

ARTICLE X.—*Descriptions of New Species of Rotifera and Protozoa from the Illinois River and Adjacent Waters.*
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In April, 1894, the Biological Experiment Station of the University of Illinois was established on the Illinois River at Havana, Illinois. Collections were made from various substations, located upon the river and adjacent lakes, at stated periods, the intervals varying from one week to one month. Nearly all of the towings made were examined by me, and the list of animals includes ninety species of Rotifera and eighty species of Protozoa. Among the Rotifera there are three presumably hitherto undescribed species of the genus *Brachionus*. This genus is well represented by ten species and two varieties, and affords an interesting field for study.

ROTIFERA.

Brachionus variabilis n. sp.

(Plate XXII., Fig. 1 and 2.)

This species is remarkable because its posterior spines disappear with age.

The lorica is smooth and oval in outline. There are six occipital spines, of which the middle pair are longest and are curved outward. The second and third pair are of about equal length, and half as long as the middle pair. There are usually two lateral posterior spines present, which have a slight outward curve. A square plate projects from the dorsal posterior edge just over the foot orifice, and is a constant feature.

The outer pair of occipital spines are strengthened by a sharp spine-like reinforcement at their bases. The pectoral edge is very irregular. There is a sinus in the middle, at each side of which is a papillæ-like process. Between these processes and the lateral spines, there is

a deep sinus on each side. The surface of the lorica is marked by short ridges running back from the spines and median processes.

The posterior spines are about one fifth the length of the lorica. In many specimens, especially old ones, these spines are quite short, and in some instances they are entirely wanting. So far as observed, the newly hatched young and embryos in the eggs all possess the posterior spines, this indicating that the spines are characteristic of the species and are shed or absorbed only in old age. The quadrate plate over the foot orifice may serve as an easy means of identification, since I know of no other member of this genus that has a similar structure. The eggs are carried about fastened to the posterior part of the lorica.

The internal structure of this rotifer is normal. There is a large subquadrate dark-ruby eye just in front of the mastax. The foot and two toes are small for such a large species. Length of lorica, including spines, .342 mm. to .418 mm.; width .209 mm. to .257 mm.

This species was found in tows from the Illinois River, Quiver Lake, Thompson's Lake, and Phelps Lake. It is very restless and active, and occurs only in open water, free from vegetation.

Brachionus punctatus n. sp.

(Plate XXIII., Fig. 3-5.)

Lorica, as seen dorsally, subquadrate, sides slightly convex. A cross section would be nearly circular. Four occipital spines of about equal length, curving slightly downward and outward. In the lumbar region there is a slight invagination of the lorica on each side, thus causing blunt angles on the surface of the lorica, and making it irregular. The entire surface and spines are covered with minute spinules. The surface of the lorica is also marked off into areas by several curved lines. There are no posterior spines.

The posterior part is slightly excavated on the dorsal and ventral surfaces around the foot, the ventral excavation being more pronounced than the dorsal. The pectoral edge is slightly indented in the center, the edges sloping uniformly from the lateral edges to the middle. A small red eye is situated just in front of the large mastax. A dorsal antenna is prominent in the sinus between the antlers. The foot is long and wholly retractile. The eggs are carried about fastened to the posterior part of the lorica.

The characteristic features of this rotifer are the shape of the lorica, the latero-posterior inangulations, the shape of the occipital spines, and the small spines covering the surface of the lorica. Its nearest ally is *B. budapestinensis* Daday (Plate XXIII., Fig. 6), from which it differs in the form of the lorica, in the size and shape of the occipital spines, and in the shape of the foot orifice.

This is a lively little species, and is found only in clear water, away from vegetation. Length of lorica, including spines, .151 mm. to .172 mm.; width .092 mm. to .096 mm.

Brachionus mollis n. sp.

(Plate XXIV., Fig. 7 and 8.)

Lorica thin, smooth, oval in outline; the dorsal surface highly arched; ventral surface but slightly convex. The anterior margin straight and truncated. No occipital or posterior spines. A very prominent dorsal antenna near the anterior margin.

This species is peculiar in having a very thin, soft lorica and no spines. When the animal contracts, it frequently invaginates those parts of the lorica that serve as attachments for the muscles. The foot orifice is guarded by a collar. The foot is very large and long, is wholly retractile, and ends in two small toes. The toes are very characteristic for this species. Viewed either dorsally or laterally, they taper to

very fine points. Their inner edges are convex and separated from each other, while the outer edges are concave, consequently when viewed dorsally, the toes are seen to be separated and to curve away from each other. A ruby eye is situated in front of the large mastax. The ovary is large and spherical. The stomach, viewed dorsally, is pear-shaped, with large end towards the anterior part. The eggs are carried about fastened to the posterior part of the lorica. When the animal withdraws into the lorica, the anterior edge is thrown into a number of longitudinal plications.

This species was found during July and August in tows from the Illinois River and Phelps Lake.

Length of lorica .228 mm.; width .150 mm.

PROTOZOA.

Of the eighty species of Protozoa observed, four appear to be new to science. Two of these, *Diffugia tuberculosa* and *Ceratium brevicorne*, were first found in Matanzas Lake.

Diffugia tuberculosa n. sp.

(Plate XXV., Fig. 9 and 10.)

Shell compressed, irregularly ovoid in shape, slightly constricted around the mouth, and prolonged into a short neck. Fundus rounded, and ending in one or more blunt processes, like *D. pyriformis* var. *nodosa* Leidy. On each of the compressed sides there are three small prominences or tubercles.

This is a medium-sized species, about one and a fourth times as long as wide. The shell is composed of large and small rounded sand grains. No diatoms and but very few grains of sand with sharp corners are found in the shells. This species is characterized by having three small tubercles on each of the two compressed sides. These tubercles are arranged on each side of the shell so as to form the angles of a triangle.

One is near the edge of the fundus, and the other two are placed one at each side of the shell a little above the neck. Although the shell itself varies greatly in outline and is asymmetrical, these tubercles are constant and afford an easy means of recognizing the species. The pseudopodia are simple and few in number. Length .143 mm.; width .111 mm.

This species was found in towings taken in Matanzas Lake during August. It was not common, and we have seen it but once since.

Ceratium brevicorne n. sp.

(Plate XXV., Fig. 11 and 12; Plate XXVI., Fig. 13.)

Body small, compressed, triangular; three spines, one anterior and two posterior, the left posterior one quite small. The surface is slightly roughened by the small plates, but there are no small spines. The long anterior spine smooth.

This is a compact robust little species, about two and a half times as long as wide. The shell is curved so as to be convex on the dorsal surface and concave on the ventral. The three horn-like processes or spines are straight prolongations of the shell; no specimen was found in which they were bent or curved. Length, including spines, .115 mm.; width .046 mm.

This is a rather rare form. It was found during August in towings from Matanzas Lake, in company with *Peridinium tabulatum* Ehrbg., and has been observed only at rare intervals since. It can be distinguished very readily by its compact triangular body and short straight spines.

Tintinnopsis illinoisensis n. sp.

(Plate XXVI., Fig. 14 and 16.)

Animal small, ovate, inhabiting a narrow cylindrical or thimble-shaped chitinous shell, covered for the most part with small sharp-angled grains of sand. Fundus obtusely conical or rounded. Shell either of the

same diameter throughout, or slightly dilated at oral opening. Sides straight, more than twice as long as wide.

This species agrees very closely with *T. beroidea* Stein, and I place it here provisionally until its minute structure can be more closely studied. The shape of the lorica is characteristic: long, narrow, with straight sides, often slightly dilated at the mouth, and frequently with a bluntly conical fundus, giving it the shape of a rather long thimble. It is smaller than *T. beroidea*; its average length being .059 mm. and the average width .029 mm.

