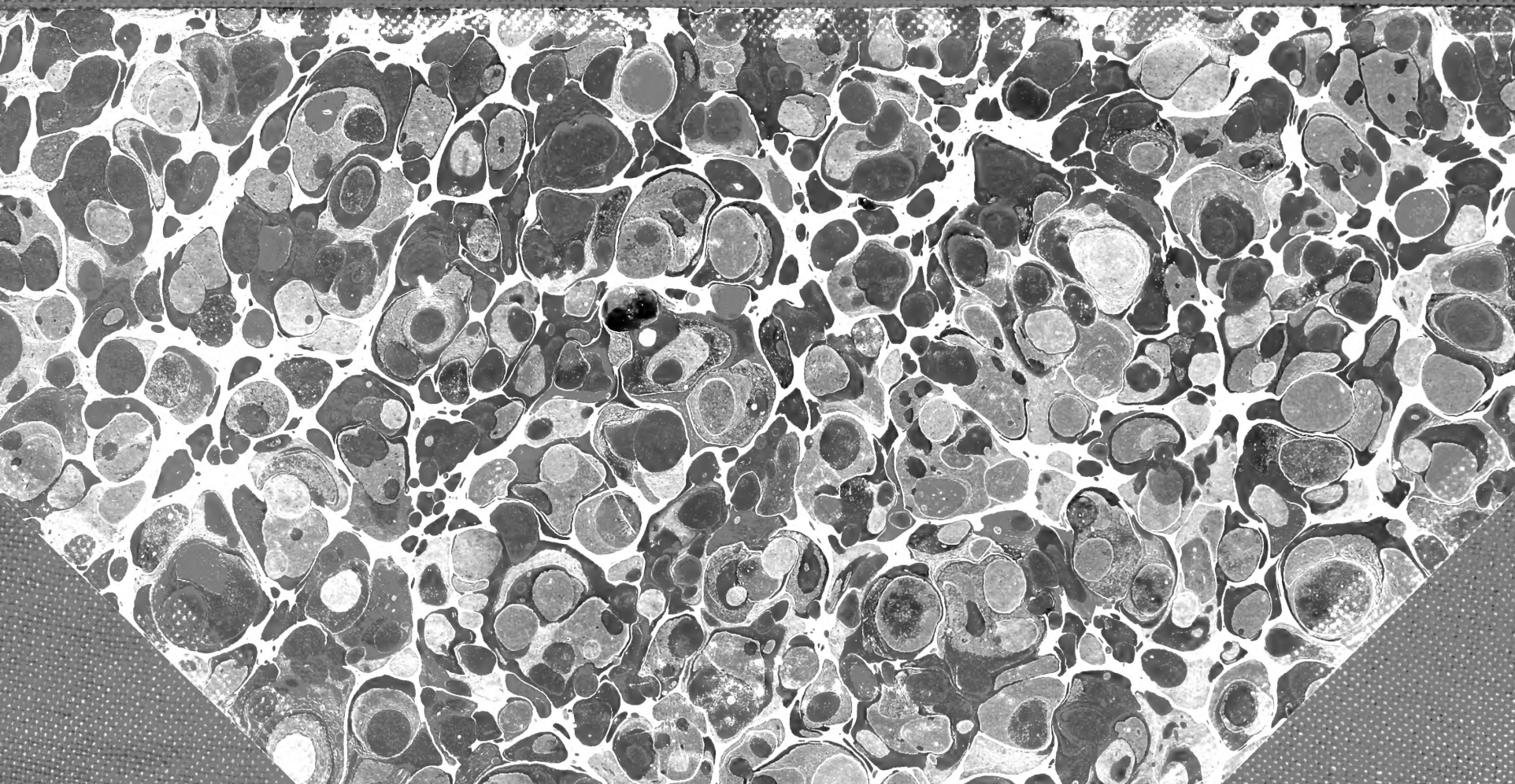
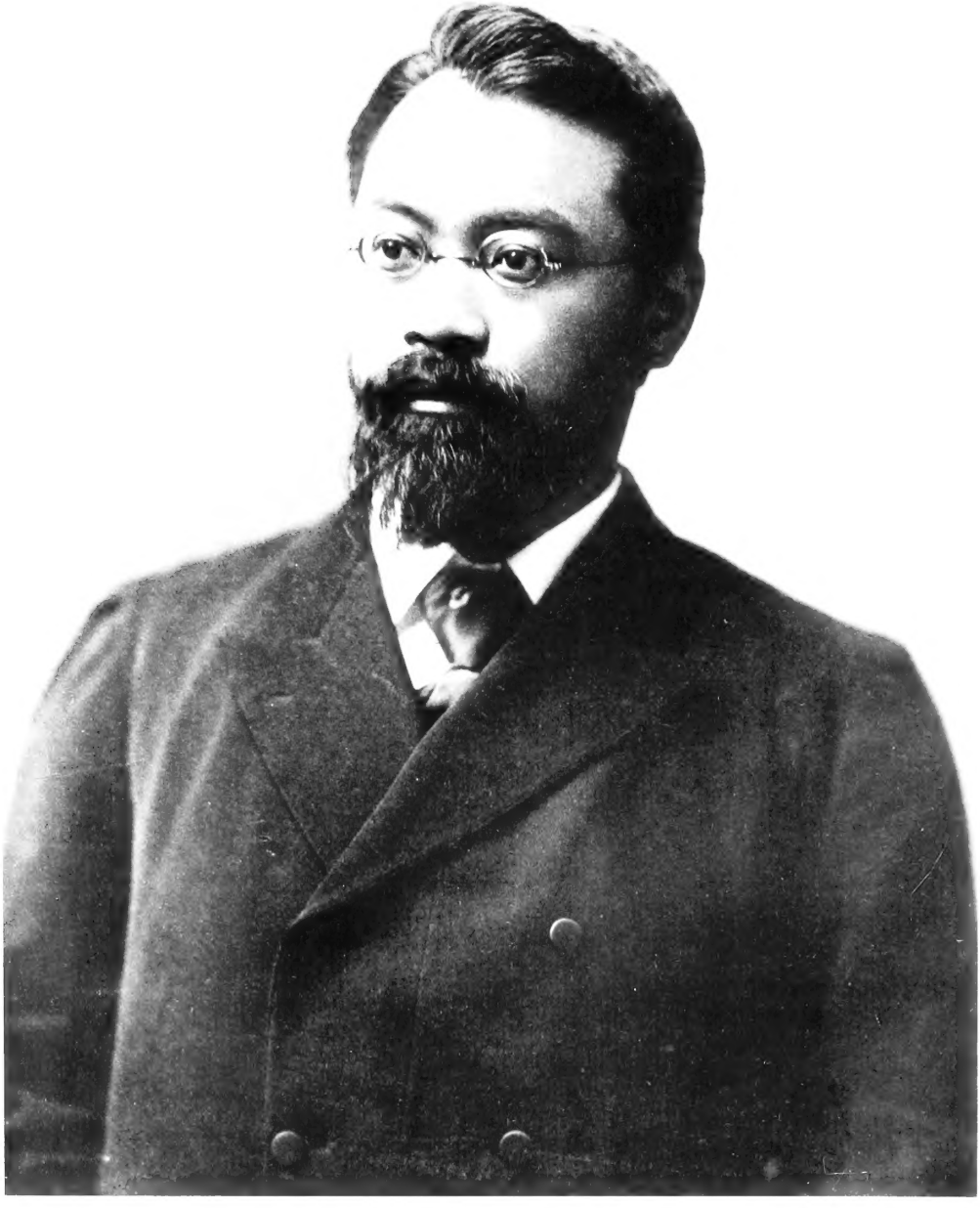




K. Mitsukuri

1857—1909.

Professor of Zoology, College of Science, Tokyo Imp. Univ., 1882—1909; Dean of the College of Science, 1901—1907; many times President of the Tokyo Zoological Society; Ph. D.; Rigakuhakushi; &c., &c.

日本動物學彙報

第七卷

自明治四十一年至同四十四年

ANNOTATIONES

ZOOLOGICÆ JAPONENSES

Auspiciis

Societatis Zoologicæ Tokyonensis

seriatim editæ.

Volumen VII.

cum XII tabulis.

TOKYO.

1908—1911.

CONTENTS.

日本動物學彙報

第七卷第一册

明治四十一年十二月二十五日發兌

ANNOTATIONES

ZOOLOGICÆ JAPONENSES.

Vol. VII., Part I.

PUBLISHED

BY

The Tokyo Zoological Society,

TOKYO.

December, 1908.

CONTENTS.

On Some Fishes from Lake Biwa, with Description of One New Species and a List of All the Fish Species hitherto known from That Locality.

BY

Shigeho Tanaka, *Rigakushi.*

Zoological Institute, Science College, Imperial University of Tokyo.

A collection of Lake Biwa fishes, which had been made in the interval of Sept. 1906 to Sept. 1907 by Mr. Shimazu, a naturalist in Kyoto, was presented by that gentleman to the Imperial University of Tokyo. These material, together with those which were collected by Mr. J. Nakanishi in Jan.—June, 1898, in the same locality and were since stored up in the University collection, will be noted upon in this paper. A species is apparently new to science, for which I propose the name *Acheilognathus shimazui*. At the end I append a list of all the fish species that have thus far become known from Lake Biwa.

Petromyzonidæ.

1. Lampetra japonica (Von Martens).

Local name: Yatsume unagi.

A single specimen 16 cm. long.

Obtained at Tokiwa, Jan. 1907.

Siluridæ.

2. Liobagrus reini (Hilgendorf).

Local name: Shichimyōzi.

A single specimen, 8.3 cm. long measured to caudal base.

Obtained at Iba, June 1907.

3. Fluvidraco ransonneti (Steindachner).

Local name : Gigi.

Two specimens. The largest is 10.2 cm. long measured to caudal base.

Obtained at Tokiwa and Zeze, May 1898 and Febr. 1907.

4. Parasilurus asotus (Linnæus).

Local name : Namazu.

A single specimen, 12.5 cm. long measured to caudal base.

Obtained at Tokiwa, Jan. 1907.

Cobitidæ.

5. Misgurnus anguillicaudatus (Cantor).

Local name : Dojō.

Two specimens ; the largest is 12.5 cm. long without caudal.

Obtained at Momose, Dec. 1906.

6. Cobitis tænia Linnæus.

Local name : Shima dojō.

Sixteen specimens, the largest measuring 8.7 cm. in length without caudal.

Collected at Kihama and Momose, March 1898 and Dec. 1906.

7. Hymenophysa curta (Schlegel).

Local name : Ayu modoki ; Umi dojō.

Five specimens, the largest being 9.1 cm. long without caudal.

Obtained at Kihama and Iba, Febr. 1898 and July 1907.

Cyprinidæ.

8. Paracheilognathus rhombea (Schlegel).

Local name : Hira bote ; Kanchira.

Seventeen specimens, the largest being 9.5 cm. long measured to caudal base.

Collected at Katata and Iba, Febr. 1898 and July 1907.

9. Acheilognathus lanceolata (Schlegel).

Local name: Bote.

Numerous specimens, the largest being 8.5 cm. long measured to caudal base.

Collected at Iba, Katata, Funaki, Matsubara and Kihama, Jan.—May, 1898 and Febr. 1907.

10. Acheilognathus limbata (Schlegel).

Local name: Bote; Aburazyako.

Numerous specimens. The largest is 5.5 cm. long measured to caudal base.

Collected at Iba, Matsubara, Funaki and Kihama, Jan.—May, 1898 and Febr. 1907.

11. Acheilognathus cyanostigma Jordan & Fowler.

Local name: Aburazyako.

Seventeen specimens; the largest is 3.9 cm. long without caudal.

Collected at Matsubara in May 1898.

