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Identified and Unidentified Diatom Genera Found on *Zostera marina,* Montague Harbour, Galiano Island, BC. Morphological and Molecular Data

IMERSS, UBC and UVIC-AMF

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Contents

Abstract

A diverse range of microscopic biota are found on eelgrasses. Diatoms play a significant role in this microbiota and often cover eelgrass leaves in thick formations. The role of diatoms and their interactions with bacteria and eukaryotes is under-studied. To initiate an understanding of the ecological spatial distribution and dynamics, including the total microbiota found on the eelgrass *Zostera marina* at Montague Harbour Marine Provincial Park (MHMPP), Galiano Island, British Columbia, molecular and physical sampling for diatom identification was coordinated on March 7, 2021. DNA barcoding of 16S, 18S, and RBCL target regions from extracted DNA of swabs was taken on proximal, medial and distal sections. Physical sampling, from the same plants were acquired, across a stretch of the MHMPP beach. Each sample was physically divided into three 8-10 mm sections and preserved for diatom identification; a) by imaging intact sections with scanning electron microscopy (SEM) and b) cleaned frustules for SEM and light microscopy. Additionally, five samples were taken on different dates over two years. We have identified 60 genera of diatoms through morphological methods over the five sampling dates. Confident molecular sequence matches are 45 (85%) of the 53 genera identified morphologically on the co-sampling date of March 7, 2021. Ten additional genera have been identified through molecular sequences but not yet identified morphologically, though we presume these diatoms will be rare occurrences. Early results of counting on sections indicates that less than 10 genera will make up the vast majority of diatoms. Currently, adding together the morphological identifications and confident sequence data, results in a total of 70 genera over five samplings in a two-year period. With a high percentage of the diatom genera identified, we have begun the next phase of the diatom portion of this project; the counting of genera in numerous randomly selected 200 µm squares of in situ leaf sections.

Summary of Results

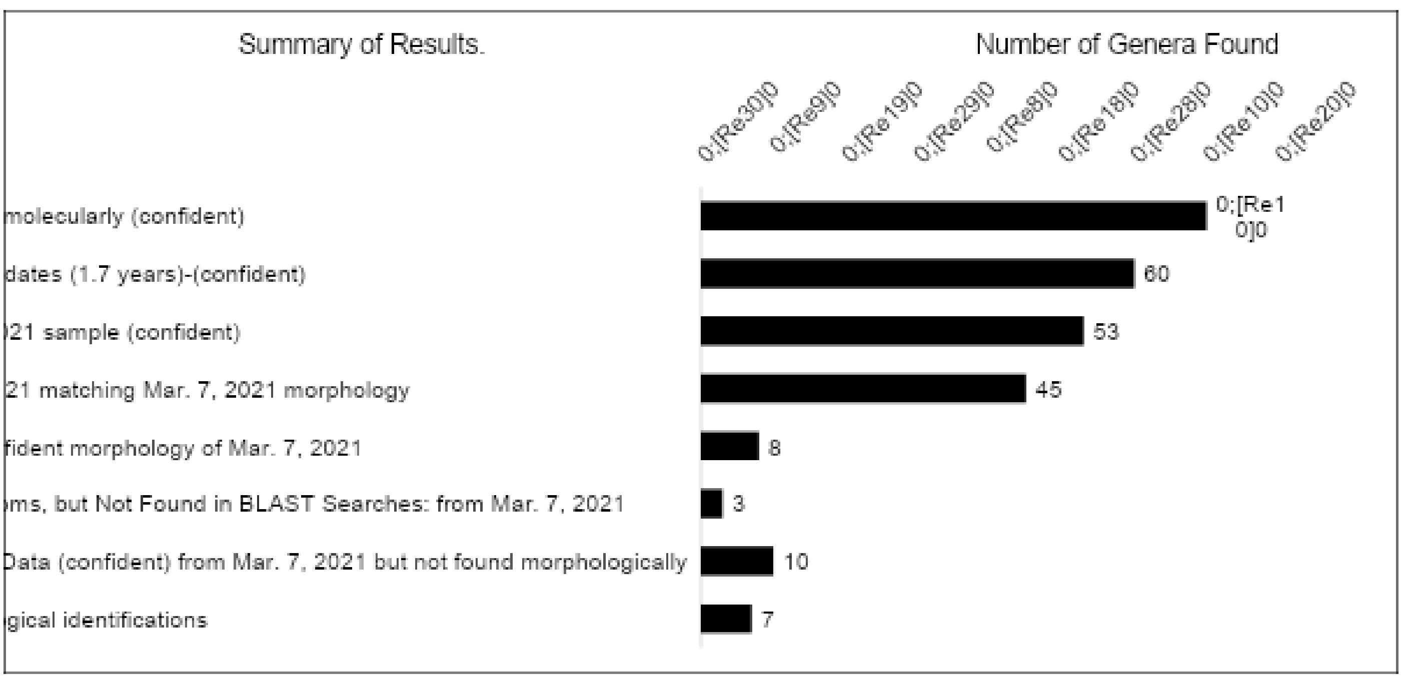

Table 2: Diatoms Found on *Zostera marina*, Montague Harbour Marine Provincial Park, Galiano Island, 2020-2022

		1	2	3	4	5	6	7	8
		All Genera Reported: morphologically and molecularly (confident)	Identified Morphologically over 5 sampling dates (1.7 years)- (confident)	Identified Morphologically from March 7, 2021 sample (confident)	Confident Molecular Sequences Mar. 7, 2021 matching Mar. 7, 2021 morphology	Non-confident Sequence Matches, but confident morphology of Mar. 7, 2021	Confident morphology of Mar. 7, 2021 Diatoms, but Not Found in BLAST Searches from Mar. 7, 2021	Additional Genera Found in the Molecular Data (confident) from Mar. 7, 2021 but not found morphologically	Additional genera: Non-confident morphological identifications
1	*ACHN*	*Achnanthes* Bory 1822	*Achnanthes* Bory 1822	*Achnanthes* Bory 1822	*Achnanthes* Bory 1822				*Donkinia* Ralfs, 1861
2	ACHNA	*Achnanthidium* Kützing, F.T. (1844)						*Achnanthidium* Kützing, F.T. (1844)	*Gomphoseptatum* Medlin, 1986
3	ACTI	*Actinoptychus* Ehrenberg 1843	*Actinoptychus* Ehrenberg 1843						*Hanzschia* Grunow, A. 1877
4	AMPH	*Amphora* Ehrenberg ex Kützing, 1844	*Amphora* Ehrenberg ex Kützing, 1844	*Amphora* Ehrenberg ex Kützing, 1844	*Amphora* Ehrenberg ex Kützing, 1844				*Podosira* Ehrenberg, 1840
5	ATTH	*Attheya* T.West, 1860	*Attheya* T.West, 1860	*Attheya* T.West, 1860	*Attheya* T.West 1860				*Rhopalodia* O. Müller, 1895 nom.
6	BACI	*Bacillaria* Gmelin, J.F. (1791)	*Bacillaria* Gmelin, J.F. (1791)	*Bacillaria* Gmelin, J.F. (1791)	*Bacillaria* Gmelin, J.F. (1791)				*Undatella* Paddock & P.A.Sims, 1980
7	CAMP	*Campylodiscus* Kützing 1844	*Campylodiscus* Kützing 1844	*Campylodiscus* Kützing 1844		*Campylodiscus* Kützing 1844			
8	CHAE	*Chaetoceros* Ehrenberg 1844	*Chaetoceros* Ehrenberg 1844	*Chaetoceros* Ehrenberg 1844	*Chaetoceros* Ehrenberg 1844				
9	COCC	*Cocconeis* Ehrenberg 1838	*Cocconeis* Ehrenberg 1838	*Cocconeis* Ehrenberg 1838	*Cocconeis* Ehrenberg 1838				
10	COSC	*Coscinodiscus* Ehrenberg, 1839	*Coscinodiscus* Ehrenberg, 1839	*Coscinodiscus* Ehrenberg, 1839	*Coscinodiscus* Ehrenberg, 1839				
11	CYCL	*Cyclotella* (Kützing) Brébisson, 1838, nom. et typ. cons.	*Cyclotella* (Kützing) Brébisson, 1838, nom. et typ. cons.						
12	CYLI	*Cylindrotheca* *Rabenhorst, 1859, nom. cons.*	*Cylindrotheca* *Rabenhorst, 1859, nom. cons.*	*Cylindrotheca* *Rabenhorst, 1859, nom. cons.*	*Cylindrotheca* *Rabenhorst, 1859, nom. cons.*				
13	*DIME*	*Dimeregramma* Ralfs 1861	*Dimeregramma* Ralfs 1861	*Dimeregramma* Ralfs 1861	*Dimeregramma* Ralfs 1861				
14	DIPL	*Diploneis* Ehrenberg ex Cleve, 1894	*Diploneis* Ehrenberg ex Cleve, 1894	*Diploneis* Ehrenberg ex Cleve, 1894	*Diploneis* Ehrenberg ex Cleve, 1894				
15	DITY	*Ditylum* J.W.Bailey ex L.W.Bailey, 1861	*Ditylum* J.W.Bailey ex L.W.Bailey, 1861	*Ditylum* J.W.Bailey ex L.W.Bailey, 1861		*Ditylum* J.W.Bailey ex L.W.Bailey, 1861			
16	ELLE	*Ellerbeckia* Crawford, R.M. 1988	*Ellerbeckia* Crawford, R.M. 1988	*Ellerbeckia* Crawford, R.M. 1988	*Ellerbeckia* Crawford, R.M. 1988				
17	ENTO	*Entomoneis* Ehrenberg, 1845	*Entomoneis* Ehrenberg, 1845	*Entomoneis* Ehrenberg, 1845	*Entomoneis* Ehrenberg, 1845				
18	EPIT	Epithemia Kützing, 1844	Epithemia Kützing, 1844	Epithemia Kützing, 1844		Epithemia Kützing, 1844			
19	EUCA	*Eucampia* Ehrenberg 1839	*Eucampia* Ehrenberg 1839						
20	ENCY	*Encyonema* *Kützing, F.T. (1834)*	*Encyonema* *Kützing, F.T. (1834)*	*Encyonema* *Kützing, F.T. (1834)*	*Encyonema* *Kützing, F.T. (1834)*				
21	EXTU	*Extubocellulus* Hasle, von Stosch & Syvertsen 1983						*Extubocellulus* Hasle, von Stosch & Syvertsen 1983	
22	FALL	*Fallacia* *Stickle et Mann in Round et al. 1990.*	*Fallacia* *Stickle et Mann in Round et al. 1990.*	*Fallacia* *Stickle et Mann in Round et al. 1990.*	*Fallacia* *Stickle et Mann in Round et al. 1990.*				
23	FOGE	*Fogedia* Witkowski, Lange-Bertalot et Metzeltin 1997	*Fogedia* Witkowski, Lange-Bertalot et Metzeltin 1997	*Fogedia* Witkowski, Lange-Bertalot et Metzeltin 1997			*Fogedia* Witkowski, Lange-Bertalot et Metzeltin 1997		
24	FRAG	*Fragilaria* Lyngbye 1819						*Fragilaria* Lyngbye 1819	
25	FRAGI	Fragilariopsis Hustedt 1913	Fragilariopsis Hustedt 1913	Fragilariopsis Hustedt 1913	Fragilariopsis Hustedt 1913				
26	GEDA	*Gedaniella* Chunlian Li, A. Witkowski & M.P. Ashworth 2018						*Gedaniella* Chunlian Li, A. Witkowski & M.P. Ashworth, 2018	
27	GOMP	*Gomphonemopsis* Medlin 1986	*Gomphonemopsis* Medlin 1986	*Gomphonemopsis* Medlin 1986	*Gomphonemopsis* Medlin 1986				
28	GRAM	*Grammatophora* Ehrenberg 1840	*Grammatophora* Ehrenberg 1840	*Grammatophora* Ehrenberg 1840			*Grammatophora* Ehrenberg 1840		

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29	GYRO	***Gyrosigma*** Hassall, 1845, nom. cons.	***Gyrosigma*** Hassall, 1845, nom. cons.						
30	HALA	***Halamphora*** (Cleve) Mereschkowsky, 1903	***Halamphora*** (Cleve) Mereschkowsky, 1903	***Halamphora*** (Cleve) Mereschkowsky, 1903	***Halamphora*** (Cleve) Mereschkowsky, 1903				
31	HASL	***Haslea*** Simonsen, R. (1974)	***Haslea*** Simonsen, R. (1974)	***Haslea*** Simonsen, R. (1974)	***Haslea*** Simonsen, R. (1974)				
32	HOBA	***Hobaniella*** P.A.Sims & D.M.Williams, 2018: *synonym is Odontella*	***Hobaniella*** P.A.Sims & D.M.Williams, 2018: *synonym is Odontella*	***Hobaniella*** P.A.Sims & D.M.Williams, 2018: *synonym is Odontella*	***Hobaniella*** P.A.Sims & D.M.Williams, 2018: *synonym is Odontella*				
33	HYAL	***Hyalodiscus*** Ehrenberg (1845)	***Hyalodiscus*** Ehrenberg (1845)	***Hyalodiscus*** Ehrenberg (1845)	***Hyalodiscus*** Ehrenberg (1845)				
34	*ISTH*	***Isthmia*** Agardh 1832						***Isthmia*** Agardh 1832	
35	*LEPT*	***Leptocylindrus*** Cleve, 1889	***Leptocylindrus*** Cleve, 1889	***Leptocylindrus*** Cleve, 1889	***Leptocylindrus*** Cleve, 1889				
36	LICM	***Licmophora*** C.Agardh, 1827	***Licmophora*** C.Agardh, 1827	***Licmophora*** C.Agardh, 1827	***Licmophora*** C.Agardh, 1827				
37	LYRE	***Lyrella*** (Ehrenberg) Karayeva 1978	***Lyrella*** (Ehrenberg) Karayeva 1978	***Lyrella*** (Ehrenberg) Karayeva 1978	***Lyrella*** (Ehrenberg) Karayeva 1978				
38	MELO	***Melosira*** C. Agardh, 1824, nom. cons.	***Melosira*** C. Agardh, 1824, nom. cons.	***Melosira*** C. Agardh, 1824, nom. cons.	***Melosira*** C. Agardh, 1824, nom. cons.				
39	MINI	***Minidiscus*** Hasle, 1973	***Minidiscus*** Hasle, 1973	***Minidiscus*** Hasle, 1973	***Minidiscus*** Hasle, 1973				
40	MINU	***Minutocellus*** Hasle, von Stosch and Syvertsen 1983						***Minutocellus*** Hasle, von Stosch and Syvertsen 1983	
41	NAVI	***Navicula*** *Bory 1822*	***Navicula*** *Bory 1822*	***Navicula*** *Bory 1822*	***Navicula*** *Bory 1822*				
42	NITZ	***Nitzschia*** Hassall, 1845, nom. cons.	***Nitzschia*** Hassall, 1845, nom. cons.	***Nitzschia*** Hassall, 1845, nom. cons.	***Nitzschia*** Hassall, 1845, nom. cons.				
43	ODON	***Odontella*** (Lyngbye) C.Agardh	***Odontella*** (Lyngbye) C.Agardh	***Odontella*** (Lyngbye) C.Agardh	***Odontella*** (Lyngbye) C.Agardh				
44	OPEP	***Opephora*** F. Petit, 1888	***Opephora*** F. Petit, 1888	***Opephora*** F. Petit, 1888	***Opephora*** F. Petit, 1888				
45	PARA	***Paralia*** Heiberg, 1863	***Paralia*** Heiberg, 1863	***Paralia*** Heiberg, 1863	***Paralia*** Heiberg, 1863				
46	PARI	***Paribellus*** Cox 1988	***Paribellus*** Cox 1988		***Paribellus*** Cox 1988				
47	PERI	***Pertrephis like*** (*Perisphis nom. nud.*)	***Pertrephis like*** (*Perisphis nom. nud.*)	***Pertrephis like*** (*Perisphis nom. nud.*)					
48	PETR	***Petroneis*** A. J. Stickle & D. G. Mann, 1990	***Petroneis*** A. J. Stickle & D. G. Mann, 1990	***Petroneis*** A. J. Stickle & D. G. Mann, 1990	***Petroneis*** A. J. Stickle & D. G. Mann, 1990				
49	PLAG	***Plagiogramma*** Greville, 1859	***Plagiogramma*** Greville, 1859	***Plagiogramma*** Greville, 1859	***Plagiogramma*** Greville, 1859				
50	PLAGI	***Plagiotropis*** Pfitzer, 1871	***Plagiotropis*** Pfitzer, 1871	***Plagiotropis*** Pfitzer, 1871		***Plagiotropis*** Pfitzer, 1871			
51	PLAN	***Planothidium*** Round and Bukhtiyarova 1996.	***Planothidium*** Round and Bukhtiyarova 1996.	***Planothidium*** Round and Bukhtiyarova 1996.	***Planothidium*** Round and Bukhtiyarova 1996.				
52	PLEU	***Pleurosigma*** W. Smith, 1852	***Pleurosigma*** W. Smith, 1852	***Pleurosigma*** W. Smith, 1852	***Pleurosigma*** W. Smith, 1852				
53	PODO	***Podosira*** Ehrenberg, 1840	***Podosira*** Ehrenberg, 1840	***Podosira*** Ehrenberg, 1840	***Podosira*** Ehrenberg, 1840				
54	PROS	***Proschkinia*** Karayeva 1978						***Proschkinia*** Karayeva 1978	
55	PSAM	***Psammodictyon*** D. G. Mann, 1990	***Psammodictyon*** D. G. Mann, 1990	***Psammodictyon*** D. G. Mann, 1990	***Psammodictyon*** D. G. Mann, 1990				
56	PSEU	***Pseudogomphonema*** Medlin 1986	***Pseudogomphonema*** Medlin 1986	***Pseudogomphonema*** Medlin 1986	***Pseudogomphonema*** Medlin 1986				
57	PSEUN	***Pseudo-nitzschia*** H. Peragallo, 1900	***Pseudo-nitzschia*** H. Peragallo, 1900		***Pseudo-nitzschia*** H. Peragallo, 1900				

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58	**RHAB**	***Rhabdonema*** Kützing, 1844, nom. cons	***Rhabdonema*** Kützing, 1844, nom. cons	***Rhabdonema*** Kützing, 1844, nom. cons	***Rhabdonema*** Kützing, 1844, nom. cons				
59	**RHIZ**	***Rhizosolenia*** Brightwell, 1858, nom. et typ. Cons	***Rhizosolenia*** Brightwell, 1858, nom. et typ. Cons			***Rhizosolenia*** Brightwell, 1858, nom. et typ. Cons			
60	***RHOI***	***Rhoicosphenia*** Grunow, 1860	***Rhoicosphenia*** Grunow, 1860	***Rhoicosphenia*** Grunow, 1860	***Rhoicosphenia*** Grunow, 1860				
61	**SHIO**	***Shionodiscus*** Alverson, A.J., Kang, S.-H. & Theriot, E.C. (2006)						***Shionodiscus*** Alverson, A.J., Kang, S.-H. & Theriot, E.C. (2006)	
62	**SEMI**	***Seminavis*** D.G. Mann 1990						***Seminavis*** D.G. Mann 1990	
63	**SERR**	***Serratifera*** M.P.Ashworth, C.Li & A.Witkowski, 2016						***Serratifera*** M.P.Ashworth, C.Li & A.Witkowski, 2016	
64	**SKEL**	***Skeletonema*** Greville, 1865, nom. et typ. cons	***Skeletonema*** Greville, 1865, nom. et typ. cons	***Skeletonema*** Greville, 1865, nom. et typ. cons	***Skeletonema*** Greville, 1865, nom. et typ. cons				
65	**STEP**	***Stephanopyxis*** Ehrenberg, C.G.1845	***Stephanopyxis*** Ehrenberg, C.G 1845	***Stephanopyxis*** Ehrenberg, C.G. 1845		***Stephanopyxis*** Ehrenberg, C.G. 1845			
66	**TABU**	***Tabularia*** (Kützing) D.M.Williams & Round, 1986	***Tabularia*** (Kützing) D.M.Williams & Round, 1986	***Tabularia*** (Kützing) D.M.Williams & Round, 1986	***Tabularia*** (Kützing) D.M.Williams & Round, 1986				
67	**THAL**	***Thalassiosira*** *Cleve, 1873*	***Thalassiosira*** *Cleve, 1873*	***Thalassiosira*** *Cleve, 1873*	***Thalassiosira*** *Cleve, 1873*				
68	**TRAC**	***Trachyneis*** Cleve, P.T. (1894)	***Trachyneis*** Cleve, P.T. (1894)	***Trachyneis*** Cleve, P.T. (1894)		***Trachyneis*** Cleve, P.T. (1894)			
69	**TRIG**	***Trigonium*** Cleve, P.T. (1867)	***Trigonium*** Cleve, P.T. (1867)	***Trigonium*** Cleve, P.T. (1867)		***Trigonium*** Cleve P.T. (1867)	***Trigonium*** Cleve. P.T. (1867)		
70	**TRYB**	***Tryblionella*** W. Smith, 1853	***Tryblionella*** W. Smith, 1853	***Tryblionella*** W. Smith, 1853	***Tryblionella*** W. Smith, 1853				
		70	60	55	45	8	3	10	7

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1. Sixty genera are reported with certainty (Chart 1, col. 2).[1] from all five samplings over two years, based on morphological methods.
2. Five additional genera (Chart 1, col. 7) are of uncertain (uc) taxonomic placement and require more images, taxonomic investigations and or molecular confirmation: 1) *Donkinia* Ralfs, 1861; 2) *Gomphoseptatum* Medlin, 1986; 3) *Hanzschia* Grunow, A. 1877); 4) *Rhopalodia* O. Müller, 1895, nom. cons. and 5) *Undatella* Paddock & P.A.Sims, 1980.
3. Fifty-three genera are reported with certainty (Chart 1, col. 3) from the March 7, 2021 sampling based on morphological methods; 88% of the 60 genera identified over five sampling dates in two years.
4. Forty-five genera are confidently supported by the March 7, 2021 molecular data (MOL) (Chart 1, col. 4). The molecular data supports 85% of all genera confidently reported using morphology methods from the March 7, 2021 sample.
5. Eleven additional genera are non-confident in reasonable alignment stats or without sequence matches (Chart 1, col. 5, 6). Nine genera identified morphologically are lacking in high alignment stats: 1) *Campylodiscus* Kützing 1844[2]; 2) *Ditylum* J.W.Bailey ex L.W.Bailey, 1861[3]; 3) *Epithemia* Kützing, 1844[4]; 4) *Fogedia* Witkowski, Lange-Beralot et Metzeltin 1997[5]; 5) *Plagiotropis*[6]; 6) *Rhizosolenia* Brightwell, 1858, nom. et typ. Cons[7]; 7) *Stephanopyxis* Ehrenberg, C.G. (1845)[8]; 8) *Trachyneis* Cleve, P.T. (1894)[9] (Chart 1, col. 5). Three genera morphologically identified are without sequence matches: 1) *Fogedia* Witkowski, Lange-Beralot et Metzeltin 1997; 3) *Grammatophora* Ehrenberg 1840 and 2) *Trigonium* Cleve, P.T. 1867 (Chart 1, col. 6).
6. The molecular data from March 7, 2023 matches 76% of the diatoms identified over a 1.7-year period on five sampling dates.
7. Eight genera identified morphologically are 'probable' matches to the molecular data (Chart 1, col. 5): they are found repeatedly but they lack very high percentage sequence identity matches[10] to sequences found with BLAST (NIH 2023) and the distance tree results are only moderate to weak. Three more genera identified by morphological methods have sequences with matches in the BLAST databases, however the alignment data and distance tree results are not dependable.
8. An additional 10 genera have been identified with confidence based on BLAST results from two molecular sequence datasets but have not yet been identified by morphological methods (Chart 1, col. 6). Results listed in these two sequence datasets were examined with the databases accessed by BLAST set to *Sequences producing only significant alignments* and double checked in the BLAST Distance Tree of results program and only with repeated entries that have excellent or high scoring alignments.[11] The following genera have repeated results of very low e values, high query cover, sequences producing significant alignments (very high Per. Ident) and excellent distance tree results (here listed as: confid.): 1) *Achnanthidium* Kützing, F.T. (1844) (confid[12]); 2) *Extubocellulus* Hasle, von Stosch & Syvertsen 1983 (confid.); 3) *Fragilaria* Lyngbye 1819[13] (confid.); 4) *Gedaniella* Chunlian Li, A. Witkowski & M.P.