It was found in April and May, in company with *Codonella cratera* Leidy, in tows from the Illinois River, Thompson's Lake, and Quiver Lake.

Opercularia irritabilis n sp.

(Plate XXVI., Fig. 17 and 18.)

Body ovate, elongate, truncated posteriorly, two and a half times as long as wide. Greatest diameter in front of the middle, from whence the sides slope gradually from the posterior end. Peristome border everted, thickened, forming a conspicuous ridge or ring; constricted below the border.

Ciliary disc slightly dome-shaped, not highly elevated; two rows of cilia present. The cuticular surface is smooth. Endoplasm granular, yellowish. Contractile vacuole large, circular, placed in the anterior part, near the peristome. Nucleus band-like, curved, placed transversely in the anterior part of the body.

The zoöids are very sensitive, and when contracted they have an oval shape; the anterior part is projected into a snout-like prominence and thrown into numerous longitudinal folds; while the posterior part is contracted around the base of the pedicle, and thrown into transverse plications. The membranous collar is not very conspicuous. The pharynx is large, extends half the

length of the body, and is lined with cilia. The endoplasm in the posterior part of the body is clear, and numerous fine longitudinal striations can be differentiated. These unite and form the core of the stalk, which has also fine longitudinal striations. The stalk is variously branched. Some of the zoöids have long pedicles, while others are nearly sessile. The colonies are large, consisting of several hundred individuals. Multiplication by longitudinal division was noticed. Length, .178 mm. to .20 mm.; width .078 mm.

This species is similar to *Opercularia articulata* Ehrbg., but differs from it in the shape of the body, the character of the peristome border and pharynx, and the elevation of the ciliary disc.

It was found during the summer months at many of the stations, always attached to some animal, and seemed to prefer the young musk turtle, *Aromochelys odoratus*. It also occurred on the backs of the snapping turtle, *Chelydra serpentina*, and the crayfishes *Cambarus diogenes*, and *C. blandingii* var. *acuta*.

Tokophrya quadripartita C. & L. was found common in company with this species, as was also a small *Opercularia* which may turn out to be a variety. The zoöids are small—length .08 mm.; width .042 mm.—but otherwise they seem to agree with the larger species. A part of the food of this species consists of diatoms and *Euglena*.

Collections are still being made at the various stations, and further study will no doubt add other forms to this list.

Havana, May 12, 1896.

EXPLANATION OF PLATES.

PLATE XXII.

- Fig. 1. *Brachionus variabilis* n. sp.
 Fig. 2. " *variabilis* n. sp. Form without posterior spines.

PLATE XXIII.

- Fig. 3. *Brachionus punctatus* n. sp. Lateral view.
 Fig. 4. " *punctatus* n. sp. Dorsal view.
 Fig. 5. " *punctatus* n. sp. Anterior and posterior ends of lorica.
 Fig. 6. *Brachionus budapestinensis* Daday.

PLATE XXIV.

- Fig. 7. *Brachionus mollis* n. sp. Dorsal view.
 Fig. 8. " *mollis* n. sp. Lateral view.

PLATE XXV.

- Fig. 9. *Diffugia tuberculosa* n. sp.
 Fig. 10. " *tuberculosa* n. sp. Another form.
 Fig. 11. *Ceratium brevicorne* n. sp. Ventral view.
 Fig. 12. " *brevicorne* n. sp. Dorsal view.

PLATE XXVI.

- Fig. 13. *Ceratium brevicorne* n. sp. Lateral view.
 Fig. 14. *Tintinnopsis illinoisensis* n. sp.
 Fig. 15. " *illinoisensis* n. sp. Another form.
 Fig. 16. " *illinoisensis* n. sp. Another form, not so much magnified.
 Fig. 17. *Opercularia irritabilis* n. sp. Expanded zoöid.
 Fig. 18. " *irritabilis* n. sp. Contracted zoöid.

PLATE XXII.

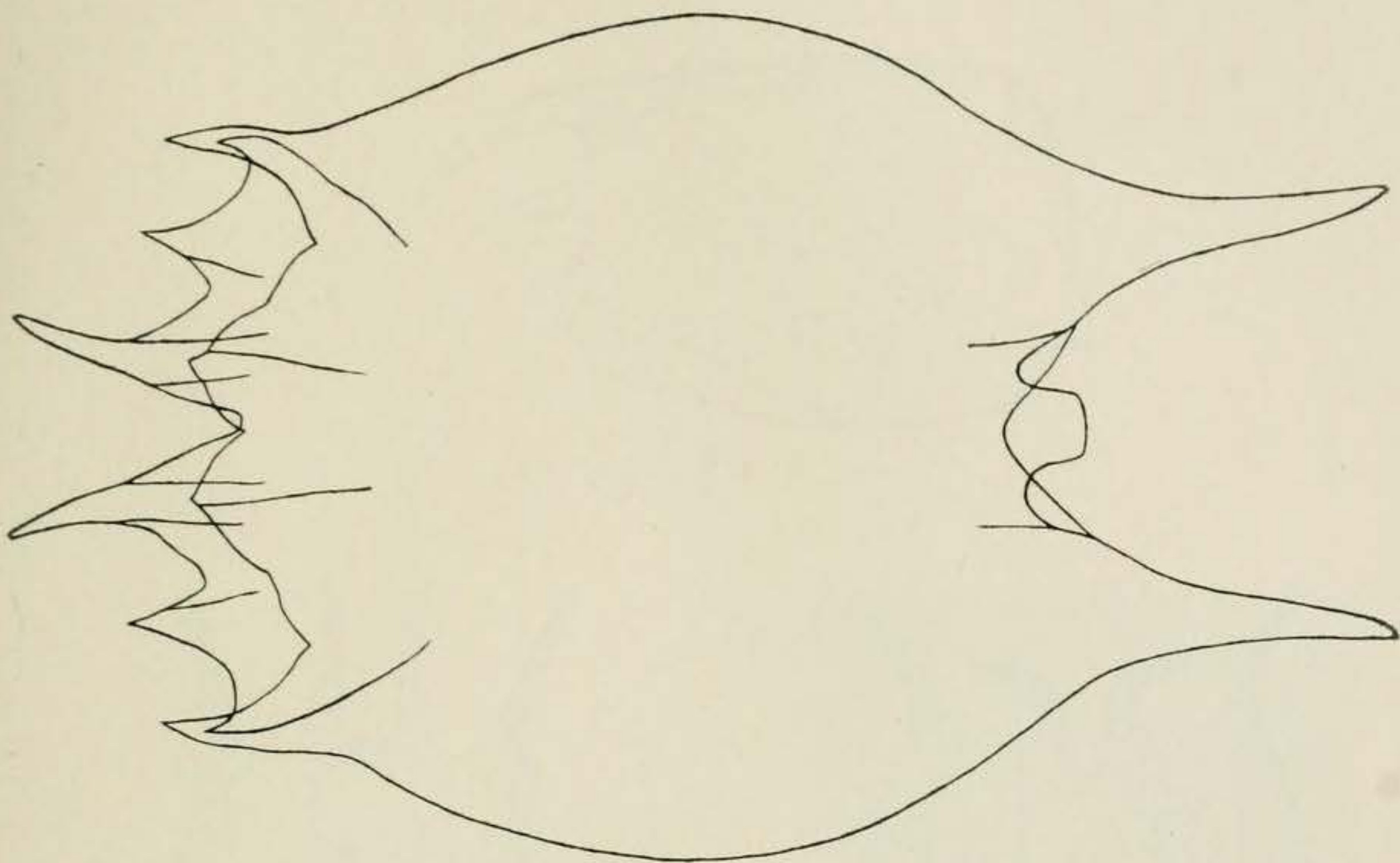


Fig. 1.

