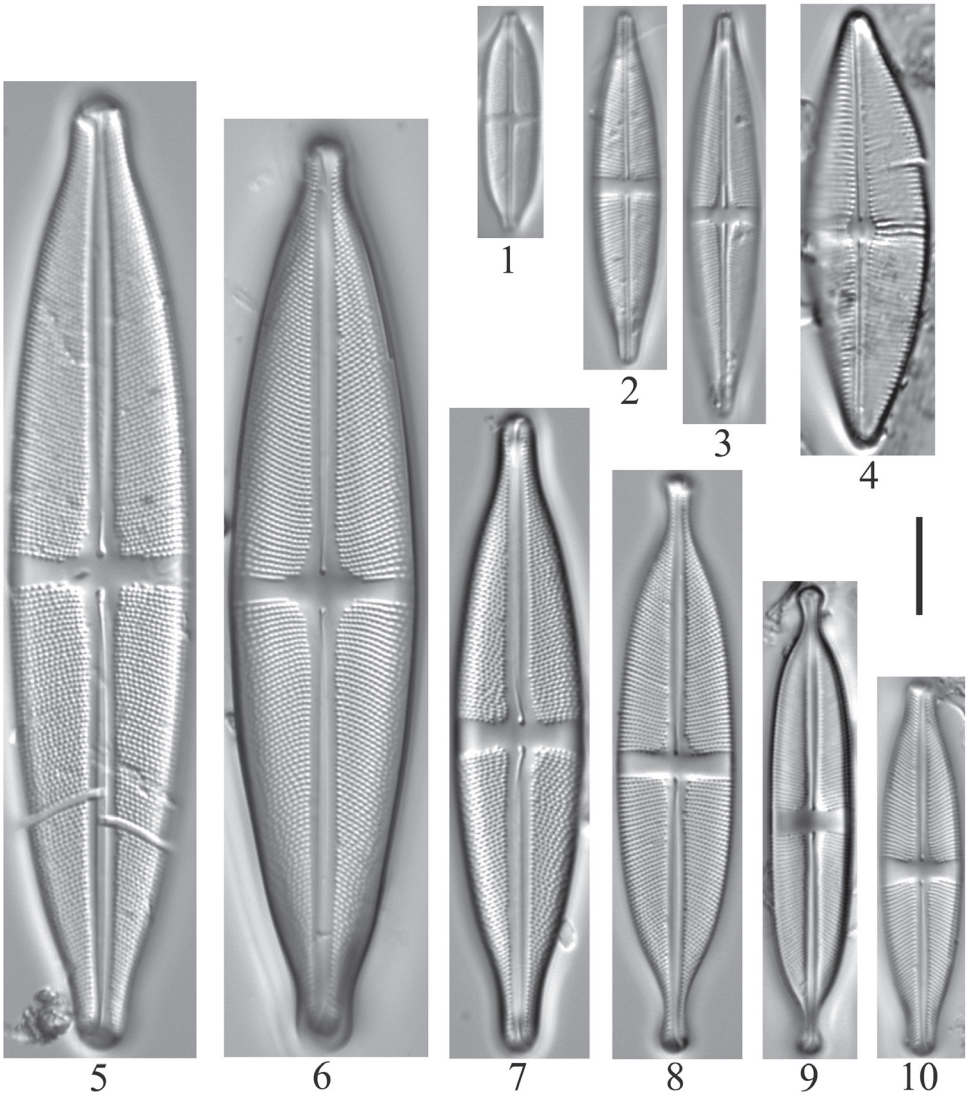

Plate 131. Hood. **1** *Stauroneis livingstonii* (6913) **2, 3** *Stauroneis smithii* var. *incisa* [*S.* sp. PH] (6912) **4** *Staurophora* sp. (6912) **5** *Stauroneis gracilis* (6906) **6** *Stauroneis kuelbsii* (6898, 6903, 6906) **7** *Stauroneis hyperborea* [PH] (6906, 6909) **8** *Stauroneis amphicephala* (6903, 6906) **9** *Stauroneis reichardtii* (6898) **10** *Stauroneis jarensis* (6903, 6904, 6906, 6907). Scale bar: 10 μm.