[1] '*Pariraphis like'* is included in the certain list of genera since it is found regularly and has a consistent taxonomy.
[2] *Campylodiscus***:** Sequences found in BLAST, but low stat confidence in the alignment and distance tree results
[3] *Ditylum*: Sequences found in BLAST, but low stat confidence in the alignment and distance tree results.. Part and entire valves of *Ditylum sp*. are commonly observed in slides from March 7, 2021 sections.
[4] *Epithemia*: Sequences found in BLAST, but low stat confidence in the alignment and distance tree results.
[5] *Fogedia*: No sequences found.
[6] *Plagiotropis:* Sequences found in BLAST, but low stat confidence in the alignment and poor distance tree results.
[7] *Rhizosolenia*: Sequences found in BLAST, but low stat confidence in the alignment and poor distance tree results.
[8] *Stephanopyxis;* Numerous hits in BLAST, but low stat confidence in the alignment and moderate distance tree results.
[9] *Trachyneis*: Sequences found in BLAST, but low stat confidence in the alignment and distance tree results.
[10] BLAST, Per. Ident.
[11] At this time we have not developed a precise set of numeric guidelines for determining how confidant we are of good matches to BLAST entries; except that we consider confident matches to have: 1) very good base alignment stats (high query cover and percent ident.(usually no less than 90-93% percent ident.), 2) in the top 10 genera listed in the BLAST search table and top query genera are separated by percent ident. from the next matches and 3) excellent distance tree results; horizontally very close to the query sequence and linked to the same or a very close node.
[12] *Arcocellulus*: though many sequences are listed, only one sequence, SLIVA 2586 has an excellent alignment match and very excellent distance tree results. Also, sequences occur in the top list with *Minutocellus* and in excellent distance tree results; maybe both genera are present or one.
[13] *Fragilaria:* Two good query sequences so far (March 26, 2023). Their alignment stats and distance tree results are excellent. Marine species.

Ashworth, 2018 (confid.); 5) *Isthmia* Agardh 1832 (confid.); 6) *Minutocellus* Hasle, von Stosch and Syvertsen 1983 (confid.); 7) *Podosira* Ehrenberg, 1840 (confid.); 8) *Proschkinia* Karayeva 1978 (confid.); 9) *Shionodiscus* Alverson, A.J., Kang, S.-H. & Theriot, E.C. (2006); 10) *Seminavis* D.G. Mann 1990 (confid.); 11) *Serratifera* M.P.Ashworth, C.Li & A.Witkowski, 2016 (confid.).

9. *Arcocellulus* Hasle, von Stosch & Syvertsen (1983) is occasionally found in BLAST searches with strong alignment and distance results, with only one excellent sequence match in BLAST, and often indistinguishable stats relative to *Minutocellus,* is herein is listed as probable (probab.).
10. Five more genera are showing moderate indications of being present in the March 7, 2021 molecular samples, but not yet observed by morphology. The lower confidence is due to weaknesses in alignment stats, distance tree results or a low number of occurrences in the datasets (here listed as: possible): 1) *Bacterosira Gran 1900*[14] *(*possible); 2) *Berkeleya Graville 1827 (*possible); 5) *Cymbellonitzschia* Hustedt 1924;[15] 6) *Lemincola* Round & Basson, 1997.[16]; 7) *Leyanella* and *Pseudoleyanella* (possible); 3) *Pinnularia* Ehrenberg, 1843, nom. et. typ. cons (possible to uncertain); 4) *Phaeodactylum* Bohlin, K. (1898) (possible); 5) *Ralfsiella* (Ralfs) P.A.Sims, D.M.Williams & Ashworth 2018 (possible[17]). We are continuing to search the sequence data for good BLAST results occasionally found in the Family, Order or Genera columns of the sequence data.
11. Seventy genera are confirmed by adding together the morphological identifications (60) and the genera confidently identified through molecular sequences (10) (Chart 1, col. 1) but are not yet identified using morphology, found on *Z. marina* over a 1.7-year period from 5 samples.
12. One fairly common genus is currently undergoing taxonomic placement (paper in progress) and is tentatively identified as *Pariraphis like* (Witkowski, pers. comm.) is included in the total genera recorded.
13. *Rhoicosphenia*, a genus regularly seen in all the Z. marina samples and straightforward to identify, to date, has only appeared in one record (SILVA 519, Bacillariophyceae_fa) by a search using BLAST.[18] The excellent alignment and distance tree stats from BLAST makes the molecular identification certain.
14. *Achnanthes cf. elongata*, is common on some proximal and medial leaf sections and is straightforward to identify. It is the only *Achnanthes* species observed on March 7, 2021 Z. marina sections. However, though it has appeared in BLAST searches using all the sequence data,.all three matches in BLAST gave moderate alignment stats and poor distance tree results. It is possible that the species we observe is a different or undescribed species compared to the morphologically very similar *Achnanthes cf. elongata,* reported as epizoic by Majewska et al. 2017.
15. *Cocconeis*, possibly the most abundant diatom on Z. marina shows few hits within the molecular data. It is possible that swabbing a flat, well silicified and strongly adhering diatom missed collecting sufficient quantities of the diverse taxon range of *Cocconeis* observed on Z. marina leaves during all samplings.
16. A considerable number of SEM and LM images have been taken. Not all prepared SEM stubs and LM slides of cleaned material have been examined or re-examined. Out of 200+ folders of SEM and LM images, there are approximately 20 unprocessed folders yet to be examined in detail since the first sampling in August 2020. In the March 7, 2021 sampling: approximately 85% of a possible 70 folders have been examined and processed. Based on the folders left to examine, it is expected that more genera will be identified, especially those only identified by molecular methods. Re-examining SEM and LM material has continued to yield new confirmed genera (i.e. *Podosira* and *Campylodiscus*), better images and taxonomic features of previously identified images.

[14] *Bacterosira*: Only one query sequence so far (March 26, 2023). However, it's alignment stats and distance tree results are very good. It was previously placed as a species under *Thalassiosira*.
[15] *Cymbellonitzschia:* Only one query sequence so far (April 3, 2023). However, it's alignment stats and distance tree results are good.
[16] *Lemincola*: Only two query sequences so far (March 27, 2023) and it is considered a non-marine diatom. However, it's alignment stats and distance tree results are very good.
[17] *Ralfsiella*: only to sequences in SILVA records. However, the alignment and distance tree results are excellent.
[18] See the notes: Distinguishing Rhoicosphenia, Gomphonemopia, Pseudogomphonema, Gomphoseptatum & Licmophora-(MW-Dec 23-2021-Aug 28-2021 AvA Edits Nov14-2021)-AC.docx

2. Introduction

3. Methods and Materials

2.1 *Study area and sampling collection*

Fig. 1. Map of the Salish Sea, Gulf Islands and Galiano Island.

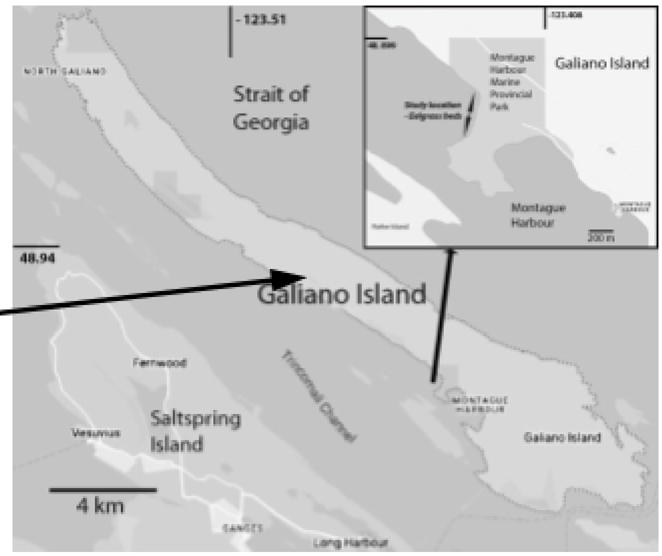

Fig. 2. Map of Galiano Island and study area. The inset shows the location of the study area, located at the Montague Harbour Marine Provincial Park.

At low tides, 10 *Zosteria marina* eelgrass leaf samples were harvested evenly across the entire 400 m long shallow gravel beach at Montague Harbour marine Provincial Park (MHMPP) (Lat: 48.896732, Long: -123.403318), Galiano Island, British Columbia, Canada (Fig. 1-2.). Galiano Island is a narrow, 26 km long island in the Gulf Islands within the Salish Sea. Authorization to harvest eelgrass leaves in the provincial park was granted to the research team by BC Parks. Although five separate samplings have been taken at MHMPP over a three-year period, the March 7, 2021 samples were taken together for the purposes of both molecular and morphological analysis. Leaves were cut in-situ 10-20 mm above the rhizome base providing 10 secondary and 10 tertiary leaves.

For morphological research, each leaf was placed in a freshly opened pre-labeled Ziplock plastic bag containing 300 mL of 0. 2 µm filtered MHMPP water that was collected 2 days before the harvesting of the leaves. On the shore, with sterile gloves, a polypropylene cutting board, ruler tweezer and razor blades (all items washed between samples with 100% ethanol) each leaf was sliced into three sections--proximal, media and dorsal--and each of those three sections cut into three 8 mm sections for a total of 90 individual samples. Each 8mm section was placed in labeled 15 mL sterile poly Falcon tubes with 4% final concentration of Formalin and inserted upright into test tube racks and transported within 1 hour undisturbed to a 2-3°C refrigerator. [Need the protocol for the sampling of leaves for molecular analysis: Similarly, at the same time and location, X sections of secondary and tertiary leaves of proximal, medial and distal sections were swabbed with sterile Q-tips and stored in liquid nitrogen for molecular analysis. The use of secondary and tertiary leaves was alternated between the molecular analysis and the microscopy teams.

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2.2. DNA extraction, PCR amplification and high-throughput sequencing (HTS) library preparation

[Need the full protocol] Molecular data (MOL) obtained by performing DNA barcoding of 16S, 18S, and RBCL target regions from extracted DNA of swabs. Sequence data processing, including taxonomic assignment of the Amplicon Sequence Variants (ASVs), was performed in the DADA2 pipeline (Callahan et al. 2016). 16S and 18S taxonomy was assigned from the SILVA 138 database and RBCL sequences assigned with DiatBarcode V10 database. The taxonomy database from Siobhan Schenk (Parfrey lab, UBC) sent on February 25, 2022 is the output (3221 sequence records) of the denoised output of DADA2 pipeline. A second database of 3,965 sequences was generated from the March 7, 2021 data with SILVA by Siobhan Schenk on Feb. 10, 2023 (SILVA #X,).

2.3 *Microscopical analysis*

Samples for morphological analysis were prepared in two ways: 1) sections of Z. marina were scraped with a sterile razor or toothbrush in a few mL of 0.2 µm MHMPP water to produce a concentrated pool of diatoms of which 5 mL was pipetted and placed in a 50 mL. borosilicate centrifuge tube. Diatoms were cleaned with concentrated reagent grade concentrated sulfuric acid in a ratio by volume of 1:4 sample to acid at between 95-100°C for 2-3 hours or until the mixture was faint straw coloured or clear. The same procedure was used for whole 8 mm leaf sections to capture all of the diatoms. Concentrated reagent grade Nitric acid (47%) to reagent grade concentrated sulphuric acid (97%) in a 1:3 ratio was also used for bulk cleaning of diatom and leaf samples in the same manner as with the sulfuric acid methods used previously. In some cases where samples showed some residual organics, concentrated (37%) hydrogen peroxide was further added and held at 95-100°C for 1 hour. Thereafter samples were washed 8-9 times, each time removing the supernatant to 5 mL and washing with 35 mL of with distilled and deionized water at 12 h intervals to a neutral pH. Cleaned diatom suspensions were pipetted onto cover slips, covered and left at room temperature overnight to dry. Permanent slides were mounted with Naphrax (Brunel Microscopes: http://www.brune lmicroscopes.co.uk/), which has a high refractive index. Diatom analysis was performed using a Nikon E800 with a Nikon 1.4 n.a. condenser and either Nikon 60x PlanApo n.a. 1.4 DIC or 100× PlanApo (n.a. 1.4) DIC objectives.

For SEM examination, 2-3 drops of the cleaned sample was filtered onto 13 mm Whatman Nuclepore polycarbonate membranes (Fisher Scientific, Toronto, Canada) using Swinnex, polypropylene, 13mm Filter Holders (Sterlitech Corp. https://www.sterlitech.com) and washed with 60 mL of distilled and deionized water. Filters were air-dried overnight or in a 60°C oven for 1 hr., mounted onto aluminum stubs and sputtered coated with gold. Besides acid cleaned samples, a second method was used to take images of intact diatoms in-situ on the eelgrass: a) The formalin solution used to store the Z. marina 8 mm sections in 15 mL polytubes was removed by a sterile glass Pasteur pipette, being careful to not touch or disturb the specimen, b) Specimen solution was diluted with 15 mL of distilled and deionized water carefully pipetted into the tube. Let sit for 2 hrs. to dissolve marine salts. c) after removing the water to 1-2 mL a sequential ethanol series of 50%, 60%, 70%, 90% and 100% 3x (ethanol dried with zeolites) of 10 mL at 30 minutes was carefully pipetted and removed by pipette to not disturb or touch the specimen. d) Then, 1x 5 mL application of 1:1 Ethanol to HMDS (Hexamethyldisilizane, Ted Pella Inc. https://www.tedpella.com/) followed by 3 mL of 100% HMDS at 30 min. each was pipetted, and the supernatant removed. e) After the last application of HMDS the section of eelgrass was slid out of the tube onto a cleaned and sterile 100 mm glass petri dish and allowed to air dry in a fume hood. Specimens were transferred to a 60°C oven to fully dry. f) Specimens were mounted on black carbon stickies (Ted Pella Inc.): To attach it to the carbon sticky, the tip of a sterile fine tweezer was used to press the section down in 6 equidistant spots around the edge of the section. 3) Another method was used to image semi-cleaned eelgrass sections. Before using the in-situ method, after a soak in deionized and distilled water, 30% hydrogen peroxide was added to the eelgrass sections for 24 hrs. at 20°C to remove some of the organics to make genus identifications easier and examine girdle bands of intact cells, without resorting to full acid cleaning. After gold sputter coating, samples were imaged with a Hitachi s4800 FESM or a Hitachi

TM4000 SEM instruments at the Advanced Microscope Facility, University of Victoria, British Columbia, Canada.

Identified Diatom Genera

Abbreviations used:

1. Observed approximate frequency (not by numerical counts): **1** = rare, **2** = common, **3** = very common, **4** = abundant[19]
2. a) **X** = reported/imaged, b**) blank space** (either not found yet or due to the non-examination of samples), c) **uc**= uncertain or unconfirmed, though they fit some genus characteristics but require further investigation.
3. **SEM** = Scanning Electron Microscopy, **LM** = light microscopy (cleaned frustules, prepared slides), **Live** = live cells in light microscopy, **MOL** = molecular data: confid. (confid.), prob. (prob.), indic. (indications).

- All diatom genera and species names are from AlgaeBase (Guiry and Guiry, 2021) recently cited papers or diatom taxonomic references.

- Further information is found on the detailed a) **Checklist of Diatoms of the Southern Gulf Isl.(in process),** b) **Updates on Genera Identified** (with images) and c) **Taxonomic Notes.**

No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
1.	ACHN	*Achnanthes* Bory 1822. The only *Achnanthes* observed for March 7, 2021 leaf sections is an elongate-linear *Achnanthes,* fairly abundant and with unusual characteristics: they are highly elongate, lack apical pore fields, are mono-raphid, noticeably heteropolar (bent valves) and have other characteristics typical of *Achnanthes*.[20] A variety of more common *Achnanthes* species are present in other eelgrass samplings. *Achnanthes bongranii* (which should be spelt *A. bongrainii* (M.Peragallo) Mann 1937: 16, shows up in the molecular sequences. (#319, SILVA-BLAST: Achnanthes bongranii 100%, 2e-179, 95.53%; Achnanthes sp. 100%, 1e-161, 92.02%); Achnanthales (MOL-52-V60, MOL-262-V306); Achnanthales (MOL 104-V121, Planothidium lanceolatum isolate 100% BLAST). Comparing Achnanthales sequences in the March 7, 2021 sampling	2-3	x	x	X SEM, (MOL-c onfid.)	x		SEM, LM, Live, (MOL -confid.)

[19] Names for relative abundance used by Jacob and Noten (1980).
[20] Detailed taxonomic notes are forthcoming. This diatom is placed in the *Achnanthes* taxon since the cells are bent along the transapical axis and broad in the centre girdle view and are monoraphid (Round et al. 1990, Plinski and Witowski 2020: 62). The closest fit to the observed diatoms are a recently described species, *Achnanthes elongata* Majewska & Van de Vijver 2017 found on the carapaces of marine turtles in Costa Rica (Majewska et al. (2017), a variety of *A. groenlandica* (Cleve) Grunow 1880 or possibly an undescribed *Achnanthes* species. A. Witkowski confirms it is similar to

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		against data in BLAST has so far three matches for *A. elongata* (SILVA 546 (BLAST: *Achnanthes elongata*, 688, 100, 0.0, 97.519, MT441502,-could not find in distance tree); SILVA 1632 (96.91% ident.); SILVA 2150 (97.27% ident.), all with poor distance tree results. *Achnanthes spp. show significant close alignments to Achnanthes in BLAST*. #35-SILVA Feb 10-2023: (BLAST: Achnanthidium sp. 98% 2e; Achnanthidium saprophilum 98%, 2e); SILVA # 1453 A. bongranii, (BLAST: Achnanthes bongranii, 608, 608, 100%, 2e-169, 94.04% - poor distance tree alignment). BLAST searches: 33, 37 (95.44% ident), 38, 249, 284, 319 (good), 326, 453, 454, 461, 466, 467 (99.27% ident), 477 97.46% ident.), 479 (98.99% ident.- Halamphora), 481 (98.99% ident. Halamphora), 497, 499, 587 (Achnanthes chlidanos isolate, 483, 74, 1.33e-131, 98.535, KJ658412 (Achnanthes chlidanos has lots of poor quality hits); SILVA 319, Bacillariophyceae, BLAST: Achnanthes bongranii (M.Peragallo) Mann 1937: 16, 100%, 2e-179, 95.53%; Achnanthes sp. 100%, 1e, 92.02%, good distance tree result); SILVA 1453, Coscinodiscophytina_cl (BLAST: Achnanthes bongranii, 608, 608, 100%, 2e-169, 94.04% - 1st in alignments, however, poor distance tree alignment)							
2.	ACTI	***Actinoptychus*** Ehrenberg 1843 *No BLAST hits from the SILVA library of sequences (see Appendix D)*	1				x		LM
3.	AMPH	***Amphora*** Ehrenberg ex Kützing, 1844 *SILVA #477 (BLAST: Halamphora bicapitata* **(**Hohn & Hellerman) Stepanek & Kociolek, 2018 *#477***,** 673, 673, 100%, 0.0e, 97.46%; Amphora coffeiformis, 673, 673, 100%, 0.0e, 97.46%); SILVA #2123, under the taxon Fragilariales --BLAST: Amphora sp. Kützing, F.T. (1844, 634, 634, 100%, 4e-177, 95.24% - good on distance tree results; Amphora_sulcata (MOL-43-V51); Amphora_lineolata (MOL-57-V67); Amphora_abludens (MOL-82-V97) Amphora_helenensis (MOL-221-V256) Amphora_beaufortiana (MOL-331-V386); Amphora_vixvisibilis (MOL-380-V437)	2	x	x	X (MOL-confid.)	x	x	SEM, LM Live (MOL-confid.)