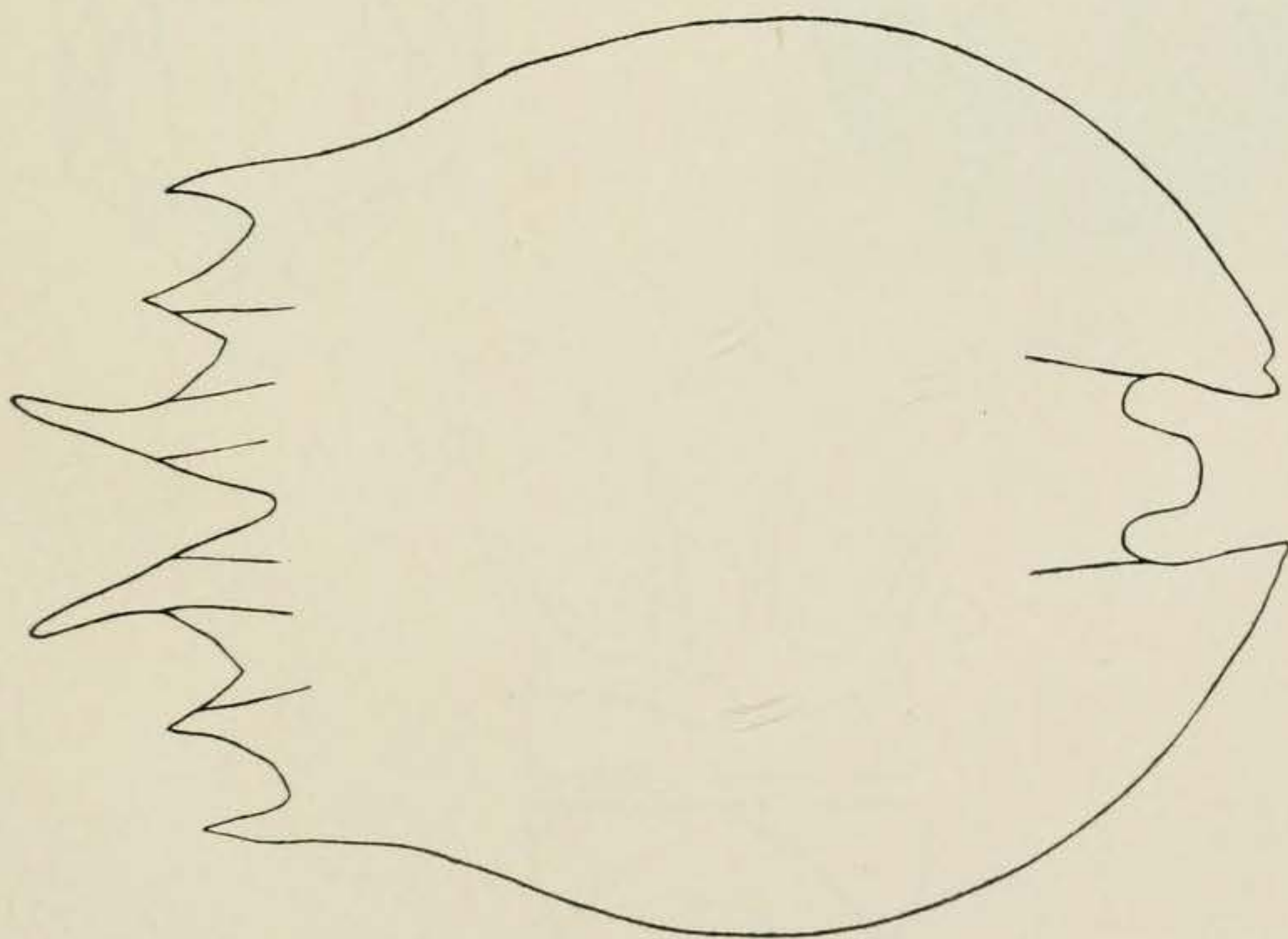


Fig. 2.

PLATE XXIII.

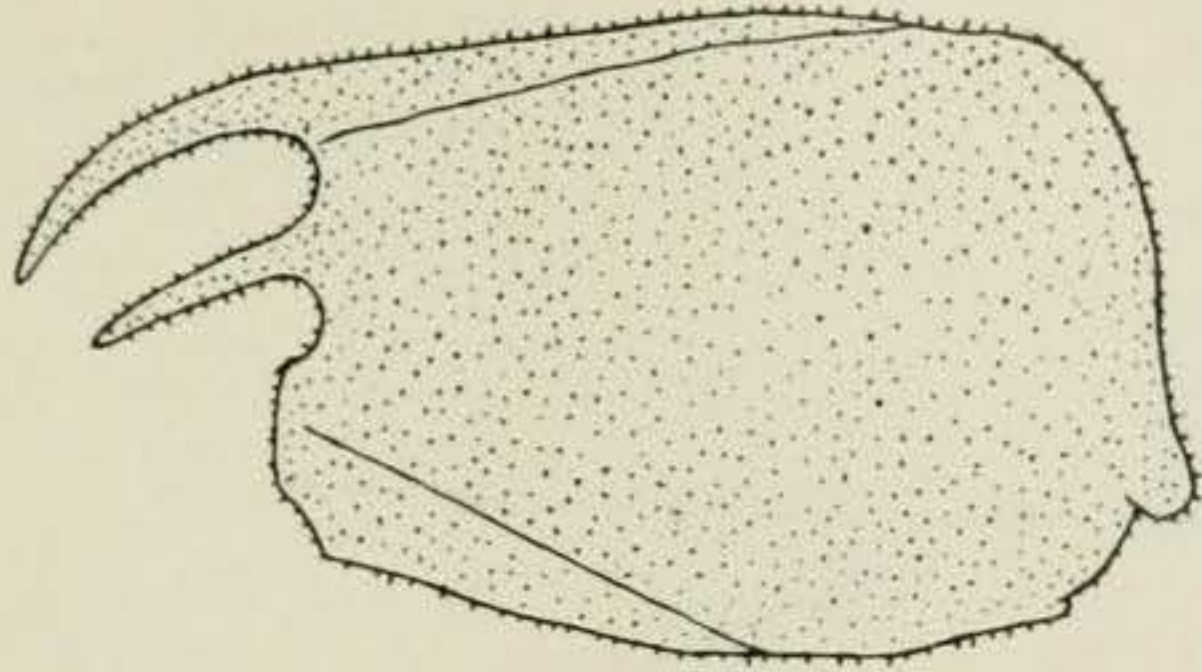


Fig. 3.