Lateral band and spot very distinct in many specimens; in some others the band ends rather indistinctly in the anterior part, the spot being indistinct also; in still others the entire lateral band and the spot are both indistinct.

12. Acheilognathus shimazui, n. sp.

Local name: Aburabote.

Head 4, height of body $2\frac{3}{5}$ to $2\frac{3}{4}$ in total length exclusive of caudal; eye $3\frac{1}{4}$, snout $3\frac{1}{4}$, interorbital $2\frac{3}{5}$, maxillary barbel $3\frac{1}{4}$ in head. D. III, 8; A. II, 10; L. lat. 32 to 35; L. trans. 5 to 6+1+3.

Body moderately compressed; caudal peduncle compressed. Back elevated. Upper contour highest at the origin of dorsal, but lower contour lowest at a short distance before the origin of ventral. Eye lateral, high up; interorbital broader than diameter of eye, convex. Snout equal to eye in length, its profile rather steep; nape elevated. Maxillary barbel rather strong, equal to diameter of eye in length.

Pharyngeal teeth one-rowed, 3 to 5 in number, the teeth entire or slightly serrated. Highest part of the body at the origin of ventral; origin of dorsal midway between tip of snout and root of middle caudal rays; anal inserted beneath third or fourth soft ray of dorsal; origin of last ray of dorsal above fourth soft ray of anal; outer margin of both these fins broadly rounded. Pectoral pointed, not reaching ventral; ventral broadly rounded in posterior margin, reaching origin of anal. Caudal emarginate. Scales large; lateral line complete. Colour in formalin brownish, paler beneath; edge of every scale darker; without shoulder spot and lateral band; both vertical fins each with 2 pale longitudinal bands. Caudal and pectoral paler, without marking. Ventral dark, much so posteriorly.

The species is very closely allied to *Acheilognathus lanceolata* (Schlegel), but differs from this in having fewer scales and slightly longer barbel and in the marking.

The species was obtained at Tokiwa in Dec. 1906. The type specimen is numbered 1833 in the Zoological Museum, Imperial University of Tokyo. The species is named for Mr. Shimazu who collected the specimens.

Measurements of Acheilognathus shimazui.

Specimen	A.	B. (Type.)
Total length (measured to root of middle rays of caudal)..	5.2 cm.	5.3 cm.
Height of body	2.0 „	1.9 „
Width of body	0.9 „	0.9 „
Height of caudal peduncle	0.7 „	0.7 „
Length of head	1.3 „	1.3 „
Diameter of eye	0.4 „	0.4 „
Interorbital width	0.5 „	0.5 „
Length of snout	0.4 „	0.4 „

Length of barbel	0.4 cm.	0.4 cm.
Height of the highest ray of dorsal	0.9 „	0.9 „
Height of the highest ray of anal	0.8 „	0.8 „
Length of pectoral	0.9 „	1.0 „
Length of ventral	0.8 „	0.8 „
Number of rays of dorsal	III, 8	III, 8
Number of rays of anal	II, 10	II, 10
L. lat.	32 or 33	35 or 33
L. trans.	9 (5+1+3)	10 (6+1+3)
Number of scales between lateral line and root of ventral	4	4
Number of rays of pectoral	13 or 14	12 or 14
Number of rays of ventral	9	9

13. **Leucogobio jordani** Ishikawa.

Local name: Yanagi moroko.

One typical specimen, 7.3 cm. long measured to caudal base. Obtained at Tokiwa, Dec. 1906.

One other specimen, 9.3 cm. long measured to caudal base was obtained at Iba in May 1907.

The specimen bears the local name "Honmoroko." It closely agrees with *Leucogobio jordani*, described and figured by Dr. Ishikawa, but differs from this in the origin of dorsal being slightly nearer to the origin of rudimentary caudal rays than to the tip of snout, and in the same being farther from the base of middle caudal rays than from the tip of snout. Nevertheless, I consider the specimen to be not sufficiently differentiated to base a distinct species upon it; so that I have referred it to *Leucogobio jordani* Ishikawa.

14. **Leucogobio mayedæ** Jordan & Snyder.

Local name: Deme moroko; Yanagi moroko; Moroko.

Numerous typical specimens, the largest measuring 9 cm. in length as measured to caudal base, obtained at Katata, Matsubara, Zeze, Kihama and Funaki, Jan.—May, 1898.

Mixed with the above were obtained at Zeze, Katata and Funaki (Jan.—April, 1898), numerous others which do not quite agree with the description of the species. In these, the origin of dorsal lies midway between tip of snout and origin of the uppermost ray of caudal ; on the dorsal fin is present a broad dark oblique band running from a point slightly above the middle of first ray to near tip of last ray ; beside the lateral band there occurs a dark spot at the base of the middle rays of caudal. Size up to 8 cm. in length without caudal. Provisionally I include the form within the range of *Leucogobio mayedae*.

15. Leucogobio güntheri Ishikawa.

Local name : Moroko ; Yanagi moroko.

Eleven specimens. The largest is 8.4 cm. long, measured without caudal.

Collected at Momose and Katata, Febr. 1898 and Nov. 1906.

16. Zezera hilgendorfi (Ishikawa).

Local name : Aburame.

One specimen, 9.8 cm. long as measured without caudal.

Obtained at Hirata, Nov. 1906.

17. Sarcocheilichthys variegatus (Schlegel).

Local name : Higai.

Numerous specimens. The largest is 14 cm. long without caudal.

Collected at Iba, Kihama, Matsubara, Kaminifu and Nagahama, in Febr.—May 1898 and in Febr. 1907.

18. Zacco sieboldi (Schlegel).

Local name: Mutsu.

Numerous specimens. The largest is 12 cm. long without caudal.

Collected at Iba, Funaki and Kihama, March 1898 and June 1907.

19. Zacco platypus (Schlegel).

Local name: Haya; Oikawa.

Two specimens. The largest is 10.5 cm. long without caudal.

Collected at Funaki and Tokiwa in 1898 and in Febr. 1907.

20. Pseudogobio esocinus (Schlegel).

Local name: Kamatsuka.

Six specimens. The largest is 15 cm. long without caudal.

Collected at Kihama, Matsubara and Tokiwa, in Febr.—May 1898 and in Dec. 1906.

21. Pseudorasbora parva (Schlegel).

Local name: Yoshitsutsuki; Chōchinmoroko; Ishimoroko.

Numerous specimens. The largest is 6.5 cm. long without caudal.

Obtained at Nagahama and Momose in May 1898 and in Dec. 1906.

22. Ischikauia steenackeri (Sauvage).

Local name: Wataka.

Numerous specimens. The largest is 20.5 cm. long without caudal.

Collected at Iba, Katata and Funaki, in Jan.—March 1898 and in Febr. 1907.

23. Leuciscus hakuensis Günther.

Local name: Ugui.

Three specimens. The largest is 25.5 cm. long without caudal.

Collected at Iba and Kihama, in Jan.—Febr. 1898 and in March 1907.

24. Leuciscus jouyi Jordan & Snyder.

Local name: Abura mutsu; Abura moroko.

Three specimens. The largest is 8.5 cm. long without caudal.

Obtained at Iba and Kaminifu, in Febr. 1898 and in June 1907.

25. Biwia zezera (Ishikawa).

Local name : Zezera.

Numerous specimens. The largest is 5.9 cm. long without caudal Collected at Kihama in Febr. 1898.

Markings present in some specimens, but altogether absent in others.

26. Hemibarbus barbus (Schlegel).

Local name : Migoi.

One specimen, 14.5 cm. long without caudal.

Obtained at Kihama, Febr. 1898.

27. Opsariichthys uncirostris (Schlegel).

Local name: Hasu.

Two specimens. The largest is 18 cm. long without caudal.

Obtained at Tokiwa and Funaki, Jan. 1898 and 1907.

28. Carassius auratus (Linnæus).

Local name : Gengorō buna ; Hiwara ; Mabuna ; Ganzo.

Numerous specimens. The largest is 12.5 cm. long without caudal.

Collected at Funaki, Wani, Tokiwa, Iba and Kihama in Jan.—April, 1898, and in Jan.—Febr., 1907.

The different local names are applied to this species according to certain variation in form and marking, but this can not be regarded to represent specific difference. The species is about as much variable as the following species.

29. Cyprinus carpio Linnæus.

Local name : Koi ; Yamato goi.

Six specimens. The largest is 15.5 cm. long without caudal.

Collected at Funaki, Kihama and Tokiwa, in Febr.—June, 1898, and in Jan.—Sept., 1907.

Salmonidæ.

30. Oncorhynchus masou (Brevoort).

Local name: Amenouwo.

Numerous specimens; the largest being 31 cm. long without caudal.

Obtained at the Salmon Haon Hatchery, Kaminifu and Momose in Febr. 1898 and in March 1907.

31. Plecoglossus altivelis Schlegel.

Local name: Hiuwo; Koayu.

Twelve specimens. The largest is 8.8 cm. long without caudal.

Collected at Hirata, Momose, Funaki and Kihama, in Jan.—Febr., 1898 and in Sept. 1906.

Pœciliidæ.

32. Oryzias latipes (Schlegel).

Local name: Uroni; Medaka.

Eight specimens. The largest is 2.3 cm. long without caudal.

Obtained at Tokiwa in Febr. 1907.

33. Fundulichthys virescens (Schlegel).

Local name: Kinta.

Two specimens. The largest is 3.6 cm. long without caudal.

Obtained at Tokiwa in Jan. 1907.

Cottidæ.

34. Cottus pollux Günther.

Local name: Fugu; Okoze; Kazika.

Three specimens. The largest is 8.5 cm. long without caudal.

Collected at Takase, Iba and Tokiwa, between Dec. 1906 and June 1907.

Gobiidæ.

35. Ctenogobius similis (Gill).

Local name : Ishimochi ; Ishibishisho ; Ishibushi.

Numerous specimens. The largest is 9.2 cm. long without caudal.

Collected at Momose, Tokiwa, Kihama and Matsubara in May 1898 and in Oct. 1906—Febr. 1907.

36. Chænogobius castaneus (O'Shaughnessy).

Local name : Isaza.

Numerous specimens. The largest is 5 cm. long without caudal.

Collected at Momose and Funaki, May 1898 and Oct. 1906.

D. VI—8 or 11 to 12. A. 9 or 11 to 12.

37. Chænogobius macrognathos (Bleeker).

Local name : Haze ; Ishibushi.

Two specimens. The largest is 9.1 cm. long without caudal.

Collected at Matsubara and Iba, in May 1898 and in Febr. 1907.

38. Odontobutis obscurus (Schlegel).

Local name : Donko ; Ishibushi ; Doman.

Three specimens. The largest is 9 cm. long without caudal.

Collected at Kihama and Momose, in March—May 1898 and in Dec. 1906.

A List of All the Fish Species hitherto known from Lake Biwa.

[*Species printed in smaller type are somewhat doubtful to the locality.*]

Petromyzonidæ.

1. Lampetra japonica (Von Martens).

Local name : Yatsume unagi.

Siluridæ.

2. Liobagrus reini Hilgendorf.

Local name : Shichimyōzi ; Hinamazu.

3. **Fluvidraco ransonneti** (Steindachner).
   Local name: Gigi; Gibachi.

4. **Fluvidraco nudiceps** (Sauvage).

5. **Parasilurus asotus** (Linnæus).
   Local name: Namazu.

6. **Pseudobagrus aurantiacus** (Schlegel).
   Local name: Gigi.

Cobitidæ.

7. **Cobitis tænia** Linnæus.
   Local name: Shimadojō.

8. **Misgurnus anguillicaudatus** (Cantor).
   Local name: Dojō.

9. **Hymenophysa curta** (Schlegel).
   Local name: Ayumodoki; Umidojō.