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
4.	ATTH	***Attheya*** T.West, 1860 (MOL-431-V493) SILVA #1108 (BLAST: Attheya longicornis, 427, 427, 98%, 5e-115, 93.68%--Attheya spp. Sequences *show significant close alignments to Attheya sequences in BLAST*); Attheya_decora (MOL-349-V405); MOL 189-V222, 289-V336 Mediophyceae (*Atthyea longicornis*, max score, 98%, 93.33; *A. septentrionalis* same score and percentages, but lower on the list-BLAST); Mediophyceae SILVA #2572 (BLAST: *Attheya longicornis* or *Attheya septentrionalis:* 422, 422, 98%, 2e-113, 93.33%— good on distance tree); SILVA #2573 BLAST: Attheya longicornis & A. Septentrionalis, 416, 416, 98%, 1e-111, 92.98%- excellent distance tree results)	1	x SEM		X (MOL-confid.)			SEM (MOL-confid)
5.	BACI – double check sequences	***Bacillaria*** *Gmelin, J.F. (1791) Bacillariales (MOL-53-V61)* Under Bacillariophyceae - BLAST: Bacillaria paxillifer, 449, 449, 98%, 1e-121, 95.09%); *MOL: Bacillaria paxiillifer* max score & 97% BLAST. Bacillariales (BLAST: 2e-188, 1e-116, 1e-111: Trybionella, Nitzschia and Bacillaria paxillifer in that order—not very specific in the distance tree) Lots of entries for Cylindrotheca_closterium: 1e to 2e (BLAST; SILVA, Cylindrotheca closterium, 98%, 1e, 96.14%); Bacillaria paxillifer (BLAST: B. paxillifer 427, 427, 98%, 5e-115, 93.68%—distance tree results inconclusive) Note: Bacillariales refers to a family that has many genera, including Bacillaria, listed in Appendix A. Others in the family include Cylindrotheca, Nitzschia, Pseudo-nitzschia, Tryblionella, amongst others found in the identified genera.	2	x	x	X (MOL-confid.)	x	x	SEM, LM Live (MOL-confid.)
6.	CAMP	***Campylodiscus*** Kützing 1844 Found on: Zm_MHMPP-Mar 7-2021_slide 1-T42_4Db+c nitric acid (imaged May 2, 2023) (MW). DADA2 sequences: V55 (poor), V386 (moderate-poor distance tree), V452,V515, V2240 SILVA: 242, 434, 438 (too far away on nodes), 588, 2492, 3660, 3716, 2983.	1			X- LM (MOL-Possible)			LM
7.	CHAE	***Chaetoceros*** Ehrenberg 1844 (MOL-1843-V200) Chaetoceros_diadema (MOL-401-V460); SILVA #2580, Chaetoceros cf.wighamii	1			X SEM (MOL-confid.)			SEM (MOL-confid.)

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		BLAST: Chaetoceros cf. wighamii and Chaetoceros sp. 739, 739, 100%, 0.0, 100.00% - excellent distance tree alignment; SILVA #2581, *Chaetoceros convolutes*, (BLAST: *C. convolutus* Castracane 1886 Castracane, 1886, 749, 749, 100%, 0.0, 100.00%- good distance tree alignment); SILVA #2582, Chaetoceros diadema, (BLAST: C. diadema, 745, 745, 100%, 0.0, 100.00%)							
8.	COCC	***Cocconeis*** Ehrenberg 1836 Cocconeis (MOL-20-V24, 100-V117) Bacillariophyceae 243-V282 97%, 93.26%BLAST; #30 SILVA Feb 10-2023 Cocconeis (Cocconeis cf. cupulifera SZCZCH662) 98% 1e-121, 95.01%) (BLAST: *Cocconeis mascarenica* Riaux-Gobin & Compere, 2008, 477, 477, 98%, 5e-130, 96.84%)-good distance tree alignment, better than C. cf. cupulifera); 682-V780-Cocconeis, BLAST: likely C. Cocconeis stauroneiformis, 689, 689, 100%, 0.0, 98.22%; SILVA # 323, BLAST: C. stauroneiformis,— 711, 711, 100%, 0.0, 100.00%—perfect alignment score— and matching the query sequence on the distance tree results.	4	x	x	X (MOL-confid.)	x	x	SEM, LM Live (MOL-confid.)
9.	COSC	***Coscinodiscus*** Ehrenberg, 1839 Coscinodiscus sp on Zm MHMPP-Nov 15-2020-environ-stub 4_m004.tif (Mar 7-2021) MQ-Feb 3, 2022 (not processed); SILVA #1452, Ok alignments for Coscinodiscus granii, 355, 355, 100%, 2e-93, 88.89%.; SILVA #1345, Coscinodiscus granii 457, 914, 100%, 5e-124, 98.83%—which is a perfect match horizontally and node in the distance tree results; -(Mar 12-21_m002_2_edited-1.jpg; Box 8 stub 72b	2		x	X (MOL-confid.)			SEM (MOL-confid.)
10.	CYCL	***Cyclotella*** (Kützing) Brébisson, 1838, nom. et typ. cons. BLAST searches: Weak match with SILVA sequences 2596, 2983, 3731.	1	x					LM
11.	CYLI	***Cylindrotheca*** *Rabenhorst, 1859, nom. cons. (MOL-58-V68)* Cylindrotheca_closterium (MOL-5-V6); #231 SILVA, Feb 10-2023, Cylindrotheca_closterium (BLAST; C. closterium, 98%, 1e-131, 96.14%; 494, 494, 98%, 5e-135, 97.89%); SILVA #328,	2		x	x (MOL-confid.)	x		SEM Live (MOL-confid.)

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		BLAST: Cylindrotheca closterium, 726, 726, 100%, 0.0, 100.00%— excellent alignment score — and excellent result in distance tree results; found under a record “Bacillariophyceae”);)							
12.	DIME	***Dimeregramma*** Ralfs 1861: SILVA #2123, Found in the taxon Fragilariales—BLAST *Dimeregramma minor* var. *nanum* (W.Gregory) Van Heurck 1896, 571, 571, 100%, 3e-158, 92.36%—in the distance tree results; Note: For *Dimeregramma the class is* Bacillariophyceae, the order is Plagiogrammales and the family is Plagiogrammaceae. So, something is not quite right here (same with finding Amphora sp. in the same alignments); #2591, BLAST: *Dimeregramma* sp. SZCZCH437, 747, 747, 100%, 0.0, 100.00%—excellent alignment stats-very good distance tree results, Plagiogramma sp., 747, 747, 100%, 0.0, 100.00%—) Plagiogramma is very slightly closer to the query than Dimeregramma on the distance true results)	1			X (MOL – confid.)			LM (MOL-confid.)
13.	DIPL	***Diploneis*** Ehrenberg ex Cleve, 1894 Diploneis (MOL-379-V436); SILVA #2755, BLAST: *Diploneis vacillans* (A.W.F.Schmidt) Cleve 1894 444, 444, 100%, 5e-120, 94.44%-distance tree results good); SILVA 2755 is very good alignment stats and distance tree results; SILVA #2850, *Diploneis vacillans*, 438, 438, 100%, 2e-118, 94.10%-good distance tree alignment); 1065-BLAST: Diploneis cf. smithii 701, 701,100%, 0.0, 98.73%—very good distance tree results and alignment score)	1	x		X (MOL-confid.)			LM (MOL-confid.)
14.	DITY	***Ditylum*** J.W.Bailey ex L.W.Bailey, 1861 Note: Ditylum external processes and valves are commonly found in the SEM images and slides of cleaned frustules. There are no entries in the molecular data for the Order Lithodesmiales, however 116 entries for the class Mediophyceae. BLAST: Weak matches with SILVA sequences 588, 1627, 1631.	2			X	x	x	SEM, LM
15.	DONK	***Donkinia*** Ralfs, 1861	1			(MOL -uc)	x-uc		Live

No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		Uncertain identification: only one live sample and it looks similar to Pleurosigma directum in valve view. Requires more samples and cleaned. Donkinia possibly showed up in the MOL under Naviculales MOL- 123-V143 BLAST , 100%, 93.42%, 3e-115; BLAST: Donkinia sp. 427, 427, 100%, 5e-115, 93.43%-good result in the distance tree spans. Also, good result for Lithodesmium sp.)							(MOL uc)
16.	ELLE	***Ellerbeckia* Crawford, R. M. 1988.**: (MOL-328-V383). Ellerbeckia_sp. Silva #2983; Ellerbeckia_sp., BLAST #2983; 399, 399, 98%, 1e-106, 91.93%; good on distance tree results; (SILVA #2982-BLAST 98% 2e-108, 92.28%, 98% 1e-101, 90.88%)—best match on a distance tree is a Rhodophyta; *Gayliella sp*.; DADA2 V452, Ellerbeckia_sp., BLAST: 399, 399, 98%, 1e-106, 91.93%, good on distance tree, 2nd node. *Ellerbeckia Stb 1-Zm NA cleaned-MHMPP-Nov 15-20(x500)-TM4000-Dec 29-2020-2.tif; Box 9 16P 23 Feb 2022_m006.tif (Mar 7-2022) RR (unprocessed)-valve view; Ellerbeckia_Zm MHMPP_Mar 7-2021_Box 9 16P_RR (Feb 23 2022)_m006_3.tif*	1		x	X-SEM (MOL-confd.)	x		SEM (MOL- -confd..)
17.	ENTO-Double check sequences	***Entomoneis*** Ehrenberg, 1845 (MOL-452-V515), #3660 SILVA Entomoneis cf. alta (BLAST: 98% 1e-126, 96.14%); found under Surirellales SILVA #3659 (BLAST: Entomoneis sp. strain TA350, 444, 444, 98%, 5e-120, 94.74%)-good distance tree & with lots of Entomoneis sp. listed first on alignments; SILVA 515, top of list 466, 466, 98%, 1e-126, 96.14%, good distance tree and lots of hits.	2	x		X SEM LM (MOL-confid.)	x		SEM (MOL-confid.)
18.	EPIT	**Epithemia** Kützing, 1844: Certain morphological. SILVA #3742 (BLAST: Bacillaria sp. 433, 433, 98%,1e-116, 94.04%; Epithemia sorex Kuetzing 1844, 405, 405, 98%, 2e-108, 92.28%-distance tree shows close to Epithema sorex, but closer to Bacillaria; (BLAST: unknown diatoms, ***Epithemia pelagica*** Schvarcz, Stancheva & Steward, 2022, 468, 936, 100%, 3e-127, 99.61%-very good	1		x	X MOL (UC)			LM MOL (UC)

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		alignment stats, tree distance ok.—uncertain MOL.							
19.	EUCA	***Eucampia*** Ehrenberg 1839	1				X		SEM
20.	ENCY/ CYMB	***Encyonema*** Kützing, F.T. (1834) (freshw only?.) (MOL-548-V620; & #29 98% e2 SILVA-BLAST-Feb 102-23); SILVA #29, BLAST: (Encyonema prostratum 392, 392, 97%, 2e-104, 91.67%—1st in alignments- and on distance tree results, & Or ***Cymbella*** (freshw.)(Mol 224-V260, 222-V258): So far, only a live cell has been imaged and possibly one SEM image. Until cleaned frustules are found, it's generic placement is uncertain. It is unlikely to be *Cymbella* due to its plastid shape and it lacks a large central pyrenoid.[21] Both *Encyonema* and *Cymbella* are reported by Plientz et al. (2003) and Cymbella by Riznyk (1973), Shim (1976) and Tynni (1986) in Salish Sea marine habitats. [Enycyonema present in March 7 samples, confirmed by molecular data-genus only]. The order Cymbellales is also confirmed in molecular data (Mol 224-V260, 222-V258, 280-V326, mostly Cymbella lanceolata & Cymbella cistula); (BLAST: Encyonema silesiacum, 590 590, 100%, 8e-164, 93.70%- very good distance tree results	1			X- (MOL- confid.)		x-uc	SEM Live (MOL- - confid.)
21.	FALL	***Fallacia*** *Stickle et Mann in Round et al. 1990. Fig. 9.* Fallacia (MOL-194-V22); Fallacia laevis (MOL 79-V94,100%, 93.75% BLAST); *Fallacia hodgeana*, #509 SILVA (BLAST:, 100% 0e, 96.28%); 256-V298 Bacillariophyceae (Fallacia litoricola isolate, max score 100%, 98.61% BLAST); *Fallacia litoricola* isolate, max score 100%, 98.26%, same for *F. hidgeana* and *F. bosoensis* at 97.92 and 97.57% respectively found under Bacillariophyceae – BLAST; MOL-297-V347-Bacillariophyceae (Fallacia litoricola isolate, max score 100%, 97.92%, same F. bosoensis and F. hodgeana at 97.22 and 96.88% respectively_ BLAST); Fallacia (BLAST: *Fallacia laevis* Li & Suzuki, 2022, 433, 433,				X- (MOL- confid.)			SEM (MOL- confid.)

[21] Round et al. (1990).

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		100%, 1e-116, 93.75%—distance tree results for *Fallacia sp.* is a good alignment).							
22.	FOGE	***Fogedia*** Witkowski, Lange-Beralot et Metzeltin 1997. Fig. 7-8. Genus not found in any of the SILVA sequences				X LM			LM
23.	FRAG	**Fragilariopsis** Hustedt 1913 Fragilariopsis?-Zm MHMPP-stb-T45 distal-cleaned Mar 7-2021-TM4000-MW-(Sept 4-2021)_013(x4.0k)_2.tif1913 (MOL-444-V507). Fragilariopsis_kerguelensis (O'Meara) Hustedt (MOL-446-V509); BLAST: F. kerguelensis, 460 460, 98%, 5e-125, 95.79%—excellent distance tree results. Fragilariopsis or Nitzschia on Zm stub 20 En-7-medial-Mar 7-2021 (MW) (Aug 24-2021)_035(x3.0k)_2.tif				X- (MOL-confid.)			SEM (MOL-confid.)
24.	GOMP	***Gomphonemopsis*** Medlin, 1986 Gomphonemopsis_pseudoexigua (MOL-449-V512 Gomphonemopsis_pseudoexigua (BLAST: 499, 499, 100%, 1e-136, 97.92%- excellent distance tree result. SILVA #1524, BLAST: Gomphonemopsis pseudoexigua 499, 499, 100%, 1e-136, 97.92%--excellent distance tree result.	4		x	X SEM LM (MOL-confid.)			SEM LM (MOL-confid.)
25.	GOMS	***Gomphoseptatum*** Medlin, 1986 (uc-only one SEM image)_	1			X-uc			SEM (uc)
26.	GRAM	***Grammatophora*** Ehrenberg 1840. Note: This genus is commonly found in samples, however not yet found in the molecular data, yet there 1,507 entries for the Bacillariophyceae in which *Grammatophora is a sub-taxon.*	2		x	X-			SEM LM Live
27.	GYRO-Scan database for any good results	***Gyrosigma*** Hassall, 1845, nom. cons: 96-V91, BLAST: Trachyneis sp., 3rd on list of alignments, 449, 449, 100%, 1e-121, 94.79%—good score, ok distance tree result); (BLAST: *Gyrosigma limosum* Sterrenburg & Underwood 1997 & *Gyrosigma acuminatum* (Kuetzing) Rabenhorst, 699, 699, 100%, 0.0, 97.78%- some gaps, good alignment stats, distance tree is OK.; found in SILVA #279, 349. 407, 449, 500 (good), 576, 597, 671, 672, 673, 674, 676, 1621, 2149, 2692. SILVA 2706,	1		X (MOL-prob.)				SEM (MOL-prob.)

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		Naviculales (BLAST: ***Gyrosigma acuminatum*** (Kuetzing) Rabenhorst, 466, 466, 98%, 1e-126, 96.14%, poor distance tree result, though Gyrosigma was near the top of the matches. Pleurosigma is a better match.							
28.	HALA	***Halamphora*** (Cleve) Mereschkowsky, 1903: SILVA #425, BLAST: ***Halamphora nagumoi*** Stepanek et al. in Stepanek & Kociolek, 2018, 449, 449, 98%, 1e-121, 95.09%—good distance tree results); SILVA *#477 (BLAST: Halamphora bicapitata* (Hohn & Hellerman) Stepanek & Kociolek, 2018, 673, 673, 100%, 0.0, 97.46%; Amphora coffeiformis, 673, 673, 100%, 0.0, 97.46%-very good distance tree results) Halamphora (MOL-174-V205, 218 V252); Halamphora_montana (MOL-354-V410) As we learn to distinguish between *Amphora* and *Halamphora*, more *Amphora* identifications will be moved to *Halamphora*. However, *Halamphora coffeiformis* (formerly *Amphora coffeiformis* appears to be common on all *Z. marina* samplings.	2	x	x	X (MOL - confid.)			SEM (MOL - confid.)
29.	HANZ	***Hanzschia*** Grunow, A. 1877 (*H. vergata,* only one LM image, not enough images). No sequences matching Hanzschia in all SILVA data.	*?*	*X-uc*					LM-uc
30.	HASL	***Haslea*** Simonsen, R. (1974): Haslea on Zm-Mar 7-2021-leaf 4 T42 4Db_c Nit A-E800-MU2003-Mar 25-2022-slide 1-0079a_2.tif; Haslea crucigera_Box 11-Zm Mar 7-2021-stb2 T45 SA1-H2O2-TM4000 MW-Oct 24-2022-24_4(x1).tif *Haslea* (MOL-25-V31); Haslea_howeana or H. avium (MOL-60-V70 BLAST 3e-135) Haslea_howeana (MOL-84-V99); #2734 SILVA Haslea_howeana; Haslea_pseudostrearia (MOL-313-V367); Haslea cf. howeana-BLAST: Haslea cf. howeana, 510, 510, 100%, 5e-140, 98.61% - marginal on distance tree; SILVA 2799, BLAST: Haslea cf. howeana510, 510, 100%, 5e-140, 98.61% excellent alignment score- good on distance tree, however Navicular is slightly closer; 76-V91Haslea nipkowii,455, 455, 100%, 2e-123, 95.14%—ok distance tree, Navicular sp. a				*X LM SEM (MOL-confid.)*			LM SEM (MOL -confid.)

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		bit closer, but Haslea has a better alignment match; 84-V99 (BLAST: H howeana, 510, 510, 100%, 5e-140, 98.61%—excellent alignment scores, top of list, but slightly distant on distance tree results; SILVA 501, SILVA 2710, Haslea, BLAST: 505, 505, 100%, 2e-138, 98.26%—good distance tree results)							
31.	HOBA Search MOL 2022 records (SILVA has been searched)	***Hobaniella*** P.A.Sims & D.M.Williams, 2018: *synonym is Odontella longicrucis-* monogeneric*),* (rare) *July 22, 2021 (Aug. 4, 2020), slide 1a, 0194-0240, slide 1b, 0126-0160. Molecular data confirms Odontella sp. MOL 464-V529,* (BLAST: Odontella sp. 743, 743, 100%, 0.0, 99.75%; Odontella longicruris 722, 722, 100%, 0.0, 99.51%, also V529 , BLAST: ***Ralfsiella smithii*** (Ralfs) Sims, Williams & Ashworth, 2018, 743, 743, 100%, 0.0, 99.75%; Odontella sp. 743, 743, 100%, 0.0, 99.75%; Odontella longicruris 722, 722, 100%, 0.0, 99.51%— O. longicruris found in distance results better than O. aurita.) *which could be Odontella longicrucis = Hobaniella: Hobaniella found in SILVA 2587, Hobaniella longicruris with a 0-e, 98.27% alignment, however distance tree results are stronger for O. aurita.* Conclusion:confident on the genus Hobaniella as it is a synonym for Odontella which is a confident match of sequences.	*1*	*x*		*X-* *LM* *(MOL-* confid. On genus)			LM (MOL-confid. On genus)
32.	HYAL	***Hyalodiscus*** Ehrenberg (1845) Hyalodiscus_scoticus (MOL-70-V82); #2603 SILVA, Hyalodiscus_scoticus; Hyalodiscus_scoticus (BLAST: Podosira stelligera 527, 527, 100%, 5e-145, 99.65%; Hyalodiscus_scoticus 527, 527, 100%, 5e-145, 99.65% — alignment stats and distance tree results are same for *P. stelligera* and *H. scoticus; SILVA #1459* (BLAST: H. scoticus, 779, 779, 100%, 0.0, 100.00%, same stats for Podosira stelligera synonym = H. stelligera — perfect match and distance in distance tree results for both genera/species.)	*2*		*x*	*X-* *SEM* *(MOL-confid.)*	*x*	*x?*	*SEM* LM Live (MOL-confid.)
33.	LEPT	***Leptocylindrus*** Cleve, 1889 Leptocylindrus_danicus (MOL-384-V441); # 2492 SILVA, Leptocylindrus danicus, Leptocylindrus_danicus BLAST: 472, 472, 100%, 2e-128, 96.18%-excellent distance	1			X- SEM confid.			SEM (MOL-confid.

