BIHANG TILL K. SVENSKA VET. AKAD. HANDLINGAR. Band 1. N:o 11.

EXAMINATION OF DIATOMS

FOUND ON THE SURFACE OF THE SEA OF JAVA

BY

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WITH 3 PLATES.

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It is a wellknown fact that the open sea is sometimes coloured for considerable distances by a great number of small microscopical organisms, swarming close to the surface. Seafaring people call it "*sawdust sea*", but very few scientific researches on the organisms, living in such a manner have been yet published. The only complete examination, of which I am cognizant, is by GRUNOW *), who enumerates 13 different forms of diatoms, collected near the Nicobarian Island Tilanschang and found there on the surface of the sea.

I was just engaged in examining a larger number of samples of diatoms, collected on the open sea during the last two Swedish arctic expeditions to Greenland and of which I intend shortly to give a complete account, when I received by the favour of Prof. LOVÉN a sample of diatoms, collected by Captain KNOLL on the surface of the sea of Java Lat. 4° 20′ S. Long. 105° 22′ O. The mass, preserved in alcohol, consisted almost entirely of diatoms, but it contained also some animals such as smaller crustaceans, radiolaria and especially a *Peridinium,* which animal also occurs under similar circumstances the northern Atlantic.

A very complete investigation of this diatomaceous mass yelded about 50 different species of diatoms, the most common among them being represented by *Chætoceros, Bacteriastrum, Rhizosolenia* and *Coscinodiscus.* The oceanic forms from the northern Atlantic and from Davis Strait, which I have examined, belong also for the most part to the genera *Chætoceros* and *Rhizosolenia,* but *Bacteriastrum* is entirely absent and *Coscinodiscus* is somewhet rare. It was a very interesting fact to find that some of the species, living in the northern Atlantic

*) Verhandlungen der k. k. zoolog. bot. Ges. in Wien 1863, pag. 140.

and near the equator in the sea of Java, were exactly identic; some *Rizosoleniæ, Chætoceros Peruvianum* and some others occurring in both.

The forms of diatoms found in the collection from Java were the following:

1. **Coscinodiscus Oculus Iridis** Ehrb. (M. Geol. Pl. XVIII fig. 42 & Pl. XIX fig. 2) *variety;* very common.

The variety of this species was distinguished by its cellules, being larger near the margin of the valve (6 in 0,025 m.m.) and gradually decreasing in size towards the centre, where in most specimens is a collection of some few, very large cellules. Smaller specimens cannot be distinguished from *C. radiatus* and larger specimens have no central star, in which case they cannot be distinguished from *C. Gigas.* The most common form resembles C. Gigas in the arrangement of its cellules, but C. Oculus Iridis in the central star of larger cellules. Probably C. Oculus Iridis, Gigas and radiatus are only varieties of one and the same species. The size of the marginal cellules of C. Gigas from the Virginia deposit ware found to be 4 cells in 0,025 m.m.

2. **Coscinodiscus lineatus** Ehrb. (Kg. Bac. Pl. I fig. 10) *var. excentricus* (*C. excentricus* Auct.) not very rare.

Coscinodiscus lineatus and excentricus are connected by so many intermediate forms, that they can hardly be different species. The specimens of that species were surrounded by a large limbus of mucus, divided into segments by radiate lines, probably a secretion from the joint of the two valves. The case reminds one of *C. Sol.* Wallich (accord. to Pritch. Infus.).

3. **Coscinodiscus concavus** Greg (Diat. of Clyde pag. 500 Pl. X fig. 47 non C. concavus Ehb. = Endictya oceania). Disc covered by regular, somewhat large, hexagonal cellules (6 in 0,025 m.m.) arranged in straight lines making with each other en angle of 60°. Diam. 0,05 m.m. Colour of the dry valve leaden.

This species, which was somewhat rare in the diatomaceous mass from Java, cannot be the same as Endictya oceania, which I have seen from Peruvian guano. In most specimens of C. concavus four mucous masses were projecting from the joint of the two valves.

4. **Eupodiscus Jonesianus** GREVILL. (T. M. Soc. n. s. Vol. X pag. 22. Pl. II fig. 3) very common.