Cyprinidæ.

10. **Paracheilognathus rhombea** (Schlegel).
    Local name: Hirabote; Kanehira.

11. **Paracheilognathus longipinnis** (Regan).

12. **Acheilognathus lanceolata** (Schlegel).
    Local name: Bote.

13. **Acheilognathus limbata** (Schlegel).
    Local name: Zako; Bote; Aburazyako.

14. **Acheilognathus cyanostigma** Jordan & Fowler.
    Local name: Aburazyako.

15. **Acheilognathus shimazui** Tanaka.
Local name: Aburabote.

16. **Leucogobio jordani** Ishikawa.
Local name: Yañagimoroko; Honmoroko.

17. **Leucogobio biwæ** (Jordan & Snyder).

18. **Leucogobio mayedæ** (Jordan & Snyder).
Local name: Dememoroko; Moroko; Yanagimoroko.

19. **Leucogobio güntheri** Ishikawa.
Local name: Moroko; Yanagimoroko.

20. **Zezera hilgendorfi** (Ishikawa).
Local name: Aburame.

21. **Sarcocheilichthys variegatus** (Schlegel).
Local name: Higai; Aburabae.

22. **Abbottina psegma** Jordan & Fowler.

23. **Zacco platypus** (Schlegel).
Local name: Haya; Oikawa.

24. **Zacco sieboldi** (Schlegel).
Local name: Mutsu.

25. **Zacco temmincki** (Schlegel).
Local name: Kawamutsu.

26. **Pseudogobio esocinus** (Schlegel).
Local name: Kamatsuka.

27. **Otakia rasborina** Jordan & Snyder.

28. **Pseudorasbora parba** (Schlegel).
Local name: Moroko; Yoshitsutsuki; Chōchinmoroko; Ishimoroko.

29. **Ischikauia steenackeri** (Sauvage).
Local name: Wataka; Wadaka; Watako; Umauwo.

30. **Leuciscus hakuensis** Günther.
Local name: Ugui.

31. **Leuciscus jouyi** Jordan & Snyder.
Local name: Aburamutsu; Aburamoroko.

32. **Leuciscus cærulescens** (Sauvage).

33. **Leuciscus japonicus** (Sauvage).

34. **Phoxinus steindachneri** Sauvage.
Local name: Aburamutsu.

35. **Gnathopogon elongatus** (Schlegel).
Local name: Moroko; Mugitsuki.

36. **Biwia Zezera** (Ishikawa).
Local name: Zezera.

37. **Hemibarbus barbus** (Schlegel).
Local name: Migoi; Sai.

38. **Opsariichthys uncirostris** (Schlegel).
Local name: Hasu.

39. **Carassius auratus** (Linnæus).
Local name: Zako; Gengorōbuna; Hiwara; Mabuna; Ganzo.

40. **Cyprinus carpio** Linnæus.
Local name: Koi; Yamatogoi.

41. **Tribolodon punctatus** (Sauvage).

Anguillidæ.

42. **Anguilla japonica** Schlegel.
Local name: Unagi.

Salmonidæ.

43. Oncorhynchus masou (Brevoort).
Local name: Amenouwo.

44. Salmo perryi Brevoort.

45. Plecoglossus altivelis Schlegel.
Local name: Hiuwo; Koayu.

Pœciliidæ.

46. Oryzias latipes (Schlegel).
Local name: Uroni; Medaka.

47. Fundulichthys virescens (Schlegel).
Local name: Kinta.

Cottidæ.

48. Cottus pollux Günther.
Local name: Fugu; Okoze; Kazika.

Gobiidæ.

49. Ctenogobius similis (Gill).
Local name: Ishimochi; Ishibishisho; Ishibushi.

50. Chænogobius castaneus (O'Shaughnessy).
Local name: Isaza.

51. Chænogobius macrognathos (Bleeker).
Local name: Haze; Ishibushi.

52. Odontobutis obscurus (Schlegel).

Local name: Donko; Ishibushi; Doman; Dorobo; Chichimuko.

53. Eleotris oxycephala (Schlegel).

Local name: Doman.

54. Acanthogobius flavimanus (Schlegel).

55. Chæturichthys hexanemus (Bleeker).

Local name: Akahaze.

JUNE, 1908.

On a Small Collection of Tide-Pool Fishes from Misaki, with Descriptions of Two New Species.

BY

Shigeho Tanaka, *Rigakushi.*

Zoological Institute, Science College, Imperial University of Tokyo.

In the beginning of May, 1908, I had occasions of collecting some small fishes in rock-pools in the vicinity of Misaki. I have tried both chloride of lime and carbolic acid for poisoning the rock-pools, but the method was not without drawback. The poisoned fishes sank down to the bottom of water, so that they, especially the smaller ones could be picked up only with much difficulty. Morever, chloride of lime, with its strong ordour and the skin-attacking property, makes itself very disagreeable to the collector. In this respect carbolic acid is more preferable. However, I have after all preferred the bucketing out of water with the help of a few people.

As the outcome of my efforts, I have obtained numerous specimens representing 26 species. Two of the species are apparently new to science, which I will propose to call *Aspasma misakia* and *Zoarchias neglectus*.

Family Syngnathidæ.

1. Hippocampus japonicus Kaup.

Two specimens, male and female, of almost equal length and both captured from the same hole. Length of head 1.4 in centimetres.

D. 13. A. 3.

The number of rays in dorsal is less than that given by Jordan

and Snyder*, according to whom the existence of 16 dorsal rays should form one of the specific characters. Further, there exist no filaments on back, unlike the figure given by the same authors. Nevertheless, the short snout, the very low coronet and the number of body plates in the specimens decidedly indicate that they are to be referred to the species mentioned.

In the male specimen, the egg-pouch is well developed, extending over seven plates. Body tubercular. A broad blackish band extends from beneath pectoral, passing vent, to near origin of anal. Dorsal dark, with a rather broad, whitish, outer edge; the dark part beautifully reticulated with whitish spots; a much darker band between the dark basal part and the whitish outer edge. Body dark brown, pale beneath. Basal parts of pectoral and anal dark, distal parts pale.

The female specimen is filled up with large eggs. A broad blackish band on belly, which is slightly paler than in the male, extending to vent, but not to anal. Dorsal dusky, paler than in the male, but its markings and colour of edge as in the male. Body almost smooth, with inconspicuous processes on back. Colour of body paler than in the male; basal parts of pectoral and anal slightly dusky, the distal parts paler.

Family Serranidæ.

2. Epinephelus diacanthus (Cuvier & Valenciennes).

A specimen, measuring 6.2 cm. without caudal.

Family Kyphosidæ.

3. Girella punctata Gray.

Numerous specimens, all young, the largest measuring 11 cm. in length without caudal.

---

* Jordan and Snyder—Proc. U.S. Nat. Mus., vol. XXIV, No. 1241, 1901, p. 16, pl. 10.

Dorsal spines 14 or 15 in number. Body dark, pale beneath; each scale much darker at edge; edge of opercle, margin of branchiostegal membrane and base of pectoral blackish.

Family Aplodactylidæ.

4. Goniistius zonatus (Cuvier & Valenciennes).

Seven specimens. The largest is 8 cm. long without caudal.

Nine oblique bands are constantly present and form a characteristic feature of the species. Of the specimens about 5 cm. long without caudal, some have a dark edge on soft dorsal, while in others the same is absent. The sixth to eighth bands are continued into soft dorsal. In all the specimens, the posteriormost parts of the spinous dorsal, into which the fifth dark band of the body is continued, have a blackish patch.

Family Labridæ.

5. Thalassoma cupido (Schlegel).

Fifteen specimens. The largest is 10 cm. long without caudal.

6. Halichœres tremebundus Jordan & Snyder.

Four specimens. The largest is 4.7 cm. long without caudal.

D. IX, 11; A. III, 10. Pores in lateral line 26 in number.

Family Scorpænidæ.

7. Sebastichthys elegans (Steindachner & Döderlein).

Four specimens. The largest is 8 cm. long without caudal.

D. XIII, 12 or 13. A. III, 6.

8. Sebastichthys mitsukurii (Cramer).

Two specimens. The largest is 6 cm. long without caudal.

9. Paracentropogon rubripinnis (Schlegel).

One specimen, 3.5 cm. long exclusive of caudal.

Family Hexagrammidæ.

10. Hexagrammos otakii Jordan & Starks.

One specimen, 4.8 cm. long without caudal.

Family Cottidæ.

11. Pseudoblennius cottoides (Richardson).

Numerous specimens. The largest is 9.3 cm. long without caudal. It was much distended at belly ; on dissection it was found to contain 14 small larval crabs and 1 small snail.

Family Gobiidæ.

12. Chasmichthys gulosus (Guichenot).

Numerous specimens. The largest is 8.7 cm. long without caudal.

Height of body 5 or 6, length of head 3 in total length without caudal. D. VI—11 or 12. A. 10.

Ground colour and markings are variable to some extent in distinctness, but the characteristic markings largely prevail. Marginal white band on vertical fins not constant in width. The smallness of the scales covering body forms a characteristic feature of the species.

13. Chasmichthys dolichognathus (Hilgendorf).

Numerous specimens. The largest is 5.6 cm. long without caudal.

Height of body $5\frac{1}{3}$ to 7, head $3\frac{1}{2}$ in total length without caudal. D. VI—9 or 11. A. 9 or 10.

Ground colour and markings variable to some extent. Scales larger in size than in *Chasmichthys gulosus*, by which character the two species may be distinguished from each other.

14. Petrogobius daimio Jordan & Snyder.

Numerous specimens. The largest is 8.8 cm. long without caudal.

15. Asterropteryx abax Jordan & Snyder.

Numerous specimens. The largest is 3.2 cm. long without caudal.

16. Clariger cosmurus Jordan & Snyder.

Numerous specimens. The largest is 3 cm. long without caudal. D. III—11 to 13. A. 11 to 12.

There are some six cirrhi of a blackish or whitish colour below eye.

17. Leuciogobius guttatus Gill.

One specimen 2.7 cm. long without caudal. D. 9. A. 10.

Body brown, somewhat pale beneath; a blackish band on root of caudal; all the fins, except the ventral, each with oblique rows of blackish spots. Ventrals pale.

Family Gobiesocidæ.

18. Aspasma minima (Döderlein).

Numerous specimens. The largest is 4.9 cm. long without caudal. Head $3\frac{3}{4}$ to 4, height of body 6 to $6\frac{1}{2}$ in total length without caudal. D. 7. A. 7.

The species shows 3 principal colour variations which intergrade into one another. These variations are probably due to the sex or to age.

First variety of colouration; lemon yellow above, pale below; a dark yellow band runs from near the posterior end of maxillary to near opercle. No spots on body; vertical fins and caudal with or without spots. Ground colouration variable to some extent.

Second variety of colouration: ground colouration, its variability and band on cheek same as in the first. Four or five narrow pale bands on back, these being sometimes replaced by spots. A pale band

connects both eyes. On these bands as well as elsewhere are scattered reddish spots, which may however be entirely absent.

Third variety of colouration : ground colour same as in the above, or a little redder. Band on cheek also present ; band on back present or absent. Scattered reddish spots profusely present, sometimes extending to under surface ; band connecting eyes present or not.

The above description of colour is given from specimens that have been preserved in formalin for some days after capture, but little or no change of colour seems to have taken place. After the examination of the specimens the preservation-fluid was changed and when re-examined some months since, the markings had faded away for the most part.

19. Aspasma misakia, n. sp.

Height of body $5\frac{2}{5}$ to $6\frac{3}{5}$, head about 3 in total length without caudal ; eye 5, interorbital $3\frac{1}{2}$, snout 3 in head. D. 14 or 15. A 12 or 13.

