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NOTES
ON
NEW AND RARER SPECIES
OF
DIATOMACEÆ,
OF THE
UNITED STATES SEABOARD.

BY
F. W. LEWIS, M. D.

C. Van Brunt

PHILADELPHIA:
MERRIHEW & THOMPSON, PRINTERS,
Lodge street, north side of Pennsylvania Bank.
1861.

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C. Van Brunt

with respects of
Arthur M. Edwards.

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NOTES ON SOME AMERICAN DIATOMACEÆ.

The present communication contains brief notices of some of the rarer and hitherto undescribed species of Diatomaceæ of the United States Sea Board, which have fallen under my observation during the last three years, together with a list of a few of the more characteristic and generally distributed coastal species.

The forms to be described are mostly salt-water or brackish. A few species, however, known as fresh-water will be noticed where these have been found domesticated along with the marine.

I have endeavored, as far as possible, to avoid describing species unless from perfect specimens; carefully rejecting all doubtful and imperfect forms. Sources of error arising from the great variation in size, outline, and striation, and from the absence of certain and positive indications whereby the sporangial may be detected and classified with its typical variety, I have also endeavored to guard against. The want, however, of several important consulting authorities on this branch in the Academy's Library, together with the not always satisfactory character of the material furnishing the data of this paper, often consisting of muds and mixed gatherings, must be my excuse for any errors or inadvertencies which may be found in its pages.

Among those to be described will be introduced one or two doubtful forms, probably sporangial, as *Amphiprora pulchra* Bailey, and extraordinary varieties of *Surirella ovata* and *Triceratium alternans*, both of which last are figured.

It is proposed to consider the species to be noticed in the following order:

1. "New species and sporangial forms." 2. "Rare species and species not hitherto noted as belonging to this country." 3. "Species characteristic of the American coast." 4. "Species of universal distribution."

The precise locality and nature of the gathering from which specimens have been derived will be indicated, excepting where species are of general distribution and very abundant along the coast, along with such other distinctive characters as may be necessary for the definition of new or doubtful species; and as it is not intended that the summary shall present a complete resumé of native marine species, mention of many forms known to me not referable to one or other of the above four divisions will be omitted.

It may not here be out of place to add, that the result of my limited investigations convinces me that a rich and unexplored field lies open in the United States for those whose time and attention may hereafter be directed to this branch of microscopic research, a branch, until very recently, comparatively neglected in this country. Perhaps a reason for this neglect may be found in the great interest attaching to the less laborious study of the numerous fossil diatomaceous deposits of our country, and of the new and ever varying guanos so frequently finding their way to our shores. Without any intention of undervaluing the importance of researches on fossil botany, it may yet be doubted whether results so satisfactory and important to science are likely to accrue, as when the living forms are the subject of study. Nothing certainly would seem so well calculated to dampen the ardor of physiological inquiry as prolonged and laborious examinations of the minute detail of the silicious skeletons of these organisms without reference had to the kind and manner of life they once invested.

As an additional argument in favor of the study of living species it may here be mentioned that many of the fossil forms are still to be found as living spe-

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cies on the coast, or under circumstances which prove them to have been alive at no very remote period. It is not unusual to meet with some of these in the Delaware tidal mud, and a still larger number are to be found in the blue clay (old estuary) deposit immediately underlying it. Among these a few of the most common are, *Eupodiscus Ralfsii*, *E. argus*, *Coccolithus gigas*, *C. ocul-iridis*, *C. centralis*, *Triceratium striolatum*, *T. punctatum*, *Actiniscus sirius*, &c., *Sceptroneis caduceus*, occurs living on algae at Riviere du Loup, St. Lawrence river, *Goniothecium obtusum* at Black Rock Harbor, L. I.

The important question, too, of the influence of locality on the growth and development of species nowhere presents itself in so interesting a point of view as in this country. The large extent of its sea board, embracing every variety of climate, the continuous chains of estuaries and sounds along the entire line of coast, and the many rivers, large and small, traversing every kind of soil from the southern alluvial to the granite ranges of the north east, offer an unsurpassed field for the study of this influence.

Although not able to pursue the subject at this time, I cannot refrain from alluding to a fact which forces itself on the mind at an early stage of these investigations, viz.: the great distance from the sea at which marine influences continue to make themselves felt. Philadelphia is situated nearly a hundred miles from the ocean, and even at the period of spring tides at least fifteen miles above the faintest suspicion of brackish water, and yet quite a number of the diatoms in the Delaware at this point are purely marine, and a still larger number brackish. The agency of migratory fish, as the shad and low swimming sturgeon, in bringing about this result, is no doubt important, but will not serve to explain the presence of brackish and marine species in the ditches adjoining Cooper's Creek, a tributary of the Delaware, and in Fox Chase Run, some ten miles above this city, at points not within tidal range. The old estuary bed of the Delaware (blue clay) before alluded to, was very rich in these forms, and by digging down a short distance at any part of the meadow land bordering the river, the blue clay which contains them may be exposed. An idea which naturally suggests itself under these circumstances as a solution of this paradoxical difficulty is, that possibly the telluric impression of the subjacent soil may continue to make itself felt in the development of species for a long period after the other surroundings have ceased to be favorable.