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		tree results ; BLAST: L. danicus 472, 472, 100%, 2e-128, 96.18%—good to excellent distance tree results)							
34.	LICM	***Licmophora*** C.Agardh, 1827, nom. et typ. cons. (MOL-1745-VV189); (BLAST: Licmophora paradoxa and Licmophora abbreviata, 745, 745, 100%, 0.0, 100.00%) Licmophora_paradoxa (MOL-59-V69, 213-V247 100% BLAST) SILVA data has many entries of Limporphora including 2 entries for Licmophora_paradoxa #2494 and 2496; SILVA #2497 BLAST: L. abbreviata 466, 466, 100%, 1e-126, 95.85%—distance tree results good); SILVA # 2127, Licmophora juergensii Agardh 1831 BLAST: L. juergensii Agardh 1831, 47, 747, 100%, 0.0, 100.00%—excellent distance tree results); SILVA 2126, BLAST: Licmophora paradoxa and Licmophora abbreviata, 745, 745, 100%, 0.0, 100.00%-very excellent distance tree results)	2-3			X- SEM (MOL-confid.)	x	x	SEM LM Live (MOL-confid.)
35.	LYRE Need to search through the 2022 database of sequences	***Lyrella*** (Ehrenberg) Karayeva 1978: Lyrella_hennedyi (MOL-216-V250); SILVA 30 is marginal result; SILVA #40, Feb 10-2023 (BLAST, possibly Lyrella_hennedyi 100%, 1e, 93.77%); #2517 SILVA, BLAST: Lyrella_hennedyi 438, 438, 100%, 2e-118, 94.10%, but 1st entry is Petroneis humerosa, 395, 395, 100%, 2e-105, 94.44% with a good alignment score. Next scores are Lyrella, owever, distance tree result for Lyrella is very good, same node as query sequence, much better than Petroneis) ; Lyrella sp_Box 11-Zm Mar 7-2021-stb2 T45 SA1-H2O2-TM4000 MW-Oct 24-2022-39_2(x3.0k).tif	1	x	?	X- LM SEM (MOL-confid.)			SEM LM (MOL-confid..)
36.	MELO	***Melosira*** C. Agardh, 1824, nom. cons. (MOL-916-V101, 11 hits): SILVA #1623, #1622, (BLAST: Melosira nummuloides 656, 656, 100%, 0.0, 96.26% - good to excellent distance tree result); 916-BLAST: Melosira sp.446, 446, 100%, 2e-120, 86.85%—good alignment stats, maybe *Melosira capsularum* Yang & Wang, 2022–but is freshwater); 1263 BLAST: Melosira sp. 446, 446, 100%, 2e-120, 86.85%—top alignment stats-could not find in distance tree, Melosira moniliformis 100% 3e109,	2-3	x	x	X- (MOL-confid.)	x	x	SEM LM Live (MOL-confid.)

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		85.11%—good alignment stats); SILVA 1454, Melosira (BLAST: 736, 736, 100%, 0.0, 99.75%, excellent distance tree results);							
37.	MINI	***Minidiscus*** Hasle, 1973 Minidiscus_trioculatus (MOL-17-V21, 225-V261); SLIVA #3732, Minidiscus_trioculatus (BLAST: T. trioculatus, 483, 483, 100%, 1e-131, 96.88%—good distance tree result); SILVA # 2584 (BLAST: *Minidiscus trioculatus* (F.J.R.Taylor) Hasle 1973749, 749, 100%, 0.0, 100.00% - excellent distance tree results); SILVA #2585, (BLAST: *Minidiscus variabilis* Kaczmarska in Kaczmarska et al. 2009, 749, 749, 100%, 0.0, 100.00%—distance tree reflects close distance to Minidiscus trioculatus.	1			X-SEM (MOL-confid.)			SEM (MOL - confid.)
38.	NAVI	***Navicula** Bory 1822:* individual, chain and tube dwelling species: Navicula_rhynchocephala_var._hankensis (MOL-2-V3_1e-139); Navicula_kongfjordensis (MOL-3-V4); Navicula_perminuta (MOL-6-V9); Navicula_avium (MOL-8-V11); Navicula_pseudacceptata (MOL-44-V52); Navicula_glaciei (MOL-108-V125); Navicula_ramosissima (MOL-141-V166); Navicula_slesvicensis (MOL-167-V197); Navicula_reinhardtii (MOL-415-V475) Navicula_hippodontafallax (MOL-266-V310); Navicula_rhynchotella (MOL-301 V351); Navicula_cari (MOL-302-v352); SILVA # 2147 (BLAST: various species of Navicula. Navicula phyllepta Kützing 1844, 520, 520, 100%, 1e-142, 89.90%—not in the distance tree results. Best tree result is close to Navicula trivialis and *Navicula salinarum* Kolbe 1927; *Navicula perminuta* Grunow, BLAST: N._perminuta, 532, 532, 100%, 1e-146, 100.00%—excellent distance tree result); SILVA 2694, Navicula_rhynchocephala var. hankensis (BLAST: Navicula sp. 532, 532, 100%, 1e-146 ,100.00%, very excellent distance tree results;	4	x	x	X-LM SEM (MOL-confid.)	x	x	SEM LM Live (MOL-confid.)
39.	NITZ	***Nitzschia*** Hassall, 1845, nom. cons.	4	x	x	X-SEM LM	x		SEM LM Live

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No.	Countin g Codes	Genera	Fre que ncy	July- Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		Nitzschia dissipata, #232, #270, SILVA Feb. 10-2023: (BLAST: Nitzschia dissipata, 100%, 1e, 93.77%); Nitzschia_draveillensis (#308, SILVA, (BLAST: 98% 1e); Nitzschia_dubiiformis (MOL-18-V22) & #233 SILVA Feb. 10-2023; Nitzschia frustulum (#252, SILVA, Feb 10-2023: BLAST: 100% 1e; Nitzschia inconspicua ((#252, SILVA, Feb 10-2023: BLAST 100% 1e; Nitzschia_laevis (MOL-85-V101) & SILVA #257, #268 (98%, 2e); Nitzschia_microcephala (MOL-350-V406); Nitzschia placea (#261, SILVA) Nitzschia_promare (MOL-99-V116); #259 SILVA Nitzschia_pumila (MOL-197-V230); Nitzschia_recta (MOL-36-V43); #232 SILVA Nitzschia cf. recta 100%, 1e, 98%; Nitzschia reskoi (#296, SILVA, 98% 1e, 96.14%; Nitzschia_sigmoidea (MOL-38-V45); #235 SILVA, Feb 10-2023 (BLAST: Nitzschia sigmoidea 100%, 1e); Nitzschia_spathulata (MOL-86-V102, 308-V359) & morphology, #269, SILVA (100% 2e); Nitzschia_volvendirostrata (MOL-97-V144); #249, #258 &#265 (2e) SILVA Feb 10-2023; SILVA 232, Nitzschia_dissipata (BLAST: Nitzschia cf. recta 466, 466, 100%, 1e-126, 95.83%, very excellent distance tree results for the genus)				(MOL-- confid.)			(MOL-c onfid.)
40.	ODON	***Odontella*** (Lyngbye) C Agardh Odontella_aurita (BLAST: O. aurita, 516, 516, 98%, 1e-141, 99.30%—excellent alignment and excellent in distance tree result) (MOL-464-V529) Odontella_aurita (MOL-48-V56, MOL 260-V304); SILVA # 2587 BLAST: O. aurita, perfect match in sequence alignment to databases and distance tree)	2	x	x	X- (MOL-c onfid.)			SEM LM Live (MOL-c onfid.)
41.	OPEP	***Opephora*** P. Petit, 1889 Opephora pacifica_Box 11-Zm Mar 7-2021-stb2 T45 SA1-H2O2-TM4000 MW-Oct 24-2022-10_3-(x2.0k).tif. Opephora sp. #431, SILVA, Bacillariophyceae (BLAST: Opephora sp., 494, 494, 100%, 5e-135, 97.57%-excellent	2-3	x	x	X- SEM LM, (MOL-c onfid.)			SEM, LM, (MOL-c onfid.)

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		distance tree match); Bacillariophyceae (BLAST: Opephora sp. 532, 532, 100%, 1e-146, 100.00%, very excellent distance tree result); SILVA 2130, 499, 100, 1.01e-136, 97.917, KR048204, Opephora sp. SZCZCH153 good alignment stats; SILVA 2132, 516, 100, 1.01e-141, 98.958, KR048204, Opephora sp. SZCZCH153; Note: It is possible that some of the *Opephora* observed are similar looking species of *Serratifera* and *Gedenella* found in the molecular data, but not yet confirmed by morphology.							
42.	PARA	***Paralia*** Heiberg, 1863 Note: This genus is commonly found in samples, can even be seen at 50x SEM overview images, however it has not been found in the Feb. 25, 2022 molecular data. Yet there are 8 entries for the class Coscinodiscophyceae in which *Paralia is a sub-taxon.* #1345 SILVA = Paralia sulcate. Sequence data using BLAST on Coscinodiscophyceae (98-V115) gave only readings for the genus Paralia (taxid:216907 & 216927): query cover of 100% for Paralia sulcate and 85% for Paralia fenestrata.; 1405-V153, BLAST: Paralia longspina or Paralia sulcata, 100%, e0, 99.75% ident; Paralia sulcata, 473, 947, 100%, 5e-129, 100.00%; SILVA #1458, (BLAST: Paralia longspina. 741, 741, 100%, 0.0, 99.75%—excellent alignment and excellent distance tree results.	2	x		X (MOL-c onfid.)			SEM (MOL-- confid.)
43.	PARI	***Paribellus*** Cox 1988. Fig. 10.: Parlibellus_delognei_f._ellipticus (MOL-49_V57); SILVA 2693; Parlibellus_protracta (BLAST: Prestauroneis integra, 468, 468, 96%, 3e-127, 96.79%—uncertain tree placement for the genus) Parlibellus_protracta (MOL-145-V170); SILVA # 2732 Parlibellus_delognei_f._ellipticus (BLAST: *Parlibellus delognei* f. *ellipticus* (Lobban) E.J.Cox, 499, 499, 98%, 1e-136, 98.25%—distance tree results are excellent)		X		*(MOL* -confid.)			LM (MOL-c onfid.);
44.	PERI	***Periraphis like**. (Periraphis nom. nud.).* Previously listed as *Catenula-Catenulopsis*, but it's taxonomic placement is still	2-3			*X-uncer-t ain taxon-omi c*			SEM

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		uncertain but moving closer to a new genus called *Pairaphis*.[22] SILVA 320, BLAST: Catenulaceae sp., 725, 725, 100%, 0.0, 100.00%—Pinnularia sp. has same excellent alignment stats, then less exact fits are Halamphora, Amphora, Diploneis, and Brachysira. On distance tree results, this sequence is close to Biremis sp. and Diploneis sp.)				*place-me nt*			
45.	PETR	***Petroneis*** A. J. Stickle & D. G. Mann, 1990 Showed up SILVA #2517, BLAST: under Lyrella_hennedyi, but 1st significant alignment is Petroneis humerosa P. humerosa, 395, 395, 100%, 2e-105, 94.44% with a very good alignment score and an excellent horizontal distance tree result by eliminating other diatoms from the search); SILVA #37, P. humerosa, Max score 444, Total Score 100%, 3e-120 & Per. Ident. 94.44%, very good distance tree result.; SILVA #287, BLAST Petroneis humerosa, 462, 462, 100%, 2e-125, 94.44%)	1-2	x		*X (MOL-* confid.)			LM (MOL-c onfid.))
46.	PLAGG	***Plagiogramma*** Greville, 1859 (MOL-2059-V223, e value 0.0) *Plagiogramma on Zm MHMPP-Mar 7-2021-Box 1b T32_6 _1Mb_c MQ-Mar 29-2022_m003_2.tif* Plagiogramma tsawwassen 100%, 92.01% BLAST); SILVA #2591 BLAST: Plagiogramma sp., 747, 747, 100%, 0.0, 100.00%—for sure #2591, BLAST: *Dimeregramma* sp. SZCZCH437, 747, 747, 100%, 0.0, 100.00%—excellent alignment stats-very good distance tree results, Plagiogramma sp., 747, 747, 100%, 0.0, 100.00%—) Plagiogramma is very slightly closer to the query than Dimeregramma on the distance true results)	*1*			*X- (MOL-c onfid.)*	*x*		*LM SEM (MOL-c onfid.)*
47.	PLAGT	***Plagiotropis*** Pfitzer, 1871, nom. illeg. *Plagiotropis* sp. MOL 220-V255, BLAST: Plagiotropis sp. strain 450, 450, 100%, 6e-122, 93.75%- -alignment score is OK,match for query sequence. SILVA 379, Bacillariophyceae (BLAST: Plagiotropis sp., 433, 433, 100%, 1e-116, 93.75%, 1st in alignment score, uncertain, distance tree result is not confid.;	*2*	*x*	*x*	*X (MOL-prob.)*			*SEM LM Live (MOL-pr ob.)*

[22] A. Witkowski, 2022, pers. commun.

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
48.	PLAN	***Planothidium*** Round and Bukhtiyarova 1996. Fig. 1-3, 5-6 (MOL-584-VV657); MOL4-**V5** Planothidium lanceolatum strain D16_002 (98% BLAST_2e-108); #33, SILVA, Feb 1—2023: Planothidium sp. BLAST: 98% 1e, Pauliella_taeniata 98% 1e); #39, SILVA, Feb 10-2023 (BLAST-Planothidium lanceolatum 100%, 2e); SILVA # 582, BLAST: Planothidium sp. SZCZCH26, 717, 717, 100%, 0.0, 99.00%—excellent distance tree results); SILVA # 335, BLAST: *Planothidium lanceolatum* (Brebisson ex Kuetzing) Lange-Bertalot 1999, homotypic synonym: *Achnanthidium lanceolatum, 434, 434, 100%, 6e-117, 93.40%—perfect alignment score, excellent alignment result and distance tree results have excellent horizontal results for many Achnanthidium sp.); SILVA 467,* Bacillariophyceae. BLAST: Planothidium confid. and excellent distance tree results)	*1-2*			*X (MOL-confid.)*			*SEM (MOL--* confid.)
49.	PLEU	***Pleurosigma*** W. Smith, 1852, nom. et typ. cons. (MOL-55-V64-BLAST: (BLAST: Pleurosigma sp. 477, 477, 100%, 5e-130, 96.53%)—for sure. Distance tree good. Maybe *P. stuxbergerii* isolate; SILVA #671, Pleurosigma intermedium var. mauritianum (Grunow ex Cleve) M. Peragallo 1903 (BLAST: 743, 743, 100%, 0.0, 99.75%, distance tree results excellent and close to query sequence).	2		x	X (MOL-*confid.)*			SEM LM Live (MOL-*confid.)*
50.	PODO	***Podosira*** Ehrenberg, 1840: *(morphologically confirmed, with one exterior and one interior valve views; Podosira sp_Zm MHMPP(Mar 7-2021-Box 1b Stub T32-7 March 31 2022_m021_2.tif, Podosira sp-Zm, MHMPP-Mar 7-21-T57 9D C H2O2 Hot-TM4000-before(x2.0k) July 23-2021-ECH_2.tif SEM images from March 7, 2021 and an LM live image from Oct 2020): There is confident molecular evidence for it being in the Mar. 7, 2021 eelgrass sample. MOL-98-V115,* BLAST: 405, 405, 100%, 2e-108, 92.01%, 1st alignment line, good distance tree result, *under* Coscinodiscophyceae = *Podosira baldjickiana* Sequence data under Coscinodiscophyceae : 98-V115 = Podosira baldjickiana 405, 405, 100%, 2e-108,	1		x-uc	SEM-uc (MOL-*confid.)*			SEM, Live, (MOL-*confid.)*

No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		92.01%—Abe,K., Lam,D.W., Ashworth,M.P., Harwood,D.M. and Jordan,R.W. (2022). Observations on Praecorethron crawfordii gen. et sp. nov. (Corethrales, Bacillariophyceae) from Upper Cretaceous marine sediments, southwest Pacific. Nova Hedwig Beih 151 (2022) In press; SILVA #1452, *Podosira baldjickiana* (BLAST: *P. baldjickiana* Grunow, 1888, 405, 405, 100%, 2e-108, 92.01%-good distance tree alignment); SILVA #2603 under Hyalodiscus_scoticus-BLAST: Podosira stelligera 527, 527, 100%, 5e-145, 99.65% & Hyalodiscus_scoticus 527, 527, 100%, 5e-145, 99.65% —alignment stats and distance tree results are same for *P. stelligera* and *H. scoticus)*.; SILVA 705, Bacillariophyta (BLAST: ***Podosira baldjickiana*** Grunow, 1888, 399, 399, 100%, 1e-106, 91.67%, very good distance tree result)							
51.	PSAM	***Psammodictyon*** D. G. Mann, 1990 Psammodictyon (MOL-403-V462); Psammodictyon sp. (#310, SILVA-Feb 10, 2023 Psammodictyon_sp. (BLAST: Psammodictyon panduriforme var. continuum, 516, 516, 98%, 1e-141, 99.30%—excellent top alignments scores with multiple entries and very excellent distance tree results to query seq.) Note: only one entry record to date with 15 hits.	1-2			X SEM (MOL -confid.)			SEM (MOL -confid.)
52.	PSEUG	***Pseudogomphonema*** Medlin 1986 Pseudogomphonema_kamschaticum (MOL-12-V15. 20 entries in the SILVA molecular data, e.g. #2701. Entries in the orginal Mol data have generated a species name with an 2e value, i.e.: Pseudogomphonema_kamschaticum (BLAST: 521, 521, 98%, 2e-143, 99.65%); SILVA #2701, BLAST: P. kamschaticum, 521, 521, 98%, 2e-143, 99.65%-top 3 alignments and excellent score and excellent distance tree result); Navicula (BLAST: Pseudogomphonema sp. LM-2002, 726, 726, 100%, 0.0, 99.25%, excellent distance tree result);	4		x	X (MOL -confid.)			SEM LM (MOL-co nfid.)
53.	PSEUN	***Pseudo-nitzschia*** H. Peragallo, 1900 Note: found in the molecular data, SILVA 1333, BLAST: Pseudo-nitzschia	1-2	x		(MOL -confid.)			SEM (MOL -confid.)

No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		hainanensis Chen & Li, 2021, 427, 855, 99%, 4e-115, 96.86%—top of list, OK to good alignment, fair distance tree results; SILVA 487, Bacillariophyceae_fa (BLAST: Bacillaria sp. and B. Bacillaria paxillifer, 737, 737, 100%, 0.0, 99.50%—very excllent on distance tree results); There are 158 entries for the genus Bacillaria in which *Pseudo-nitzschia is closely related. Pseudo-nitzschia was found under a search of a sequence for SILVA #302,* Nitzschia_microcephala, BLAST- found Pseudo-nitzschia way down the list: 411, 411, 98%, 5e-110, 92.63%—but good alignment score and shows up somewhat distant and many nodes away on the distance tree-PDF file saved of the tree. *Pseudo-nitzschia was only seen on Aug. 4, 2020 Z. marina leaves. Also shows up in SILVA #275, but far down the alignment list.and could not find in distance tree results;* SILVA #484, (BLAST: Pseudo-nitzschia sp. 702, 702, 100%, 0.0, 98.26%—found far down the alignment list, but stats are good; SLIVA #485 BLAST: Bacillaria sp. and B. Bacillaria paxillifer, 737, 737, 100%, 0.0, 99.75%—very good on distance tree, Pseudo-nitzschia sp. 686, 686, 100%, 0.0, 97.51%; SILVA # 487, BLAST: Bacillaria sp. and B. Bacillaria paxillifer, 737, 737, 100%, 0.0, 99.50%—very good on distance tree, Pseudo-nitzschia sp. 691 691 100% 0.0, 97.76%- far down in the alignment runs.							
54.	RHAB	***Rhabdonem**a* Kützing, 1844, nom. cons.: Aug 4, 2021 slide 1b E800 cleaned 0076-0101, valve view. MOL-259-V302 Found under Fragilariophyceae (BLAST: Rhabdonema arcuatum, 521, 521, 98%, 2e-143, 99.65%—good alignment at the top of the list, excellent distance tree results) Not found yet in the SILVA molecular data; Fragilariophyceae (BLAST: ***Rhabdonema arcuatum*** (Lyngbye) Kuetzing 1844, 521, 521, 98%, 2e-143, 99.65%, very excellent distance tree results)	2	x	x	X-(MOL-confid.)	x		Live LM (MOL -confid.)
55.	RHIZ	***Rhizosolenia*** Brightwell, 1858, nom. et typ. Cons; *Rhizosolenia* was not listed in the MH table of sequences from Feb 25, 2022. *Rhizosolenia* is found in the SILVA	2			(MOL-uc)	x		SEM LM (MOL-uc)

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		molecular data in three sequences: 350, 369 and 371; all three sequences give poor alignment and distance tree results. Found distantly in SILVA 2755.							
56.	RHOI	***Rhoicosphenia*** Grunow, 1860: Bacillariophyceae_fa SILVA 519, BLAST: Rhoicosphenia cf. abbreviata, 715, 715, 100%, 0.0, 99.24%—3 base pair difference to query seq., top of alignment list and top 12, excellent distance tree result. Note: Rhoicosphenia is one of the most abundant diatoms on *Z. marina* medial and distal sections, however to date, only one molecular sequence hit with excellent and confid. stats has been found and all the diatom sequences in SILVA have been reviewed. Another sequence, SILVA 2755 is all low quality matches.	4	x	x	X (MOL-confid.)		x	SEM, LM, Live, (MOL -confid.)
57.	RHOP	***Rhopalodia*** O. Müller, 1895, nom. cons. (unconfirmed-only one image). No sequence matches found in all of the SILVA data.	*1*		*x-uc*				*LM-uc*
58.	SHIO	***Shionodiscus*** Alverson, A.J., Kang, S.-H. & Theriot, E.C. (2006): SILVA #2583 Thalassiosira (BLAST: Minidiscus sp. & Thalassiosira bioculata (Shionodiscus is the strongest match and in distance tree results, 749, 749, 100%, 0.0, 100.00%—more hits for T. bioculata and excellent results for T. bioculata, however T. oestrupii (Shionodiscus oestrupii) and Shionodiscus biocultus are equal for distance result and very excllent in distance tree result. Shionodiscus species are common in the Salish Sea.				(MOL -confid.)			(MOL -confid.)
59.	SKEL	***Skeletonema*** Greville, 1865, nom. et typ. cons.(MOL-2149-V232) Skeletonema_costatum (MOL-39-V47, 219-V254); SILVA #2592 (BLAST: S. costatum or S. marinoi; 745, 745, 100%, 0.0, 100.00%); SILVA 2593, 2594, 3727 are also excellent matches; 39-V47 (BLAST: S. costatum, 527, 527, 100%, 5e-145, 99.65%—excellent alignment score and excellent distance tree results)	2	x		X (MOL -confid.)	x		SEM (MOL -confid.)
60.	STEP Double check	***Stephanopyxis*** Ehrenberg, C.G. (1845) (synonym Eupyxidicula Blanco, S. & Wetzel, C.E. (2016))	1			X (MOL-prob.)			SEM (MOL-prob.)