Disc very large, covered by numerous small hexagonal cellules, those in the centre being generally larger and arranged in a star just as in Cos. centralis, but in some specimens, especially the larger, they are wanting and in their place is a blank space. Processes, if present, are in all specimens, which I have examined, two and these not symmetrical, but in many specimens they do not appear. The margin of the smaller specimens has often a circle of apiculi, but these are often wanting. In this character they agree with *Coscinodiscus concinnus* (Sm) Roper. When the disc has no apiculi and no processes it cannot be distinguished from *Cosc. centralis* EHRB. and I have very little doubt that *Eupodiscus Jonesianus* as well as *Cosc. concinnus* and *Cosc. centralis* are forms of the same species.

The frontview of E. Jonesianus is quadrate with very convex ends and broad connecting membrane.

5. **Actinocyclus Ralfsii** (Sm.) Ralfs (in PRITCH. Infus. pag. 835. Pl. V fig. 84) not uncommon.

6. **Actoptychus undulatus** KG. (SM. Syn. I pag. 25. Pl. V fig. 43) very rare.

7. **Asterolampra Marylandica** EHRB. (*A. impar* SHADB. T. M. Soc. Vol. 2. pag. 17. Pl. I fig. 14) very rare.

8. **Asteromphalus Wallichianus** (GREV.) Ralfs (in PRITCH. Inf. pag. 837) very rare. Pl. I. fig. 1.

Not having had any opportunity of seeing a figure of the species, I am somewhat uncertain about the correctness of the determination and for this reason I have given a sketch of the form from Java. Length 0,048 m.m. Breadth 0,036 m.m. The segments are finely punctated and the puncta as in a Pleurosigma arranged in obliquely decussating lines 30 in 0,025 m.m.

9. **Asteromphalus flabellatus** (Bréb.) GREV. (M. J. Vol. VII pag. 160. Pl. VII fig. 4—5) somewhat rare.

10. **Asteromphalus reticulatus** CL. *N. sp.?* Rays seven, six of which are very broad; reticulated spaces covered by large, hexagonal cellules (14 in 0,025 m.m.). Umbilical space small

and the umbilical lines, passing from the top and the sides of the median one, angularly bent in the middle. Diam. 0,051 m.m. Pl. I fig. 2.

Somewhat rare resembles most *A. Ralfsianum* NORM. (= *A. heptactis* RLFS.) but seems to be different from that species, of which I unfortunately have not any specimen for comparison. The central (umbilical) space is very small and the cellules near the radii are not much larger than the other.

11. **Triceratium annulatum** WALLICH (M. J. Vol. VI pag. 249. Pl. XII fig. 19) very rare.

12. **Triceratium undulatum** BRIGHTW. (M. J. Vol. VI pag. 154 Pl. VIII fig. 1—5) not rare.

This species has been before found in the Monterey earth and also near the coast of Sussex, England.

13. **Triceratium Favus** var. *spinigerum* N. var.

Small with only few large hexagonal cellules. Each side of the frustule has two smaller projecting spines. This form reminds one of *T. muricatum* BRTW. but it has two spines on each side just as *T. Robertianum* GREV.

Extremely rare, only one specimen observed. Pl. I fig. 3.

14. **Biddulphia Indica** (EHRB.) ROPER (T. M. S. VII pag. 16. Pl. II fig. 20—22) Somewhat rare. Found before in Natal (*Shadbolt*).

15. **Biddulphia Chinensis** GREV. (T. M. S. n. s. Vol. XIV pag. 81. Pl. IX fig. 16). Not very rare. Found before near Hong Kong.

16. **Hemiaulus Heibergii** CL. *N. sp.* Sideview elliptical. Frontview narrow, almost linear, with long, slender, subacute processes; valves with numerous puncta, arranged in somewhat irregular lines.

Breadth on fr. w. 0,051 m.m.

Not very rare. Pl. I fig. 4.

The frustules are arranged in long, concatenated chains, which have large quadrate foramina.

17. **Hemiaulus membranaceus** CL. *N. sp.* Scarcely siliceous, valve without any markings. Frontview broadly linear, with

shortly produced angles, which are pointed with very small subulate processes. The frustules are concatenated in long chains, having narrow, linear foramina.

Breadth (F. V.) 0,12 m.m. Height of the frustule 0,024 m.m.