Maxillary reaches not to eye. Colour in formalin yellowish red above, paler below ; a reddish band runs from near end of maxillary to cheek. Vertical fins and caudal yellowish red ; pectoral and ventral much paler. No marking on caudal.

The species is easily distinguished from *Aspasma minima* (Döderlein) in the physiognomy, in the point of continuation of vertical fins into caudal and in colouration. The species is closely allied in physiognomy and in the position and extent of fins, to *Aspasma ciconiæ* Jordan & Fowler, but differs from this in the following points : vertical fins continued into the proximal parts of caudal instead of to caudal peduncle ; more number of rays in vertical fins ; peculiar colouration ; and the maxillary not reaching eye.

Two specimens. The type, 5.4 cm. long without caudal, is contained in the Zoological Museum of Science College, registered No. 1781.

Measurements of Aspasma misakia.

Specimen	A. (Type.)	B.
Total length without caudal	5.4 cm.	3.3 cm.
Height of body	1.0 „	0.5 „
Height of caudal base	0.5 „	0.3 „
Length of head	1.9 „	1.05 „
Horizontal diameter of eye	0.35 „	0.25 „
Interorbital width	0.5 „	0.3 „
Length of snout	0.6 „	0.35 „
Length of pectoral	0.65 „	0.4 „
Lenght of caudal	0.8 „	0.45 „

Family Blennidæ

20. Tripterygion etheostoma Jordan & Snyder.

Numerous specimens. The largest is 5.1 cm. long without caudal.

21. Aspidontus elegans (Steindachner).

Numerous specimens. The largest is 6.2 cm. long exclusive of caudal.

22. Scartichthys enosimæ Jordan & Snyder.

One specimen, 9.5 cm. long exclusive of caudal.

D. XII, 20. A. I, 22.

23. Zacalles bryope Jordan & Snyder.

Numerous specimens; the largest is 6.6 cm. long without caudal.

D. XXIII, 18. A. I, 32.

24. Dictyosoma burgeri Van der Hoeven.

Numerous specimens; the largest being 16 cm. long without caudal.

25. Zoarchias veneficus Jordan & Snyder.

Six specimens; the largest being 7.2 cm. long as measured to tip of caudal.

The black bands and interspaces are nearly equal in breadth.

26. Zoarchias neglectus, n. sp.

Head about 7, height of body about 9 in total length measured to tip of caudal; eye $3\frac{3}{5}$, interorbital 6, snout 4 in head. D. XXII, 65. A. I, 55.

Body long, slender, compressed; gradually sloping from behind nape to tip of tail. Head moderate, pointed; snout sharp, pointed; eye high up, upper rim of orbit forming a fleshy projection above level of interorbital space; interorbital convex. Mouth wide, slightly oblique; maxillary extending to a short distance beyond vertical through orbit, its length equal to one half the head; lips broad, thin, reflected outward; teeth in narrow bands on jaws, vomer and palatines. Gill-membranes continuous, forming a broad fold across the insthmus; gill-rakers on first gill-arch about 4+10 in number, minute, slender, pointed; pseudobranchiae large. Head without filaments or papillae; nostrils with tubes. Head naked; body with minute, circular, deeply-embedded scales; no lateral line.

Dorsal inserted above the base of pectoral, the spines very low, the length of each spine shorter than diameter of orbit; anal inserted beneath the origin of soft rays of dorsal; both vertical fins confluent with caudal. Pectoral longer than half the head, rounded postriorly. No ventrals.

Colour in formalin light brown; whitish spots present here and there, somewhat forming reticulation by confluence; along the middle parts a longitudinal series of short blackish lines. Dorsal and anal paler, with whitish vertical bands, each band being lined with blackish line

on both sides; number of the band 4 on spinous dorsal, 11 on soft dorsal and 19 on anal; a blackish oblong spot on some anteriormost rays of dorsal; caudal whitish. Pectoral also whitish, with a blackish patch at base. A line from tip of snout to upper end of gill-opening blackish; head above this line brownish, the lower parts whitish or dusky or with some reticulation.

The ground colour is variable to some extent; markings of body and the median row of short lines also variable, sometimes wholly wanting. But the whitish bands lined with blackish lines on the vertical fins are invariably present.

In a specimen, measuring 6.7 cm. in length measured to tip of tail, there are distinctly visible a blackish spot on the origin of dorsal and an oblique line extending from above corner of mouth across eye to upper edge of gill-opening. A very faint series of short lines along the median parts of body; other markings on body scarcely present. Markings of vertical fins very indistinct unlike other specimens, in which these markings are constantly very distinct, even when other markings on the rest of body are indistinct.

The species is very closely allied to *Zoarchias veneficus* Jordan & Snyder, but differs from this in having less number of rays on spinous dorsal, soft dorsal and anal, and in the markings. Although the ground colour and the marking are variable to some extent, the marking of the vertical fins always forms prominent character of the species.

Eighteen specimens of the species were taken together with *Zoarchias veneficus* Jordan & Snyder in tide-pools at Jōgashima and Bishamon (both near Misaki).

The type, 7 cm. long as measured to tip of tail, is contained in the Zoological Museum, Science College, the register number being 1969.

Measurements of Zoarchias neglectus.

Specimen	A.	B.	C.
Total length measured to tip of tail	6.8 cm.	6.6 cm.	6.1 cm.
Height of body..	0.8 „	0.7 „	0.7 „
Length of head..	1.0 „	0.9 „	0.9 „
Horizontal diameter of eye	0.3 „	0.25 „	0.25 „
Interorbital width	0.15 „	0.15 „	0.2 „
Length of snout	0.25 „	0.2 „	0.2 „
Distance from tip of snout to origin of dorsal	0.9 „	1.0 „	0.9 „
Distance from origin of dorsal to end of spinous dorsal..	1.7 „	1.8 „	1.6 „
Distance from tip of snout to end of spinous dorsal..	2.7 „	2.8 „	2.4 „
Distance from tip of lower jaw to origin of anal ..	2.4 „	2.4 „	2.2 „

October, 1908.

Descriptions of Eight New Species of Fishes from Japan.

BY

Shigeho Tanaka, *Rigakushi.*

Zoological Institute, Science College, Imperial University of Tokyo.

1. Lestidium japonicum, *n. sp.* (Paralepididæ.)

Head 5 to $5\frac{1}{8}$, height of body without ventral keel $17\frac{2}{5}$, the same including the keel about 15 in total length without caudal; eye $6\frac{1}{3}$, interorbital 10 to 14, snout 2 in head.

Body elongate, compressed, deepest at nape, tapering very gradually to the very narrow caudal peduncle. Head long, its posterior parts compressed. Eye lateral, high up, impinging on upper profile, its vertical diameter exceeding the horizontal diameter; interorbital space slightly concave. Mouth wide, scarcely extending to vertical through anterior rim of orbit. Lower jaw slightly longer than upper jaw but included by the latter; the anterior arched portion of premaxillaries toothless; near the front, on each side, is a long, depressible canine, preceded by one or two much smaller, depressible teeth; behind these, after a short toothless interval, is a single series of short fixed teeth; mandibular teeth in 2 series,—an outer row of short, fixed teeth and an inner row of longer, canine-like, depressible teeth; canines widely spaced, about 9 in number on each side; palatine teeth similar, arranged in 2 series,—an inner series with large, canine-like, depressible teeth, about 6 to 9 in number on each side and an outer series consisting of short, fixed teeth, extending backward farther than the inner series; vomer toothless; on each side near the median part of tongue a longitudinal series of small depressible teeth. Dr. Gilbert says* that in his *nudum* a subocular photophore is distinctly

* Gilbert—Bull U.S. Fish Commission for 1903, pt. II, 1905, p. 608.

present but the specimens, 2 in all, of the present species seem not to possess an organ of the kind.

Dorsal inserted slightly nearer to origin of anal than to that of ventral and also slightly nearer to tip of pectoral than to base of caudal. Ventral inserted nearer to posterior nostril than to base of caudal. Caudal forked, with well developed rays which reach to base of anal. Vent represented by a longitudinal slit, overlapped by the short ventral fins. Adipose fin small, inserted before last anal ray. Lateral line incomplete, ending behind middle of anal fin.

Colour in formalin translucent, the back being somewhat darker; sides of snout blackish. A small black spot directly in front of eye and a rather faint one immediately below it. Opercles externally bright silvery, internally blackish. Median line of abdomen blackish, with a median narrow whitish space backward from vertical through tip of pectoral; caudal peduncle washed with blackish and silvery, this area extending forward to middle of anal. Peritoneum black; fins largely translucent, slightly dusky. Caudal and anal slightly blackish, the anterior part of anal black-punctate at base; ventral similarly marked at base.

The species differs from *Lestidium nudum* Gilbert in having insertion of dorsal nearer to origin of anal than to that of ventral, in longer base of anal and in rather smaller head.

Two specimens were captured in Sagami Sea by Mr. Aoki in 1908. Both are contained in the Zoological Museum of the Science College, the register number of the type being 2013.

Measurements of Lestidium japonicum.

Specimen	A.	B. (Type.)
Total length exclusive of caudal	19.0 cm.	17.4 cm.
Height of body (without abdominal keel)	1.1 „	1.0 „
Height of body (including abd. keel)	1.2 „	1.2 „

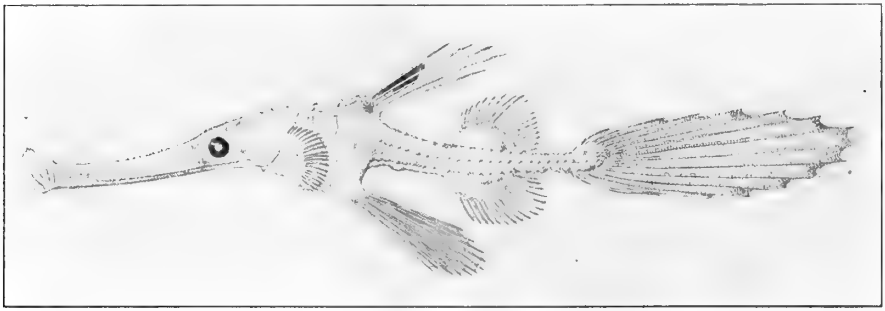
Length of head (measured from tip of snout)	3.8 cm.	3.4 cm.
Horizontal diameter of orbit	0.6 „	0.55 „
Interorbital width	0.4 „	0.3 „
Length of snout	2.0 „	1.7 „
Length of pectoral	1.6 „	1.4 „
Distance from tip of mouth to its corner	1.9 „	1.65 „
Distance from tip of mouth to origin of pectoral	4.1 „	3.5 „
Distance tip of mouth to origin of ventral	9.8 „	9.0 „
Distance from origin of pectoral to origin of ventral	5.7 „	5.2 „
Distance from origin of ventral to origin of anal	4.0 „	3.5 „
Distance from origin of vental to base of caudal	9.4 „	8.0 „
Number of dorsal rays	9	10
Number of anal rays	49	42
Number of ventral rays	9 or 10	9 or 10
Number of pectoral rays	11	10 or 12

2. Solenostomus leptosoma, *n. sp.* (Solenostomidæ.)

Head $2\frac{3}{8}$, height of body $5\frac{1}{4}$, height of caudal peduncle $27\frac{1}{2}$ in total length without caudal; eye $7\frac{2}{3}$, interorbital $11\frac{1}{2}$, snout $1\frac{1}{8}$ in head; height of snout at middle of its length 7 in the length. D. V—19. A. 16. V. 7. P. ca. 23.