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
	sequenc es	*(MOL-1405-V153,* Stephanopyxis, 608, 608, 100%, 2e-169, 93.84%; DADA2-V1536, V2169, V2120, V3190, V1039 (all mediocre quality matches. *(S. turris and S. nipponicca are commonly observed diatoms in Trincomali Channel, Galiano Island waters) MOL (1st sheet) SEM- March 7, 2022 T32_7 (RR-Mar. 16-2022): SILVA #1458, BLAST:* Stephanopyxis, 608, 608, 100%, 2e-169, 93.84%—good for distance tree results.							
61.	TABU	***Tabularia*** (Kützing) D.M.Williams & Round, 1986 (MOL-1298-V141) Tabularia_tabulata (MOL-45-V53, and a close match to 287 V334); 3 species that have been identified by morphology are also in the MOL data as Fragiaria (MOL: *MOL-748-V831* Fragilaria (BLAST: Tabularia sp. 100% 0e, 99.75; Tabularia laevis 100% 0e, 99.75; Tabularia tabulata 100%, 0e, 99.75; T. fasiculata 100%, e0, 98.77%; Also for SIVA searches, e.g. #2160, Tabularia.; (BLAST: Tabularia sp. 741, 741, 100%, 0.0, 99.75% excellent alignment scores in top 4 and excellent distance tree results. 100% 0e, 99.75; Tabularia laevis 100% 0e, 99.75; Tabularia tabulata 100%, 0e, 99.75; T. fasiculata 100%, e0, 98.77%)	4	x	x	X SEM LM (MOL -confid.)	x	x	SEM, LM, Live, (MOL -confid.)
62.	THAL	***Thalassiosira*** *Cleve, 1873* SILVA, #3724, BLAST: Thalassiosira sp. 527, 527, 100%, 5e-145, 99.65%-good alignment on distance tree); Thalassiosira (MOL 252-V293) Thalassiosira_antarctica SILVA #3739-BLAST: Thalassiosira angulata Max Score 483, Total Score 483, 100%, 1e-131, 96.88%; Thalassiosira antarctica Max Score 483, Total Score 483, 100%, 1e-131, 96.88%-slighty far away in the distance tree); SILVA # 3730- Thalassiosira_minima (BLAST: doubtful it is T. minima, closer to T. antartica, or better Thalassiosira) Thalassiosira_nordenskioeldii (MOL-19-V23); SILVA #3741, BLAST: T. nordenskioeldii, 527, 527, 100%, 5e-145, 99.65%-excellent distance tree alignment); Thalassiosira_angulata (MOL-41-V49); Thalassiosira_eccentrica (MOL-115-V135); SILVA #2602, Thalassiosira (BLAST: T. *eccentrica*, 749, 749, 100%, 0.0, 100.00%	2	x	x	X (MOL -confid.)			SEM, LM, (MOL -confid.)

No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		& *T. minima* 749, 749, 100%, 0.0, 100.00%—same alignment stats and same distance tree results-excellent); Thalassiosira_pacifica (MOL-191-V224); Thalassiosira_oceanica (MOL-381-V438); Thalassiosira_minima (MOL-429-V491); Thalassiosira_spinulifera (MOL-430-V492); (BLAST: Thalassiosira hendeyi, 527, 527, 100%, 5e-145, 99.65%-good alignment on distance tree, but sits very close to *Thalassiosira anguste-lineata;* BLAST: *T. tenera*, 505, 505, 100%, 2e-138, 98.26% —good alignment in distance tree)*;* (BLAST: Thalassiosira sp. 494, 494, 100%, 5e-135, 97.57%; *Thalassiosira decipiens* (Grunow) E.G.Jrgensen 1905, 488, 488, 100%, 2e-133, 97.22%; SILVA #3735. *Thalassiosira antarctica* Comber 1896: 491, pl. 11, 488, 488, 98%, 2e-133, 97.54%—closest alignment in the distance tree); SILVA # 3728, Thalassiosira_angulata (BLAST: T. baltica. 521, 521, 98%, 2e-143, 99.65%, T. angulata 499, 499, 100%, 1e-136, 97.92%).							
63.	TRAC	***Trachyneis*** Cleve, P.T. (1894): SILVA 2786, BLAST: Trachyneis sp., 472, 472, 100%, 2e-128, 96.18%, good alignment stats, but Navicula and Gyrosigma have better results on the distance tree; SILV 2832, BLAST: Navicular sp, best matches; Trachyneis sp., 445, 445, 100%, 2e-123, 95.14%, good alignment stats, but Navicula and Gyrosigma have better results on the distance tree results. MOL-76-V91 (possible): Naviculales (Haslea nipkowii, max score, 100% & 95.15; Trachyneis sp., 100%, 94.79%, but high e value of 7e-122 BLAST; SILVA 373, BLAST: Trachyneis sp., 422, 100, 2.24e-113, 93.056, KX981824; Also found in SILVA 702, 2706, 2750, 2751, 2772, 2777, 2778, 2786, 2788, 2790, 2791, 2797, 2801, 2803, 2810, 2833 (good one); SILVA 2731, BLAST: Trachyneis sp 449, 100, 1.04e-121, 94.792, KX981824, close match to sequences, however distance tree is unreliable for Trachyneis. Distinctive morphology. Not yet conclusively found in the molecular data,	2	x	x	X-(MOL-prob.)			LM Live, (MOL--prob.)

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		however, note there are only 2 entries for Trachyneis in BLAST.							
64.	TRIG	***Trigonium*** Cleve, P.T. (1867) Not found in a search of all the SILVA molecular sequences.	2			X			Live
65.	TRYB	***Tryblionella*** W. Smith, 1853[23] SILVA #299, BLAST: Tryblionella sp. and T. apiculata, 499, 499, 98%, 1e-136, 98.25%, 1st, 10x alignments are Trybionella species all excellent results, excellent distance tree results; Tryblionella_gaoana (MOL-81-V96; BLAST: 494, 494, 98%, 5e-135, 97.89% or 399, 399, 98%, 1e-106, 91.93%-- Stats and distance tree indicates it could be *Nitzschia ligowskii*. ; SILVA #251, Feb 10-2023 (BLAST: *Tryblionella gaoana,* 494, 494, 98%, 5e-135, 97.89% (*Tryblionella gaoana* Witkowski & Chunlian Li 2016: 191, figs 3 i, 15) or equally BLAST = *Nitzschia ligowskii* Witkowski, Lange-Bertalot, Kociolek & Brzezinska 2004: 584-586, figs 26-81—both are equal for excllent quality on the distance tree results; Tryblionella_apiculata (MOL-443-V506, 309-V360), #299, SILVA, 98%, 1e); Tryblionella queries matche many sequences in BLAST, however the best one is #251.	2			X (MOL -confid.)	x		SEM LM, (MOL -confid.)
66.	UNDA	***Undatella*** Paddock & P.A.Sims, 1980 (occasionally observed, however it's taxonomic placement is uncertain): Only one hit for the entire SILVA, #239, BLAST: 355, 100, 2.30e-93, 88.966, KX981831, Undatella quadrata isolate, --poor on distance tree and poor stats for alignment.	2	x-uc	x-uc		x-uc		SEM (uc) LM (uc)
		Recently Identified Diatoms from Known Genera							
	NAVI	*Navicula cf. cancellata Donkin 1872 (girdle view) (Unknown diatom on Zm stub*	1			x			SEM

[23] A guide to distinguishing these two genera is forthcoming.

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		20_Ma En March 7-2021 (MW)_003(x1.5)_3.tif). Fig. 13.							
	NAVI	*Navicula directa (*Unknown diatom-on ZM MHMPP-T56 9M_B H2O2-TM4000-(MQ-July 29-22 (x1.2k)_2.tif) Fig. 14.	1			x			SEM
	NAVI	*Navicula cf. perminuta: Unknown diatom Zm-MHMPP Mar 7-2021 stb 9M RT-H2O2-TM4000_MW Sept 6-2021_011_3.tif* Appears to be common on March 7, 2021 leaf sections *Fig. 15.*	1-2			x			SEM
		Unidentified Genera							
	UNKN	*Unknown raphid diatom: a) unknown raphid on Z marina-Mar 7-2020-T45 leaf#5 Da+c slide 3 SA1b-E800-MU2003-Mar 29-2021-0052_3.tif & unknown raphid on Z marina-Mar 7-2020-T45 leaf#5 Da+c slide 3 SA1b-E800-MU2003-Mar 29-2021-0001(1)_3.tif* Figs. 11-12.				x			LM
		Genera identified from Molecular Data (ITS and RCLB, Jan. 2022 from							

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		Parfrey Lab) not yet reported by microscopy. Must have good BLAST e values, alignment stats and strong distance tree results (confident, probable and and weak)							
1.	ACHNA	***Achnanthidium:*** has 8 hits in the molecular data: SILVA #35, (BLAST: Achnanthidium sp. 98% 2e-118 (possible); Achnanthidium saprophilum 98%, 2e, *Achnanthidium minutissimum* Kuetzing) Czarnecki—good alignment stats and best on distance tree results). (MOL-35-V42, (BLAST_2e-113); SILVA 490 (BLAST: *Achnanthidium spp*.-A. cavitatum 689, 689, 100%, 0.0, 98.22%—good on distance tree result, but *Cocconeis stauroneiformis* is #1 on alignment stats, followed by 6 *Achnanthidium* x 4 different species); SILVA #564 BLAST: Achnanthidium *ovatum* Watanabe & Tuji, 689, 689, 100%, 0.0, 98.22%—distance tree results oK); SILVA # 584, BLAST: *Achnanthidium daonense* (Lange-Bertalot) Lange-Bertalot, O.Monnier & L.Ector in Monnier et al. 2007, 684, 684, 100%, 0.0, 97.97%-poor distance tree result, though on the tree; SILVA # 335, BLAST: *Planothidium lanceolatum* (Brebisson ex Kuetzing) Lange-Bertalot 1999, homotypic synonym: *Achnanthidium lanceolatum, 434, 434, 100%, 6e-117, 93.40%—perfect alignment score, excellent alignment result and distance tree results have excellent horizontal results for many Achnanthidium sp—can no longer find these strong scores and excellent distance tree results-**possible**); SILVA 490,* BLAST: Achnanthidium spp.-A. cavitatum 689, 689, 100%, 0.0, 98.22%—good on distance tree result, but Cocconeis stauroneiformis is #1 on alignment stats, followed by 6 Achnanthidium x 4 different species) — very possible, but not certain in distance tree results; Bacillariophyceae (BLAST: ***Achnanthidium daonense***(Lange-Bertalot) Lange-Bertalot, O.Monnier & L.Ector in Monnier et al. 2007, 678, 678, 100%, 0.0, 97.72% (1st hit. Acnanthes is 2nd hit, the many Achnanthidium sp. - distance tree is good for Achnanthidium sp.)				MOL-co nfid.			(MOL confid.

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
2.	ARCO	***Arcocellulus****: SILVA 2856;* (BLAST: 749, 749, 100%, 0.0, 100.00%)*; MOL-1158-V127* (BLAST e value 0.0, but Minutocellus has an equal e-value and score); Arcocellulus_mammifer (Mol-440-V503_BLAST 3e-135, but best hit is an unidentified uncultured microorganism with an e value of 2e-138); SILVA #1521-BLAST: Arcocellulus sp., 494, 494, 100%, 5e-135, 97.57%-not in distance tree' SILVA #2586, (BLAST: Best distance tree result is *Minutocellus sp*. 749, 749, 100%, 0.0, 100.00%, alignment is ***Minutocellus* cf. *polymorphus*** (Hargraves & Guillard) Hasle, Stosch, & Syvertsen; less possible is ***Arcocellulus cornucervis*** G.R.Hasle, H.A.von Stosch & E.E.Syvertsen 1983, 749, 749, 100%, 0.0, 100.00%-good distance tree results and so is ***Minutocellus polymorphus*** (Hargraves & Guillard) Hasle, Stosch, & Syvertsen with the same alignment stats); SILVA 2586, BLAST: *Arcocellulus cornucervis* G.R.Hasle, H.A.von Stosch & E.E.Syvertsen 1983, 749, 749, 100%, 0.0, 100.00%-excellent alignment stats and very excellent distance tree results)				MOL- very strong-probable			MOL- - very strong-probable
3.		*Asterionella*: has decent % identity scores with sequences 1290 (weak), 1292 (weak), 1317 (weak), 1328 (weak) although it appears lower down the list for all. Weak match with sequences 2164, 2166, 2167, 2495, 2575.				MOL- weak			MOL - uc
4.		***Bacterosira*** Gran 1900 *(Basonym; Thalassiosira constrica*: SILVA #3745 BLAST: *Bacterosira constricta* (Gaarder) J.S.Park & J.H.Lee 2016: 11, 521, 521, 98%, 2e-143, 99.65%-good alignment in distanced tree)				MOL- possible			MOL- possible
5.	done	***Berkeleya***: Berkeleya sp. MOL 109-V126-100%, 100% BLAST_3e-120 to 7e-147) found in Bacillariophyceae -uncertain: Achnanthales (Planothidium 98%, 93.33%or Berkeleya sp. 100%, 93.06% BLAST). #29-Berkelya sp. 98% e2 (SILVA & BLAST-Feb 10-2023-close in distance tree, but not certain); #31 SILVA (BLAST-Berkeleya sp. 100% 1e-116);				MOL- strong			MOL- strong

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		(BLAST: Berkeleya fennica, 516, 516, 98%, 1e-141, 99.30%)							
6.		***Biddulphiopsis:*** Stosch, H.A. von & Simonsen, R. (1984) Biddulphia alternans, 217-V251, 2e-116 Very uncertain, though occassionally found in Trincomali Channel marine plankton samples. Family: Biddulphiaceae. Round et al. 1990: 248-249.				MOL			MOL uc
7.		***Cymbellales*** (Order): is showing up in the molecular data (Mol 224-V260) However, Staurophora sp. Max score, 98%, 2e-133, 97.54% per. Ident.- marine and brackish waters. 222-V258 is the closest fit under Cymbellales. Bacillariophyceae (*Cymbella lanceolata*, *Cymbella cistula* 98%, 95.45% 2e-123; Gomphonella olivacea 98%, 95.09% high e value of 7e-122 BLAST).				MOL			MOL uc
8.		***Cymbellonitzschia:*** SILVA 284, BLAST: Cymbellonitzschia banzuensis isolate, 433, 99 1.03e-116, 94.035—good distance tree result; 98%, 94%, low e value of 7e-117 BLAST, Tokyo Bay, Japan)-**unlikley**				MOL-uc			MOL-uc
9.		***Cymbopleura sp.:*** (Freshwater only?) max score 98%, 94.39%, 2e-118 found under Bacillariophyceae – BLAST. In this search, both Planothidium and Achnanthidium have higher e-values at 1e-116.				MOL-uc			MOL-uc
10		***Eunotia sp***.: (BLAST: likely Eunotia sp. 488, 488, 100%, 4e-133, 87.13%-lots of sequences matches for Eunotia. However far away on the distance tree results, but good indication.)				Mol -uc			MOL -uc
1	EXTU	***Extubocellulus:*** Extubocellulus_spinifer (MOL-77-V92); Extubocellulus_cribriger (MOL-251-V292); #1519, SILVA, Extubocellulus_spinifer, (BLAST: Extubocellus sp. 505, 505, 100%, 2e-138, 98.26%-very good distance tree results);; #1520, SILVA Extubocellulus_cribriger - BLAST: E. cribriger, 527, 527, 100%, 5e-145, 99.65–very good distance tree results); 251 V292 (BLAST: E._cribriger 548,				MOL -confid.			MOL-confid. - -certain

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		548, 100%, 2e-151, 99.65%—very good distance tree result)							
12	FRAG	***Fragilaria:*** *there are 6 entries in the molecular data for this genus:* *SILVA #2124,* Fragilaria (BLAST: Fragilaria striatula Lyngbye 1819 (*Grammonema striatula*-not accepted by AlgaeBase- https://www.diatombase.org/aphia.php?p=taxdetails&id=968692), 745, 745, 100%, 0.0, 100.00%—excellent distance tree results; SILVA #2125 Fragilaria (BLAST: *Fragilaria* striatula entered as *Grammonema striatula,* 739, 739, 100%, 0.0, 99.75%—excellent distance tree results); SILVA #2133, BLAST: Fragilaria sp. 510, 510, 100%, 5e-140, 98.61%); SILVA #2151 BLAST: Fragilaria striatula entered as Grammonema striatula, 739, 739, 100%, 0.0, 99.75%—good distance tree results); *(i.e. MOL-748-V831* Fragilaria (BLAST: Tabularia sp. 100% 0e, 99.75; Tabularia laevis 100% 0e, 99.75; Tabularia tabulata 100%, 0e, 99.75; T. fasiculata 100%, e0, 98.77%; *MOL- 1087-V119, MOL 287-V-334: 748, 1087, 1317, 1741, 1943 and 3214) (are these the Tabularia that have clear central areas? The raw molecular data showed Tabularia spp. As well as Tabularia tabulata)*				MOL-confid.			MOL-confid.
13	GEDA	***Gedaniella*** Chunlian Li, A. Witkowski & M.P. Ashworth, 2018: Gedaniella_panicellus, BLAST: ***Gedaniella panicellus*** *SZCZCH1350* Chunlian Li, Yu & Witkowski 2018, 532, 532, 100%, 1e-146, 100.00%, excellent distance tree result for genus and species; Gedaniella SILVA #2131; BLAST: Gedaniella paucistriata 518, 518, 100%, 3e-142, 98.96%; Gedaniella_mutabilis 516, 516, 100%, 1e-141, 98.96%); Gedaniella (MOL-102-V119); Gedaniella_mutabilis (MOL-117-V137); Gedaniella_panicellus (MOL-250-V291); #2137, SILVA (BLAST: Gedaniella 100% 1e, 93.77, Nanofrustulum 100%, 2e, 94.10%; SILVA # 2138, BLAST: G. panicellus, 516, 516, 100%, 1e-141, 98.96%—good distance tree results); SILVA #2131BLAST: Gedaniella sp. 444, 444, 100%, 5e-120, 94.44%-good distance tree				MOL-confid.			MOL-confid.

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No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		results); 28-V35, possibly Gedaniella boltinii SZCZP,416, 416, 100%, 1e-111, 92.71%, though 12 down the list of alignments, but ok for distance tree results)							
14		***Gomphonella:*** *Gomphonella olivacea:*, 98%, 5e and 2e = *Gomphonema olivaceum* (Hornem.) Bréb. 1838 (Hofmann et al. 2013, Levkov et al. 2016); #438, SILVA, *Gomphonella olivacea*, 98%, 2e, 1e)				MOL-uc			MOL-uc
15		***Grammonema (needs investigation of number of hits and what it looks like-see*** Fragilaria striatula***)*** (Agardh, C.A. (1832). Conspectus Criticus Diatomacearum. Part 4. *Lundae. Litteris Berlingianis.* pp. 48-66.) *Grammonema striatula SILVA #2124,* Fragilaria (BLAST: *Grammonema striatula* (old name = Fragilaria striatula Lyngbye 1819- https://www.diatombase.org/aphia.php?p=taxdetails&id=968692), 745, 745, 100%, 0.0, 100.00%—good distance tree results;				MOL-uc			MOL-uc
16	ISTH	***Isthmia:*** *Isthmia enervis* Ehrenberg 1838, (BLAST: *Isthmia enervis* Ehrenberg, 632, 632, 100%, 1e-176, 94.81%) - good distance tree data. Found in abundance on Elaine Humphrey's eelgrass sample from Sidney Island, Gulf Island, B.C.				MOL-confid.			MOL-confid.
17	Look for more hits	***Lemnicola*** Round & Basson, 1997: Bacillariophyceae (BLAST: Lemnicola sp. 499, 499, 98%, 1e-136, 98.25%—good distance tree alignment). NOTE: Regarded as non-marine genera; SILVA # 584, BLAST: Lemnicola sp. ,712, 712, 100%, 0.0, 99.24% and good distance tree result.				MOL-possible			MOL-possible
18	Look for more hits	*Leyanella* Hasle, Stosch von & Syvertsen 1983 :SILVA #2578, *Leyanella probus* strain, 721, 721, 100%, 0.0, 98.77%) Hasle, G.R., Stosch, H.A. von & Syvertsen, E.E. (1983). Cymatosiraceae, a new diatom family. *Bacillaria* 6: 9-156. Distance tree data looks good but not a firm phylogeny match; SILVA #2577, Leyanella probus strain, 726, 726, 100%, 0.0, 99.01%); SILVA 2577, (BLAST: Leyanella probus strain, 726, 726, 100%, 0.0, 99.01%) Hasle, G.R., Stosch, H.A. von & Syvertsen, E.E. (1983);				MOL-strong			MOL - strong