Not rare. Pl. I fig. 5.

The *Climacodium Frauenfeldianum* GRUN (*Novara. Exp.* pag. 102 Pl. I a. fig. 24) from the Nicobar Ids. seems to be nearly related to our species.

18. **Eucampia Zoodiacus** EHB. (SM. Syn. Vol. II pag. 25. Pl. XXXV fig. 299 and Pl. LX fig. 299).

Somewhat rare and found before in Sussex, Gr. Br.

19. **Mölleria cornuta** CL. *N. sp. Ch. Gen. Mölleria:* Sideview elliptical. Frontview curved, not symmetrical on both sides of the longitudinal axis, but symmetrical on both sides of the transverse axis. The extremities of the valves produced in long processes. Connecting membrane with numerous costæ (rudiments of diaphragms?)

This interesting genus, named in honour of the famous preparer of diatoms M. MÖLLER of Altona, forms a very interesting connecting link between *Eucampia*, which it resembles in its general form, and the *Striatellæ*, having the structure of the connecting membrane of the latter family.

Char. Sp. M. cornuta N. Sp. almost membranaceous; diaphragms alternate, numerous. Valve with scarcely distinguishable sculpture.

Lenght 0.036 m.m. Height 0,144 m.m. L. of the cornes 0,024 m.m.

Somewhat rare Pl. I fig. 6.

20. **Skeletonema costata** (GREV.) CL. (*Melosira costata* GREV. T. M. S. n. s. Vol. XIV pag. 77. Pl. VIII fig. 3—6.) Valve scarcely siliceous, having on their upper margin a crown of large and somewhat strong processes, which meet similar processes from another frustule. The frustules are connected into long chains just as Creswellia.

Not uncommon. Found before near Hong Kong and in the North Sea (Yorkshire). This species is certainly no Melosira and seems to me to belong to the genus *Skeletonema* (GREV.

T. M. S. n. s. Vol. XIII pag. 43) of which only one species is known, the *S. Barbadense* GREV. from the Barbados deposit.

21. **Creswellia Palmeriana** GREV. (T. M. S. n. s. Vol. XIII pag. 2 Pl. 1 fig. 9.)

Not uncommon. Found before near Hong Kong and on the coast of Australia.

22. **Lauderia annulata** CL. *N. sp. Ch. Generis.* Frustule cylindrical, sideview orbicular, covered, at least near the margin, with numerous short, hairlike processes or spines. Frontview annulated. Sculpture consists of very fine puncta.

This genus, named in honour of M. LAUDER, who has largely contributed to the history of one of the most interesting families of diatoms the Chetoceræ, in some characters resembles Creswellia, but in other respects Striatellæ. It seems to be a connecting link between the two forms, just as Mölleria between Eucampia and Striatellæ.

Lauderia annulata N. sp. almost membranaceous; surface and connecting membrane covered by numerous small puncta, visible only with high power.

Breadth of f. v. 0,024—0,075. Height of f. v 0,096. Not very rare. Pl. I fig. 7.

23. **Bacteriastrum varians** LAUDER (M. J. XII pag. 8 Pl. III fig. 1—6) very common. Found before near Hong Kong (LAUDER) and Nicobarian Ids (GRUN).

24. **Chætoceros Peruvianum** BRIGHTW. (M. J. vol. IV pag. 107 Pl. VII fig. 16—18). Tolerably common. Found before in guano from Callao and also in the northern Atlantic (CL.) and Davis Strait (CL.). The long horns are transversely striated, but the striæ are very fine (about 70 in 0,025 m.m.)

Var. robustum CL. *n. var.* Horns stout triangular and distinctly transversely striated; probably the same form as *Ch. boreale?* LAUDER (T. M. S. n. s. Vol. XII pag. 78. Pl. VII fig. 7). Striæ about 36 in 0,025 m.m. Pl. II fig. 8 a. upper valve. b. lower valve.

25. **Chætoceros compressum** LAUDER (T. M. S. n. s. Vol. XII pag. 78. Pl. VIII fig. 6) very rare; found before near Hong Kong.

26. **Chætoceros denticulatum** LAUDER (T. M. S. l. c. p. 79 Pl. VIII fig. 9). Somewhat rare. Observed before near Hong Kong.