At all events it needs some other explanation than that ordinarily had recourse to, viz., the hardihood of these low forms of organic life, and the agency of birds and fish, to account for the permanent localization of marine species at points apparently so unsuited to their existence.

I. *New species and Sporangial forms.*

1. *Triceratium alternans*, *Bailey*. *Sporangial?*—This somewhat doubtful form has so few of the characters of *T. alternans*, that but for the occurrence of intermediate varieties the propriety of its reference to that species might seem questionable. The structure of the valve is distinctly cellular, in the smaller varieties indistinctly so, and that of the obtuse processes faintly punctate. The largest frustules attain the size of *T. fastuosus*.

Hab.—St. Mary's river, Ga., in scum of a salt marsh.

2. *Surirella pulchra*, n sp. F. V. Linear narrow, often somewhat twisted. V. Ovate or elliptical, axe distinct, canaliculi numerous, marginal inflated as in *S. fastuosa*, 6 in '001, extending for about two-fifths of the distance to centre of valve, central portion smooth circumscribed on either side by a coarsely striated arcuate band with harshly defined edges, and connected with its fellow at a short distance from the end of the valve. Immediately exterior to these bands, and separating them from the inner termination of the canaliculi throughout the entire length of the valve, is a corresponding only somewhat narrower arcuate smooth space. Length of valve '005 to '009. Pl. I. f. 1.

This very beautiful form, evidently allied to *S. fastuosa* and *S. eximia*, *Mic. Journ.*, differs from both in the greater number of its canaliculi and the

presence of the striated bands. In this respect it closely resembles the species next to be described.

Hab.—St. Mary's river, Ga., salt marsh and in tidal mud. Wharf at Fernandina, Florida, tidal deposit. Pier at St. Augustine, Florida. Rare.

3. *Surirella Febigerii*, n. sp. F. V. As in last described. V. Elliptical to linear ovate, sometimes broadly sphenoid, alæ inconspicuous, canaliculi 6 a 7 in '001, straight or slightly convex, linear, reaching from the margin to a striated arcuate band situated relatively to the valves as in the preceding. Interspaces of the canaliculi strongly punctate. Central portion similar in outline to that of *S. pulchra*, elevated above the surface of the valve and coarsely striate. Length of valve '006 a '010. Pl. I. f. 2.

The striking similarity in outline and number of canaliculi of this to the last described species, together with the correspondence in both of the arcuate striated bands, at first led me to regard these forms as merely different aspects of the same frustule (valve); but after careful examination of several detached valves, by reversing the slides and other manipulations, I am led to conclude that they belong to different species. Both are very striking and showy forms, more particularly the last, whose strongly marked intercostal puncta, and the generally ornate character of its valve, make it a singularly beautiful microscopic object. *S. Febigerii* is pretty generally, but not abundantly, distributed along the Atlantic coast. The first specimens were detected by me two years ago in mud dredged from New London Harbor, sent me by Mr. Febiger, of Wilmington, Del., in honor of which careful and industrious observer I have named the species.

Hab.—New London Harbor mud, St. Mary river, mud from oysters. Wharf at Fernandina, and more recently at Cape May salt marshes, by Mr. Febiger. From its wide range of locality it will doubtless prove a common form on the coast.

4. *Surirella ovata*, Kütz, *Sporangial?* Pl. I. f. 3. This variety is not common in salt marshes along the Jersey coast, although specimens of the size figured are very rare. A comparison with the typical species will show considerable points of difference, but these become less in frustules which approximate to the normal size, although never altogether lost. It is perhaps entitled to rank as a variety of *S. ovata*. Length of valve '0009 a '0050.

5. *Cymatopleura marina*, n. sp. F. V. Linear, slightly inflated, ends more or less truncate. V. Lanceolate, very acute, undulations from 6 to 13. Surface of valve irregularly punctate. Length of valve '0007 a '002. Pl. I. f. 4.

This inconspicuous little form, although not yet found in quantity, occurs at various points along Long Island Sound. As far as is known to the writer it is the only marine species.

Hab.—On algæ at New London, New Haven and Black Rock Harbors. East river (Mr. Febiger), in mud.

6. *Amphiprora conserata*, n. sp. Frustules adherent in curved bands often to the number of 12 or more. Frustule straight, membranaceous. F. V. Linear oblong, slightly dilated. Keel or ala central or subcentral, constricted, costate, spathulate at extremities. V. Lanceolate or lanceolate with produced extremities. Pl. I. f. 8. 5

The great variation in size, outline and general configuration of the frustules of this species, together with the fact of their being so imperfectly silicious that a boiling in weak acid either distorts or entirely destroys the specimen, renders it not improbable that this may be an early developmental form, although of what known species, if any, would be difficult to say. A smooth and very diaphanous variety of *A. paludosa* occurs in the same gathering.