Body elongate, much compressed; its highest part at origin of first dorsal; height of body before anal equal to diameter of eye; caudal peduncle very slender, compressed; its length slightly longer than base of second dorsal. Head moderate in size; eye lateral, high, rather large; interorbital deeply concave; a longitudinal ridge with sharp spinules runs antero-posteriorly on outer boundary of interorbital; this ridge, running forward and meeting with its opposite fellow at the end

of the second third of snout length, becomes a median line that runs along back of snout. Posteriorly the interorbital ridges slightly



Solenostomus leptosoma Tanaka. Type.

converge toward each other down to end of occipital region, whence they continue farther as parallel ridges along the back. On nape a median ridge with retrorse spinules runs backward, ending at origin of first dorsal. Occipital part translucent, so that the brain is faintly visible through skin. Snout compressed, long, slender, tubular ; the preorbital part steep in upper profile ; outside the point of meeting of the ridges running forward from interorbital, a bundle of about 3 small hooked spines is present. The above-mentioned ridge with spinules runs along back of snout and stops at a point about half way in the length of snout. Outside this ridge there run the upper, lateral, spineless ridges parallel with each other, leaving a narrow area between them. Lower lateral and mandibular ridges without spines. Mouth terminal, directed upward ; its cleft measured from tip of snout to corner of mouth equal to interorbital width. Body with several rows of spinules. Before first dorsal and ventral, a median ridge with spinules ; upper lateral, middle and lower lateral ridges present, forming 4 parallel series of plates on each side of body. Behind first dorsal and ventral, median ridges absent, but behind anal a rudimentary ridge reappears on belly. A series of plates on body, 32 in number, of which 4 are before first dorsal, 6 between the origin of first dorsal and vent, 22 between vent and caudal base including vent. First dorsal extends over one and a half plate ; second dorsal and anal

over 7 plates. First dorsal high, acutely pointed, its tip reaching beyond middle of base of second dorsal when folded backward; length of the longest spine equal to half length of head. Second dorsal rounded in margin, rather low, its highest ray twice as long as diameter of eye. Anal same as second dorsal in form and height; both these fins not quite reaching base of caudal with their posterior free end in the depressed state. Pectoral short, slightly longer than diameter of eye. Ventral long, ending in the same vertical as the tip of first dorsal and extending to middle of base of anal; its insertion nearer to base of caudal than tip of snout by twice eye diameter. Caudal long, slightly longer than the length from posterior rim of eye to origin of anal.

Colour in spirit light yellow, with dusky colouration here and there. First dorsal rather dusky, 2 long black ocelli on interradial membrane between first and third spines, the posterior one being smaller; caudal dusky, posteriorly darker. Second dorsal, anal and pectoral of a light colour. Ventral slightly dusky, posteriorly darker.

The species seems to be allied to *Solenostoma brachyurum* Bleeker described in Günther's Catalogue, but differs from it in colouration, especially in that of first dorsal on which occur 2 distinct black spots in the present species.

Only a single specimen was obtained at Yodomi, Sagami Sea, in February 1908. It is registered No. 1784 in the Zoological Museum, Science College.

Measurements of Solenostomus leptosoma.

Total length ex. of caudal	5.5 cm.
Height of body	1.05 „
Height of body before anal	0.3 „
Height of caudal peduncle	0.2 „
Length of caudal peduncle	0.7 „

Length of head	2.3 cm.
Length of snout	1.75 „
Horizontal diameter of eye	0.3 „
Interorbital width	0.2 „
Height of snout at middle of its length	0.25 „
Height of first dorsal	1.2 „
Length of ventral	1.35 „
Length of caudal	2.5 „
Distance from tip of snout to *first* dorsal	3.25 „
Distance from eye to first dorsal	1.45 „
Distance between 2 dorsals	0.95 „

3. **Ctenogobius kurodai**, *n. sp.* (Gobiidæ.)

Head $3\frac{1}{2}$ to $3\frac{1}{3}$, height of body $5\frac{1}{2}$ to $5\frac{5}{6}$ in total length without caudal; eye 4, interorbital $6\frac{2}{3}$ to 7, snout 4 to 5, maxillary $2\frac{1}{2}$; height of caudal peduncle $2\frac{1}{2}$ in head. D. VI—8 to 10. A. 8 to 9. P. 19. Scales in longitudinal series 28 to 30; same in transverse series 9 to 10.

Body rather elongate, highest at a short distance behind origin of pectoral; caudal peduncle much compressed. Head moderate in size, depressed, about $\frac{1}{5}$ less broad than long and about $\frac{1}{4}$ less high than broad, upper contour gently convex, lower contour nearly horizontal; eye rather small, high up, projecting above upper contour, obliquely directed; interorbital flat; snout slightly shorter than diameter of eye, upper profile in rather steep curve; tip of snout pointed when viewed from side, broadly rounded when viewed from above. Mouth subinferior, slightly obliquely directed; lower jaw slightly longer than the upper; lips rather broad, reflected outward. Teeth on both jaws, all simple, in 2 rows, the outer teeth on upper jaw slender but much larger than inner ones; outer series on lower jaw scarcely larger than inner series,

but without larger canines near angle of mouth; those on symphysis like those on side, but a little smaller; no teeth on vomer and palatines; tongue broad, slightly rounded or truncate at tip. Maxillary extending to vertical from antrior rim of orbit, entirely concealed under preorbital and lip. Anterior nostril with a long tube; posterior nostril without it. No barbel on chin; cheeks slightly tumid. Gill-opening lateral; isthmus broad, slightly shorter than postorbital part of head; gill-rakers on first gill-arch 7+10 in number, stumpy, very short; a large slit behind last gill; pseudobranchiae developed. Two dorsals well separated from each other though by a short space. Origin of first dorsal midway between tip of snout and posterior end of base of second dorsal, or above the beginning of the second half of pectoral. Origin of second dorsal nearer to caudal base than to posterior rim of eye by length of snout. In the first dorsal the third or fourth spine longest, equal to postorbital part of head, outer margin rather rounded, with the membrane between spines distinctly scalloped. Second dorsal slightly lower than the first, the highest ray being the sixth; the margin broadly rounded, but scarcely scalloped. Anal immediately behind vent, inserted below fourth ray of second dorsal; rays highest behind the middle part but somewhat shorter than the rays of second dorsal; the edge rounded, but not scalloped; both vertical fins not reaching to caudal base when folded backward. Pectoral rather large; no papilla on inner edge nor filamentous appendages above; rounded posteriorly, extending beyond vent. Ventral rather small, free to base, not reaching to vent, distance between tip of ventral and vent slightly less than one-half the distance between the former and the orgin of ventral. Caudal rounded. Anal papilla well developed. Scales rather large, finely ctenoid; nape closely covered with smaller cycloid scales, but occipital parts naked. Throat before ventral with a very few number of small cycloid scales; breast behind ventral with small, cycloid scales. Opercles and cheeks naked. No lateral line.

Colour in formalin blackish above, paler below ; on median parts of body some six, indistinct dark blotches at somewhat equidistant intervals ; behind the posteriormost blotch of the series a very distinct dark blotch on caudal base. Above the series and on back some more blotches present. Second dorsal with about 5 oblique series of blackish spots, directed downward and backward ; broadly edged with whitish. Caudal dusky, with broad, whitish edge. Anal dusky, also with whitish, broad edge. Pectoral slightly dusky, with narrow whitish edge. Ventral dusky, with whitish edge. Head indistinctly spotted above, dusky or pale below ; 3 dark lines radiating from eye, of which one runs horizontally forward from eye and unites with the fellow of the other side on anterior edge of preorbital parts ; the second line runs forward and downward to reach angle of mouth ; the third goes backward and disappears at a point midway between its origin and the uppermost edge of opercle. Colouration and markings considerably vary with age. In a specimen 3.6 cm. long without caudal, markings of second dorsal indistinct, but almost uniformly dusky and with whitish edge ; markings of body and head very indistinct. In a specimen 2.7 cm. long without caudal, the markings are very distinct ; first dorsal and caudal showing the same markings as the second dorsal ; anal whitish or with same marking as in second dorsal ; pectoral whitish or with some rows of spots ; ventral whitish ; head with very distinct markings.

The species is quite distinct from any species of the genus hitherto known from Japan. The chief characteristics of the species are as follows : head broader than high ; snout short ; ventral small, not reaching to the perpendicular passing through tip of pectoral ; vertical fins all with a somewhat small number of rays ; nape closely scaled.

Numerous specimens from a fresh-water pond in the garden of Marquis Kuroda in Tokyo. The largest specimen, the type, is 3.6 cm. long without caudal ; it is contained in the Zoological Museum of the Science College, registered No. 2008. The species is named for Mr. N. Kuroda, by whom it was discovered.

Measurements of Ctenogobius kurodai.

Specimen	A.	B.	C.
Total length without caudal	3.6 cm.	3.5 cm.	3.0 cm.
Height of body	0.65 „	0.6 „	0.6 „
Height of caudal peduncle	0.4 „	0.4 „	0.35 „
Height of head	1.0 „	1.0 „	0.85 „
Length of snout	0.25 „	0.25 „	0.2 „
Horizontal diameter of eye	0.25 „	0.25 „	0.2 „
Interorbital width	0.15 „	0.15 „	0.1 „
Length of maxillary	0.4 „	0.4 „	0.3 „
Length of pectoral	0.8 „	0.8 „	0.7 „
Length of ventral	0.6 „	0.65 „	0.55 „

4. Ctenogobius katonis, *n.sp.* (Gobiidæ.)

Head $3\frac{3}{4}$, height of body $4\frac{1}{2}$ in total length without caudal; eye $4\frac{1}{2}$ to 5, interorbital about 6, snout $2\frac{2}{3}$ to 3 in head.

Body rather elongate, slightly compressed; caudal peduncle compressed. Head rather large, its posterior part slightly depressed; eye moderate in size, its upper margin projecting above contour of head, directed obliquely, slightly nearer to tip of snout than to posterior edge of opercle; interorbital slightly narrower than diameter of eye, broadly convex; snout moderate in length, its upper contour gently curved, acutely pointed when viewed from side, broadly rounded when viewed from above. Anterior nostril with a short tube, slightly nearer to tip of snout than to anterior rim of eye; posterior nostril almost tubeless, situated midway between the anterior nostril and the anterior rim of eye. Mouth slightly oblique; lower jaw slightly included; lips very broad, reflected outward. Maxillary extending to vertical through posterior nostril; entirely concealed by preorbital. Teeth on jaws in

2 rows ; outer tooth being larger and somewhat incisor-like ; inner tooth smaller and sharply pointed. Teeth on lower jaw slightly smaller and those of inner row somewhat truncate ; on symphysial parts the outer series is absent. None on vomer and palatines. Tongue broad, rounded at tip. Preopercle unarmed. Gill-openings separate, isthmus broad, the breadth equal to length of snout ; gill-rakers on first gill-arch 4 + 8 in number, blunt, the length about $\frac{1}{3}$ diameter of eye ; pseudobranchiae developed ; a slit behind last gill ; branchiostegals 3 in number. Origin of dorsal slightly nearer to posterior end of base of second dorsal than to tip of snout, or above origin of the posterior half of pectoral ; membrane between spines scalloped ; the highest spines not reaching second dorsal. Second dorsal inserted very slightly nearer to upper edge of opercular flap than to base of caudal, the highest rays not reaching base of caudal, the margin rounded, but the membrane not scalloped between rays. Anal inserted below fourth ray of second dorsal and immediately below vent ; the outline same as that of second dorsal, highest rays extending farther backward than those of second dorsal when folded, but not reaching base of caudal. Pectoral without silk-like rays in the upper part, its posterior margin rounded ; distance between its posterior tip and vent equaling length of snout. Ventral below posterior end of base of pectoral ; its disc slightly broader than long, extending to vertical through end of the second third of pectoral. Caudal very broadly rounded. Anal papilla well developed. Scales rather large, ctenoid. Nape closely scaled, the scales small and cycloid ; occiput, cheek and opercle scaleless ; throat before ventral with a very few number of small, cycloid scales ; breast behind ventral also with small, cycloid scales. No lateral line.