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		best for distance tree result is Pseudoleyanella lunata isolate NG0002 18S ribosomal RNA gene, partial sequence, then Leyanella sp,; Cymatosiraceae, a new diatom family.*Bacillaria* 6: 9-156.							
19		***Medlinella amphoroidea:*** (MOL #263, SILVA Feb 10-2023, 98%, 2e, 97.54%				MOL-uc			MOL-uc
20	MINU	***Minutocellus:*** *Minutocellus* has an equal e-value and score *as Arcocellulus MOL-1158-V127* (BLAST e value 0.0); SILVA #1521, Minutocellus polymorphus, 483, 483, 100%, 1e-131, 96.88%—good distance tree results). (Hargraves & Guillard) Hasle, Stosch, & Syvertsen 1983; SILVA # 2586, BLAST: and so is ***Minutocellus polymorphus*** (Hargraves & Guillard) Hasle, Stosch, & Syvertsen 749, 749, 100%, 0.0, 100.00% (shows a perfect match)-good to excellent distance tree results with the same alignment stats)				MOL-confid.			MOL-confid.
21		***Nanofrustulum wachnickianum*** Chunlian Li, Witkowski & Ashworth 2018: MOL-248-V288under Fragilariales (Nanofrustulum wachnickianum SZCZCH194, max score 100%, 94.10% 2e-118- BLAST)				MOL			MOL
22		***Pauliella*** Round, F.E & Basson, P.W. (1997)**:** Pauliella_taeniata (MOL-187-V219, #32-2e-118 & SILVA_DiatBarcde_PR2_summarized-Feb 10-2023; SILVA #320, 327, Pauliella toeniata shows up as a distant node and in the right horizontal distance to the query sequence, but is 17 sequences down from the top score, but is still a good score at 680, 680, 100%, 0.0, 98.22%); SILVA 29, BLAST Pauliella taeniata Pauliella taeniata (381, 381, 96%, 4e-101, 91.23%) is very good in the distance tree results, alignment				MOL-prob.			MOL-prob.
23	PHEO	***Phaeodactylum*** Bohlin, K. (1898): *SILVA #521:* (BLAST: Phaeodactylum tricornutum 654, 654, 100%, 0.0, 96.03%) *good distance tree result MOL-513-V58;* (BLAST: Phaeodactylum tricornutum, 302, 450, 100%, 4e-77, 100.00%, can't find Phaeodactylum tricornutum in the distance				MOL-Strong			MOL-Strong -

No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		tree; (BLAST: Phaeodactylum tricornutum, 656, 656, 100%, 0.0, 96.03%, good distance tree results, excellent alignment and lots of tops hits. However, Gomphonemopsis cf. pseudoexigua is a little better for distance tree result, but only one entry, where as Phaeodactylum is close but many more entries.); (BLAST: Phaeodactylum tricornutum, 656, 656, 100%, 0.0, 96.03%, good on distance tree result but entry 2, Gomphonemopsis is a better tree result, however there are many lop results for Phaeodactylum tricornutum; ***(have ckecked all sequences in SILVA-only strong, not certain)***							
24	Look for more hits	***Pinnularia:*** *(MOL-976-V107, e value = 0)* *Or* ***Caloneis amphisbaena:SILVA 2815;*** (BLAST: Caloneis amphisbaena 449, 449, 100%, 1e-121, 94.79%; Pinnularia subanglica K.Krammer 449, 449, 100%, 1e-121, 94.79%); SILVA 320, BLAST: Pinnularia sp. 725, 725, 100%, 0.0, 100.00%has same excellent alignment stats and good distance tree result,; SILVA 2185, Pinnularia (BLAST: Caloneis amphisbaena 449, 449, 100%, 1e-121, 94.79%; Pinnularia subanglica K.Krammer449, 449, 100%, 1e-121, 94.79%)-good distance results for Pinnularia; SILVA 2826, BLAST: ***Fallacia monoculata*** (Hustedt) D.G.Mann & 427, 427, 100%, 5e-115, 93.40%, Pinnularia sp. 427, 427, 100%, 5e-115, 93.40% —Ok distance tree results (hundreds of hits with the sequences, but distance tree resukts moderate-prob. to uncertain)				MOL-U C			MOL-uc-
25	PROS	***Proschkinia (highly likely to be found in the microscopic images):*** ***SILVA 334,*** BLAST: Proschkinia cf. complanatula, 732, 732, 100%, 0.0, 99.75%; distance tree results are very strong for Proschkinia and good for Proschkinia cf. complanatula); *Proschkinia_complanatula* # 2761, SILVA (BLAST: Proschkina 98%, 1e, 99.30); *Proschkina cf. complanatula* #450, SILVA (100%, 0e) or *Proschkina staurospeciosa* (100%, 0e); Proschkinia cf. complanatula				MOL-co nfid.			MOL- confid.

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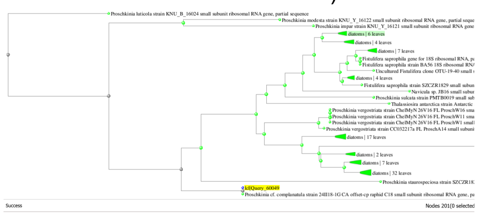
No.	Countin g Codes	Genera	Fre que ncy	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7 , 2021	SEM LM Live MOL
		(BLAST: 510, 510, 98%, 5e-140, 98.95%, with distance tree, for sure Proschkinia sp. but slight uncertainly regarding the species P. complanatula; SILVA 369, Bacillariophyceae (BLAST: *Proschkinia* sp. 1 RoG-2019444, 444, 98%, 5e-120, 94.74%, excellent distanced tree results) 							
26	Look for more hits	*Ralfsiella smithii (=Cerataulus smithii Ralfs in Pritchard) marine species.* V529, BLAST: ***Ralfsiella smithii*** (Ralfs) Sims, Williams & Ashworth, 2018, 743, 743, 100%, 0.0, 99.75%; SILVA 2590, BLAST: ***Ralfsiella smithii*** (Ralfs) Sims, Williams & Ashworth, 2018 synonym = Cerataulus smithii var. smithii Ralfs in Pritchard, 1861, 727, 727, 100%, 0.0, 99.75%—excellent match to query in distance tree results, as is Odontella sp. and O. aurita; O. longicruis is 11th on the list of alignments, 722, 722, 100%, 0.0, 99.51%—not in the distance tree results); ***Ralfsiella smithii*** (Ralfs) Sims, Williams & Ashworth, 2018, 743, 743, 100%, 0.0, 99.75%- excellent distance result to query (Odontella sp.); *2x excellent query matches in the molecular data, found under Odontella which will show almost the exact same alignment stats and distance tree results. However, have never seen this taxon in any reports or LME or SEM on the West Coast. Ralfsiella smithii:* *https://www.marinespecies.org/aphia.php?p=taxdetails&id=974475 and AlgaeBase:* *https://www.algaebase.org/search/species/detail/?species_id=171157*				MOL??? 2 hits-prob.			UC MOL--prob.
27	SEMI	***Seminavis D.G. Mann, 1990 (marine):*** SILVA # (BLAST: Seminavis robusta, 510, 510, 98%, 5e-140, 98.95%- distance tree alignment excellent); (MOL-65-V77) Seminavis_robusta (MOL-131-V156, 299-V349 e values ranging from 7e-137 to 2e-113); SILVA 2798, BLAST: Seminavis				MOL-confid.			MOL—confid.

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		robusta, 499, 499, 98%, 1e-136, 98.25%-distance tree alignment excellent); (BLAST: Seminavis sp., 499, 499, 98%, 1e-136, 98.25%—excellent distance tree alignment); 122-V142 BLAST: Seminavis robusta 427, 427, 98%, 5e-115, 93.68%-good distance tree results); Seminavis, 699, 699, 100%, 0.0, 98.01%-good distance tree; (BLAST: *Seminavis* sp. 4a LKM-2015 & Seminavis cf. robusta, 743, 743, 100%, 0.0, 100.00%, very excellent distance tree result)							
28	SERR	***Serratifera:*** Serratifera_andersonii SZCZP695 (BLAST: 510, 510, 98%, 5e-140, 98.95%-high confidence-very excellent distance tree results); MOL-348-V404, 3e-140 to 2e-138-high confidence) Considered a synonym of *Pseudostaurosira andersonii* (Chunlian Li, Dabek & Wachnicka) E.A.Morales, C.E.Wetzel & Ector[24] (Guiry and Guiry 2022) Note: some identified *Opephora* may be Serratifera. Images need re-examination.				MOL-confid.			MOL—confid. LM?
		Stauroforma: *Stauroforma rinceana* SZCZCH, max score, 100%, 92.01-BLAST in Bacillariophyta MOL 290-V337, 2e-108				MOL-uc			MOL-uc
		Possible Genera with less likely hits from BLAST molecular data sequences (ITS and RCLB, Jan. 2022 from Parfrey Lab) not yet reported by microscopy.							

[24] According to Morales et al. (2019) Serratifera and *Gedaniella were both erected by molecular data (reference) but may not be valid based on morphological evaluations.*

No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		High E values or iffy alighnment percentage and poor or not distance tree results							
1.		***Astartiella*** Witkowski, Lange-Bertalot & Metzeltin, 1998: SILVA #1524, BLAST 405, 405, 98%, 2e-108, 92.28%—better, but OK distance tree result)				X MOL			MOL?
2.	Look for more hits	***Ctenophora pulchella*** (a brackish water to freshwater species), SILVA #2133, C. pulchella 394, 394, 98%, 5e-105, 91.61% is the closest match in the distance tree results but is far down the list of the best sequence alignment. *C. pulchella* is a brackish water diatom that was previously Synedra pulchella or Fragilaria pulchella. This species has these distinctive characteristics similar to a Tabularia sp. we see on occasion on the eelgrass: Valves are elongate. The central area has a thickened, dome-like silicicious fascia and ghost striae may be present. Each pole has a rimoportula positioned near the axial area, positioned diagonally to the apical axis (https://diatoms.org/species/ctenophora_pulchella/guide)				X MOL?			MOL?
3.	Look for more hits	***Cymbellonitzschia banzuensisi*** SILVA 284, BLAST: Cymbellonitzschia banzuensis isolate, 433, 99 1.03e-116, 94.035—good distance tree result; 98%, 94%, low e value of 7e-117 BLAST, Tokyo Bay, Japan)-**unlikley**				X?			MOL?
4.	Look for more hits	***Gomphoneis****: found under Cymbellales, 100% match in GeneBank MOL224-V260,* 3e-130 *:* Gomphoneis okunoi Ak513 chloroplast rbcL gene for ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit, partial cds Sequence ID: LC530728.1Length: 1485 Number of Matches: 1 Syn: Gomphonella and Gomphonema *This genera has a higher e value than Staurophora sp. at* 2e-133				X?			MOL?
5.		***Gomphonema parvulum*** *MOL 68-V80* Gomponema pseudoaugur_3e-115: BLAST, *MOL-241-V280, 98%, 92.28%*				X?			MOL?
6.		*Scoliopleura peisonis* strain (freshwater species), max score. 100%, 93.75%, high e- value = 7e-117 BLAST				X MOL			MOL

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No.	Counting Codes	Genera	Frequency	July-Aug. 2020	Nov. 15, 2020	Mar. 7, 2021	July 22, 2021	Nov.7, 2021	SEM LM Live MOL
		then Halaphora and Panothidium lower percentages-BLAST found under Bacillariophyceae							
7.		***Staurophora:*** 98%, 98.60; Gomphoneis olivacea 98%, 96.49%—Staurophora is a closer match in BLAST for MOL 260 V304; SILVA # 1523 (BLAST: Staurophora sp. 505, 505, 98%, 2e-138, 98.60%—reasonable distance tree results —found under Cymbelles				x-MOL?			MOL
8.		***Sternimirus shandongensis*** Witkowski & Chunlian Li 2016 (MOL-352-V408, not found in BLAST, however the best alignment is with 2e-133 is Bacillariophyta sp. SZCZCH968 ribulose-1,5-bisphosphate carboxylase/oxygenase large subunit (rbcL) gene, partial cds; chloroplast)				x-MOL			MOL

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- Andrzej Witkowski (University of Szczecin, Institute of Marine and Environmental Sciences, Szczecin, Poland) generously made edits to the unidentified images, Feb. 10, 2022: 1) Unknown but suspected *Achnanthidium* images were identified as *Planothidium*, 2) a possible LM image of *Aneumastus* was identified as *Fogedia*, 3) an SEM image of a questionable *Planothidium* has been identified as *Fallacia*, 4) unknown, possibly *Petroneis*, identified as *Paribellus*, 5) Fig. 13, unknown was identified as *Navicula cf.*

cancellata, 6) Fig. 14 has been identified as *Navicula directa,* and 7) Fig. 15. *Unknown, identified as Navicula cf. perminuta.* Also, Catenula is unconfirmed. It may be *Catenula* or *Catenulopsis*, but Andrzej Witkowski is suggesting it may fit closer to a newly proposed (nov. nud.: no valid nomenclatural status) genera called *Pariraphis* Sh. Mayama (Mayama et al. 2018: p. 42, Plate 9, fig. 10, Kryk et. al. 2020) So for now it is listed as *Periraphis* like.

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Images of Previously Unidentified Diatoms

Fig. 1. Nine white arrows highlight a group of *Planothidium* frustules on a March 7, 2021 distal section of *Z. marina*.

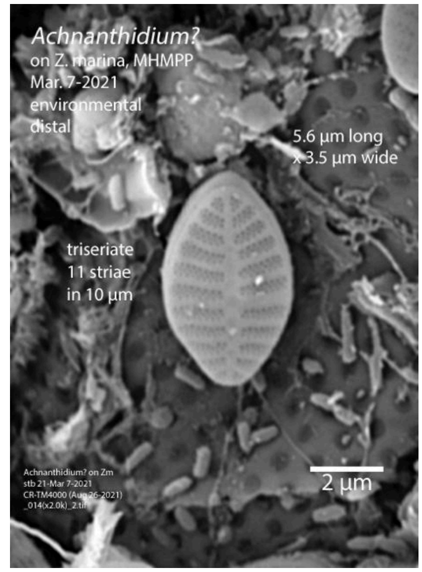


Fig. 2. A *Planothidium* frustule on a March 7, 2021 distal section of *Z. marina*.(same frustule in Fig. 1 with the image rotated 90 degrees)

Fig. 3. Girdle view. *Planothidium*. frustule is arched in girdle view with a convex RLV. From a March 7, 2021 medial section.

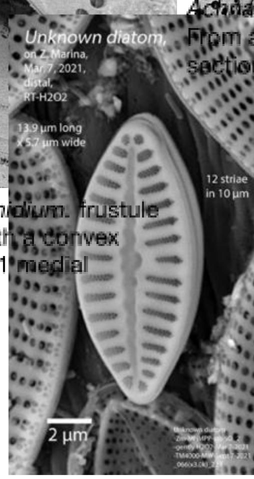


Fig. 4. Valve view. *Cocconeis*, not *Achnanthidium* or *Planothidium*. From a March 7, 2021 medial section.

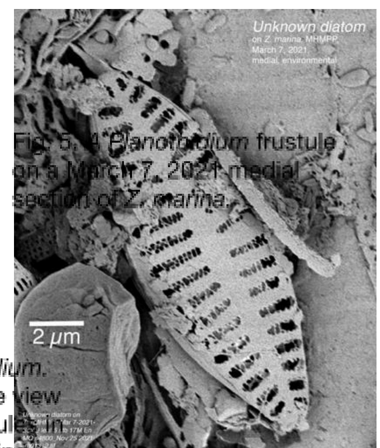
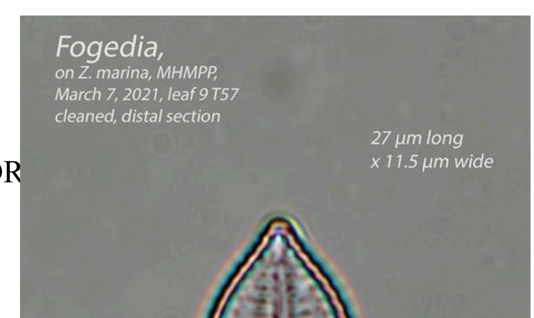


Fig. 5. A *Planothidium* frustule on a March 7, 2021 medial section of *Z. marina*.

Fig. 6a & b. Valve view. *Planothidium*. Frustule is clearly arched in girdle view with a convex RV or RLV of frustule in Fig. 1-3.? Has a distinctive opening along the apical axis where a raphe would normally be located. From a March 7, 2021 distal section, RT-H2O2 cleaned.



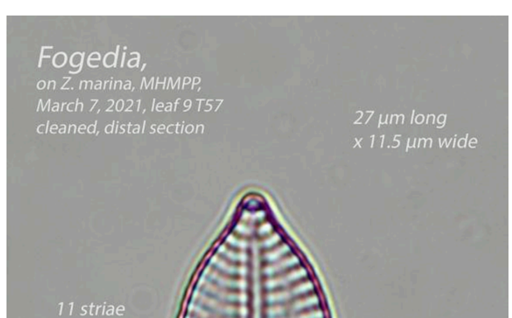


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Fig. 7. *Fogedia.* Stack of seven LM images. (Plinski and Witkowski, 2020: p. 109-110, Fig. 536-537, pp. 320-321)

Fig. 8. *Fogedia.* Single LM image. (Plinski and Witkowski, 2020: p. 109-110, Fig. 536-537, pp. 320-321)

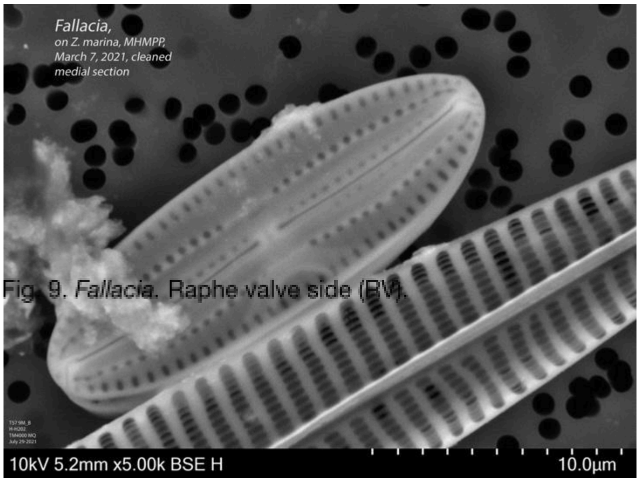


Fig. 9. *Fallacia*. Raphe valve side (RV).

Fig. 9. *Fallacia*. March 7, 2022 sample, with *Navicula directa*. SEM

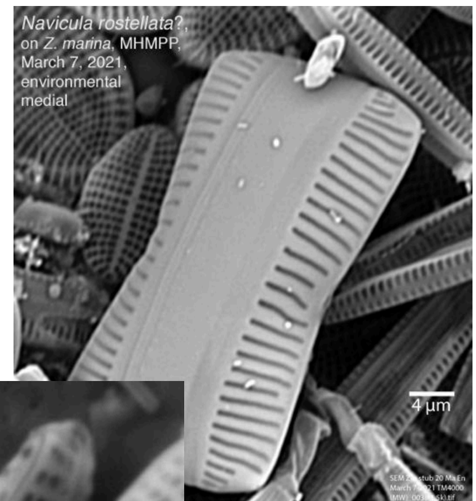


Fig. 13. *Navicula cf. cancellata* SEM image. (Plinski and Witkowski, 2020: p. 104, Fig. 491, pp. 312-313)

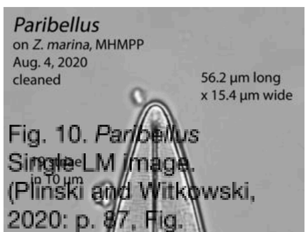
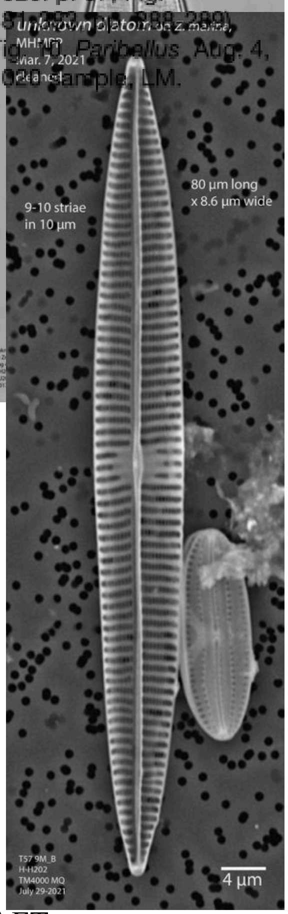


Fig. 10. *Paribellus* Single LM image. (Plinski and Witkowski, 2020: p. 87, Fig. 381-383, pp. 288-289)

Fig. 10. *Paribellus*. Aug. 4, 2020 sample, LM.

Fig. 11. Unknown, *Achnanthes*? Single LM image.

Fig. 12. Unknown, *Achnanthes*? Single LM image.



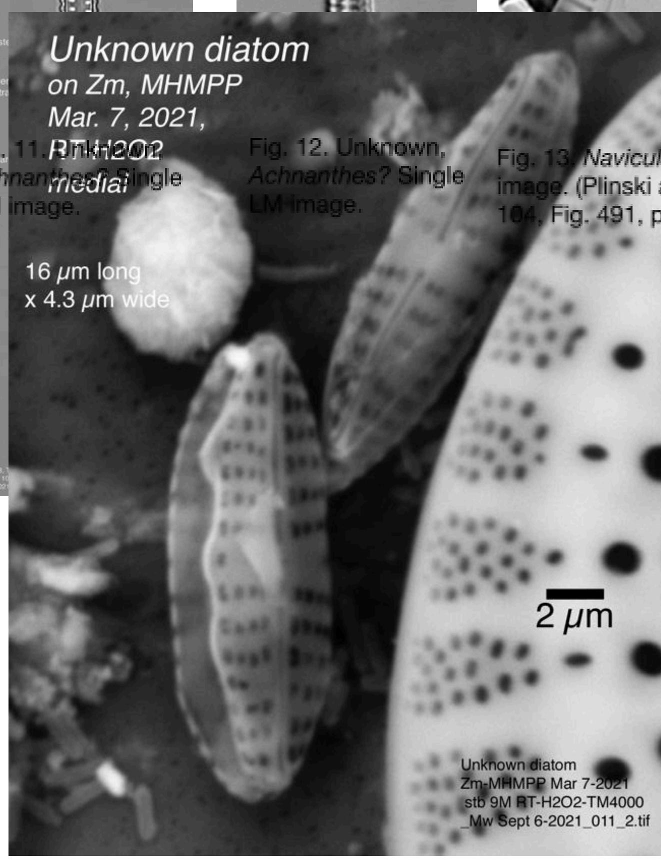


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Fig. 14. *Navicula directa*. Hendey 1964: 202. SEM image.