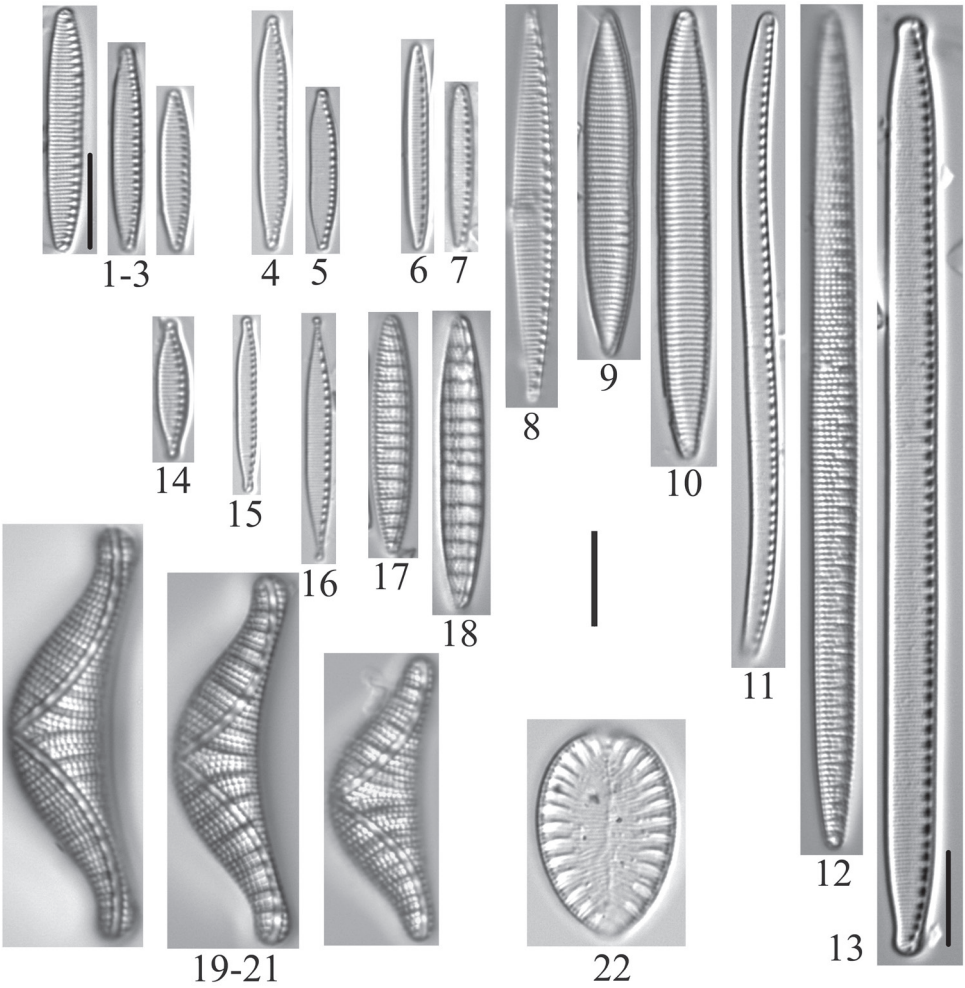

Plate 132. Hood. **1–3** *Nitzschia alpina* (6898, 6904) **4, 5** *Nitzschia frustulum* (6908, 6912) **6, 7** *Nitzschia acidoclinata* (6898, 6899) **8** *Nitzschia* sp. [cf. *N. fossilis*] (6911) **9, 10** *Nitzschia angustata* (6898, 6904, 6909) **11** *Nitzschia nana* (6912) **12** *Denticula kuetzingii* var. *rumrichae* (6906) **13** *Nitzschia regula* var. *robusta* (6904) **14** *Nitzschia* sp. [cf. *N. bacillum*] (6898) **15** *Nitzschia perminuta* (6912) **16** *Nitzschia suchlandtii* [*N. gracilis* sensu lato PH] (6900) **17** *Denticula kuetzingii* (6898, 6904) **18** *Denticula valida* [*D. kuetzingii* PH] (6909) **19–21** *Epithemia smithii* (6898, 6902, 6908) **22** *Surirella brebissonii* (6913). Scale bars: 10 µm.

Appendix 2: Index to diatom images

Table 7. List of taxa and index to plates.

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Achnanthidium Kützing	3				77	
Achnanthidium duthiei (Sreenivasa) Edlund						110
Achnanthidium kriegeri (Krasske) Hamilton, Antoniades & Siver		24				110
Achnanthidium minutissimum (Kützing) Czarnecki		24				110
Actinella punctata Lewis		20				
Adlafia minuscula (Grunow) Lange-Bertalot			46			
Amphora Ehrenberg in Kützing	5					
Amphora copulata (Kützing) Schoeman & Archibald	5					125
Amphora lange-bertalotii Levkov & Metzeltin				64		
Amphora pediculus (Kützing) Grunow	5					
Amphora thumensis (Mayer) Cleve-Euler	5					
Aneumastus rostratus (Hustedt) Lange-Bertalot	4					
Aneumastus tusculus (Ehrenberg) Mann & Stickle	4			59		114
Aulacoseira Thwaites		18				
Aulacoseira alpigena (Grunow) Krammer	1		38			
Aulacoseira ambigua (Grunow) Simonsen			38			
Aulacoseira crassipunctata Krammer		18				
Aulacoseira italica (Ehrenberg) Simonsen	1		38			
Aulacoseira nivalis (W. Smith) English & Potapova	1					
Aulacoseira subarctica (O. Müller) Haworth			38		77	
Boreozonacola olympica (Sovereign) Lange-Bertalot et al.			46			
Brachysira Kützing		25		59	89	114
Brachysira arctoborealis Wolfe & Kling						114
Brachysira brebissonii Ross in Hartley	3	25				
Brachysira calcicola Lange-Bertalot						114
Brachysira microcephala (Grunow) Compére	3			59		114
Brachysira ocalanensis Shayler & Siver		25				
Brachysira procera Lange-Bertalot & Moser		25				
Brachysira styriaca (Grunow) Ross in Hartley						114
Brachysira zellensis (Grunow) Round & Mann				59		
Caloneis Cleve	12, 13			70	101	
Caloneis bacillum (Grunow) Cleve		33				
Caloneis falcifera Lange-Bertalot, Genkal & Vekhov				70		