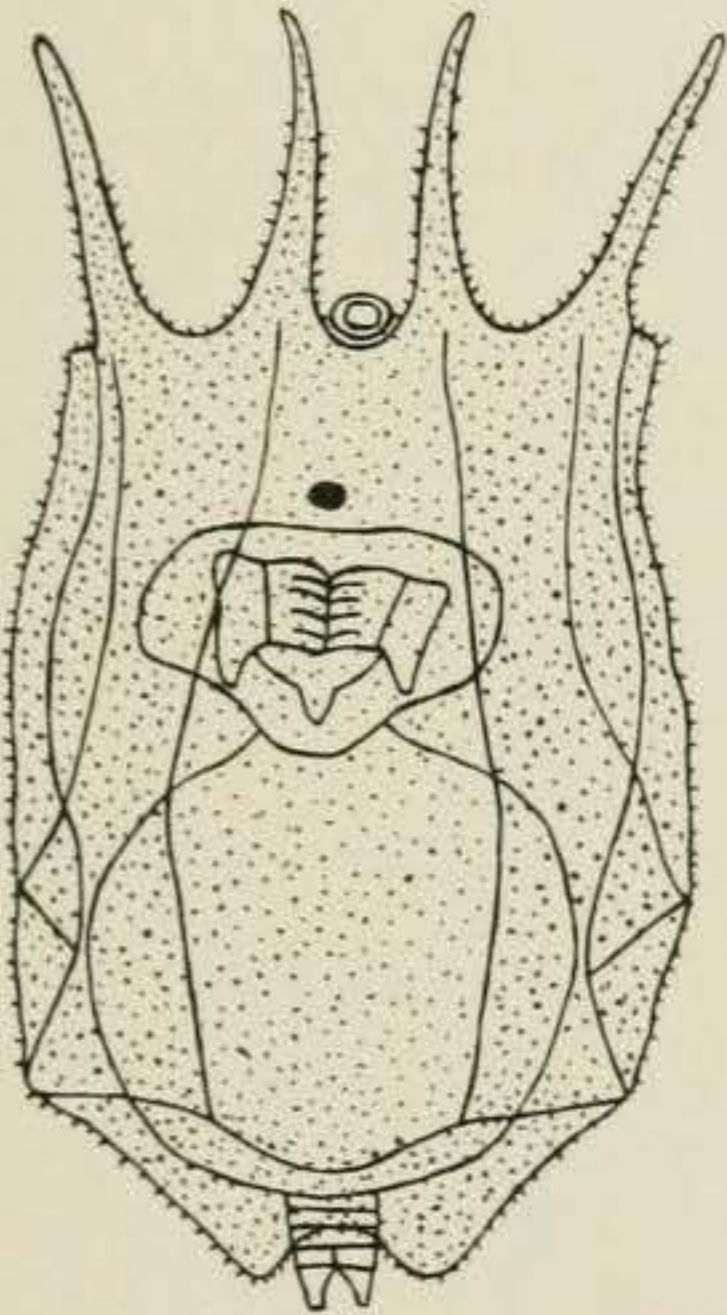


Fig. 4.

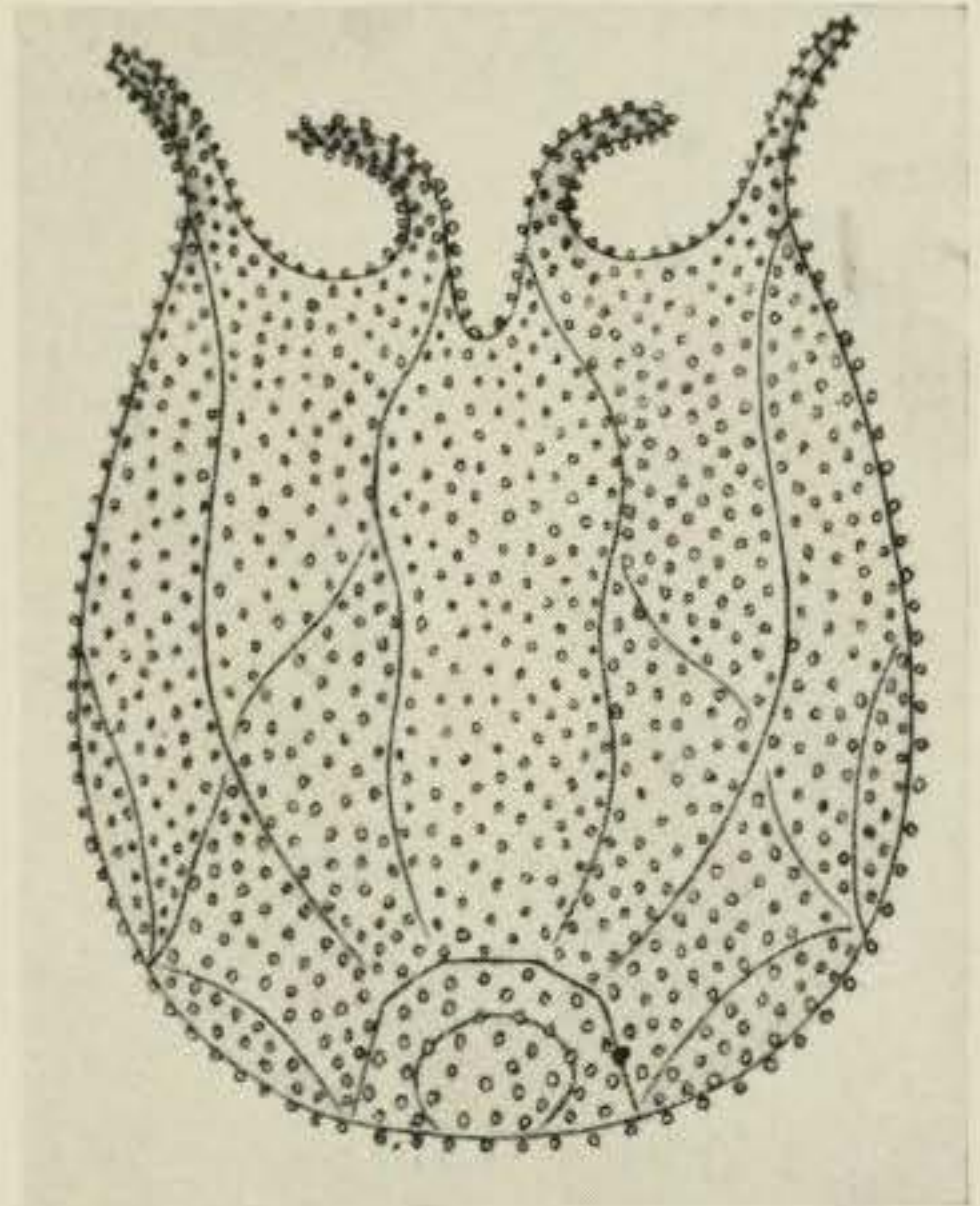


Fig. 6.

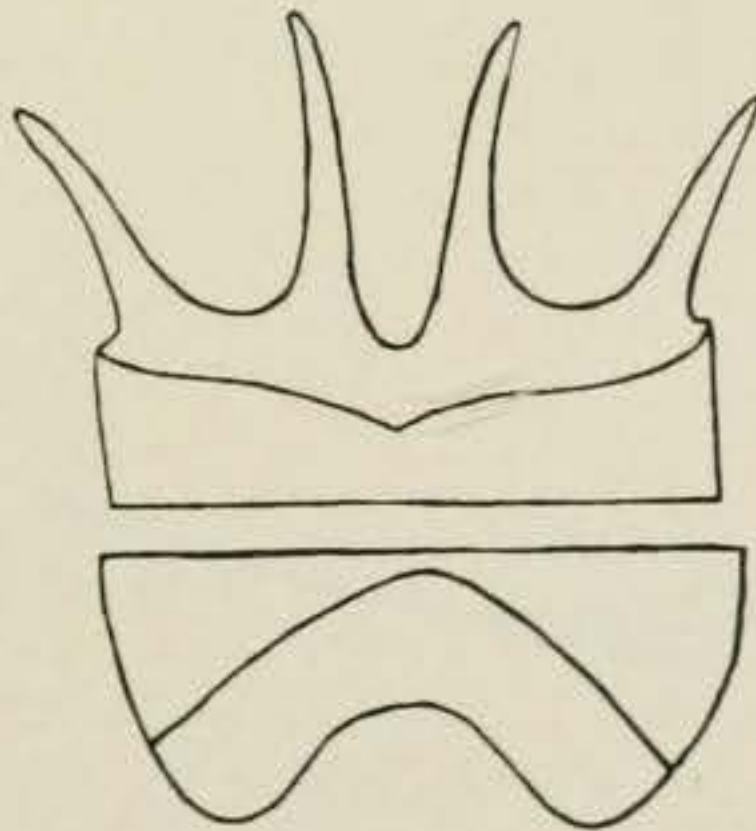


Fig. 5.

PLATE XXIV.