Colour in formalin blackish brown above, pale below ; about 7 indistinct cross patches at equal intervals along the median parts of body. Between these patches and back about 6, more indistinct patches present above interspaces of the former. Posterior parts of

belly and lower parts of caudal base with or without very indistinct patches. Nape, snout and cheek with dark, rivulate lines. Several dark lines radiate forward from eyes; under surface of head pale. First dorsal dusky, with faintly visible oblique lines and with a very indistinct narrow whitish edge. Second dorsal dusky, with narrow whitish outer edge; about 6 dark lines run obliquely downward and backward. Anal similarly coloured as second dorsal, but with more indistinct markings. Pectoral dusky, its proximal parts having 2 dark cross-lines, outer surface of the base with a very distinct dark patch at the upper end. Ventral dusky, without markings. Caudal dusky; with several, wavy, dark, cross bars; posteriorly very narrowly edged with whitish.

The species is very closely allied to *Rhinogobius nagoyæ* Jordan & Seale but differs from this in having scaly nape and in the shorter maxillary which does not extend to the anterior rim of orbit.

Four specimens were collected from fresh-water in Kanazawa, Kaga, by Mr. K. Katō, instructor of natural history in the Middle School of that district, for whom the species is named. The type, 6.1 cm. long without caudal, is contained in the Zoological Museum, Science College, the register number being 2002. The species is locally known by the name of "Kin-kan," the meaning of which is uncertain.

Measurements of Ctenogobius katonis.

Specimen	A.(Type.)	B.	C.	D.
Total length ex. of caudal	6.1 cm.	4.6 cm.	4.5 cm.	5.1 cm.
Height of body	1.4 „	1.0 „	1.0 „	1.1 „
Height of caudal peduncle	0.8 „	0.6 „	0.55 „	0.65 „
Length of head	1.8 „	1.4 „	1.2 „	1.35 „
Horizontal diameter of eye	0.35 „	0.25 „	0.3 „	0.3 „
Interorbital width	0.35 „	0.2 „	0.2 „	0.35 „

Length of snout	0.7 cm.	0.45 cm.	0.45 cm.	0.5 cm.
Distance between tip of snout and origin of first dorsal	2.5 „	1.7 „	1.8 „	1.9 „
Distance between tip of snout and origin of second dorsal	3.8 „	2.6 „	2.6 „	3.0 „
Distance between tip of lower jaw to origin of anal	4.2 „	3.2 „	3.0 „	3.2 „
Distance between tip of lower jaw to origin of ventral	1.9 „	—	1.25 „	1.5 „
Height of first dorsal	1.0 „	0.55 „	0.6 „	0.6 „
Height of second dorsal	0.9 „	0.5 „	0.7 „	0.75 „
Height of anal	0.85 „	0.7 „	0.55 „	0.6 „
Length of pectoral	1.6 „	1.1 „	1.1 „	1.2 „
Length of ventral	0.85 „	—	0.7 „	0.7 „
Length of caudal (as measured to tip of the middle rays)	1.2 „	0.8 „	0.85 „	1.0 „
Number of dorsal spines and rays	VI—9	VI—8	VI—9	VI—9
Number of anal rays	9	9	9	9
Number of pectoral rays	19	20	20	20
Number of scales in lateral series	33	32	31	30
Number of scales in transverse series	12	12	12	12

5. Zoarchias glaber, *n. sp.* (Blennidæ.)

Head $7\frac{1}{2}$, height of body $13\frac{1}{8}$ in total length as measured to tip of caudal; eye 4, interorbital $9\frac{1}{3}$, snout $4\frac{2}{3}$, length of maxillary $1\frac{3}{4}$, pectoral $2\frac{4}{5}$ in head. D. XXXII, 86. A I,93.

Body elongate, very much compressed, gradually narrowing towards the pointed tail. Head moderate, compressed anteriorly, but broad posteriorly, its width across at the broadest part $2\frac{1}{3}$ in the length of head; eye high up, its upper rim above level of interorbital space; interorbital slightly concave; snout pointed. Mouth wide, the cleft on lower side of head, parallel to ventral outline. Jaws subequal, the maxillary extending beyond orbit, its length a little larger than half

the length of head. Teeth pointed, in narrow bands on jaws, vomer and palatines; gill-mambranes forming a broad fold across the isthmus. Nostrils with tubes. Head naked; body with minute, circular, deeply imbedded scales; no lateral line.

Dorsal inserted above base of pectoral; the spines strong, curved, pungent, their length equal to one-half diameter of orbit; that of the rays equal to length of orbit; membrane of the fin thick anteriorly, posteriorly becoming somewhat thinner; not incised between spines or rays; both the spines and rays completely concealed; base of spinous part of fin occupying $\frac{2}{3}$ the length from origin of the fin to tip of tail. Anal inserted immediately behind vent and about beneath the twenty-second spine of dorsal; the spine strong, equal in height to the rays which are somewhat higher than diameter of orbit; membrane of the fin not incised. Dorsal and anal confluent with caudal which is rather rounded. Pectorals rounded posteriorly. No ventrals.

Colour in formalin brownish, without markings throughout; head of same colour, without markings; occipital parts with a darker patch. Vertical fins all of similar colour, without markings except that there is a blackish oblong spot on the anteriormost rays of the spinous dorsal; pectoral pale, without markings.

The species is allied to *Zoarchias veneficus* Jordan & Snyder, but differs from this in having a somewhat larger number of spines and rays in vertical fins and especially in having no markings. The species also resembles *Zoarchias neglectus* Tanaka, differing however in showing no markings and in the number of spines and rays in vertical fins.

A single specimen was collected in Sagami Sea in 1908. It is contained in the Zoological Museum as the type of the species, the register number being 2011.

Measurements of Zoarchias glaber.

Total length (measured to tip of caudal)	10.5 cm.
Height of body	0.8 „

Length of head	1.4 cm.
Horizontal diameter of eye	0.35 „
Interorbital width	0.15 „
Length of snout	0.3 „
Length of maxillary	0.85 „
Distance between tip of lower jaw and vent	3.1 „
Distance between tip of lower jaw and origin of anal	3.6 „
Length of pectoral	0.5 „

6. Carapus sagamianus, *n. sp.* (Carapidæ.)

Head $9\frac{3}{4}$ to 10, height of body at insertion of anal 15 to 16 in total length; eye 4 to $4\frac{2}{3}$, interorbital 4 to $4\frac{3}{4}$, snout 4 to $4\frac{2}{3}$, maxillary 2 in head.

Body eel-shaped, compressed, tapering towards the long and slender tail. Head rather small, slightly higher than wide; eye moderate, impinging on the upper profile; interorbital broadly convex; snout sharply pointed when viewed from side, but rather broadly rounded when viewed from above. Mouth subinferior; lower jaw slightly included; maxillary extending to vertical through the posterior rim of orbit. Teeth on jaws small, pointed, in one row; palatine teeth slightly larger, arranged likewise in a single row; vomerine teeth slightly larger than palatine ones, in a narrow band, consisting of about 4 longitudinal rows. Dorsal inserted behind pectoral; distance from lower end of pectoral base to origin of dorsal equal to that from the former to tip of snout; height of the fin along the rays at the end of the first third of dorsal equal to diameter of orbit. Anal inserted behind pectoral, at vertical through the middle of its length, the height along the rays at its highest part equal to length of post-orbital part. Pectoral small, located somewhat low, sharply pointed posteriorly. Caudal small, confluent with the vertical fins. No ventral.

No scales; a series of pores on the side high, concurrent with back, posteriorly it is broadly curved downward and runs along middle of body.

Colour in formalin light brown, with profusely scattered dark spots; all the fins pale, without markings.

The species is allied to *Carapus kagoshimanus* (Steindachner & Döderlein), but differs from this in having smaller vomerine teeth, higher vertical fins, smaller pectorals and in the position of the insertion of anal; moreover the marking is very distinct from that of *Carapus kagoshimanus*.

The species is often taken from the cloaca of littoral large Holothurians in Sagami Sea. I have before me 9 specimens, all collected by Mr. Aoki in 1908; one of them serves as the type under Mus. No. 1751.

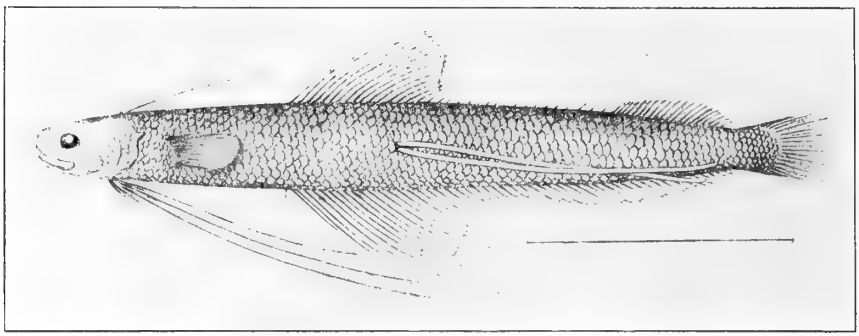
Measurements of Carapus sagamianus.

Specimen	A.(Type.)	B.	C.	D.	E.
Total length	19.0 cm.	15.5 cm.	13.0 cm.	—	15.5 cm.
Height of body	1.2 „	1.1 „	0.8 „	1.2 cm.	1.0 „
Length of head	1.9 „	1.6 „	1.4 „	1.7 „	1.6 „
Length of snout	0.45 „	0.4 „	0.3 „	0.35 „	0.4 „
Horizontal diameter of eye	0.4 „	0.4 „	0.3 „	0.45 „	0.35 „
Interorbital width	0.4 „	0.4 „	0.35 „	0.35 „	0.35 „
Length of maxillary	0.75 „	0.8 „	0.7 „	0.8 „	0.8 „
Length of pectoral	0.65 „	0.4 „	0.5 „	0.4 „	0.35 „
Distance between tip of snout and origin of dorsal	3.4 „	2.8 „	2.65 „	3.1 „	2.7 „
Distance tip of lower jaw and origin of anal	1.9 „	1.6 „	1.6 „	2.0 „	1.5 „

7. Bregmaceros atlanticus japonicus, *n. subsp.* (Gadidæ.)

Head $6\frac{4}{5}$, height of body $8\frac{1}{2}$ in total length without caudal; eye about 4, interorbital about 3, snout $3\frac{1}{3}$ in head.

Body elongate, compressed; highest part of body in front of the middle of body; caudal well separated from vertical fins. Head moderate, compressed; eye small; interorbital convex, its middle parts almost flat; snout short, rather pointed. Mouth subinferior, oblique, parallel to ventral contour of head; maxillary slightly enlarged and posteriorly exposed, extending to vertical from the posterior rim of the pupil of eye. Jaws equal, each with one row of rather small teeth, those on lower jaw being somewhat larger; none on vomer and palatines. Gill-membranes united forward and downward, free from isthmus;



Bregmaceros atlanticus japonicus Tanaka. Type.

pseudobranchiae undeveloped; gill-rakers on first gill-arch very small and pointed; branchiostegals 7 in number. Cephalic appendage slender, originating from occiput and scarcely extending to origin of first dorsal. First dorsal inserted slightly nearer to origin of second dorsal than to tip of snout and a little behind insertion of anal. Two dorsals connected by a row of detached, very inconspicuous finlets, so that the dorsals appear to be separated from each other at first sight; first dorsal much higher than the second, its highest ray equaling the length of head without snout. Anal of 2 fins, but several rays connecting the fins higher than the corresponding rays of dorsals and more or less confluent with the two anals, so that there exists no marked boundary between the anals and

the finlets; first anal much higher than the second, its height greater than length of head. Pectoral small, situated on the middle of body side, pointed posteriorly; the length equaling to distance from centre of pupil to posterior end of head. Ventrals apposed to each other before origin of pectoral and scarcely extending to origin of second anal. Caudal slightly emarginate. Scales cycloid, caducous; no lateral line.