The "plates" alluded to by the late Prof. Gregory (Marine Diatomaceæ of Clyde,) as characterizing *A. lepidoptera*, and others of the genus, are strongly marked in this species, and serve as a point of attachment between the various frustules. Arising from the surface of the valve at a short distance

from its extremity, they are broadly convex and incline somewhat outwards. By the central portion of the outer aspect or margin of these plates, each frustule is united to the adjoining one on both sides, the keels or alæ of all three overlapping for about one half their breadth. A nearly perfect circle is thus often formed by a union of from 8 to 12 frustules. I am not aware of any description heretofore given of the union of the frustules of *Amphiprora* into bands or otherwise. In consequence of this arrangement, an end view of the frustule can readily be obtained.

Hab.—On marine algæ (ceramium) off Light House Rocks, New London, abundant. The bands of frustules are often moulded around the smaller stems of *Rhodospirææ*.

7. *Amphiprora Nereis*, n. sp. Frustule usually twisted, hyaline, very inconspicuous. F. V. Elliptical with rounded ends, constriction of keel or ala very deep. V. Striated, striæ from 50 α 60 in $\cdot 001$, extending to margin of ala. Supplementary plates? crenulate or undulating, at the margin appearing as though perforated with small puncta. Length of valve $\cdot 002 \alpha \cdot 0045$.

Hab.—On algæ (*Dasya elegans*) from a brackish lake at Narragansett.

This beautiful and delicate little form I have found only at Narragansett. Its small size, and faint markings make it so inconspicuous an object that a 1-12th inch is required not only to define but even to detect the balsamed specimens on a moderately crowded slide. The only indication of marking arresting the eye, is the lines of puncta or dots seen in Pl. I. f. 6. These I at first supposed were portions of the ala, but after examining several specimens and fragments of broken valves it seems more probable to me that they form supplementary plates, arising from the ala at or near its junction with the body of the frustule, and occupying the same plane as the former.

This *Amphiprora* most nearly resembles *A. ornata* *Bailey*, in size and markings. Many of the frustules present a good deal of the rectangularity of that species, but in other respects widely differ from it.

8. *Navicula marginata*, n. sp. F. V. Oblong, slightly constricted, with rounded ends. V. Panduriform, deeply and abruptly constricted. Segments lanceolate with subacute extremities. Surface of valve very convex, striate, striæ moniliform, distinct, about 28 in $\cdot 001$. Margin of valve bordered by a series of numerous small and beautifully distinct arches, apparently due to the absence or depression of the outer silicious plate, 6 in $\cdot 001$. Length of valve $\cdot 005$ to $\cdot 006$. Pl. II. f. 1.

The only two specimens of this beautiful diatom yet found by me, were derived, the one from Black Rock Harbor, (Light House Point,) on the roots of harbor grass; the other, an imperfect frustule, from the blue clay of the old Delaware estuary, (fossil). The former was a perfect frustule, and has furnished the drawings. It is very likely that this will hereafter prove a widely distributed species on the coast, from the fact of its occurrence with recent and fossil at points so remote from each other.

The characteristic ornate border and the peculiar striation serve to distinguish it from any of the panduriform species yet figured or described.

Hab.—Blue clay, Delaware river, (fossil). Light House Point, Black Rock Harbor. On algæ.

9. *Navicula*, n. sp.? or sporangium of *N. rhomboides*?—F. V. Linear slightly inflated. V. Lance elliptic, striate; striæ parallel, very clear and sharp, 50 α 60 in $\cdot 001$; central line, together with nodules, very prominent. Length of valve $\cdot 004$ to $\cdot 013$. Pl. II. f. 3.

This large hyaline species occurs in salt and brackish localities. It is found in the St. Mary's river, within two miles of the ocean, and on the Savannah river, below the city. *Triceratium favus* is found living in the same localities. In many of its characters it is nearly allied to *N. rhomboides* and *crassinervia*, more particularly to Var. β , of the first named, and, perhaps, notwithstanding its marine habitat, ought to be regarded as a variety of one or other of these species.

Hab.—Mud from oysters, St. Mary's river, Ga. Tidal mud from Savannah river. Marsh at Fernandina, Florida. Rare.

10. *Navicula Powellii*, n. sp.—V. Linear, sharply attenuated at subacute extremities, striated; striæ costate, interrupted about their middle by a blank line running from end to end of the valve; central nodule surrounded by a large lozenge-shaped blank space, reaching to the blank line as above. Length of valve $\cdot 004$ a $\cdot 006$. Pl. II. f. 4.2

This species is allied to *Navicula lineata* Donkin, Mic. Jour., in striation, but not in general characters.

Hab.—Black Rock Harbor, on algæ and on mud. Rare.

11. *Mastogloia angulata*, n. sp.—F. V. Oblong, truncate. V. Elliptical extremities slightly produced; loculi from 8 to 12; striæ 36 a 40 in $\cdot 001$, resembling those of *Pleurosigma angulatum*. Length of valve $\cdot 0014$ a $\cdot 0035$. Pl. II. f. 4

This species cannot be confounded with *Mastogloia apiculata*, from which it differs in its more broadly elliptical shape, the smaller number of its loculi and the angular character of its striation. These specific characters are unvarying.