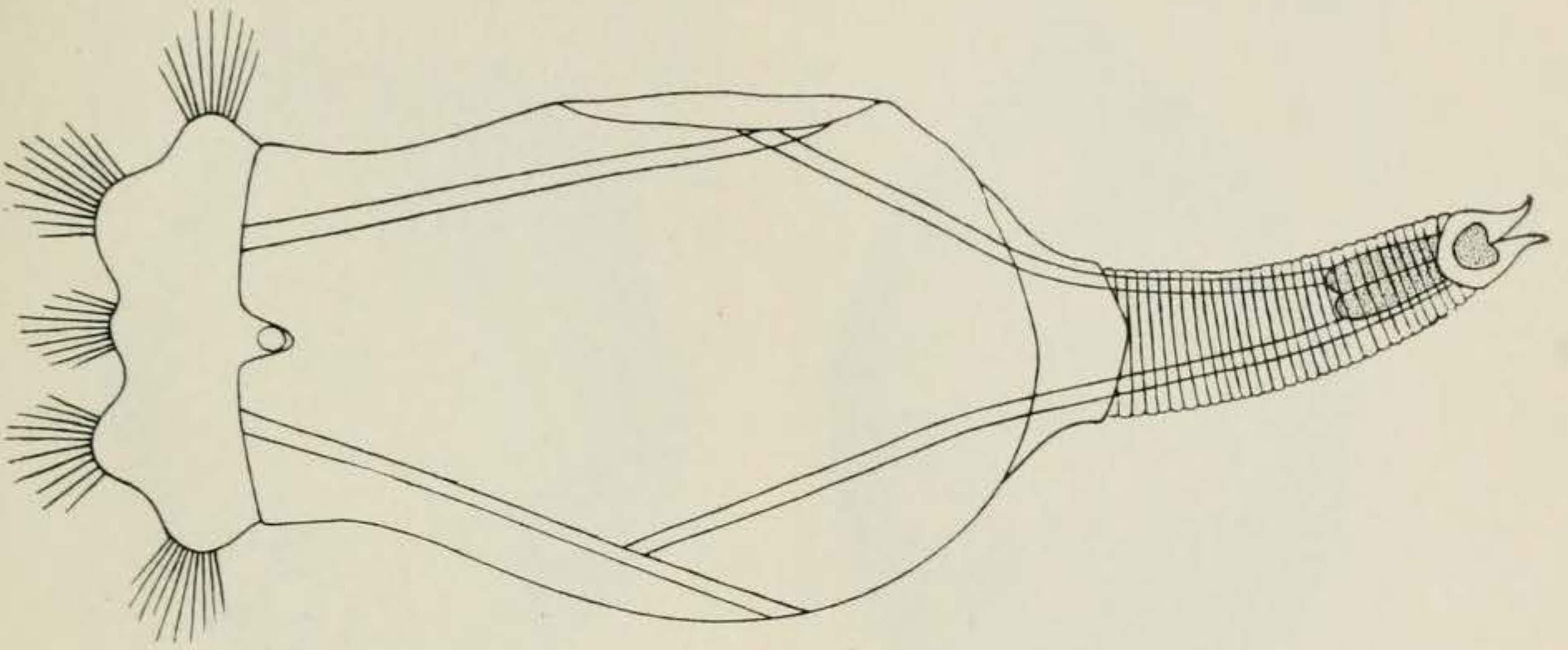


Fig. 7.

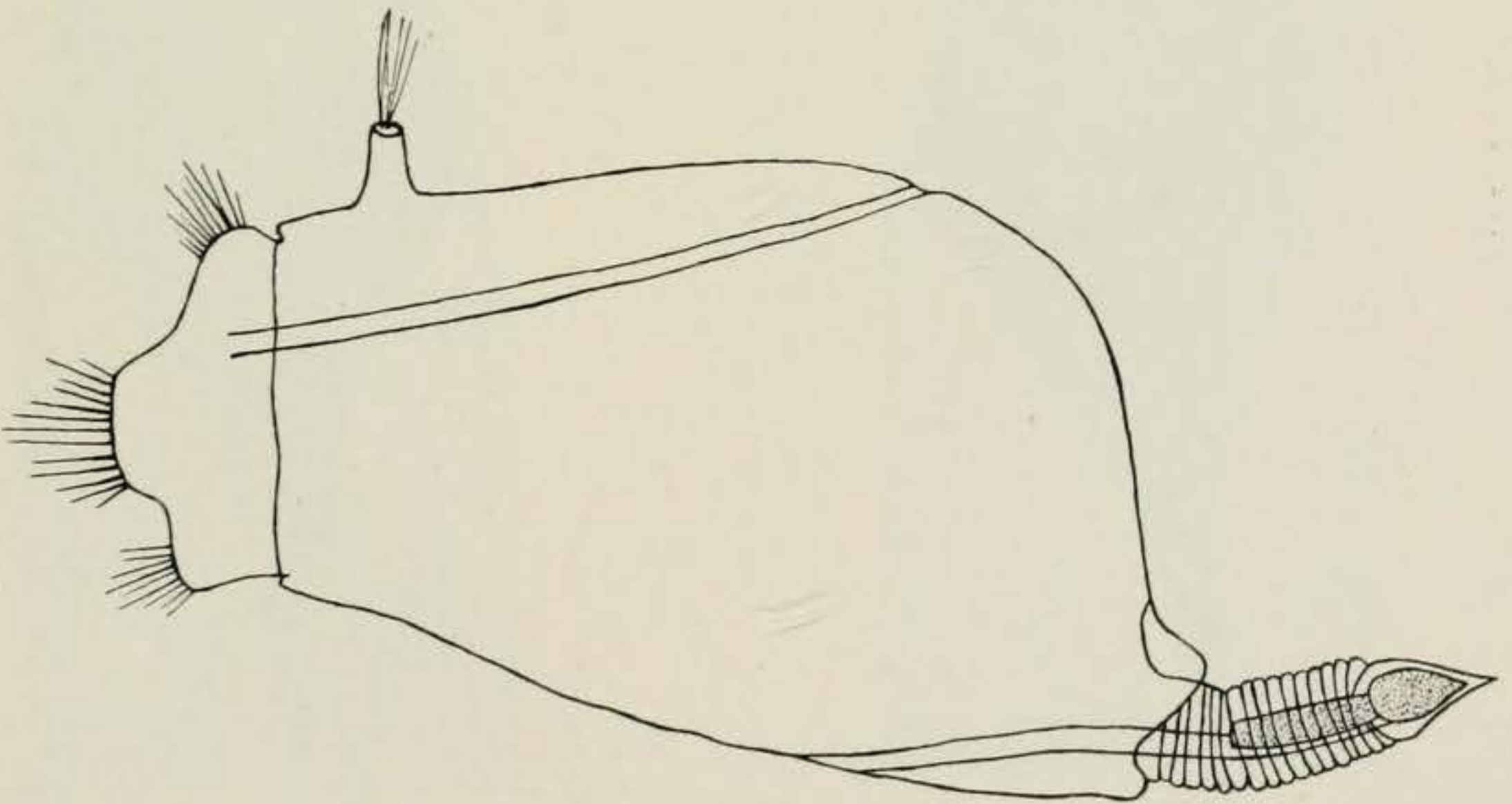


Fig. 8.

PLATE XXV.