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Caloneis fasciata (Lagerstedt) Cleve				70		
Caloneis fusus Hamilton & Antoniades in Antoniades et al.				70	101	114
Caloneis obtusa (W. Smith) Cleve				70		114
Caloneis schumanniana (Grunow) Cleve	13					
Caloneis silicula (Ehrenberg) Cleve					101	114
Caloneis tenuis (Gregory) Krammer	12, 13	33		70		114
Caloneis undulata Skvortzow & Meyer	13					
Cavinula davisiae Bahls	3					
Cavinula jaernefeltii (Hustedt) Mann & Stickle					89	
Cavinula pseudoscutiformis (Hustedt) Mann & Stickle		24	46	59		
Cavicula scutiformis (Grunow) Mann & Stickle					89	
Chamaepinnularia bergeri (Krasske) Lange-Bertalot					101	
Cocconeis Ehrenberg		24				
Cocconeis placentula Ehrenberg		24				
Cocconeis pseudothumensis Reichardt	3					
Cocconeis rugosa Sovereign						110
Coscinodiscus Ehrenberg		18				
Craticula Grunow					89	
Craticula buderi (Hustedt) Lange-Bertalot			46			
Craticula cuspidata (Kützing) Mann			46			
Craticula johnstoniae Bahls	4					
Craticula sardiniana Bahls	4					
Cyclotella distinguenda Hustedt	1					
Cymatopleura solea (Brébisson) W. Smith				76		
Cymbella Agardh			43	60		118
Cymbella alpestris Krammer	5					
Cymbella americana A. Schmidt	7		44			
Cymbella arctica (Lagerstedt) A. Schmidt						115, 116
Cymbella aspera (Ehrenberg) H. Peragallo			43			118
Cymbella botellus (Lagerstedt) A. Schmidt				60		115
Cymbella cleve-eulerae Krammer				60, 61	92	117
Cymbella cosleyi Bahls	5					
Cymbella designata Krammer				63	92	118
Cymbella excisiformis Krammer	5					
Cymbella hantzschiana Krammer	5		43			118
Cymbella krammeri Bahls				61	92	115
Cymbella naviculacea Grunow			43			121
Cymbella neocistula Krammer	5	28		61	92	
Cymbella neocistula var. *islandica* Krammer	5					

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Cymbella neoleptoceros Krammer	5					
Cymbella proxima Reimer in Patrick & Reimer	5	28			92	118
Cymbella stigmaphora Østrup	5					
Cymbella subturgidula Krammer				60		
Cymbopleura Krammer		27			94	119
Cymbopleura amphicephala (Naegeli) Krammer	7			62		
Cymbopleura anglica (Lagerstedt) Krammer	7				94	
Cymbopleura angustata (W. Smith) Krammer	7			62	94	119
Cymbopleura apiculata Krammer	7		44	63	94	120
Cymbopleura austriaca (Grunow) Krammer				63		
Cymbopleura citriformis Krammer				63	92	118
Cymbopleura crassipunctata Krammer			44			
Cymbopleura fluminea (Patrick & Freese) Lange-Bertalot & Krammer		27	44		94	119
Cymbopleura geofriedii Reichardt in Krammer				62		
Cymbopleura heilprinensis Foged	7			63	92	119
Cymbopleura hybrida (Grunow) Krammer	7			62		119
Cymbopleura incerta (Grunow) Krammer	7			62		
Cymbopleura incerta var. *spitsbergensis* Krammer				62	94	120, 121
Cymbopleura incertiformis Krammer						121
Cymbopleura incertiformis var. *linearis* (Fontell) Krammer				62	94	121
Cymbopleura lapponica (Grunow) Krammer	7					
Cymbopleura lata (Grunow) Krammer	7			63		
Cymbopleura naviculiformis (Auerswald) Krammer			44			
Cymbopleura neoheteropleura Krammer					93, 94	119, 120
Cymbopleura oblongata Krammer	7			62		121
Cymbopleura rainierensis (Sovereign) Bahls	7		44			
Cymbopleura rupicola (Grunow) Krammer	7			62		119
Cymbopleura similiformis Krammer	7					
Cymbopleura stauroneiformis (Lagerstedt) Krammer			44	62	94	119, 120
Cymbopleura subaequalis (Grunow) Krammer	7					
Cymbopleura subcuspidata (Krammer) Krammer	7	27	44			
Cymbopleura tundraphila Bahls				62		119, 120
Cymbopleura tynnii (Krammer) Krammer				63	94	119
Decussata placenta (Ehrenberg) Lange-Bertalot & Metzeltin		26				125
Delicata alpestris (Krammer) Bahls		28				
Delicata canadensis Bahls				64	91	118

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Delicata delicatula (Kützing) Krammer	5					118
Denticula Kützing				75, 76		
Denticula kuetzingii Grunow	17	37		76		132
Denticula kuetzingii var. *rumrichae* Krammer						132
Denticula tenuis Kützing				76		
Denticula valida (Pedicino) Grunow				76		132
Diadesmis perpusilla (Grunow) Mann	3					
Diatoma moniliformis Kützing	2					
Diatoma tenuis Agardh		19		56		
Diatomella balfouriana Greville	3					
Didymosphenia geminata (Lyngbye) M. Schmidt	8					
Diploneis arctica (Lange-Bertalot) Lange-Bertalot & Fuhrmann						125
Diploneis elliptica (Kützing) Cleve		24				
Diploneis finnica (Ehrenberg) Cleve		24				
Diploneis krammeri Lange-Bertalot & Reichardt				59		
Diploneis oblongella (Naegeli in Kützing) Cleve-Euler	10					
Diploneis oculata (Brébisson) Cleve	10					
Diploneis parma Cleve	10					125
Diploneis pseudovalis Hustedt	10					
Discostella pseudostelligera (Hustedt) Houk & Klee						109
Encyonema Kützing	6	30				
Encyonema elginense (Krammer) Mann						122
Encyonema fogedii Krammer	6	29	45			
Encyonema hamsherae Winter & Bahls	6					
Encyonema hebridicum (Gregory) Grunow in Cleve & Möller	6	30	45	64		122
Encyonema hintzii Krammer	6			64	90	122
Encyonema latum Krammer		29				
Encyonema lunatum (W. Smith) Van Heurck					90	122
Encyonema minutiforme Krammer		29				
Encyonema minutum (Hilse in Rabenhorst) Mann	6		45			
Encyonema neogracile Krammer		30	45		90	
Encyonema norvegicum (Grunow) Mayer	6			64		122
Encyonema paucistriatum (Cleve-Euler) Mann				64	90	122
Encyonema pergracile Krammer		30				
Encyonema perminutum Krammer						122
Encyonema perpusillum (Cleve-Euler) Mann		30				
Encyonema procerum Krammer	6					
Encyonema sibericum Krammer					90	122