Hab.—On algæ, from rocks off New Rochelle, Bannister's creek. Rockaway tidal mud. Stonington Inlet, on harbor grass, along with *M. apiculata* and *M. lanceolata*. Salt marshes at Atlantic, N. Jersey. Salt marshes at Cape May. Common.

12. *Mastogloia exigua*, n. sp.—V. Lanceolate elliptic; extremities sometimes a little produced; loculi 2 to 5, (commonly trilocular,) arched on the central aspect; striæ obscure. Length of frustule $\cdot 0005$ a $\cdot 001$. Pl. II. f. 5.

Hab.—Marsh scum of St. Sebastian river, St. Augustine, Florida. Pier at St. Augustine. Fernandina pier, coast of New Jersey.

This species occurs quite abundantly at the above localities. Its distinguishing peculiarity is the small number and curved outline of the loculi.

II. Rare and hitherto, in this country, unnoted species.

1. *Cocconeis oceanica* Ehr.—V. Broadly elliptical, somewhat larger than the variety figured in "Bacillarien."

Hab.—Tidal rocks off New Rochelle, L. I. New London and Bridgeport, attached to algæ and sertularia. Common.

2. *Epithemia constricta* W. Smith.—*Hab.* Mud from St. Sebastian river, St. Augustine, Florida. Common. L. I. Sound.

3. *Eupodiscus Ralfsii* W. Smith.—*Hab.* Mud from Black Rock Harbor. Bush river, Del., Mr. Febiger. Rice field mud, Savannah. St. Mary's river, Ga. Common, but not abundant.

4. *Actinophenia splendens* Shadbolt.—*Hab.* Delaware river mud. St. Mary's marsh, Ga. Rare.

5. *Arachnoidiscus Ehrenbergii* Bailey.—*Hab.* Long Beach, San Francisco, Cal., on algæ, along with *Hyalodiscus Californicus*. Rare.

6. *Triceratium undulatum* W. Smith.—*Hab.* Delaware river mud. St. Mary's river, Ga., marsh. Rare.

7. *Triceratium striolatum* Ehr.—*Hab.* St. Mary's river, Ga. Rice field mud, Savannah.

8. *Triceratium pentacrinus* Wallich.—*Hab.* Rice field mud, Savannah. Dredgings off Florida. U. S. Coast Survey. St. Mary's river. Rare. The 4 and 5-sided varieties are the only ones I have met with.

9. *Campylodiscus costatus* Ehr.—*Hab.* Delaware river mud. Rare.

10. *Campylodiscus parvulus* *W. Smith.*—*Hab.* On marine algæ from Newport, R. I., S. Powel. New London harbor mud. St. Augustine, Florida. The valves on the American variety, as far as met with, always have the valves at right angles to each other. Rare.

11. *Campylodiscus Ralfsii* *W. Smith.*—*Hab.* Black Rock Harbor mud. Connecticut river mud. Rare.

12. *Campylodiscus Hodgsonii* *W. Smith.*—*Hab.* Mud from Savannah river. Rare.

13. *Campylodiscus spiralis* *W. Smith.*—*Hab.* Ogeechee river, Ga. Savannah river. This fresh water species obtrudes on the above localities, also on the blue clay, Delaware river.

14. *Surirella fastuosa* *Ehr.*—*Hab.* Entire coast, on algæ and on mud. Common, and presenting a great range of outline and size.

15. *Surirella craticula* *Ehr.*—*Hab.* Delaware river mud. Rice field mud, Savannah.

16. *Nitzschia bilobata* *W. Smith.*—*Hab.* Bridgeport, Conn., harbor; adherent to roots of harbor grass. Very rare.

17. *Nitzschia closterium* *W. Smith.*—*Hab.* Marshes near Port Penn, Del. On algæ at Stonington, Conn. Rare.

18. *Nitzschia spathulata* *W. Smith* = *N. hyalina* (*Gregory*)—*Hab.* Salt marshes along the railroad at Atlantic, N. J. Salt marsh, Cape May, Mr. Febiger.

The American variety is smaller than the foreign.

19. *Nitzschia panduriformis* *Gregory.*—*Hab.* St. Mary's river, mud from oysters. Rare.

This beautiful species varies a good deal in size and somewhat in outline. The smaller specimens, but for the greater sharpness and coarseness of the striae, and the prominence of the puncta, might be confounded with the larger frustules of *Tryblionella constricta*.

20. *Nitzschia reversa* *W. Smith.*—*Hab.* St. George's Marsh, near Port Penn, Del. Marshes near Wilmington, Mr. Febiger. Rare.

21. *Nitzschia amphioxys* *W. Smith.*—*Hab.* Delaware river mud, marshes near Delaware City, Mr. Febiger.

22. *Nitzschia angularis* *W. Smith.*—*Hab.* Delaware river mud. Mud from Bannister's creek, Rockaway, L. I.