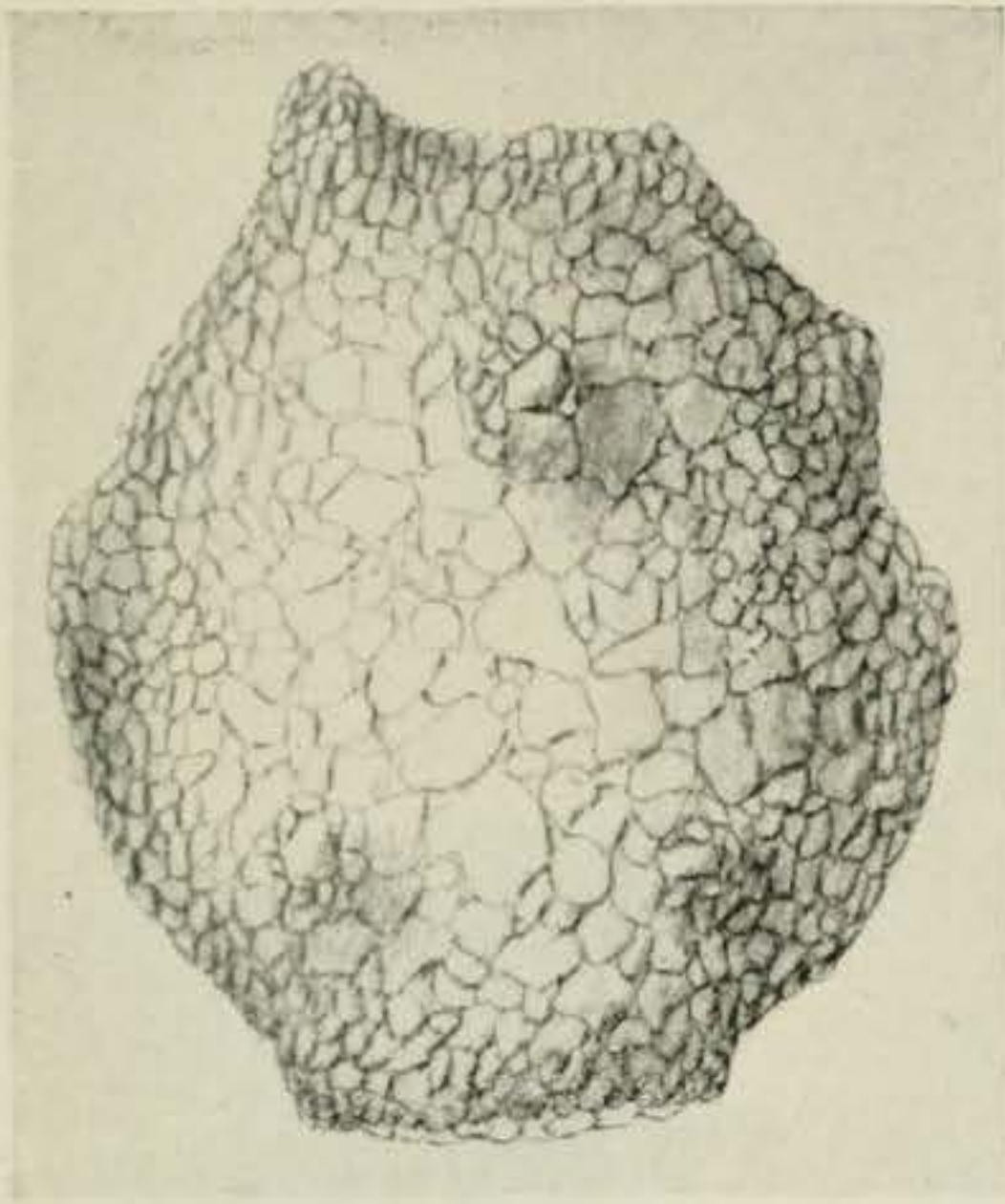


Fig. 9.

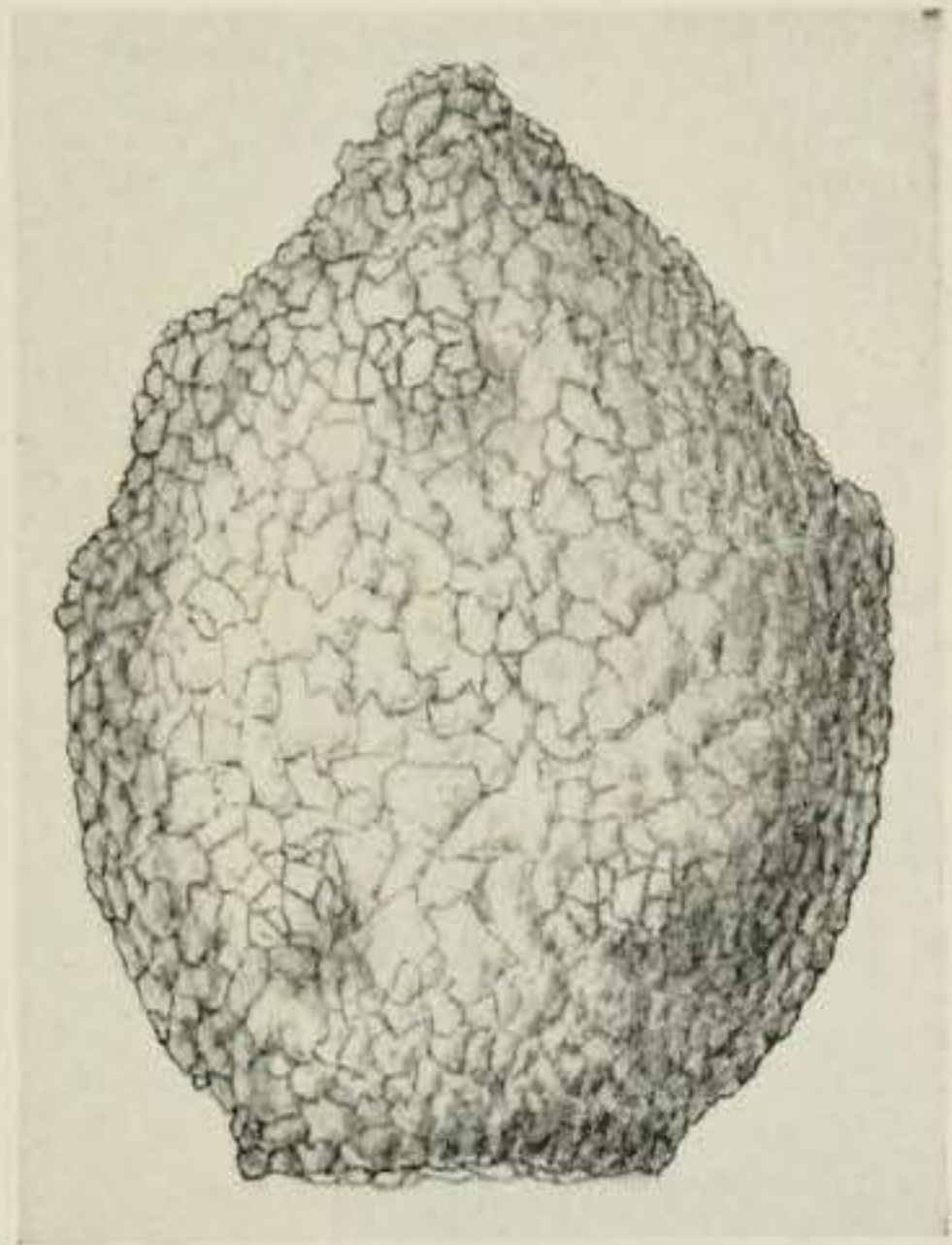


Fig. 10.