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Encyonema silesiacum (Bleisch) Mann		29		64		122
Encyonema temperei Krammer	6					
Encyonema ventricosum (Agardh) Grunow in A. Schmidt et al.	6			64	90	122
Encyonema vulgare Krammer		29		64	90	
Encyonema willeyorum Bahls					90	
Encyonopsis Krammer	6			65	91	123
Encyonopsis alpina Krammer & Lange-Bertalot	6					
Encyonopsis angusta Krammer & Lange-Bertalot				65		
Encyonopsis cesatiformis Krammer				65	91	123
Encyonopsis cesatii (Rabenhorst) Krammer	12	30			91	123
Encyonopsis czarneckii Bahls	12				91	
Encyonopsis descripta (Hustedt) Krammer				65		123
Encyonopsis falaisensis (Grunow) Krammer						123
Encyonopsis grunowii Krammer			43			121
Encyonopsis inuitorum Bahls				65	91	123
Encyonopsis lacuscaerulei Bahls				65		
Encyonopsis montana Bahls	6					
Encyonopsis neerlandica Van de Vijver et al.				65		
Encyonopsis stafsholtii Bahls		30		65	91	123
Encyonopsis subminuta Krammer & Reichardt	6	30				
Entomoneis paludosa (W. Smith) Reimer		37	53			
Epithemia Brébisson	17					
Epithemia adnata (Kützing) Brébisson	17					
Epithemia argus (Ehrenberg) Kützing	17		53			
Epithemia smithii Carruthers	17	36		76		132
Epithemia turgida var. *granulata* (Ehrenberg) Brun	17					
Eucocconeis alpestris (Brun) Lange-Bertalot	3					110
Eucocconeis depressa (Cleve) Lange-Bertalot					77	110
Eucocconeis flexella (Kützing) Meister		24		56	77	110
Eucocconeis laevis (Østrup) Lange-Bertalot				56		110
Eunotia Ehrenberg		21, 22, 23	39, 40, 41	57	78, 83, 85	
Eunotia altimontana Lange-Bertalot, Pavlov & Levkov				57		
Eunotia ambivalens Lange-Bertalot & Tagliaventi			40, 41		87	
Eunotia arcofallax Lange-Bertalot		23				
Eunotia arcubus Nörpel-Schempp & Lange-Bertalot				58	78	113
Eunotia arculus Lange-Bertalot & Nörpel-Schempp		23				

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Eunotia arcus (Ehrenberg) W. Smith	2			57	78	113
Eunotia bidens Ehrenberg			39			111
Eunotia bidentula W. Smith		20				
Eunotia bilunaris (Ehrenberg) Schaarschmidt		22			88	
Eunotia boreoalpina Lange-Bertalot & Nörpel-Schempp					87	
Eunotia boreotenuis Nörpel-Schempp & Lange-Bertalot		23			88	112
Eunotia botuliformis Wild, Nörpel-Schempp & Lange-Bertalot	2	23			88	112
Eunotia braendlei Lange-Bertalot & Werum					83	
Eunotia circumborealis Lange-Bertalot & Nörpel-Schempp			39		85	111
Eunotia curtagrunowii Nörpel-Schempp & Lange-Bertalot					78, 82	112
Eunotia denticulata (Brébisson) Rabenhorst					83	
Eunotia diadema Ehrenberg		21			84	
Eunotia diodon Ehrenberg					85	111
Eunotia dorofeyukae Lange-Bertalot & Kulikovskiy						111
Eunotia elegans Østrup					83	
Eunotia eurycephala (Grunow) Nörpel-Schempp & Lange-Bertalot			40		87	
Eunotia excelsa (Krasske) Nörpel				58		
Eunotia exigua (Brébisson) Rabenhorst						112
Eunotia faba Ehrenberg			40			112
Eunotia fallax A. Cleve			42			112
Eunotia flexuosa (Brébisson in Kützing) Kützing		22	40			
Eunotia glacialis Meister						112
Eunotia groenlandica Nörpel-Schempp & Lange-Bertalot			42			
Eunotia herkiniensis Grunow						111
Eunotia implicata Nörpel-Schempp, Alles & Lange-Bertalot						111
Eunotia incisa Gregory		23	40		87	112
Eunotia intermedia (Krasske) Nörpel-Schempp & Lange-Bertalot						112
Eunotia islandica Østrup		20		57	85	
Eunotia juettnerae Lange-Bertalot	2				87	
Eunotia julma Lange-Bertalot		22	41			112
Eunotia lapponica Grunow					83	
Eunotia latitaenia Kobayasi, Ando & Nagumo					87	
Eunotia lewisii Siver & Hamilton		23				

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Eunotia maior (W. Smith) Rabenhorst						112
Eunotia mayamae Lange-Bertalot, Bak & Witkowski					78, 82	
Eunotia mertensiae Lange-Bertalot		22				
Eunotia metamonodon Lange-Bertalot		21			81	112
Eunotia mihoi Lange-Bertalot, Pavlov & Levkov						111
Eunotia minor (Kützing) Grunow		23	39		83	113
Eunotia monnieri Lange-Bertalot & Tagliaventi			41			
Eunotia mucophila (Lange-Bertalot et al.) Lange-Bertalot			41	57		112
Eunotia naegelii Migula		22			88	
Eunotia neoborealis Lange-Bertalot		21			83	
Eunotia neocompacta Mayama					83	
Eunotia nymanniana Grunow			41			112
Eunotia paludosa Grunow		23			88	
Eunotia paralleladubia Lange-Bertalot & Mayama					80	112
Eunotia paratridentula Lange-Bertalot & Kulikovskiy			39			
Eunotia pectinalis (Kützing) Rabenhorst					79	
Eunotia perminuta (Grunow) Patrick					85	111
Eunotia praerupta Ehrenberg			42		78	113
Eunotia pseudoflexuosa Hustedt					87	112
Eunotia pseudogroenlandica Lange-Bertalot & Tagliaventi					88	
Eunotia pseudopapilio Lange-Bertalot & Nörpel-Schempp					86	111
Eunotia pseudopectinalis Hustedt					79	112
Eunotia rhomboidea Hustedt	2				88	
Eunotia sarek Berg					86	111
Eunotia scandiorussica Kulikovskiy et al.					88	
Eunotia semicircularis (Ehrenberg) Lange-Bertalot & Metzeltin					84	111
Eunotia septentrionalis Østrup					83	
Eunotia serra Ehrenberg			39			
Eunotia silesioscandica Lange-Bertalot & Sienkiewicz					83	
Eunotia soleirolii (Kützing) Rabenhorst					78	
Eunotia subarcuatoides Alles, Nörpel & Lange-Bertalot		23			88	
Eunotia suecica A. Cleve					85	111
Eunotia superbidens Lange-Bertalot		21			85	111