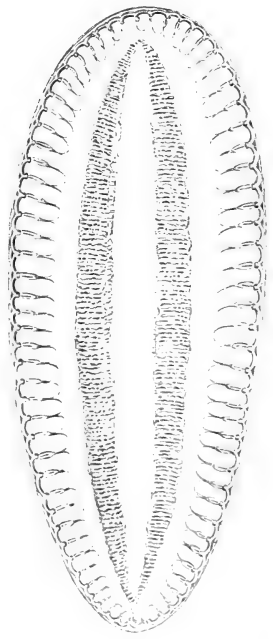
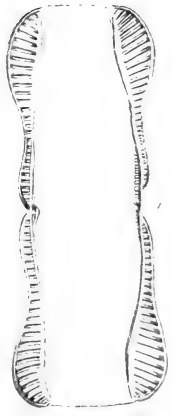
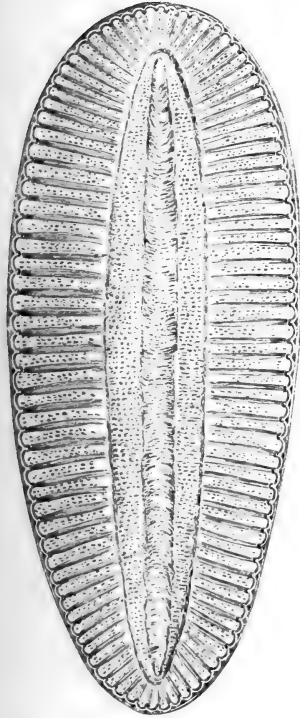
23. *Amphiprora paludosa* *W. Smith.*—*Hab.* On algæ at Stonington Inlet, L. I. Wilmington marshes, Del., Mr. Febiger. Common.

Several varieties of this species are found, in one of which the markings on the keel are entirely wanting. Atlantic salt marshes.

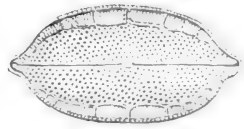
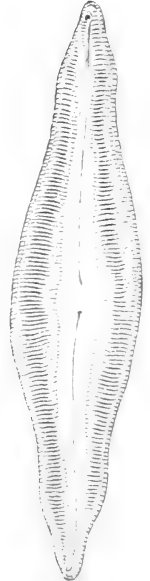
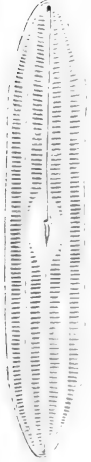
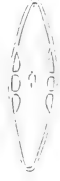
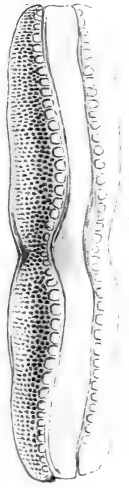
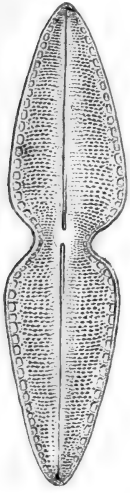
24. *Navicula trinodis* *W. Smith.*—*Hab.* Large rivers and brackish and fresh water marshes along the entire Atlantic coast. At Northam's Pond, brackish, Newport, R. I., Mr. Powel. Very abundant.

This species answers so fully to the description of *N. trinodis* *Smith*, that their identity can scarcely be questioned. A southern variety from St. Mary's river attains a much larger size, and the ends are often considerably produced. *N. trinodis* is a common rice field species. The common variety in this country is shewn in Pl. II. f. 6.

25. *Navicula Jennerii* *W. Smith.*—*Hab.* St. Sebastian river, St. Augustine, Florida; in mud. Rare.