Fig. 15. *Navicula cf. perminuta.* (Plinski and Witkowski, 2020: p. 106, Fig. 502, pp. 312-313) Appears to be common on March 7, 2021 leaf sections. SEM image.

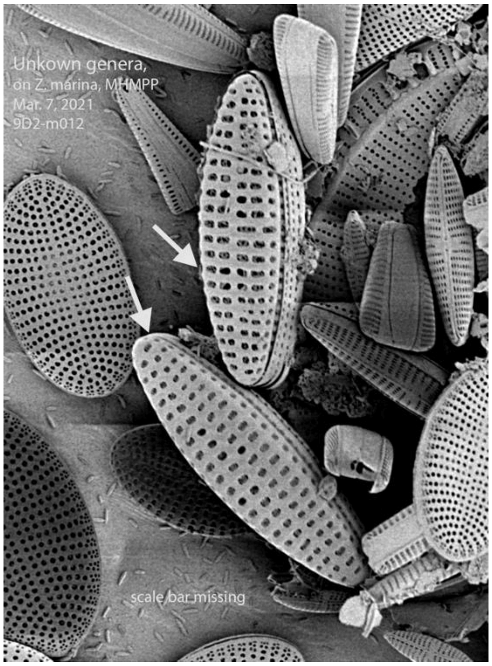

Fig. 16. Unknown genera. March 7, 2021. SEMs-Zm-MHMPP-Mar 7-2021-9D2-9M2-9P2-MQ-Sept 18-2021-m012.tif

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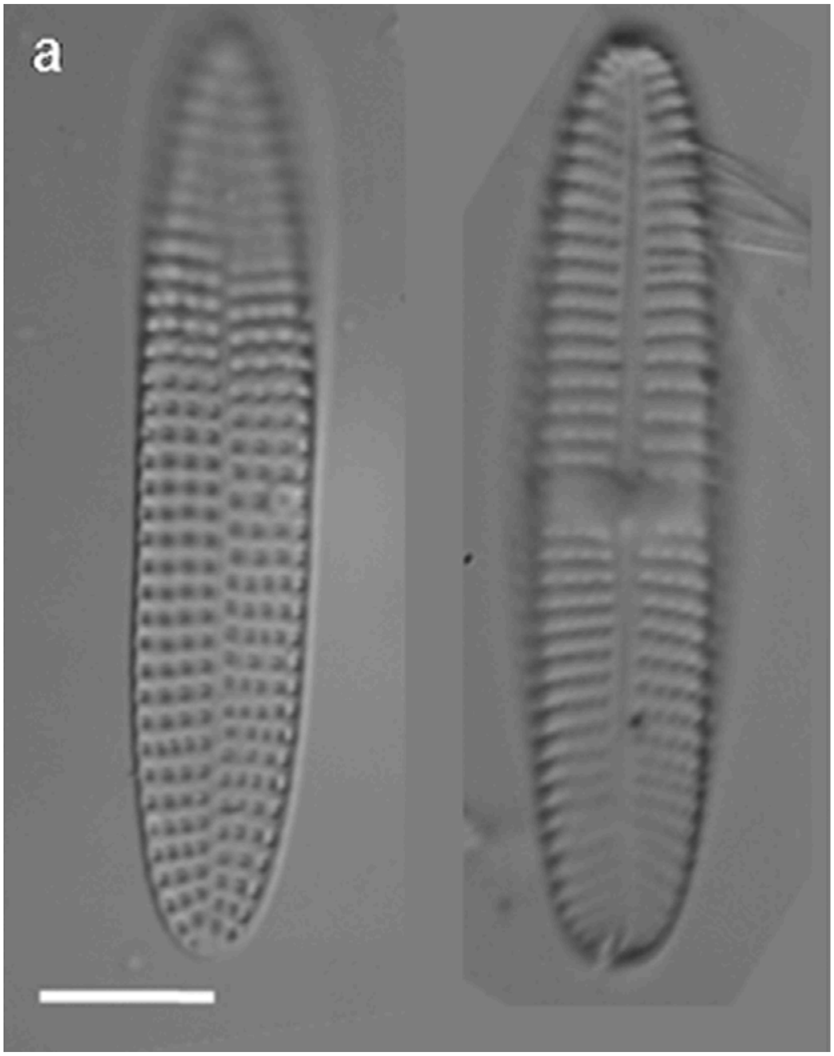

Achnanthes bongrainii is frequently found in the molecular data from March 7, 2021. This series of images is from: Daglio et al. (2018). Benthic Diatoms from Potter Cove Antartica-(2018)- Fig. 3. Marine benthic diatoms from 25 de Mayo (Potter Cove) Antarctica on colonized ceramic tiles, viewed in LM. *a Achnanthes bongrainii, b Entopyla ocellata, c Parlibellus delognei, d Licmophora antarctica, e Odontella litigiosa, f Amphora sp. G Actinocyclus actinochilus, h Cocconeis pinnata,I Cocconeis costata var. antarctica, j Cocconeis fasciolata. Scale bar=10 μm.*

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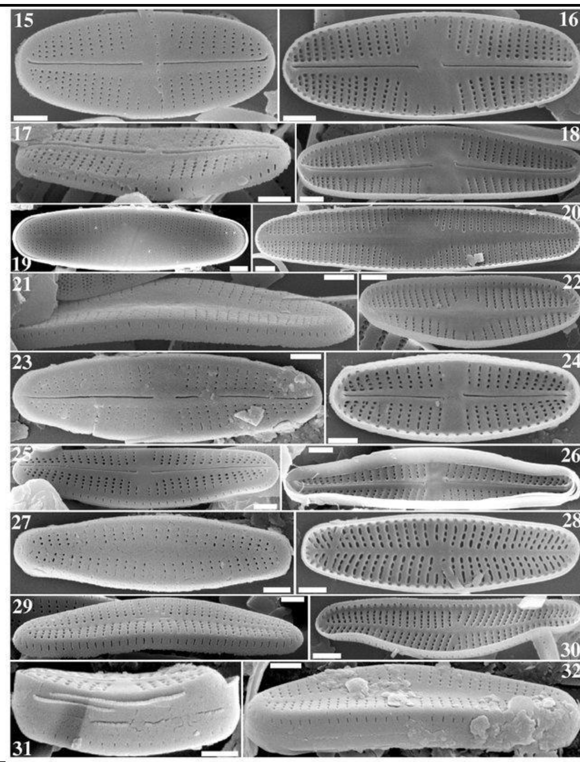
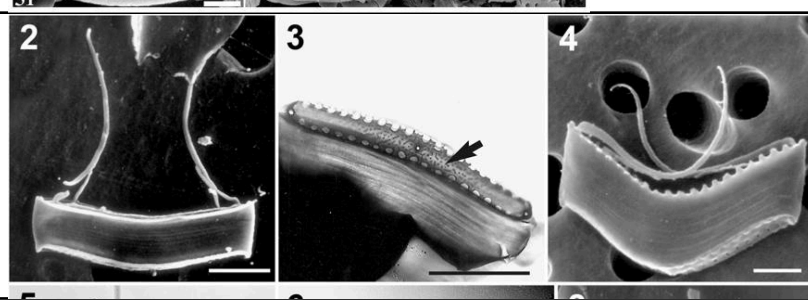
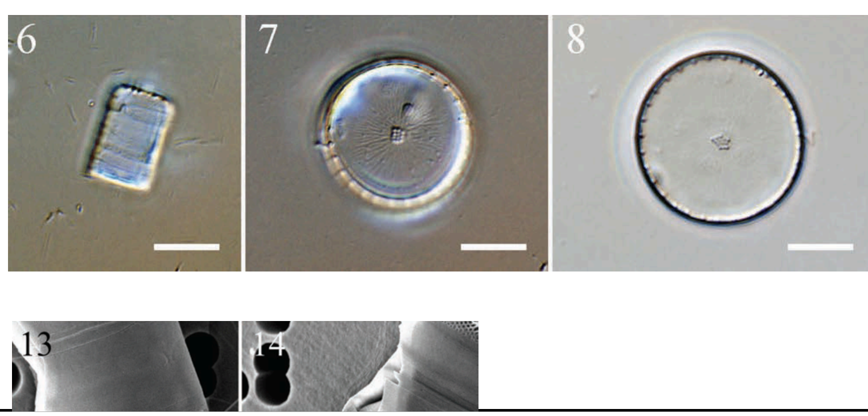
Images (not from this project) of Genera found in the Molecular Data, but not yet observed by our Microscopy

	Genera identified by molecular sequences		Source of images
	Achnanthidium		https://www.researchgate.net/publication/298988399_The_genera_Achnanthidium_Kutzing_and_Psammothidium_Bukhtiyarova_et_Round_in_the_family_Achnanthidiaceae_Bacillariophyceae_A_reappraisal_of_the_differential_criteria/figures?lo=1
	Arcocellulus		Percopo et al. 2011 https://fce-lter.fiu.edu/data/database/diatom/?species=3416
	Bacterosira Gran 1900 *(Basonym; Thalassiosira constrica*		*A phylogenetic re-definition of the diatom genus Bacterosira (Thalassiosirales, Park et al. (2016). A phylogenetic re-definition of the diatom genus Bacterosira*

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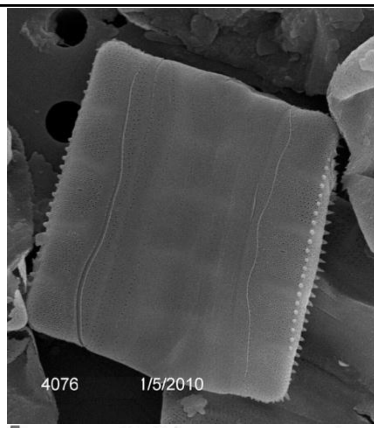
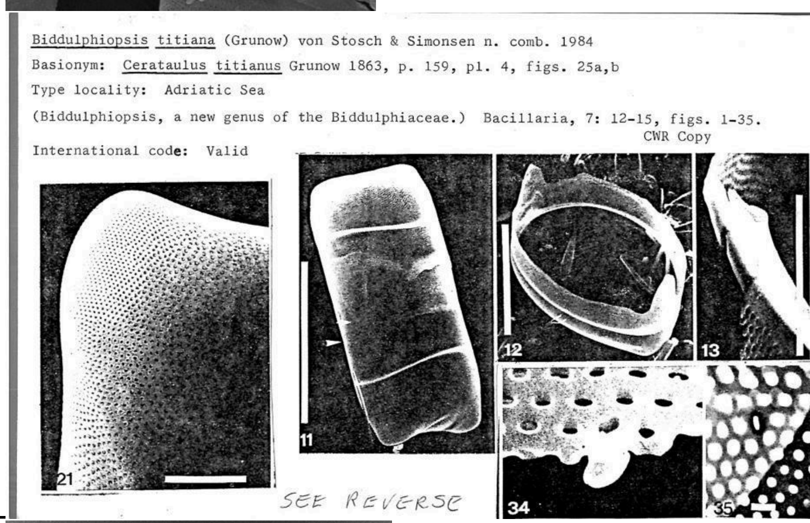
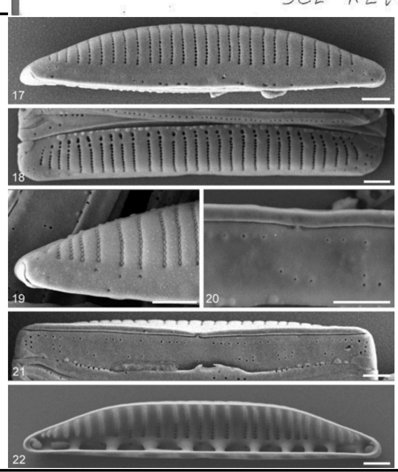
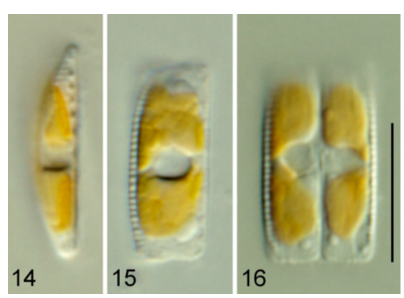
			(Thalassiosirales, Bacillariophyta), with the transfer of Thalassiosira constricta based on morphological and molecular characters. Phytotaxa 245 (1): 001–016
	Biddulphiopsis	  Biddulphiopsis titiana (Grunow) von Stosch & Simonsen n. comb. 1984 Basionym: Cerataulus titianus Grunow 1863, p. 159, pl. 4, figs. 25a,b Type locality: Adriatic Sea (Biddulphiopsis, a new genus of the Biddulphiaceae.) Bacillaria, 7: 12-15, figs. 1-35. CWR Copy International code: Valid 	http://symbiont.ansp.org/dntf/details.php?id=007846 http://symbiont.ansp.org/dntf/details.php?id=007846
	Cymbellonitzschia banzuensisi 98%, 94% BLAST, Tokyo Bay, Japan)	  	Stepanek, Joshua G.; Hamsher, Sarah E.; Mayama, Shigeki; Jewson, David H.; Kociolek, J. Patrick (2016). Observations of two marine members of the genus <i>C</i> <i>ymbellonitzschia</i>

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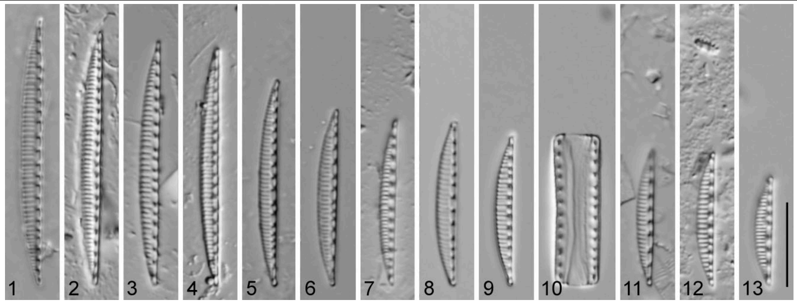
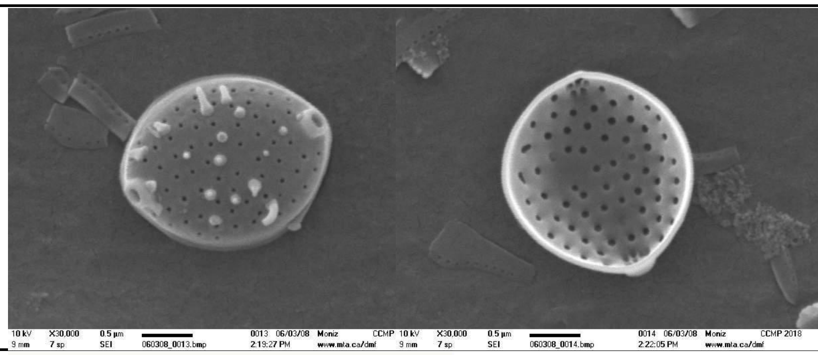
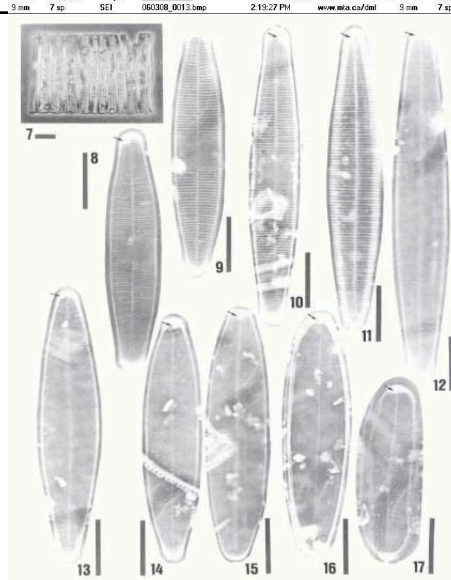
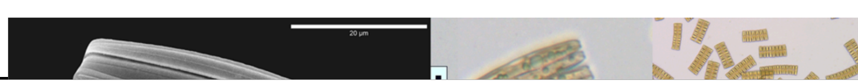
			(Bacillariophyta) from Tokyo Bay, Japan, with the description of the new species <i>C</i> <i>ymbellonitzschia banzuensis</i>. Phycological Research, 64(1), 26–34. doi:10.1111/pre.12110
	Extubocellulus		http://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxid=187471
	Fragilaria		FRAGILARIA STRIATULA LYNGBYE: A LITTLE KNOWN MARINE DIATOM FROM CHILE. Patricio Rivera1 & Fabiola Cruces (2002)
	Fragilariopsis	 	https://en.wikipedia.org/wiki/Fragilariopsis_kerguelensis https://www.authorea.com/users/359729/articles/481556-ongoing-speciation-within-the-diatom-fragilariopsis-kerguelensis-in-the

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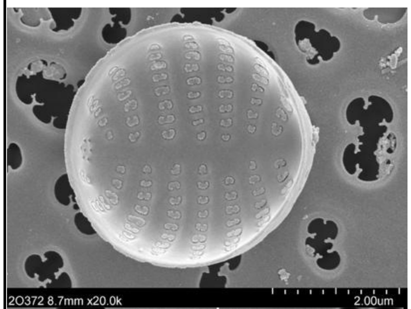
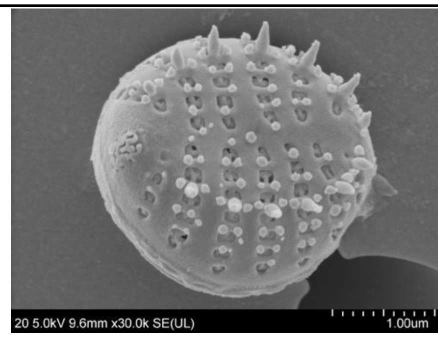
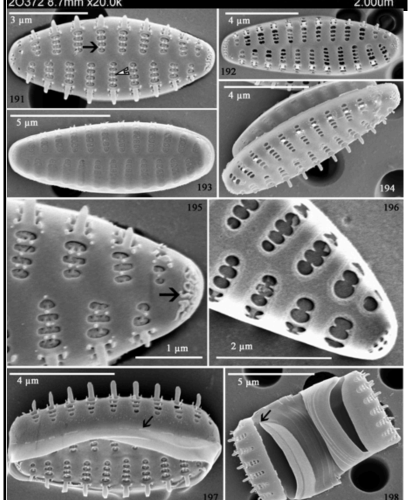
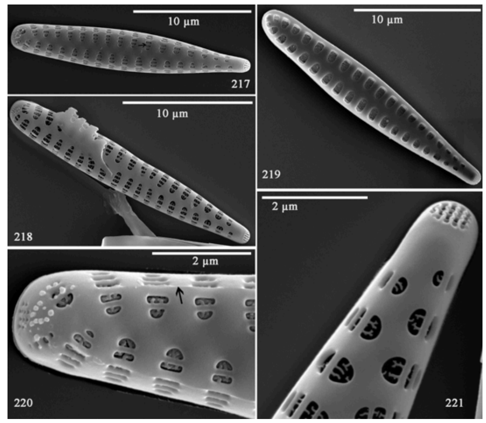
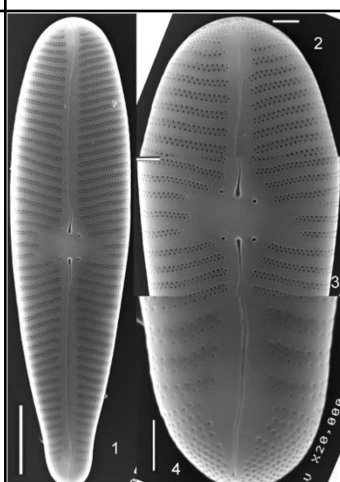
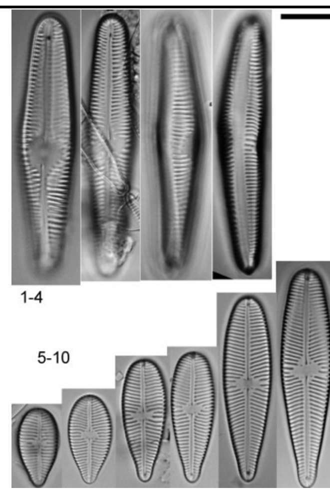
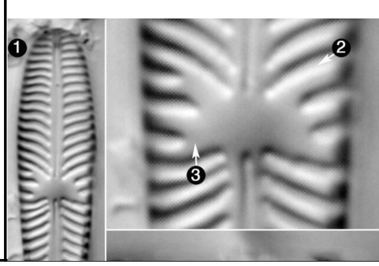
			-southern-ocean (Grattepanche 2020)
	Gedaniella	   	https://twitter.com/krawczyk_diana/status/102464955390622515 2 Li et al. (2018)
	Gomphoneis okunoi- *MOL224-V260 (GeneBank-100 % match). See images from Tuji (2005: Plate 12-13.) considered a freshwater species.* **Gomphoneis** *olivacea (Plinski and Witkowski 2020: p. 84.,pp. 286-287 fig. 375. Considered a freshwater diatom but Plinski and Witkowski (2020) list it for Gulf of Gdansk and*	  	*Tuji (2005: Plate 12-13.)* (left) https://diatoms.org/species/gomphonella_olivacea/guide