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Eunotia superpaludosa Lange-Bertalot		23	42			
Eunotia tetraodon Ehrenberg		21				
Eunotia triodon Ehrenberg			39			
Eunotia ursamaioris Lange-Bertalot & Nörpel-Schempp			42	57	83	113
Eunotia valida Hustedt					88	
Fallacia Stickle & Mann					89	
Fragilaria Lyngbye	2		38	56		109
Fragilaria capucina Desmazières		18		56		
Fragilaria capucina var. *rumpens* (Kützing) Lange-Bertalot		18				
Fragilaria crotonensis Kitton	2					109
Fragilaria nanana Lange-Bertalot	2					
Fragilaria sepes Ehrenberg						109
Fragilaria tenera (W. Smith) Lange-Bertalot	2					
Fragilaria vaucheriae (Kützing) Petersen		18		56		
Fragilariforma constricta (Ehrenberg) Williams & Round					77	
Fragilariforma nitzschioides (Grunow) Lange-Bertalot			38			
Fragilariforma polygonata (Cleve-Euler) Kingston et al.		18				
Frustulia amosseana Lange-Bertalot in Rumrich et al.	4					
Frustulia crassinervia (Brébisson) Lange-Bertalot & Krammer		26			89	125
Frustulia quadrisinuata Lange-Bertalot		26				
Frustulia saxonica Rabenhorst	4	26	47			
Frustulia vulgaris (Thwaites) De Toni						125
Geissleria Lange-Bertalot & Metzeltin	3				89	
Geissleria moseri Metzeltin, Witkowski & Lange-Bertalot					89	125
Geissleria paludosa (Hustedt) Lange-Bertalot & Metzeltin	3					
Geissleria schoenfeldii (Hustedt) Lange-Bertalot & Metzeltin					89	
Geissleria similis (Krasske) Lange-Bertalot & Metzeltin	3					
Geissleria tectissima (Lange-Bertalot) Lange-Bertalot					89	
Gomphoneis geitleri Kociolek & Stoermer	9					
Gomphonema Ehrenberg	8, 9	31	45	67	95	124
Gomphonema acidoclinatum Lange-Bertalot & Reichardt	8					
Gomphonema acuminatum Ehrenberg						124

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Gomphonema affine Kützing	8					
Gomphonema anglicum Ehrenberg	9					
Gomphonema angusticephalum Reichardt & Lange-Bertalot	9					
Gomphonema astridae Reichardt & Lange-Bertalot					95	
Gomphonema auritum Braun	8		45			
Gomphonema brebissonii Kützing	9		45	67	95	
Gomphonema caperatum Ponader & Potapova				66		
Gomphonema capitatum Ehrenberg	9			67	95	124
Gomphonema citera Hohn & Hellerman		31				
Gomphonema clavatum Ehrenberg		31				
Gomphonema coronatumaceum Bahls				67	95	
Gomphonema distans (Cleve-Euler) Lange-Bertalot & Reichardt			45	66		
Gomphonema duplipunctatum Lange-Bertalot & Reichardt		31	45			
Gomphonema exilissimum (Grunow) Lange-Bertalot & Reichardt	8	31				124
Gomphonema gracile Ehrenberg		31			95	124
Gomphonema hebridense Gregory	8					
Gomphonema insigniforme Reichardt & Lange-Bertalot			45			
Gomphonema interpositum Reichardt				67		124
Gomphonema kobayasii Kociolek & Kingston		31				
Gomphonema lagerheimii A. Cleve				66	95	124
Gomphonema lateripunctatum Reichardt & Lange-Bertalot				66, 71	95	124
Gomphonema laticollum Reichardt	9	31				124
Gomphonema longilineare Reichardt	8					
Gomphonema louisiananum Kalinsky		31				
Gomphonema micropus Kützing		31	45	66		
Gomphonema minusculum Krasske		31				124
Gomphonema minutum (Agardh) Agardh	8					
Gomphonema multipunctatum Bahls	8					
Gomphonema nathorstii Foged				66		
Gomphonema pala Reichardt	9					
Gomphonema parvulum Kützing			45			
Gomphonema procerum Reichardt & Lange-Bertalot		31				
Gomphonema pumilum (Grunow) Reichardt & Lange-Bertalot		31				
Gomphonema pygmaeum Kociolek & Stoermer	8					124
Gomphonema sarcophagus Gregory	8					124