Colour in formalin dusky; back very dark; dorsals, pectorals and caudal dark; ventrals and anals dusky; inner lining of operculum black. Air-bladder absent.

The species stands closer to *Bregmaceros atlanticus* Good & Bean* than to *Bregmaceros macclellandii* Thompson as described and figured by Day† or Günther‡. The species is of a more slender form and has the rays of vertical fins more numerous than in *Bregmaceros atlanticus*, as judged from the description and figure of this species. I think the specimens before me are to be considered to represent a local form or subspecies rather than to be specifically distinct.

Four specimens were obtained in Sagami Sea in 1908. The type is registered No. 2015 in the ichthyological collection of the Zoological Museum, Science College.

Measurements of Bregmaceros atlanticus japonicus.

Specimen	A. (Type.)	B.
Total length ex. of caudal	6.9 cm.	6.8 cm.
Length of head	1.0 „	1.0 „
Height of body	0.8 „	0.8 „
Horizontal diameter of eye	0.2 „	0.3 „

* Good & Bean, Oceanic Ichthyology, 1896, pp. 388–389, pl. cxv, fig. 331.

† Day, Fishes of India, 1878, p. 418 pl. xci, fig. 1.

‡ Günther, Challenger Report, vol. XXXI, Pelagic Fishes, 1889, pp. 25–26, pl. iii. fig. A.

Interorbital width	0.25 cm.	0.35 cm.
Length of snout	0.3 „	0.3 „
Height of rays of first dorsal	1.4 „	1.5 „
Length of ventral	3.4 „	3.6 „
Number of dorsal spine and rays	I-15-20-20	I-17-20-23
Number of anal rays	23-6-23	32-2-24
Number of pectoral rays	16	17
Number of ventral rays	5	5
Number of scales in lateral series	72	75
Number of scales in transverse series	13	14

8. Malthopsis annulifera, *n. sp.* (Ogcocephalidæ).

Head about 2, its width at posterior margin $1\frac{2}{3}$, height of body $5\frac{1}{3}$ in total length measured from tip of supraoral spine to root of middle caudal rays ; eye $4\frac{1}{3}$, interorbital $5\frac{1}{3}$, snout measured from tip of supraoral spine to eye $8\frac{3}{4}$ in head. D. 4. A. 4. P. 8 or 9. V. I, 5. C. 9.

Head triangular, its base very slightly longer than sides ; vent midway between tip of snout and base of caudal ; upper surface of head gently elevated, the under surface being flat ; tail parts behind vent slightly broader than high, convex above, flat beneath. Eye large, impinging on upper profile ; interorbital slightly convex ; supraoral spine on tip of snout, stout and rather short. Mouth cleft extending to anterior edge of pupil ; width between maxillaries equal to diameter of orbit ; a groove above mouth containing a small rostral tentacle, the cavity being a little deeper than wide. Distance from tip of upper jaw to anterior rim of eye equal to about one-half diameter of orbit. Width of trunk at axil $4\frac{1}{4}$ in total length without caudal ; its height 5 in the same length. Dorsal as well as anal without membrane behind last ray ; dorsal originating at the end of the second

third of total length without caudal; anal inserted slightly behind the middle between vent and root of caudal, or inserted entirely behind dorsal, tip of anal not reaching root of caudal. Length of the longest ray of pectoral equal to width of trunk at axil.

Cranial region elevated in front, depressed posteriorly; trunk slender, wider than high, tapering towards caudal fin. Spines on supraorbital and occipital regions rather prominent, forming 2 rows and leaving a smooth space along the median line of head. Behind occipital region a median row of spine-bearing plates running to root of caudal, forked in front of the base of dorsal fin and completely surrounding the base. Three rows of spines near outer edge of head, the middle row having larger spines anteriorly and extending forward to near the lower lip; below eye between the row and the upper row of spines about 4 large plates present; lower row of spines near outer edge of under surface, not quite reaching to below eye anteriorly. Posterior angle of head ending in a sharp triangular process with several spinules at tip. A row of plates running backward from postorbital rim continued into that on wrist; between this and the median row of plates a smooth space is present; between this lateral and the upper row of plates on outer edge of disc, about 4 plates rather closely arranged near posterior edge of the disc. Body behind vent with 3 rows of plates, upper lateral, middle and lower lateral. Plates on upper surface all with radiating ridges and a bluntly ending spine at centre. Under surface with very few plates, each without spine at centre.

Colour in formalin, gray above, pale below; 3 pairs of blackish rings; the first pair of the ring lies on an imaginary line drawn from anterior rim of eye to axil and at a point halfway of the length, diameter of the ring of this pair being $\frac{2}{3}$ diameter of pupil; rings of the second pair closer to each other than to the first pair and separated from each other by a space equal to interorbital width, each ring rather elliptical than circular in shape, the longer diameter being

slightly longer than that of pupil, and the ring on the right side set off by a blackish septum, so that here the two rings are apposed antero-posteriorly; rings of the third pair separated from each other by a narrower space than in the first pair, situated at a point slightly anterior to an imaginary line drawn through the posterior edge of disc, each ring slightly smaller than that of the first pair. All the fins except ventral dusky, without distinct markings. Ventral slightly paler, also without markings.

The species is allied to *Malthopsis tiarella* Jordan, but differs from this in the shorter dorsal and in markings.

A single specimen was collected by Mr. Aoki in Sagami Sea, in 1908. It is contained in the Zoological Museum, Science College, under Mus. No. 1754.

Measurements of Malthopsis annulifera.

Total length (measured from tip of supraoral spine to root of middle caudal rays)	7.5 cm.
Height of body (at postorbital rim)	1.4 „
Height of caudal peduncle	0.55 „
Width of caudal peduncle (at root of caudal)	0.6 „
Length of head (measured from tip of supraoral spine to gill-opening)	3.5 „
Width of head (at its base)	4.5 „
Length from tip of supraoral spine to posterior end of outer edge of disc	4.3 „
Horizontal diameter of eye	0.85 „
Interorbital width	0.65 „
Length of snout (measured from tip of supraoral spine to eye)	0.4 „
Height of trunk at vent	1.2 „
Width of trunk at vent	1.4 „
Distance from tip of supraoral spine to origin of dorsal	4.8 „
Distance from tip of lower jaw to vent	3.4 „
Distance from vent to origin of anal	1.8 „
Distance from posterior end of base of dorsal to origin of caudal	2.1 „
Length of the longest rays of dorsal	0.85 „
Length of the longest rays of anal	1.0 „
Length of caudal	1.5 „

December, 1908.

Diplocalyptra, Eine Neue Untergattung von Thouarella (Primnoidae).

VON

Kumao Kinoshita, *Rigakushi.*

(Zoologisches Institut der Kaiserlichen Universität zu Tokyo.)

In diesem Aufsatz werden zwei neue Formen beschrieben, welche unter der Gattung *Thouarella* anstellbar ersheinen Die beiden aber zeigen erhebliche Abweichungen von den bekannten *Thouarella*-Arten, was mich veranlasst hat, sie als eine Untergattung under dem Namen *Diplocalyptra* von den letzteren zu trennen. Zuerst erlaube ich mir einen Schlüssel zu den Gattungen und Untergattungen der Subfamilie Thouarellinae zu geben und dann einige Bemerkungen daran anzuknüpfen.

Subfamilie Thouarellinae Versluys.

Polypen mit Circumoperculum von primitivem Gebilde ; Verzweigung federartig, mit secundären Kurzzweigen ..... *Amphilaphis.*

Polypen mit gut ausgebildetem Circumoperculum—

Verzweigung federartig, mit secundären Kurzzweigen .....
..... *Thouarella* s.s.

Verzweigung dichotom, ohne secundäre Kurzzweige.....
..... *Diplocalyptra.*

Polypen ohne Circumoperculum (d. h. Randschuppen unbewegbar)—

Randschuppen des Polypenrumpfes zu acht vorhanden und zwar septal liegend ; ohne secundäre Kurzzweige—

Verzweigungfederartig—

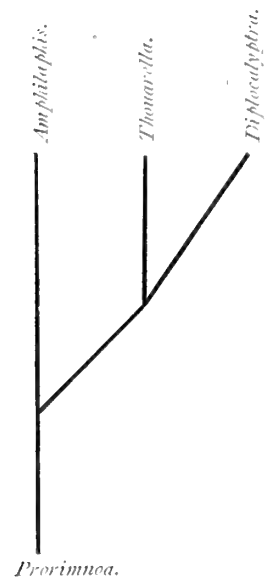
Kurzzweige regelmässig abwechselnd ; Polypen nicht in Paaren
..... *Plumarella.*

Kurzzweige unregelmässig abgehend; Polypen in Paaren....
.....? *Amphilaphis abietina.*
Verzweigung dichotom.....*Dicholaphis.*
Randschuppen zu acht vorhanden und zwar interseptal liegend
..... *Parastenella.*
Randschuppen weniger als acht—
Randschuppen zu 5 vorhanden; Verzweigung federartig; ohne secundäre Kurzzweige.....*Pterostenella.*
Randschuppen zu 4; Verzweigung nicht federartig.....
..... *Stenella* s.s.
Randschuppen 5-6; Verzweigung nicht federartig; Zweige allseitig gerichtet, vielleicht auch secundär gebildet....*Dasystenella.*

Die Gattung *Rhopalonella* Roule [1] ist nur ungenügend beschrieben, daher musste ich sie beim Errichten dieses Schlüssels unberücksichtigt lassen. Die neulich von Kükenthal [2] in *Thouarella* vereinigte Gattung *Amphilaphis* enthält zwei Arten, nämlich *A. regularis* und *A. abietina*. Die erstere wurde von Versluys [3] selbst untersucht und es wurde sicher gestellt, dass sie, wie die *Thouarella*-Arten, auch mit secundären Kurzzweigen und dem Circumoperculum versehen ist. Auf Grund dieser zwei Eigenschaften können wir sehr sicher diese Art in *Thouarella* einbeziehen. Die vorliegenden zwei neuen Formen nun haben die meisten Charactere mit *Thouarella*-Arten gemeinsam, mit alleiniger Ausnahme der Verzweigungsweise. Dieselben sind typisch dichotom verzweigt und weisen keine secundären Kurzzweige auf, während sie in der Gestalt der Polypen von den *Thouarella*-Arten ganz ununterscheidbar sind. Diese grosse Gleichheit der Polypen in *Thouarella* und *Diplocalyptra* lässt keinen Zweifel mehr, dass diese beiden Gruppen von einer gemeinsamen typisch fiederartig verzweigten Stammform [4] herrühren. Die Eigenschaft, Kurzzweige secundär zu bilden, sollte nun

1) Roule; Bull. Mus. Nat. Hist. Natur., 1907, p. 438.
2) Kükenthal; Zool. Anzeig., XXXIII, Nr. 1, 1908, p. 10.
3) Versluys; Siboga-Expeditie, XIII, Primnoidæ, 1906, p. 20.
4) Vergl. Versluys; dieselbe, p. 148, 2. Paragraph.

in *Amphilaphis* und in *Thouarella* unabhängig von einander erworben sein. Hier illustriere ich das mit einem Schema.



Amphilaphis regularis also soll in dieser Ansicht ihre eigene Gattung beibehalten.