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26. *Navicula convexa* *W. Smith.*—*Hab.* New London harbor mud. Rare.
27. *Navicula humerosa* *Brebbisson.*—*Hab.* Saguenay river, on algæ. Long Beach, N. J., on algæ. L. I. Sound, algæ. Common.
28. *Navicula Henedyii* *W. Smith.*—*Hab.* Delaware river, Kaighn's Point. Blue clay, fossil, Delaware river. New London, Conn., harbor mud.
29. *Navicula trochus* *Ehr.*—*Hab.* Blue clay, fossil, Delaware river. Very rare.
30. *Navicula truncata* *Donkin.*—*Hab.* Long Beach, N. J. New London, L. I.; algæ, &c.
31. *Navicula minutula* *W. Smith.*—*Hab.* Brackish marshes at Absecom Inlet, N. J. Cape May, salt marsh. Not uncommon.
Differs in habitat and shape, which is more pointedly elliptic, but agrees in striation and all other respects with the figure in Smith's Synopsis.
32. *Pinnularia longa* *Gregory.*—*Hab.* Providence, Fall river, on algæ. Newport, R. I., on algæ. Rare.
33. *Pinnularia polyonca* *Brebbisson.*—*Hab.* Very general along the coastal ponds and rivers. Northam's Pond, along with *Navicula trinodis*. Ogeechee and Savannah rivers, on algæ. Delaware river. On mud from Cooper's creek, N. J., and Duck creek, Del. Our native variety often attains a length of .005. The figure in *Mic. Journ.*, vol. 2, pl. iv., conveying a very poor idea of the size and general characters of *P. polyonca*, a representation of a full sized specimen will be found in *Pl. II. f. 6 & 7*.
34. *Pleurosigma macrum* *W. Smith.*—*Hab.* Brackish marshes at Wilmington, Del., Mr. Febiger. Rare.
35. *Pleurosigma obscurum* *W. Smith.*—*Hab.* Brackish marshes at Delaware City, Port Penn. Marshes of Delaware City, Mr. Febiger. Rare.
36. *Pleurosigma intermedium* *W. Smith.*—*Hab.* New Rochelle, on algæ. Dredged from sea at New London. Very abundant in this locality, but not elsewhere.
37. *Pleurosigma rigidum* *W. Smith.*—*Hab.* New Rochelle, on algæ; along with *Pleurosigma intermedium* at New London. Rare.
38. *Pleurosigma delicatulum* *W. Smith.*—*Hab.* Delaware river. Rare.
39. *Licmophora splendida* *Ehr.*—*Hab.* Rocks off Newport harbor, on algæ, Mr. Powel. Common.
40. *Podosphenia Baileyi*, n. sp., *Edwards.*—*F. V.* Broadly cuneate, truncate, sessile end often produced. *V.* Obovate, or suborbicular; the lower extremity prolonged into a very acute point, striated; striæ about 55 in .001.
Hab.—Long Island Sound, on algæ. At Stonington. New London. Black rock, Long Beach, N. J., on algæ. Common. *Pl. II. f. 8.*
This is possibly the species alluded to by Mr. Edwards, in his paper on American Diatomaceæ, *Mic. Journ.*, although in my specimens the presence of vittæ is sufficiently obvious. In this early stage the frustules are imperfectly silicious and possess short stipes, but as the growth of the individual progresses these become absorbed, until finally, as in others of the genus, they appear simply sessile.
Since writing the above, my friend Mr. Edwards has informed me of the identity of this species with his *P. Baileyi*, (manuscript.)
41. *Gomphonema marinum.*—*Hab.* New Haven harbor mud. Bannister's creek, Rockaway mud, and New Rochelle, on algæ. Not uncommon.

42. *Eucampia zodiacus* Ehr.—Hab. Dredged by Mr. Powel, off rock at Newport, R. I. Rare.

43. *Rhabdonema minutum* Kützing.—Hab. Narragansett rock, on algæ. Newport harbor, on algæ, Mr. Powel. Stonington rocks, on algæ.

44. *Cymbosira Agardhii* Kützing.—Hab. Rock off New Rochelle. Stonington Inlet.

45. *Tessella interrupta* Kützing.—Hab. Off rocks at New Rochelle, on algæ.

46. *Amphitetras antediluviana* Ehr.—Hab. Mud from Black Rock Harbor, along with Var. β . On algæ from New Rochelle. Mud from St. Mary's river. Rice field, Savannah, mud.

47. *Biddulphia turgida*.—Hab. St. Mary's river, on algæ. St. Augustine's Quay, Florida.

48. *Isthmia nervosa* Kützing.—Hab. Rivière du Loup, St. Lawrence river on algæ. L. I. Sound, fragments. Very rare.

49. *Bacteriastrum furcatum* Shadbolt.—Hab. Mud from St. Mary's river, Ga., also on algæ. St. Sebastian's river, on algæ. Fernandina, Florida. Rice field mud, Savannah river.

Var. β .—Without the bifurcate arrangement at the extremities.

50. *Bacteriastrum curvatum* Shadbolt.—Hab. Same localities as above. Detected by Mr. Febiger in some mud brought by me from St. Mary's river, marsh.

51. *Asterionella Bleakleyi* W. Smith.—Hab. St. Mary's river, on algæ. Fernandina wharf. Ogeechee canal. Savannah rice field mud, Savannah. This species occurs in greatest abundance at St. Mary's, Ga. It differs slightly from the specimens figured in Mic. Journ., in the outline of the valve, which is more slender in the American variety, and also less inflated at the base. I am of opinion that the normal number of frustules is four, which may be increased to eight by subdivision, but in this latter case the persistence of these is of short duration, two separate aggregations of four each resulting, this being the largest number capable of cohering perfectly. A group of four individuals undergoing subdivision is shown in Pl. II. f. 9, from rice field mud. It may here be mentioned that *Asterionella formosa* and *A. Ralfsii*? are occasionally met with in fresh water localities in this country. At a pond on Longacoming, N. J., Mr. Powel made a gathering, containing both these forms, along with a third, which differs so entirely from the described species, as to entitle it to rank as a distinct one. The valves are only about three times as long as broad, somewhat contracted in the centre. The striæ are indeterminate. *Asterionella formosa* occurs in the Delaware river, blue clay; also in mud from Cooper's creek. *Diatoma stellaris* of Bailey, is no doubt referable to this genus.