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Gomphonema subclavatum Grunow	8		45			
Gomphonema subtile Ehrenberg	9			67		
Gomphonema subtile var. *sagitta* (Schumann) Cleve				67		
Gomphonema truncatum Ehrenberg	9					
Gomphosinica geitleri (Kociolek & Stoermer) Kociolek et al.	9					
Halamphora borealis (Kützing) Levkov			47			
Halamphora coraensis (Foged) Levkov	5		43	64		
Hannaea arcus (Ehrenberg) Patrick		19				
Hannaea superiorensis Bixby, Edlund & Stoermer						109
Hantzschia Grunow			55			
Hantzschia abundans Lange-Bertalot	16					
Hantzschia amphioxys (Ehrenberg) Grunow			55			
Hantzschia elongata (Hantzsch) Grunow	16		55	75	108	
Hantzschia hyperborea (Grunow) Lange-Bertalot				75		
Hantzschia vivacior Lange-Bertalot			55	75		
Hippodonta hungarica (Grunow) Lange-Bertalot et al.				59		
Hygroptera balfouriana (Grunow) Krammer & Lange-Bertalot				59		125
Karayevia clevei var. *bottnica* (Cleve) Bukhtiyarova	3					
Kobayasiella jaagii (Meister) Lange-Bertalot				59	97	125
Kobayasiella micropunctata (Germain) Lange-Bertalot				59	97	125
Kobayasiella okadae (Skvortzow) Lange-Bertalot					97	
Kobayasiella parasubtilissima (Kobayasi & Nagumo) Lange-Bertalot		24				
Kurtkrammeria aequalis (W. Smith) Bahls	6					
Kurtkrammeria lacusglacialis Bahls		30				
Kurtkrammeria neoamphioxys (Krammer) Bahls					91	123
Kurtkrammeria pseudoamphioxys Bahls					91	123
Kurtkrammeria treinishii Bahls		30				
Lacustriella Lange-Bertalot, Kulikovskiy & Metzeltin					96	
Lacustriella lacustris (Gregory) Lange-Bertalot & Kulikovskiy					96	
Lindavia affinis (Grunow) Nakov et al.	1					109
Lindavia antiqua (W. Smith) Nakov et al.	1			56		109
Lindavia intermedia (Manguin) Nakov et al.				56	77	

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Lindavia michiganiana (Skvortzow) Nakov et al.				56		
Lindavia praetermissa (Lund) Nakov et al.	1		38			
Lindavia radiosa (Grunow) De Toni & Forti				56		109
Luticola Mann		24				
Luticola mutica (Kützing) Mann	3	24	46			
Mastogloia elliptica (Agardh) Cleve			47			
Mastogloia grevillei W. Smith	3					
Melosira nummuloides (Dillwyn) Agardh		18				
Meridion circulare (Greville) Agardh			38			
Meridion lineare Williams	2					
Muelleria bachmannii (Hustedt) Spaulding & Stoermer						125
Navicula Bory	11					
Navicula amphibola Cleve	11			59		
Navicula angusta Grunow		32				128
Navicula antonii Lange-Bertalot	11					
Navicula arctotenelloides Lange-Bertalot & Metzeltin	11					
Navicula aurora Sovereign	12		48			
Navicula caroliniae Bahls	11					
Navicula cryptocephala Kützing			49		97	128
Navicula cryptotenella Lange-Bertalot	11	32				
Navicula eidrigiana Carter		32				127
Navicula exilis Kützing		32			97	
Navicula gregaria Donkin		32				127
Navicula hanseatica subsp. *circumarctica* Lange-Bertalot						127
Navicula hanseatica subsp. *hanseatica* Lange-Bertalot & Stachura						127
Navicula kefvingensis Ehrenberg			48			
Navicula leptostriata Jørgensen	11	32				
Navicula lenzii Hustedt	11					
Navicula libonensis Schoeman	11		48			
Navicula lundii Reichardt	11					
Navicula notha Wallace	11			68	97	128
Navicula oblonga (Kützing) Kützing			48			
Navicula peregrina (Ehrenberg) Kützing			48			
Navicula radiosa Kützing		32	49	68		128
Navicula reichardtiana Lange-Bertalot	11					
Navicula reinhardtii (Grunow) Grunow	11			68		
Navicula rhynchocephala Kützing			49			
Navicula salinarum Grunow						127
Navicula schweigeri Bahls	11					

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Navicula seibigiana Lange-Bertalot	11					
Navicula sieminskiae Lange-Bertalot & Witkowski				68		
Navicula slesvicensis Grunow						127
Navicula subconcentrica Lange-Bertalot					97	
Navicula subhamulata Grunow in Van Heurck	11					
Navicula tridentula Krasske						128
Navicula trilatera Bahls	11		49			
Navicula tripunctata (O. F. Müller) Bory	11					
Navicula tripunctata var. *arctica* Patrick & Freese				68	97	128
Navicula trivialis Lange-Bertalot	11					127
Navicula upsaliensis (Grunow) M. Peragallo	11					
Navicula vandamii Schoeman & Archibald						127
Navicula vaneei Lange-Bertalot						127
Navicula venerablis Hohn & Hellerman					97	
Navicula veneta Kützing	11					
Navicula viridulacalcis Lange-Bertalot	11					
Navicula vulpina Kützing	12			68	97	128
Navicula weberi Bahls	11, 12					
Navicula wildii Lange-Bertalot	11					
Navicymbula pusilla (Grunow) Krammer			47			
Neidiomorpha binodiformis (Krammer) Cantonati et al.	10					
Neidiopsis vekhovii Lange-Bertalot & Genkal					98	
Neidiopsis wulffii (Petersen) Lange-Bertalot					98	
Neidium Pfitzer	10	27	46		99, 100	129
Neidium affine (Ehrenberg) Pfitzer	10	27			100	129
Neidium affine var. *humerus* Reimer					99	
Neidium affine var. *longiceps* (Gregory) Cleve	10				100	
Neidium affine var. *undulatum* (Grunow) Cleve				69		
Neidium alaskaense Foged					98	
Neidium amphigomphus (Ehrenberg) Pfitzer		27	46		99	
Neidium ampliatum (Ehrenberg) Krammer			46		99, 100	129
Neidium apiculatum Reimer	10				99	
Neidium bergii (Cleve-Euler) Krammer					100	
Neidium bisulcatum (Lagerstedt) Cleve	10		46		100	129
Neidium dubium (Ehrenberg) Cleve	10					
Neidium fogedii Bahls	10					
Neidium fossum Lefebvre & Hamilton		27		69	99	129
Neidium hitchcockii (Ehrenberg) Cleve					100	
Neidium holstii (Cleve) Krammer					98	