27. **Chætoceros protuberans** LAUDER (T. M. S. l. c. pag. 79 Pl. VIII fig. 11). Very rare; found before near Hong Kong.

28. **Chætoceros Lorenzianum** GRUNOW. (Verh. 1863 pag. 157 Pl. XIV fig. 13. *Ch. cellulosum* LAUDER l. c. p. 78 Pl. VIII fig. 12) very common. The granules of the setæ are very coarse and visible under a low power, 10 in 0,025 m.m. All the setæ are in the same plane, when observed in the sideview of the filament. I have remarked that the direction of the setæ in the different species of the genus Chatoceros is very constant.

This species has been found before near Hong Kong (LAUDER) and the Nicobarian Ids (GRUN).

29. **Chætoceros coarctatum** LAUDER? (l. c. pag. 79 Pl. VIII fig. 8) *var.?* very rare. Pl. II fig. 10 a. b. c.

Not having had any specimens for comparison I have some doubts about the correctness of the determination.

The fig. b. and c. certainly belong to the same species, but of the upper valve fig. a. I have only seen detatched valves.

30. **Chætoceros distans** CL. *N. sp.* Sideview oblong, with rounded ends and divergent, curved setæ. Frontview quadrate. Cells united into long chains, having very large quadrate foramina. Setæ almost smooth, an asperity being perceptible only with high power and oblique light.

Breadth of the frustule (f. v.) 0,024—0,018 m.m. Very common. Pl. II fig. 11 a. b.

31. **Chætoceros diversum** CL. *N. sp.* Frustules densely united to each other not leaving foramina between them. Setæ of two different kinds: the larger stout and somewhat clavate. quadrangular near the apex and distinctly denticulate on the angles; the smaller setaceous and almost smooth. The large spines are alternating in the chain with 1—2 pairs of the smaller setæ.

Breadth of the frustule 0,0075 m.m. Height 0,0096 m.m. This small species is very common. Pl. II fig. 12.

32. **Chætoceros Javanicum** Cl. *N. sp.* Frustules closely united into a filament, having narrow foramina; awns straight with small puncta arranged in spirals. Height of the frust. (f. v.) 0,0168 m.m. Breadth 0,0192 m.m.

Somewhat rare. Pl. II fig. 13.

33. **Chætoceros Ralfisi** Cl. *N. sp.* Frustules closely united into a filament, having oval foramina. Terminal awns quadrangular, with small and somewhat distant aculei on the angles, curved in the middle. Other awns straight, with indistinct sculpture.

This species resembles Ch. affine Lauder, but the awns are dissimilar. Pl. III fig. 15.

Height of the frustule (f. v.) 0,024 m.m. breadth 0,012 m.m. Not very rare.

34. **Chætoceraros secundum** Cl. *N. sp.* Frustules united in chains, which are somewhat curved and have large broad and regularly oval, almost circular, foramina. Sideview broadly oval, with all the four setæ curved in one and the same direction. Sporangial cells (f. v.) oval with small marginal setæ. Length and breadth the fr. (f. v.) 0,024 m.m. Pl. II fig. 14 a. sporangial cells f. v. b. s v.

Somewhat rare.

35. **Chætoceros paradoxum** Cl. *N. sp.* Frustules united in chains, which have large, oval foramina. Sideview oval with long awns, curved together in the direction of the shortest axis of the cell. Awns with very flat, alternating elevations, somewhat distant from each others. Frontview very difficult to see, because the long awns there meet each other.

Length and breadth of the Fr. 0,024—0,036 m.m.

Somewhat rare. Pl. III fig. 16 a. f. v. b s. v.

36. **Chætoceros equatoriale** Cl. *N. sp.* Frustule cylindrical, siliceous, awns strong, sigmoid curved, parallel, with distinct, spirally arranged spines. Breadth of the frustule 0,012 m.m. Height 0,024 m.m. Length of the awns 3,85 m.m.

Very rare, only two specimens observed. This species is most nearly related to Ch. boreale, but is distinguished by the curved and parallel awns. Pl. II fig. 9.

37. **Rhizosolenia robusta** NORMAN (in Pritch. Infus. 1861 pag. 866. Pl. VIII fig. 42) somewhat rare.