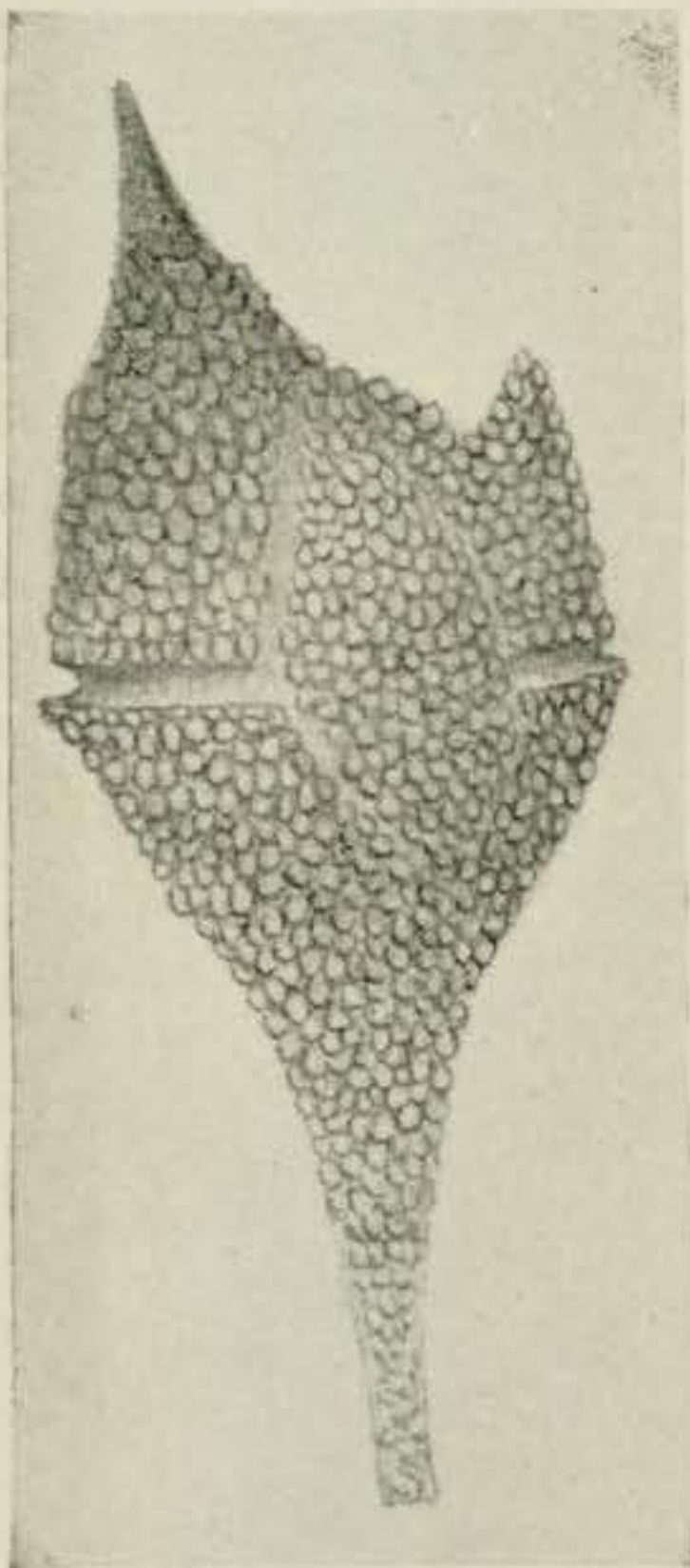


Fig. 11.

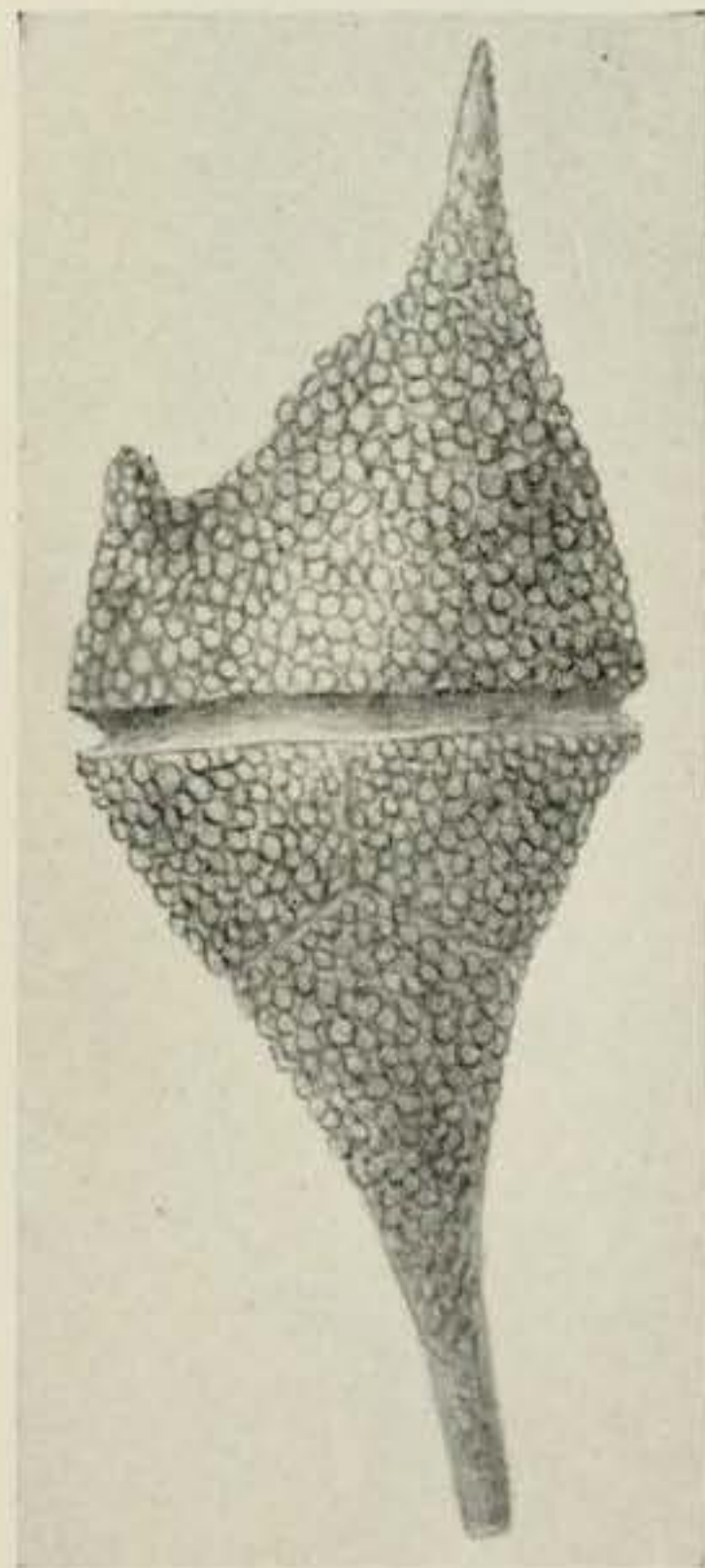


Fig. 12.

PLATE XXVI.