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Neidium ladogense (Cleve) Foged					98	
Neidium productum (W. Smith) Cleve				69		129
Neidium septentrionale Cleve-Euler						129
Neidium temperei Reimer				69	100	129
Nitzschia Hassall	16	37		75		132
Nitzschia acidoclinata Lange-Bertalot	16				108	132
Nitzschia alpina Hustedt	16				108	132
Nitzschia amphibia Grunow	16		54	75		
Nitzschia angustata (W. Smith) Grunow		37		75		132
Nitzschia bacillum Hustedt	16					132
Nitzschia commutata Grunow			54			
Nitzschia diversa Hustedt	16					
Nitzschia fonticola var. *pelagica* Hustedt	16					
Nitzschia fossilis Grunow				75		132
Nitzschia frauenfeldii (Grunow) Grunow	16					
Nitzschia frustulum (Kützing) Grunow				75		132
Nitzschia gessneri Hustedt	16					
Nitzschia gracilis Hantzsch	16	37			108	
Nitzschia inconspicua Grunow	16					
Nitzschia kittlii Grunow			54			
Nitzschia lacuum Lange-Bertalot	16					
Nitzschia lanceolata W. Smith				75		
Nitzschia liebetruthii Rabenhorst		37				
Nitzschia linearis (Agardh) W. Smith		37	54			
Nitzschia microcephala Grunow		37				
Nitzschia nana Grunow						132
Nitzschia palea (Kützing) W. Smith	16		54			
Nitzschia palea var. *tenuirostris* Grunow					108	
Nitzschia perminuta (Grunow) Peragallo	16		54	75	108	132
Nitzschia perspicua Cholnoky			54			
Nitzschia pseudofonticola Hustedt		37				
Nitzschia pura Hustedt	16					
Nitzschia pusilla Grunow		37				
Nitzschia radicula Hustedt	16		54	75		
Nitzschia recta Hantzsch		37				
Nitzschia regula var. *robusta* Hustedt	16			75		132
Nitzschia sinuata (Thwaites in W. Smith) Grunow	16			75		
Nitzschia suchlandtii Hustedt						132
Nitzschia vermicularis (Kützing) Hantzsch	16					
Nupela Vyverman & Compére						110
Nupela tenuicephala (Hustedt) Lange-Bertalot		24				
Odontidium mesodon (Ehrenberg) Kützing		19				
Orthoseira roeseana (Rabenhorst) Pfitzer	1					109

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Peronia fibula (Brébisson in Kützing) Ross		20			83	
Pinnuavis Bourrelly						126
Pinnuavis elegans (W. Smith) Okuno						126
Pinnularia Ehrenberg			70	70, 71	101, 102, 104	130
Pinnularia acrosphaeria W. Smith			51			
Pinnularia anglica Krammer	13					130
Pinnularia biceps Gregory	13				101	130
Pinnularia birnirkiana Patrick & Freese						130
Pinnularia borealis Ehrenberg	13				101	
Pinnularia borealis var. *scalaris* (Ehrenberg) Rabenhorst	13					
Pinnularia brebissonii (Kützing) Rabenhorst	13		49			
Pinnularia crucifera Cleve-Euler	13				102	130
Pinnularia decrescens (Grunow) Krammer		33		70		130
Pinnularia divergens W. Smith						130
Pinnularia divergens var. *sublinearis* Cleve					104	
Pinnularia genkalii Krammer & Lange-Bertalot			50	71	103	
Pinnularia gibbiformis Krammer			51			
Pinnularia graciloides var. *triundulata* (Fontell) Krammer			52			
Pinnularia grunowii Krammer				70	101	130
Pinnularia ignobilis (Krasske) Cleve-Euler			49			
Pinnularia isostauron (Ehrenberg) Cleve	13					
Pinnularia ivaloensis Krammer			52			
Pinnularia krammeri Metzeltin					101	
Pinnularia lailaensis Foged					104	
Pinnularia lata (Brébisson) Rabenhorst		33			101	
Pinnularia lenticula Cleve-Euler			49			
Pinnularia lokana Krammer				71		130
Pinnularia lunata Krammer & Lange-Bertalot	13					
Pinnularia macilenta Ehrenberg					102	
Pinnularia marchica Schönfelder					101	
Pinnularia mesogongyla Ehrenberg		34				
Pinnularia microstauron (Ehrenberg) Cleve	13	33			101	
Pinnularia microstauron var. *angusta* Krammer		33				
Pinnularia neomajor Krammer		35	50			
Pinnularia nodosa (Ehrenberg) W. Smith			52			
Pinnularia obscura Krasske	13		51			
Pinnularia pseudogibba Krammer				70		
Pinnularia pseudosuchlandtii Bahls	13			70		