This large species, certainly the largest of all diatoms, has been found before in the North Sea and near Australia.

The genus Rhizosolenia, puzzling as its forms may be found on a first inspection, seems to me to be very closely related to the Hemiaulidæ being to that family in about the same relation as the Isthmia to the Biddulphieæ. The annuli of the connecting membrane are perhaps nothing but the joints, by which the connecting membrane breaks up, when new frustules are growing out after the division, almost as the annuli near the ends of the cells of several species of Oedogonium.

38. **Rhizosolenia imbricata** BRIGHTW. (M. J. Vol. VI pag. 94 Pl. V fig. 6) not uncommon.

This beautiful species is easily distinguished from all the other by its coarse granules arranged in curved lines.

39. **Rhizosolenia Calcar Avis** MAX SCHULZE (M. J. Vol. VII pag. 19 Pl. II fig. 5—10) not uncommon.

Found before in the North Sea. Colour of dry valve light blue, annuli very distinct.

40. **Rhizosolenia alata** BRIGHTW. (M. J. Vol. VI pag. 95. Pl. V fig. 8).

This species is not rare and attains sometimes a very considerble length. Colour of the dry valve purplish. Found before in the Northern Atlantic and according to Grunow near ihe Nicobarian Islands.

41. **Rhizosolenia styliformis** BRIGHTW. (l. c. pag. 95 Pl. V fig. 5) very rare; found before in the northern Atlantic, in the North Sea, near Callao and Nicobarian Islands (Grunow).

42. **Rhizosolenia setigera** BRIGHTW. (l. c. pag. 9 Pl. V fig. 7). Somewhat rare; found before near the Nicobarian Islands (Grunow).

43. **Campylodiscus Brightwellii** GRUN. (Verh. 1862 pag. 445 Pl. IX fig. 4. *C. striatus* BTW. M. J. VII pag. 179. Pl. IX fig. 4) extremely rare.

44. **Novilla fastuosa** (SM.) CL.-(*Surirella f.* Sm. Syn. Vol. I pag. 32 Pl. IX fig. 66) very rare.

45. **Asterionella Frauenfeldii** Grun. (Verh. 1863 pag. 140 Pl. XIV fig. 18 a. b. c.

Very common; found before near the Nicobarian Islands (Grunow).

46. **Amphicampa equatorialis** Cl. *N. sp.* Somewhat twisted. Frontview panduriform, broadest near the ends. Valve coarsely striated, striæ composed of distinct (especially near the margin) granules. Connecting membrane with 6—7 longitudinal bars (diaphragms?), interstices being coarsely striated. Striæ 16—18 in 0,025 m.m. Length 0,12 m.m. Breadth 0,05—0,07 m.m. Very rare.

This beautiful species somewhat resembles *Amphiprora compicua* Grev. but, being twisted, it belongs to Amphicampa of Rabenhorst.

Pl. III fig. 17.

47. **Amphiprora membranacea** Cl. *N. sp.* Very large, scarcely siliceous; frontview broadly linear and very little constricted in the middle; angles rounded. Striæ parallel, very fine, but distinct about 50 in 0,025 m.m. Sideview elliptical, narrow, median line straight. Length 0,24 m.m. Breadth 0,12 m.m. (f. v.) Very rare. Pl. II fig. 18.

48. **Amphora plicata** Greg. (T. M. S. Vol. V pag. 70. Pl. I fig. 31). Very rare.

49. **Mastogloia Meleagris** Kg. *var. minutula* (Grev.) Grunow (*Mastogl. minuta* Grev. M. J. Vol. V pag. 12. Pl. III fig. 10) very rare.

50. **Nitzschia panduriformis** Greg? (*Greg* Diat. of Clyde pag. 529. Pl. XIV fig. 102 Hantzsch. Ost Ind. Arch. Diat. in Rab. Beitr. zu Kenntn. u. Verb. pag. 20 fig. 7). Very rare.

This species has no distinct oblique striæ as the sp. of Greg and resembles much more the form described by Hantzsch. Length 0,045 m.m.; striæ about 36 in 0,025 m.m. puncta about 20 in 0,025 m.m.