52. *Plagiogramma Gregorianum* Greville.—Hab. Entire Atlantic coast, L. I. Sound. At Black Rock Harbor, in mud and on algæ. New London mud. New Haven, Conn. Chesapeake Bay oysters. Rice field mud, Savannah. Never in great quantity.

The frustules of this somewhat doubtful genus vary very much in outline and the vittæ are often absent.

53. *Plagiogramma tessellatum* Greville.—Hab. Black Rock Harbor, in mud. Very rare. Only a single perfect frustule has been found by me.

54. *Podosira Montagnei* Kützing.—Hab. Newport rocks, dredged by Mr. Powel.

55. *Podosira maculata* W. Smith.—*Hab.* Coast of Florida, on algæ. Rare. Delaware river mud, also rare. Bush river, Del., Mr. Febiger.

56. *Creswellia ferox*.—*Hab.* Black Rock Harbor mud. Bannister's creek, Rockaway mud. Wilmington marshes, Mr. Febiger.

Only detached frustules have heretofore been found, but these were sufficiently characteristic to determine the species.

57. *Mastogloia apiculata* W. Smith.—*Hab.* Mud from Bannister's creek, Rockaway. Stonington Inlet, on algæ, along with *M. angulata* and *M. lanceolata*. New Rochelle rocks.

58. *Mastogloia lanceolata* W. Smith.—*Hab.* Stonington Inlet, with above.

III. *Species characteristic of the American coast.*

1. *Eupodiscus radiatus* Bailey.—*Hab.* Rivers and æstuaries from Charleston to Key West. Savannah rice field mud. Common. St. Mary's river mud, and at Fernandina, Florida. Common in tidal mud; also in algæ from pier at St. Augustine's.

2. *Auliscus pruinosis* Bailey.—*Hab.* Long Island, at Black Rock.

3. *Auliscus punctatus* Bailey.—*Hab.* Rice field mud, Savannah river. Rare.

4. *Auliscus radiatus* Bailey.—*Hab.* Fossil at Kaighn's Point, N. J., on blue clay. Rare. Bannister's creek, Rockaway, L. I. New London harbor. dredged.

5. *Auliscus cœlatus* Bailey.—*Hab.* Mud from New London harbor. Delaware river mud. Rare.

A variety of *A. pruinosis*, having three processes, occurs in Savannah river mud. All these species vary much in their markings, and occasionally so nearly approach each other in general character, as to make it very doubtful whether they ought to be kept apart.

6. *Stephanodiscus Niagaræ* Ehr.—*Hab.* Riviere du Loup, St. Lawrence river, on algæ. New Rochelle rocks, on algæ.

This fresh water species is quite common in our northern lakes and rivers, but as a marine form is rarely met with. It attains a large size in Lake Memphremagog, Canada, and in one locality, Skinner's Island, a remarkably fine variety occurs. When marine or brackish in its habitat it undergoes a marked diminution in size, preserving, however, the characteristic spines and other specific distinctions. In Kützing's description, (*Species algarum*,) it is spoken of as having a *non-radiate* granular centre, but in all the specimens which have fallen under my notice, this character has been wanting, and the centre both radiate and granular. It is difficult to understand how this very well marked species could ever have been referred to any of the known species of *Cyclotella*.

7. *Hyalodiscus subtilis* Bailey.—*Hab.* Atlantic coast. Very rare. San Francisco. On algæ from Long Beach. Abundant, and of large size.

In this latter gathering some of the frustules attained the large size of .009 in diameter. The F. V. is very narrow and linear, and the endochrome of a deep grass green color, dries in bands usually affecting the curvilinear course of the striæ. In the recent and unboiled frustules the central granular disc is not perceptible. *H. subtilis* is usually found on the axils of branching algæ, or adherent by a portion of its circumference to their stems.

8. *Snrirella limosa* Bailey.—*Hab.* Northern Atlantic coast and rivers. Common. L. I. Sound, at Rockaway, mud from creek. Delaware river. Bush

river, in mud. Duck creek, Del., mud. Rice field mud, Savannah river. The variety most commonly met with is more broadly ovate than that figured in Mic. Journ., vol. viii., and has a wide, smooth intercostal or more properly acostal space at the larger end of the valve.

9. *Amphiprora pulchra* Bailey. Sporangium of *A. alata*?—*Hab.* Entire Atlantic coast, mostly in still or stagnant salt ditches or streams. It may be observed of this species or variety, that in American localities it outnumber the supposed typical form, *A. alata*, and more than once I have found it in marshes where not a single frustule of *A. alata* has ever been seen by me. In the salt ditches along the Atlantic, N. J., railroad, *A. pulchra* is a very common form, the frustules ranging in size from that of *A. alata* to the largest dimensions heretofore seen in the former variety, and yet these smaller frustules have all the coarseness of striation and distinctive peculiarities of the largest. The same holds good at another locality, Bannister's creek, Rockaway, where, as well as at Absecom, *A. alata* is very seldom met with. While, therefore, it must be acknowledged that a certain general resemblance, amounting almost to identity of species, exists between the two, it might be well, in view of the above facts, to regard *A. pulchra* as a fixed variety of *A. alata*, and not its sporangium.