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Pinnularia rabenhorstii Hilse	13					
Pinnularia rupestris Hantzsch in Rabenhorst		35		71		
Pinnularia septentrionalis Krammer	13					
Pinnularia sinistra Krammer					102, 104	130
Pinnularia spitsbergensis Cleve			52	71	103	130
Pinnularia stomatophora (Grunow) Cleve		35	52			
Pinnularia subcapitata Gregory		33				
Pinnularia subcapitata var. *elongata* Krammer			51			
Pinnularia subgibba Krammer					102	
Pinnularia subpulchra Krammer			52			130
Pinnularia sudetica Hilse	13					
Pinnularia transversa (A. Schmidt) Mayer		34				
Pinnularia turbulenta (Cleve-Euler) Krammer	13					
Pinnularia viridiformis Krammer		34	49	71		
Pinnularia viridis (Nitzsch) Ehrenberg	13					
Placoneis Mereschkowsky				59		
Placoneis abiskoensis (Hustedt) Lange-Bertalot & Metzeltin	10					
Placoneis amphibola (Cleve) Cox	11			59		
Placoneis elginensis (Gregory) Cox			46			
Placoneis explanata (Hustedt) Mayama			46			
Planothidium Round & Bukhtiyarova			39			
Planothidium apiculatum (Patrick) Lange-Bertalot			39			
Planothidium delicatulum (Kützing) Round & Bukhtiyarova		24				
Planothidium frequentissimum (Lange-Bertalot) Lange-Bertalot					77	
Platessa conspicua (Mayer) Lange-Bertalot	3					
Psammothidium curtissimum (Carter) Aboal	3					
Psammothidium daonense (Lange-Bertalot) Lange-Bertalot	3					
Psammothidium marginulatum (Grunow) Bukhtiyarova & Round					77	110
Psammothidium nivale Potapova & Enache		24				
Pseudostaurosira brevistriata var. *inflata* (Pantocsek) Hartley	2					
Reimeria Kociolek & Stoermer	3					
Rhopalodia gibba (Ehrenberg) O. Müller	17	37	53	76		
Rhopalodia operculata (Agardh) Håkansson	17					
Rossithidium petersenii (Hustedt) Aboal					77	110
Rossithidium pusillum (Grunow) Round & Bukhtiyarova	3	24				
Sellaphora Mereschkowsky			46	59	89	125

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Sellaphora alastos (Hohn & Hellerman) Lange-Bertalot & Metzeltin				59		
Sellaphora laevissima (Kützing) Mann	4					
Sellaphora parapupula Lange-Bertalot	4				89	125
Sellaphora pupula (Kützing) Mereschkowsky	4					125
Sellaphora rectangularis (Gregory) Lange-Bertalot & Metzeltin			46			125
Semiorbis rotundus Reid & Williams		20				
Stauroforma Flower, Jones & Round						109
Stauroforma exiguiformis (Lange-Bertalot) Flower, Jones & Round						109
Stauroneis Ehrenberg	14, 15					
Stauroneis acidoclinata Lange-Bertalot & Werum			47			
Stauroneis acuta W. Smith	15					
Stauroneis akamina Bahls	15					
Stauroneis amphicephala Kützing	15		47		106	131
Stauroneis anceps Ehrenberg					105, 106	
Stauroneis angustilancea Lange-Bertalot & Metzeltin					105	
Stauroneis boyntoniae Bahls					106	
Stauroneis circumborealis Lange-Bertalot & Krammer	14				107	
Stauroneis conspicua Metzeltin & Lange-Bertalot	15					
Stauroneis fluminea Patrick & Freese					106	
Stauroneis gracilis Ehrenberg	14		47	72	106	131
Stauroneis heinii Lange-Bertalot & Krammer	14	32			105	
Stauroneis hyperborea Lange-Bertalot & Krammer				73		131
Stauroneis jarensis Lange-Bertalot, Cavacini, Tagliaventi & Alfinito	15					131
Stauroneis kootenai Bahls	14					
Stauroneis kriegeri Patrick	14					
Stauroneis kuelbsii Lange-Bertalot				72	105	131
Stauroneis lauenburgiana Hustedt	14					
Stauroneis livingstonii Reimer					106	131
Stauroneis neohyalina (M. Peragallo & Brun) Lange-Bertalot & Krammer			47			
Stauroneis pax Bahls	15					
Stauroneis phoenicenteron (Nitzsch) Ehrenberg	14					
Stauroneis pikuni Bahls	15					
Stauroneis prominula (Grunow) Hustedt					106	
Stauroneis reichardtii Lange-Bertalot, Cavacini, Tagliaventi & Alfinito	15			72	106	131

Taxa	Waterton	Haida Gwaii	Clearwater	Coppermine	Baillie/Back	Hood
Stauroneis separanda Lange-Bertalot & Werum	14					
Stauroneis siberica (Grunow) Lange-Bertalot & Krammer	15					
Stauroneis silvahassiaca Lange-Bertalot & Werum	15					
Stauroneis smithii Grunow	14					
Stauroneis smithii var. *incisa* Pantocsek						131
Stauroneis superhyperborea Van de Vijver, Beyens & Lange-Bertalot				74		
Stauroneis vandevijveri Bahls	15					
Staurophora Mereschkowsky						131
Staurosira construens Ehrenberg	2					
Staurosira construens var. *venter* (Ehrenberg) Hamilton	2					
Staurosira oldenburgioides (Lange-Bertalot) Kulikovskiy et al.	2					
Staurosirella Williams & Round	2			56		
Staurosirella lapponica (Grunow) Williams & Round	2					
Staurosirella leptostauron (Ehrenberg) Williams & Round	2					
Staurosirella pinnata (Ehrenberg) Williams & Round	2			56		
Stenopterobia anceps (Lewis) Brébisson in Van Heurck					108	
Stenopterobia curvula (W. Smith) Krammer			54			
Stephanodiscus alpinus Hustedt	1					
Surirella brebissonii Krammer & Lange-Bertalot						132
Surirella linearis W. Smith					108	
Synedra Ehrenberg	2					
Synedra acus var. *delicatissima* (W. Smith) Rabenhorst	2					
Synedra famelica Kützing			38			
Tabellaria fenestrata (Lyngbye) Kützing				56	77	109
Tabellaria flocculosa (Roth) Kützing	2	18	38	56	77	109
Tabularia fasciculata (Agardh) Williams & Round		19				
Thalassiosira Cleve		18				
Ulnaria (Kützing) Compére		19		56		109
Ulnaria ulna (Nitzsch) Compére	2					
Unknown genus		24			108	