51. **Nitzschia Fluminensis** Grun? (Verh. 1862 pag. 581 Pl. XII fig. 35) very rare. The striæ are coarser than in specimens described by Grunow viz. 32 in 0,025 m.m. (45 in 0,01″ Gr.).

52. **Nitzschia paxillifer** (MÜLLER) HEIBERG (*Bacillaria paradoxa* Sm. Syn. II pag. 10 P. 32 fig. 279) extremely rare.

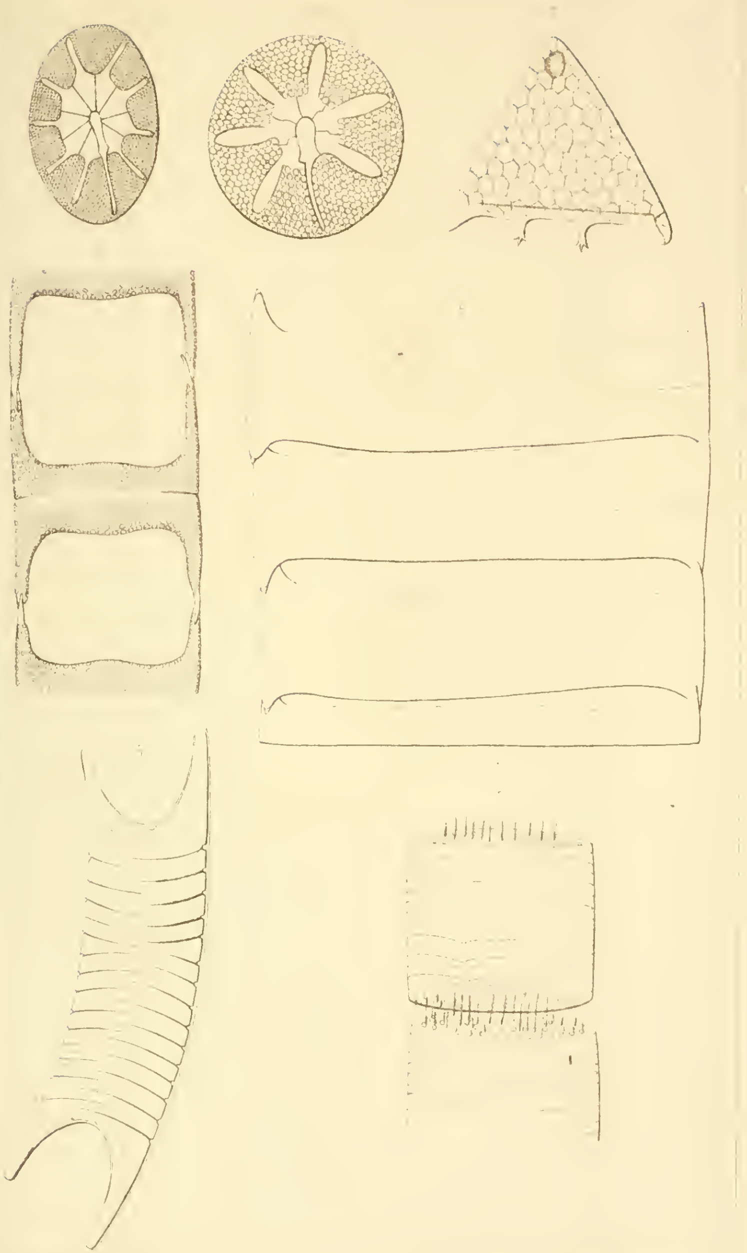
53. **Pleurosigma strigosum** SM (Syn. Vol. I p. 64 Pl. XXI fig. 203) very rare.

54. **Pleurosigma æstuarii** (BRÉB.) SM. (Syn. Vol. I pag. 65 Pl. XXI fig. 275) *var.?* Small; colour chestnut brown; striæ coarse, in smaller specimens about 33, in larger specimens about 43 in 0,025 m.m. Length 0,120 m.m. breadth 0,02 m.m. (large specimen) Lenght 0,051 m.m. breadth 0,017 m.m. (small specimen). Tolerably common. Pl. II fig. 19.