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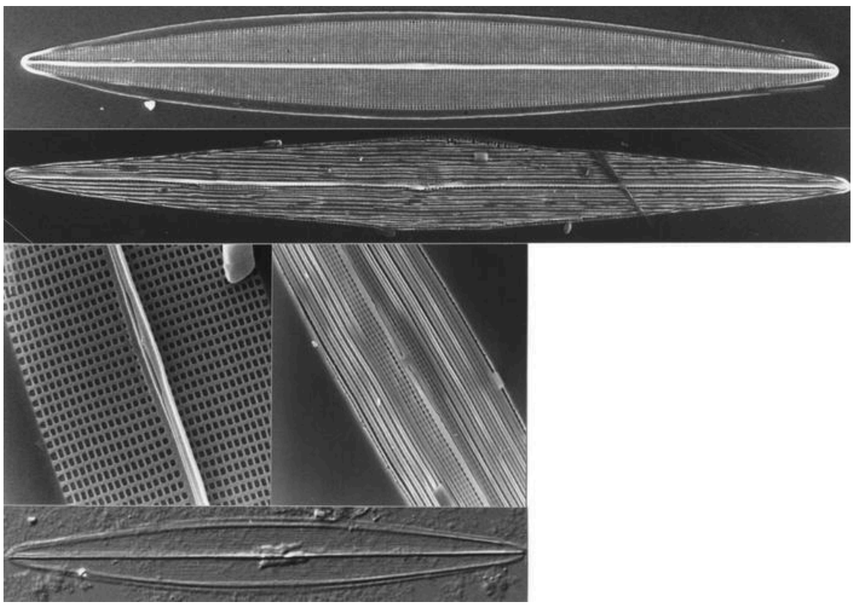
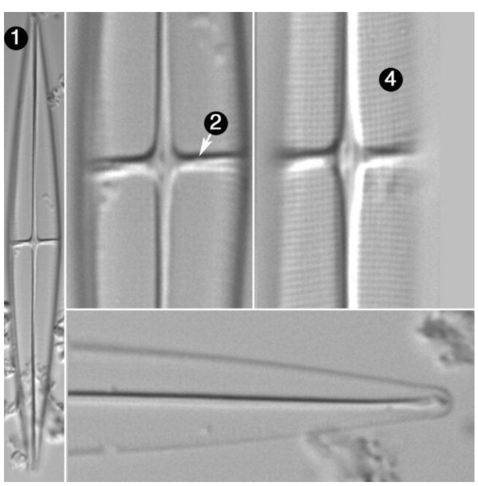
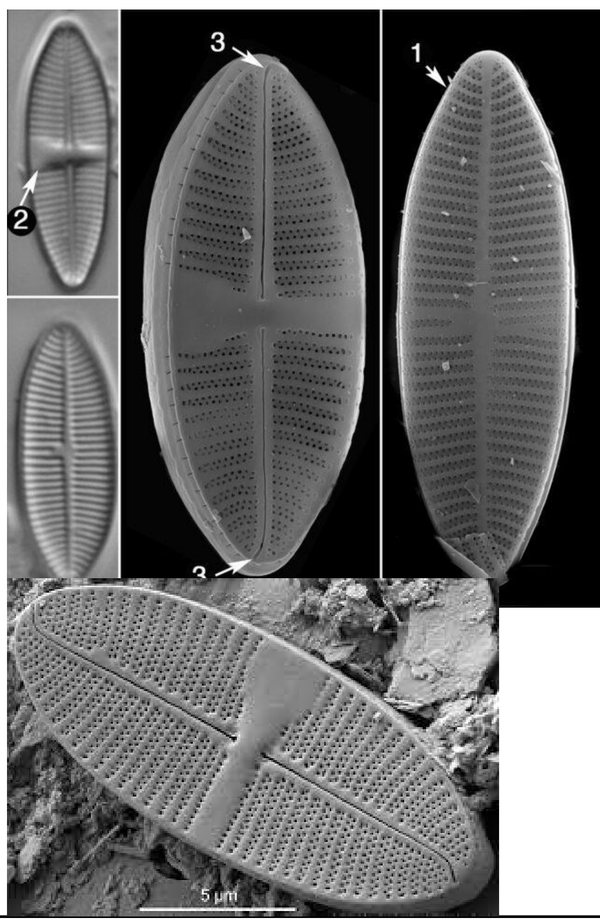
	sourounding brackish waters		
	Haslea	 	http://nordicmicroalgae.org/taxon/Haslea%20ostrearia **Haslea**

			https://diatoms.org/genera/haslea/guide
	Lemnicola **Synonyms:** *Achnanthidium hungaricum* Grunow *Achnanthes hungarica* (Grunow) Grunow in Cleve and Grunow *Microneis hungarica* (Grunow) Cleve	1. Valves linear to linear-elliptic, with subrostrate apices 2. Raphe valve with asymmetric fascia 3. Terminal raphe fissures turned to opposite sides Valves are linear to linear-elliptic with subrostrate apices. The raphe valve has a fascia. The fascia is typically asymmetric. Terminal raphe fissures are turned toward opposite sides. Striae are biseriate, 18-24 in 10 µm. 	https://diatoms.org/species/lemnicola_hungarica/guide Regarded as non-marine genera.
	Minutocellus		

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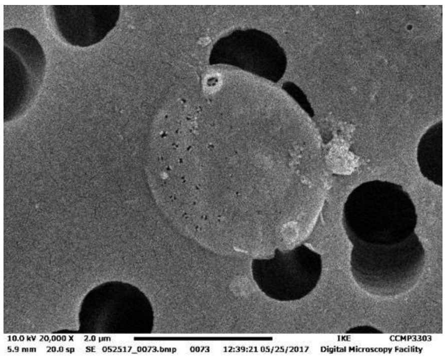
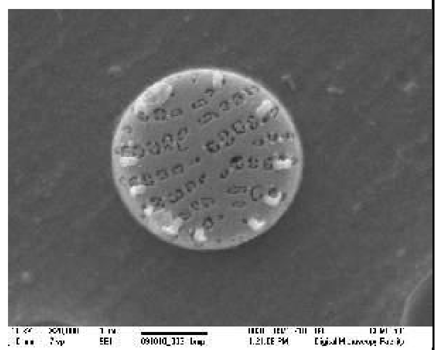
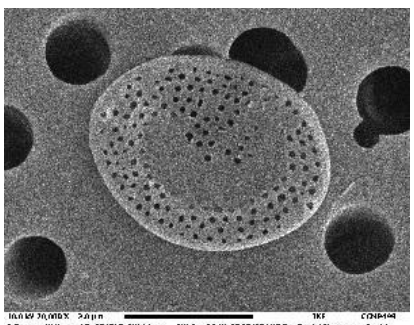
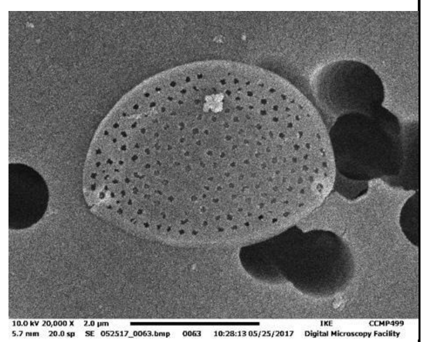
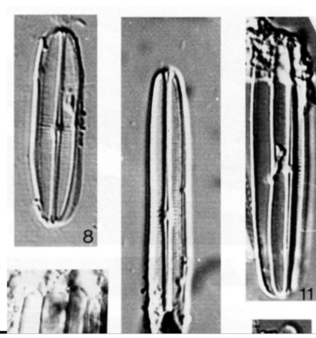
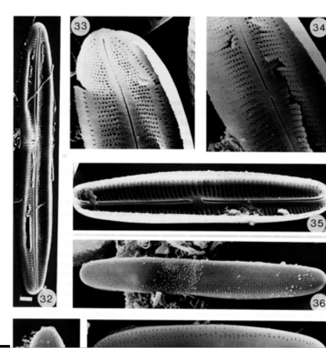
		   	
	Pauliella	 	NEW MONORAPHID DIATOM GENUS (POGONEZS) FROM BAHRAIN AND THE TRANSFER OF PREVIOUSLY DESCRIBED SPECIES A. HUNGARZCA AND A. TAENZATA TO NEW GENERA F. E. Round (1997)

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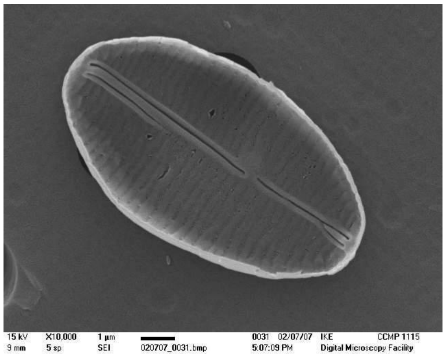
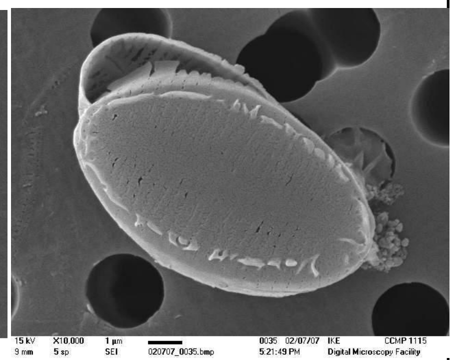
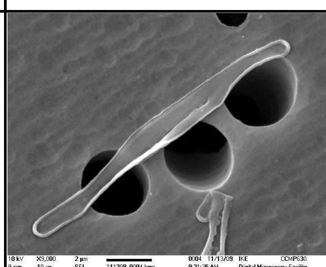
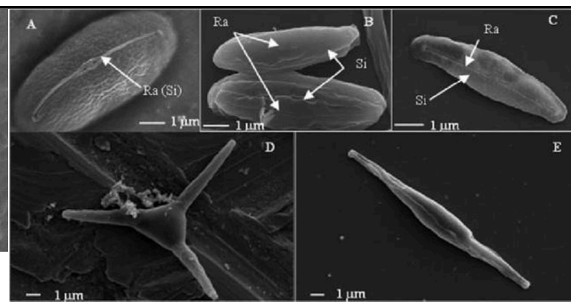
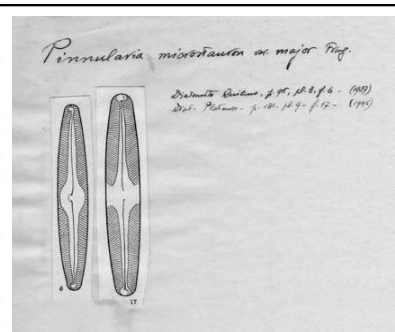
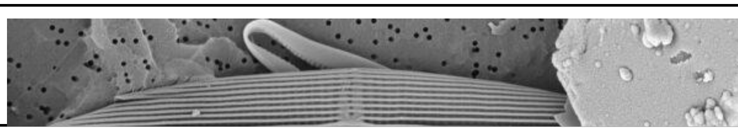
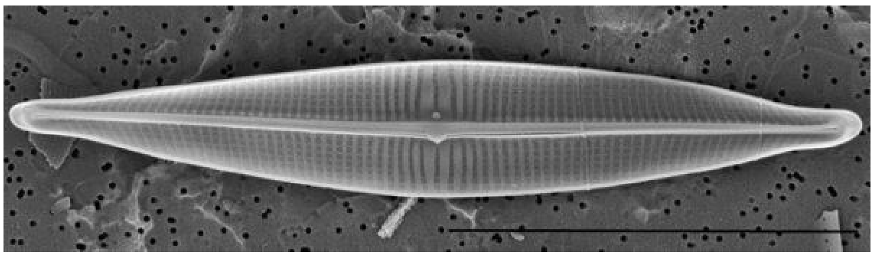
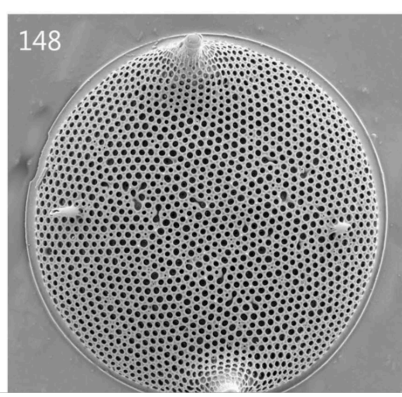
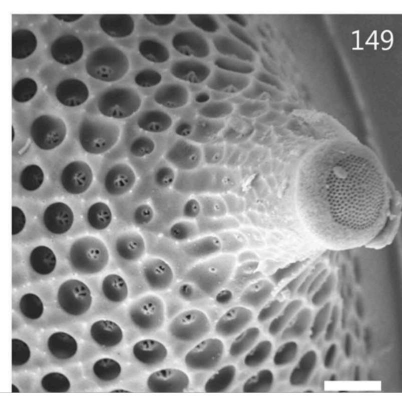
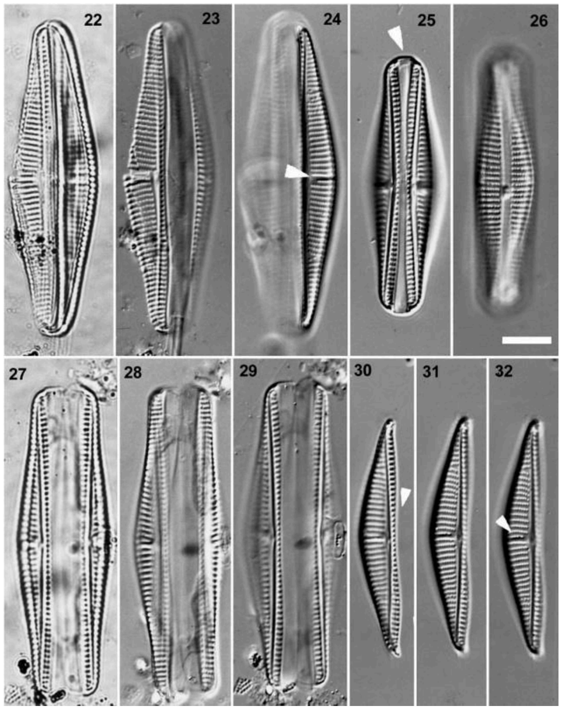
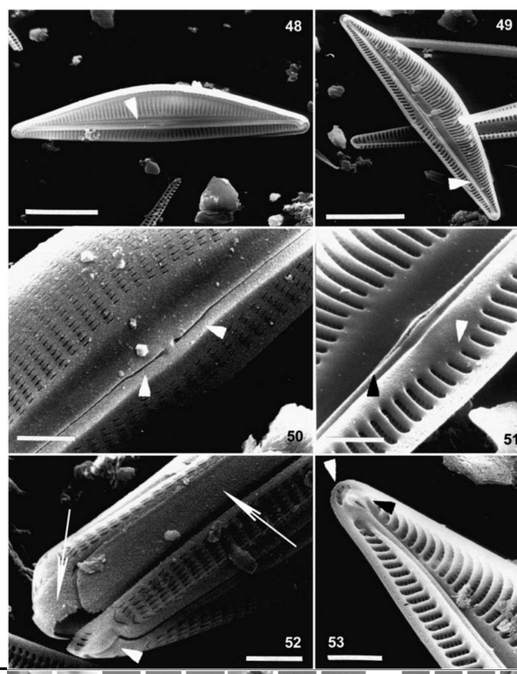
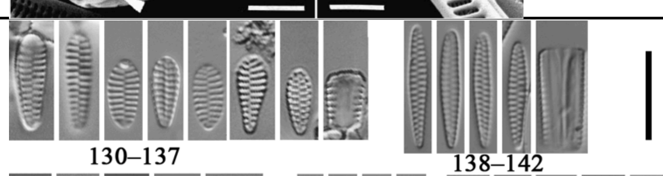
		 	http://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxid=87690
	Phaeodactylum	 	http://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxon=Phaeodactylum&searchTax= https://www.researchgate.net/publication/235993095_Phaeodactylum_tricornutum_polymorphism_an_overview/figures?lo=1
	Pinnularia	 	http://nordicmicroalgae.org/taxon/Pinnularia%20lundii (Pauli Snoeijs -marine) https://www.marinespecies.org/photogallery.php?album=4394&pic=149512 (Drawing by Frenguelli -marine Pinnularia
	Proschkinia		https://diatoms.org/species/proschkinia-browderia

		Proschkinia Proschkinia continued. 	na/images#image-95818
	Ralfsiella smithii *(=Cerataulus smithii Ralfs in Pritchard)* *2 excellent query matches in the molecular data, found under Odontella which will show almost the exact*	  	

	same alignment stats and distance tree results.		
	Seminavis	 	https://www.researchgate.net/publication/231980487_The_systematics_of_Seminavis_Bacillariophyta_The_lost_identities_of_Amphora_angusta_A_ventricosa_and_A_macilenta/figures?lo=1 Danielidis and Mann (2002)
	Serratifera_ andersonii		Li et al. (2018)

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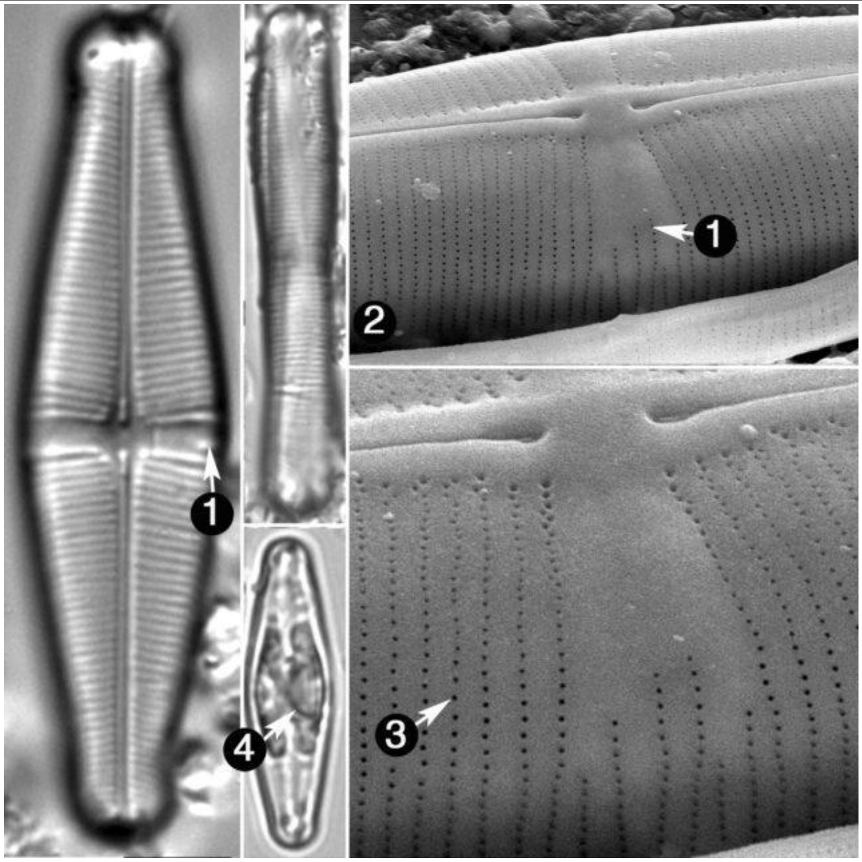
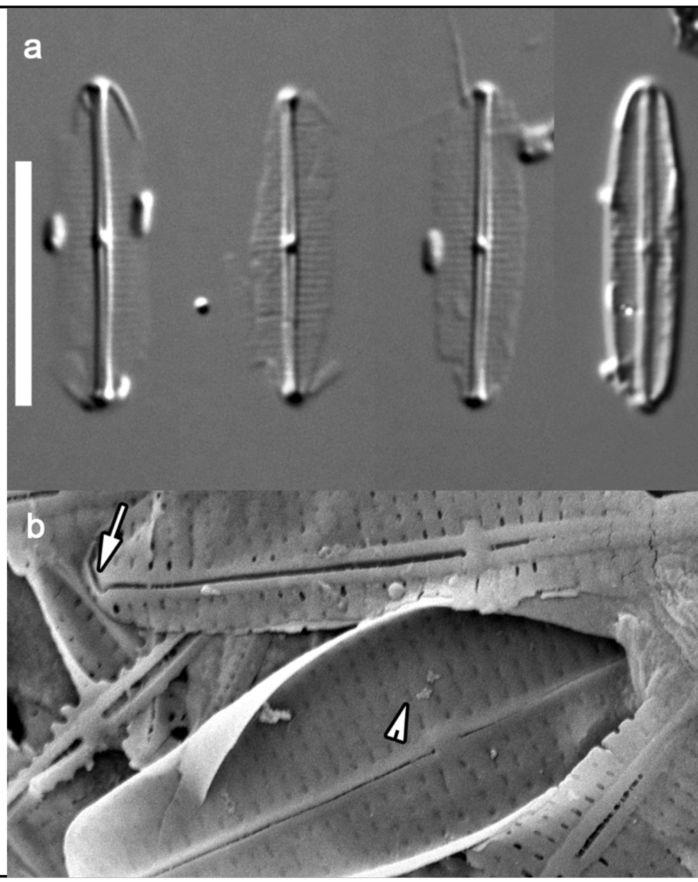
	Staurophora: *epipelic in marine and brackish waters*		https://diatoms.org/genera/staurophora/guide
	Sternimirus shandongensis		Witkowski et al. (2016)

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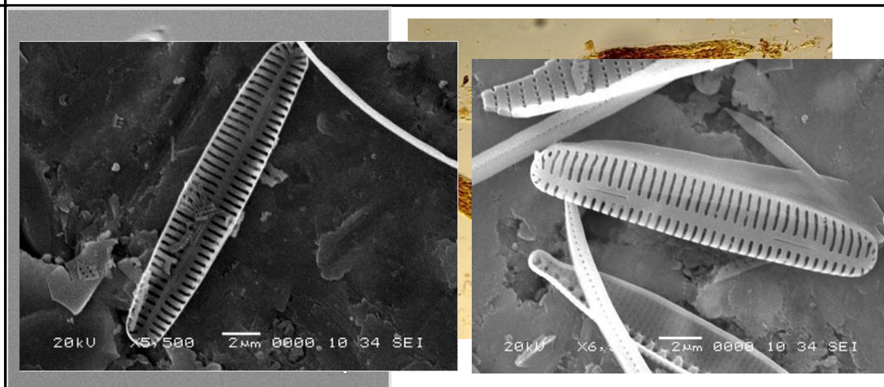
	Possible Genera identified by molecular sequences		
	Berkeleya: #31 SILVA, (BLAST-Berkeleya sp. 100% 1e-116) Bacilariophyceae: Berkeleya sp. 100%, 100% BLAST; Achnanthales (Planothidium 98%, 93.33%or Berkeleya sp. *100%,* 93.06% BLAST)		

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