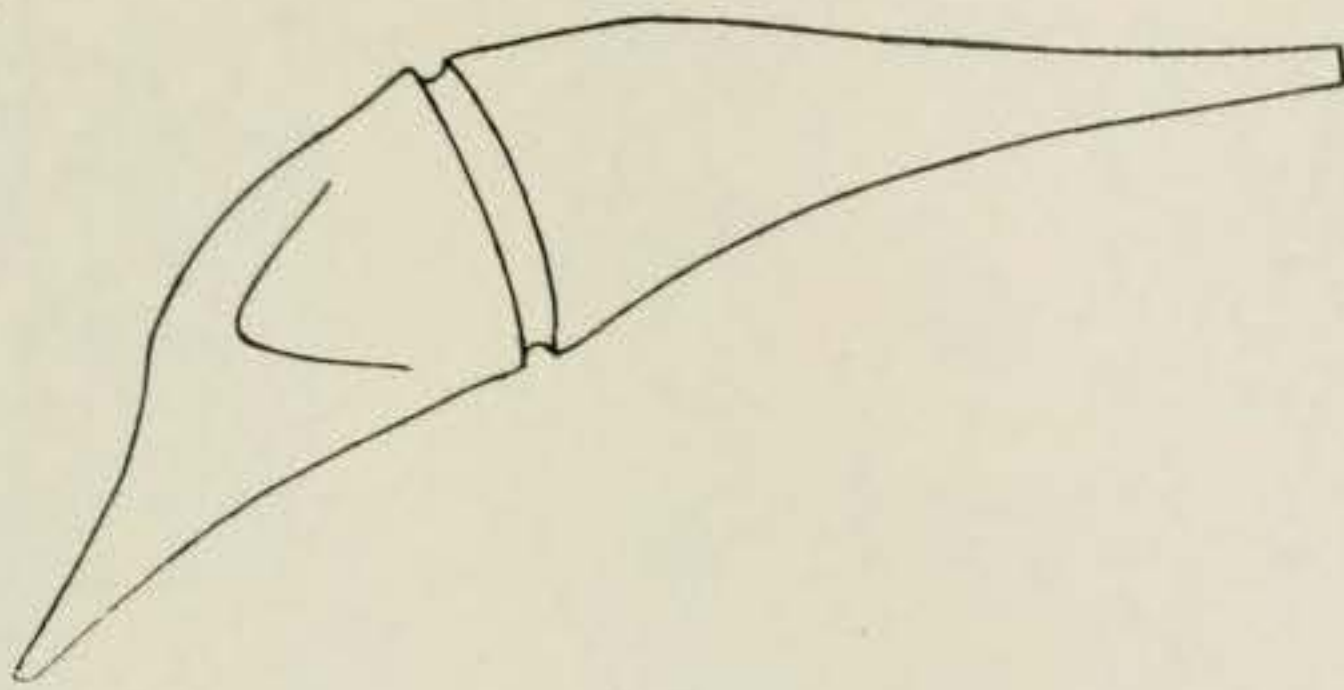


Fig. 13.



Fig. 14.

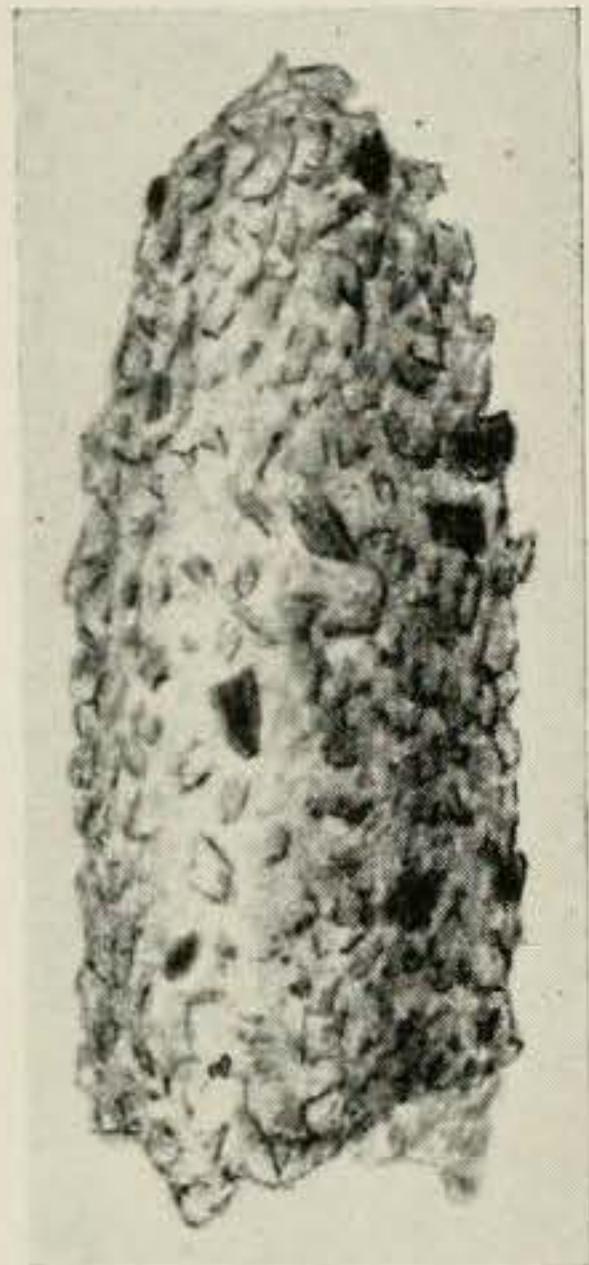


Fig. 15.

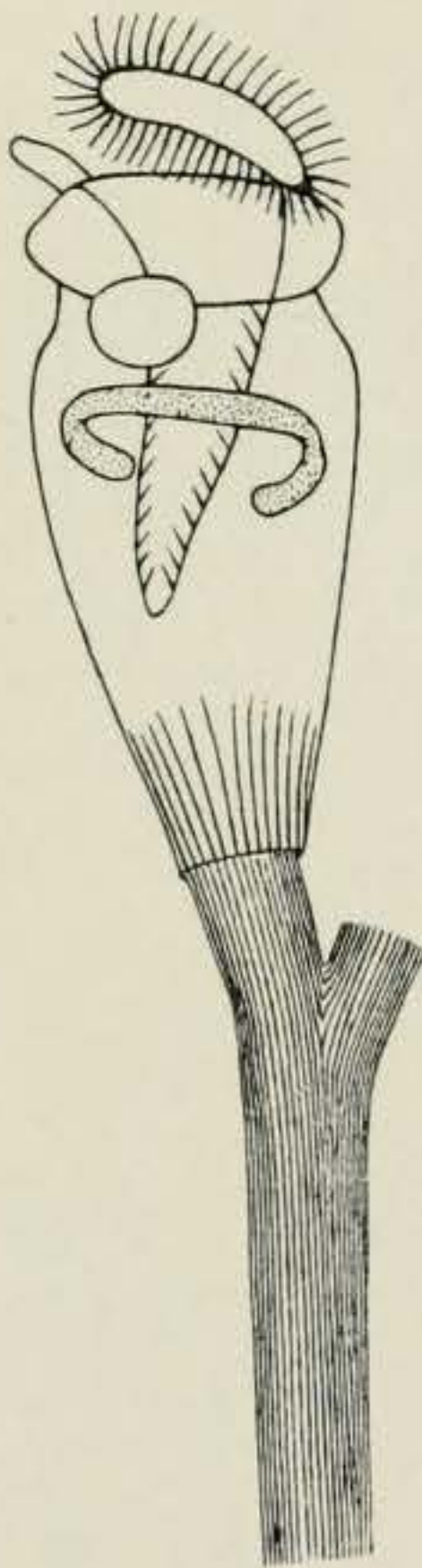


Fig. 17.



Fig. 16.

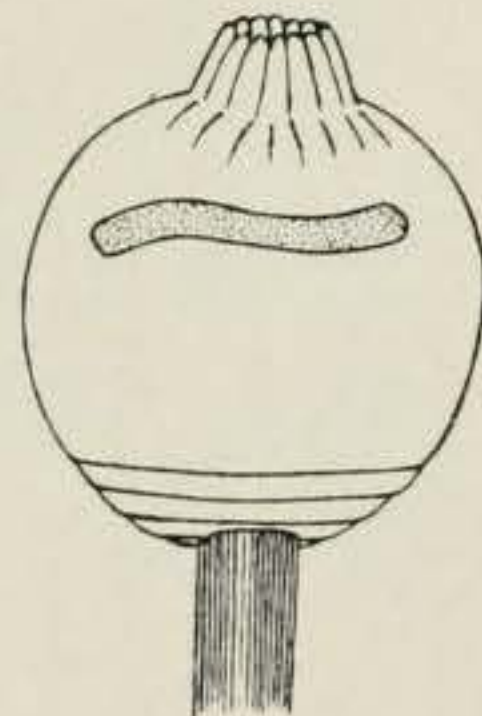


Fig. 18.