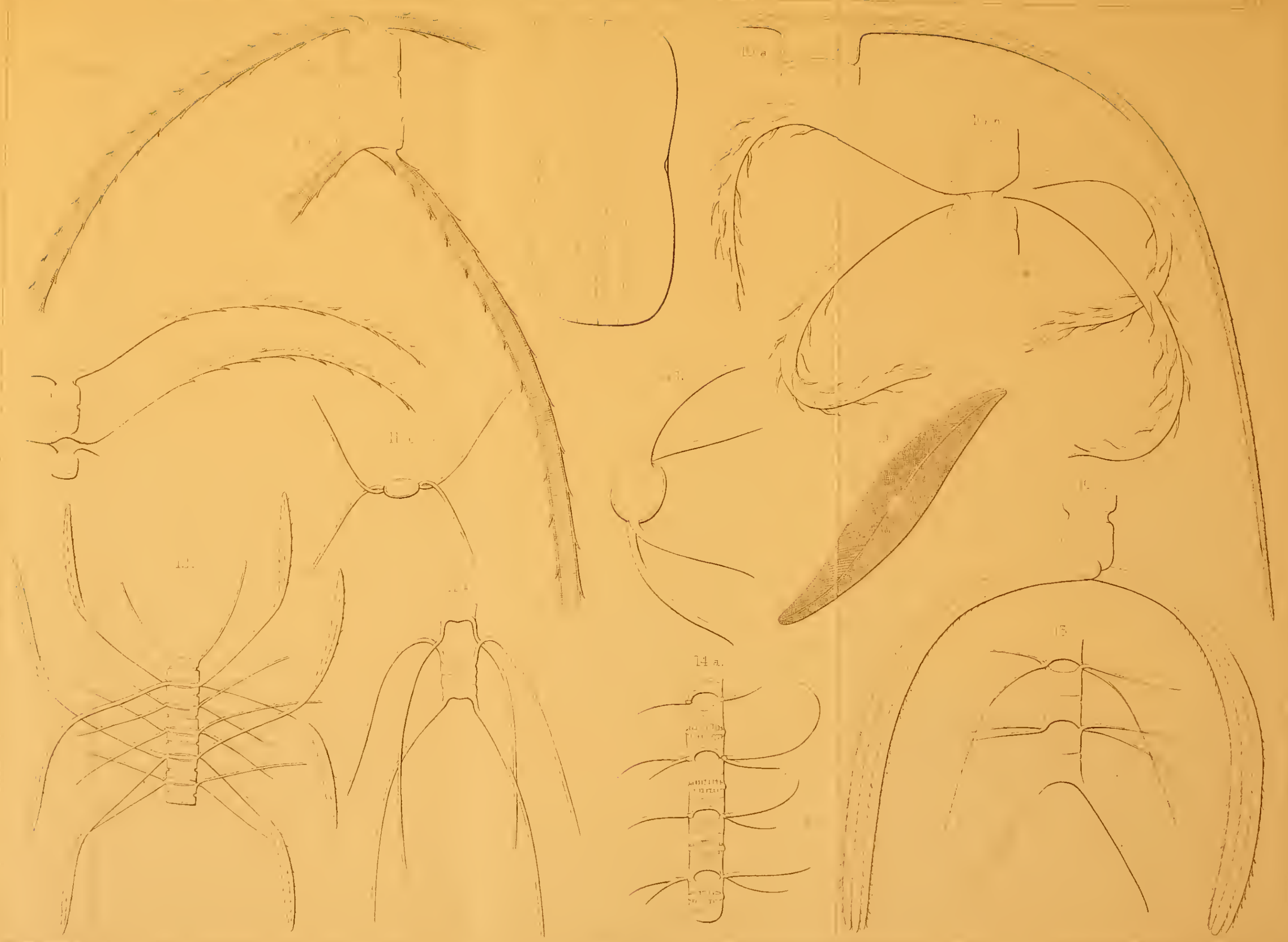
Description of plates I—III.