10. *Navicula permagna* Bailey. *Pinnularia permagna* Bailey.—*Hab.* In most of our large Atlantic rivers and brackish marshes. At Cape May, salt marsh near Cold Spring, abundant. A variety, illustrating the great range of outline in this species, is seen in Pl. II. f. 11. This is probably the *Navicula esox* of Kützing. It is more common on the Delaware river and its tributaries than that figured by Bailey. This form may be found exhibiting every range of outline between the two extremes. The striation and length of the frustule remains unaltered, however.

11. *Synedra undulata* Bailey.—*Hab.* Long Island Sound. On algæ from Newport harbor, Mr. Powel, very fine and large. Occurs in rice field earth, Savannah river.

12. *Tetragramma americana* Bailey = (*Terpsinöe americana*)—*Hab.* Atlantic coast of U. S. L. I. Sound, at New Haven. Black rock and Stonington, in mud. St. Mary's river, Ga., marsh. Delaware river, and at Bailey's locality, St. Sebastian's river, Florida. Although a widely distributed species, I have not found it in any abundance, except at the last named locality. Like *Terpsinöe musica* it is a brackish form, although often found in fresh water streams.

13. *Terpsinöe musica* Ehr.—*Hab.* Southern coast, most some distance up tidal rivers. Rice field mud, Savannah. St. Mary's river, Ga. Blue clay of Delaware river. Very rare.

14. *Podocystis americana* Bailey = (*P. adriatica*?)—*Hab.* L. I. Sound. Light House Point, Black Rock harbor, on algæ.

IV. *Species of universal distribution along the coast.*

<i>Epithemia musculus.</i>	<i>Triceratium punctatum.</i>
<i>Cocconeis scutellum.</i>	<i>Cyclotella Kützingiana.</i>
<i>Coccinodiscus subtilis.</i>	<i>rotula.</i>
<i>radiatus.</i>	<i>operculata.</i>
<i>eccentricus.</i>	<i>Surirella fastuosa.</i>
<i>oculus-iridis.</i>	<i>gemma.</i>
<i>Eupodiscus argus.</i>	<i>striatula.</i>
<i>sculptus.</i>	<i>ovata.</i>
<i>Triceratium favus.</i>	<i>salina.</i>
<i>alternans.</i>	<i>angusta.</i>

- Tryblionella acuminata.
 punctata.
 scutellum.
 Synedra fulgens.
 tabulata.
 gracilis.
 affinis.
 Nitzschia sigma.
 birostrata.
 dubia.
 plana.
 scalaris.
 obtusa.
 Amphiprora alata.
 lepidoptera.
 Navicula firma.
 liber.
 tumenis.
 didyma.
 lyra.
 punctulata.
 Smithii.
 cuspidata.
 amphisbœna.
 Pinnularia peregrina.
 cyprinus.
 Stauroneis pulchella.
 salina.
 Pleurosigma formosum.
 elongatum.
 angulatum.
 Balticum.
 Pleurosigma fasciola.
 hippocampus.
 Doryphora amphicerus.
 Bœckii.
 Podosphenia Ehrenbergii.
 Lyngbyi.
 Rhipidophora paradoxa.
 elongata?
 Achnanthes longipes.
 brevipes.
 subsessilis.
 Rhabdonema adriaticum.
 arcuatum.
 Striatella unipunctata.
 Grammatophora marina.
 serpentina.
 subtilis.
 Biddulphia pulchella.
 rhombus.
 aurita.
 Baileyi.
 Podosira hormoides.
 Melosira nummuloides.
 Borreri.
 Orthosira marina.
 Mastogloia Smithii.
 Berkleya fragilis.
 Colletonema eximium.
 Schizonema cruciger.
 Smithii.
 Homeocladia filiformis.

REFERENCES TO PLATES.

Plate I.

1. *Surirella pulchra*, n. sp.
2. *Febigerii*, n. sp.
3. *ovata* (sporangial).
4. *Cymatopleura marina*, n. sp. a, V. b, F. V.
5. *Amphiprora conserta*, n. sp. a, F. V. b, F. V., seen obliquely to shew the plates. c, V. d, end view of several frustules in union.
6. *Amphiprora Nereis*, n. sp. a, F. V. b, V. $\times 800$.

Plate II.

1. *Navicula marginata*, n. sp. a, F. V. b, V.
2. *Poweli*, n. sp.
3. _____ ? n. sp.
4. *Mastogloia angulata*, n. sp.
5. *exigua*, n. sp. a, V. b, F. V. $\times 800$.
6. *Navicula trinodis*. a, V. b, variety from St. Mary's River. c, F. V.
7. *Pinnularia (Navicula) polyonea*.
8. *Podosphenia Baileyi*. a, F. V. b, V.
9. *Asterionella Bleakleyi*.
10. *Asterionella*? _____. From same locality as *A. formosa*—Long-coming, N. J.
11. *Navicula permagna*. Var.

[Where not otherwise specified, the magnifying power used has been 500 diameters.]

G. Van Brunt