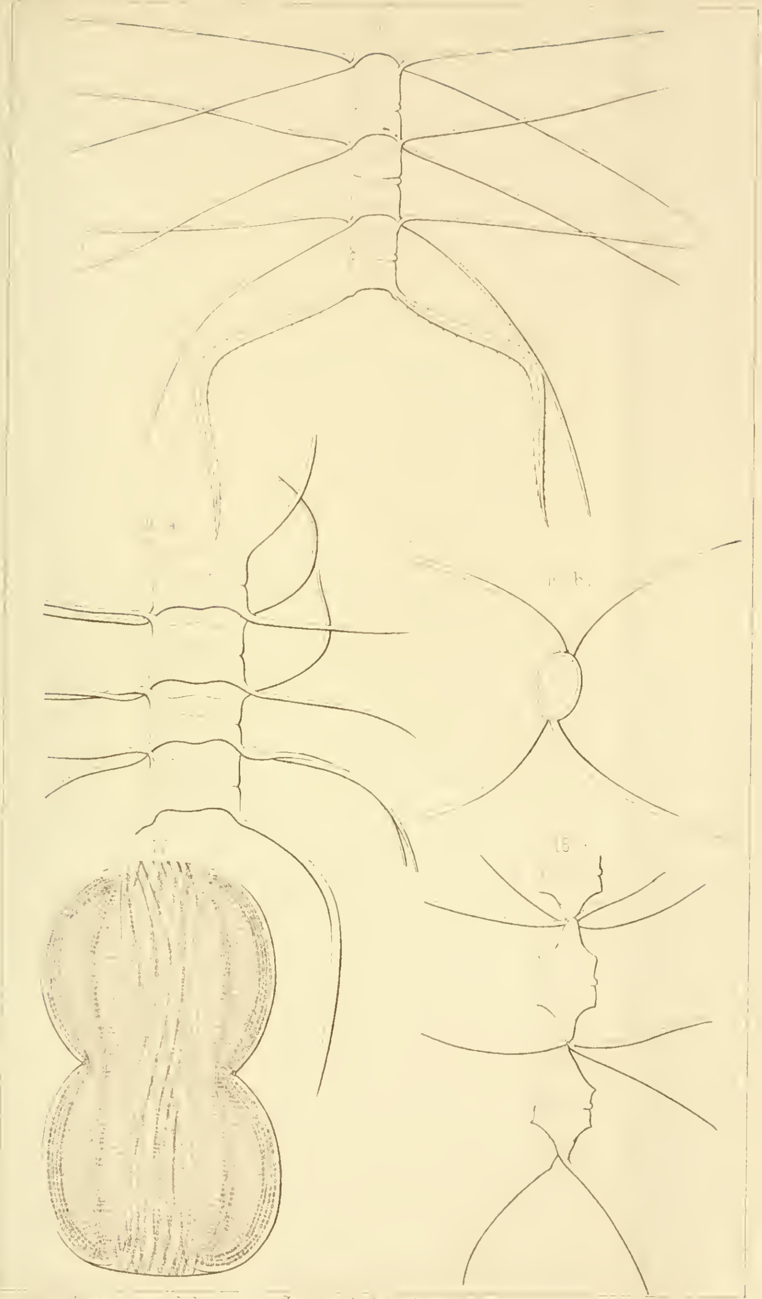
All the figures, except fig. 18, × 500 diameters.

Fig. 1. Asteromphalus Wallichianus GREV.?
» 2. As. reticulatus CL.
» 3. Triceratium Favus v. spinigerum CL.
» 4. Hemiaulus Heibergii CL.
» 5. H. membranaceus CL.
» 6. Mölleria cornuta CL.
» 7. Lauderia annulata CL.
» 8. Chætoceros Peruvianum var. robustum CL.
» 9. Ch. æquatoriale CL.
» 10. Ch. coarctatum LAUDER?
» 11. Ch. distans CL.
» 12. Ch. diversum CL.
» 13. Ch. Javanicum CL.
» 14. Ch. secundum CL.
» 15. Ch. Ralfsii CL.
» 16. Ch. paradoxum CL.
» 17. Amphicampa æquatorialis CL.
» 18. Amphiprora membranacea CL. (× 200 diameters).
» 19. Pleurosigma æstuarii *var.?*



[illegible] *Grev?* [illegible] *Cl.* [illegible] *Cl* [illegible] *Cl.* [illegible] *Cl.* [illegible] *Cl.* [illegible] *Cl.*


12.
14 a.
15



Malmgren st.

Ch. paradoxum *Cl.* Amphicampa æquatorialis *Cl.*