Amphilaphis abietina, wenn man nach den Menneking' schen Abbildungen[1] schliesst, scheint die zwei Eigenschaften, secundäre Zweigbildung und Circumoperculum, zu entbehren, wenigstens das letztere nicht zu besitzen. Dieses letztere kommt, meiner Erfahrung nach, solchen Polypen gewöhnlich nicht zu; jedenfalls wäre der Name Circumoperculum an solchen Randschuppen nicht anwendbar. Die Deckschuppen (l.c. Taf. VIII, Fig. 7 und 8) sind nämlich sehr lang und brauchen niemals die Hilfe der darauf folgenden Schuppen (Randschuppen), um der Mundscheibe vollständigen Schutz zu leisten. Die Art ist in dieser Hinsicht von *Amphilaphis regularis* sehr weit verschieden und darf nicht in *Amphilaphis* gestellt werden. Sie sollte entweder in *Plumarella* oder in *Dicholaphis* gebracht, oder besser an und für sich als eine besondere Gattung von den anderen getrennt werden.

Thouarella Gray.

Kolonie fiederartig oder dichotom in einer Ebene verzweigt, beim ersten Falle mit typischen secundären Kurzzweigen.

Polypen wirtelständig oder isoliert, schräg nach dem Apex oder senkrecht nach aussen gerichtet, keulenförmig. Operculum unbedeutend; Deckschuppen dreieckig, oft stark verkleinert, sogar bisweilen teilweise reduziert. Längsreihen der Polypenschuppen unter dem

1) Menneking; Arch. Naturgesch. LXXI, 1, 1905, Taf. VIII, Fig. 7 und 8.

Circumoperculum bei den starr abstehenden Polypen immer verloren gegangen.

Rindenscleriten dünn, mit den Rändern unregelmässig übereinander gelegt.

Untergattung Thouarella s.s.

Als die Diagnose dieser Untergattung kann dieselbe der Gattung *Thouarella*, welche ich auf S. 20 in meiner vorigen Publication gab, ohne Umschreibung gelten.

Diplocalyptra subg. n.

Diagnose :—

Kolonie klein ; Verzweigung typisch dichotom, ohne secundäre Zweige ; Aeste genau in einer Ebene verbreitert.

Achsen gelblich bis braun mit Goldglanz.

Polypen in Wirteln zu 2 bis 4, selten solitär ; auf der Rinde schief nach Apex oder senkrecht nach aussen gerichtet. Operculum unbedeutend, von den Seiten nicht ersichtlich ; Opercularschuppen triangulär, oder sehr stark verkleinert und gerundet, sogar oft teilweise reduziert. Circumoperculum sehr gut ausgebildet. Die Schuppen der Polypen dünn ; die acht Längsreihen der Polypenschuppen überall oder nur distal deutlich.

Rinde dünn ; Rindenscleriten dünn, unregelmässig in einer Schicht gelagert.

In dieser Untergattung erleiden die Polypen eine parallele Veränderung mit derjenigen der *Thouarella* s.s., nämlich bei *parva* sind die Polypen schräg nach dem Apex gekehrt und die Längsreihen der Polypenschuppen sind ziemlich deutlich, bei *coronata* aber stehen die Polypen starr nach aussen gerichtet und zeigen proximal keine deutlichen Längsreihen der Rumpfschuppen mehr.

Thouarella (Diplocalyptra) parva sp. n.

Das einzige Exemplare, wodurch diese neue Art repräsentiert ist, ist 7.5 cm. hoch. Es ist sehr stark beschadigt, sodass nur eine geringe Anzahl Polypen erhalten blieben. Demselben fehlt die Basis ; offenbar stellt es jedoch ein Fragment eines nicht sehr grossen Kolonie dar, da die Internodien sich nach der Spitze zu verlängern.

Die Verzweigung erfolgt durchaus typisch dichotom unter einem Winkel von ca. 50°. Die Länge der Internodien nimmt nach dem Apex zu von 5 bis 13 mm. zu.

Die Achsen sind dünn ; unten gelblich, oben weiss.

Die Polypen stehen, so weit wie sie erhalten sind, zu zwei in Paaren, hauptsächlich in der Ebene der Verzweigung. Auf 1 cm. Länge der Aeste finden sich ca. 6 Polypenpaare.

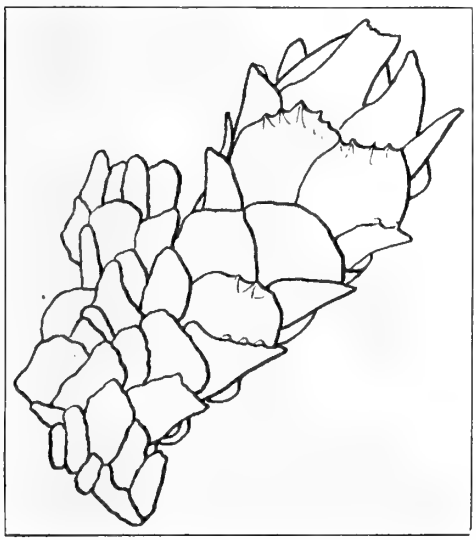


Fig. 1.
Thouarella (*Diplocalyptra*) *parva*.
Polyp (No. 1), Seitenansicht. × 50.

Die Polypen sind schief nach dem Apex gerichtet und selten berühren sie mit ihrer etwas varkürzten adaxialen Wand beinahe die Rinde. Die Länge der Polypen beträgt 1 mm. und der grösste Durchmesser liegt unmittelbar unterhalb des Circumoperculum. Bei einem Polypen (No. 1),* welchen ich auf Fig. 1 abbilde, sind die Deckschuppen ganz von den Circumopercularschuppen verborgen, welch letztere apical convergieren und in der Seitenansicht ganz wie Deckschuppen aussehen. Bei dem anderen Polypen (No. 2)

* Da ich von dem ohnehin mangelhaften Exemplare nicht viele Polypen abbrechen wollte, so habe ich nur zwei davon untersucht.

sind sie wie die darauf folgenden Rumpfschuppen nicht so stark verlängert.

Die Anordnung der Rumpfschuppen in acht Längsreihen ist beinahe deutlich. Bei dem Polypen No. 1 sind in den abaxialen und in den abaxial-lateralen Längsreihen fünf, in den adaxialen und in den adaxial-lateralen Längsreihen vier Schuppen vorhanden. Bei dem anderen Polypen aber zählen dieselben etwas mehr, und ihre Querreihen sind in dem distalen Ende etwas undeutlicher.

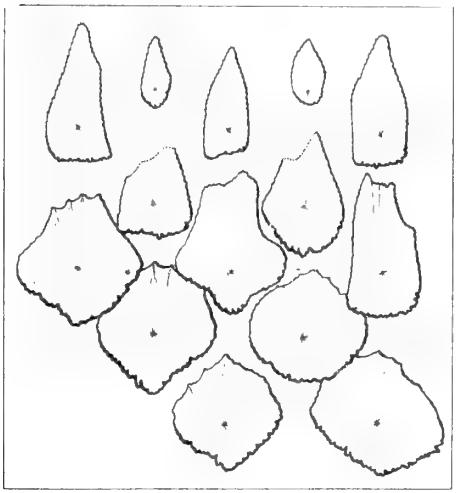


Fig. 2.

Thouarella (*Diplocalyptra*) *parva*.

Schuppen des distalen Endes eines Polypen (No. 1); von innen gesehen; die Zahlen deuten die Querreihen an. ×50.

Die zwei Polypen habe ich sorgfältig mazeriert, an der adaxialen Seite geöffnet und von innen untersucht. Der eine (No. 1) von ihnen ist hier abgebildet (Fig. 2).

Das Operculum, welches von den oft stark verkleinerten Deckschuppen gebildet wird, liegt in der Seitenansicht im Circumoperculum verborgen. Der Grössenunterschied zwischen den Deckschuppen und zwischen den Deckschuppen und den Circumoperculars chuppen verhält sich ganz wie bei *Thouarella*-Arten.* Die Grösse der Deckschuppen beträgt beim Polypen No. 1:

0.16/0.10—0.36/0.18—0.2/0.09—0.32/0.12—
0.18/0.09—0.35/0.16 m.m.

Beim anderen Polypen (No. 2) sind dieselben etwas niedriger, doch etwas breiter.

* Vergl. Kinoshita; Journal of the College of Science, Imp. Univ. of Tokyo; XXIII, 12, 1908, P. 4—5 und Taf. V, Fig. 42, 43.

Diese Deckschuppen sind oberhalb des Nucleus aussen etwas hohl, am Rande unbedeutend fein gezähnelt und sind auf der Aussenfläche sowie auf der Innenfläche in der apicalen Hälfte mit strahlenförmig gereihten Warzen locker bedeckt.

Das Circumoperculum ist sehr gut ausgebildet; es besteht aus den mehr oder weniger der Länge nach verlängerten Schuppen, welche besonders beim Polypen No. 1 so bedeutend verlängert sind, dass ich sie in der Seitenansicht der Polypen anfänglich für Deckschuppen gehalten habe. Die übrigen Rumpfschuppen der Polypen sind quer verbreitert. Diese Polypenschuppen zeigen auf ihrer Aussenfläche Warzen, welche sich in vom Nucleus ausstrahlenden Reihen anordnen, und welche sich besonders an der apicalen adaxialen Seite des Polypen beinahe zu Falten verschmelzen. Auf dem Nucleus ist allgemein eine rauhe Warze vorhanden. Die Innenfläche ist wie gewöhnlich gekörnt, der freie Randsaum aber ist frei von Granula und weist gewöhnlich zahlreiche dünne Kämme auf, welche vom Rande aus vorspringen. Der freie Rand der Schuppen also ist dementsprechend mit zahnartigen Vorsprüngen versehen.

Der grösste Durchmesser beträgt bei den Circumopercularschuppen bis 0.4 mm. (Längsdurchmesser), bei den übrigen Rumpfschuppen 0.3 —0.35—0.38 mm. (Querdurchmesser).

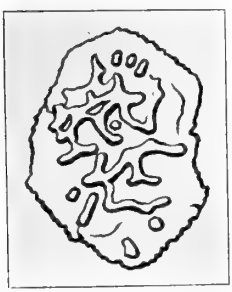


Fig. 3.

Thouarella (*Diplocalyptra*) *parva*. Sclerit aus der Rinde des untersten Astabschnittes, von aussen gesehen. × 200.

Die Rindenscleriten sind in einer Schicht gelagert und zwar unregelmässig mit den dünnen Rändern übereinander gelegt. Sie sind dünn und elliptisch in Form, teilweise fein gezähnelt. Aussenflächensculptur wie bei den Schuppen des Polypenrumpfes. Die Scleriten der Rinde des untersten Astabschnittes (Fig. 3) weisen auf der Aussenfläche unregelmässig laufende, manchmal mit einander anastomosierende, also netzartige Falten und eine geringe

Anzahl solitärer Warzen auf. Ihre Grösse beträgt 0.16 bis 0.2 mm.

Fundort : bei der Insel Kōdzu, südlich von der Prov. Idzu. Eine Tiefenangabe fehlt.

Thouarella (Diplocalyptra) coronata sp. n.

Das einzige vorliegende Exemplar ist 13 cm. hoch und 7 cm breit. Ein Hauptast ist abgebrochen.

Verzweigung geschieht typisch dichotom ; die Aeste verbreiten sich ganz genau in einer Ebene ; der Winkel der Dichotomie ist eben so gross wie bei der vorigen Art ; die Länge der Internodien liegt gewöhnlich zwischen 5–12 mm., ausnahmsweise erreicht sie 20 mm. ; die Endzweige sind meist kurz, jedoch oft 2–2.5 cm., sogar bis 5 cm. lang ; die Hauptäste sind in der Ebene der Verzweigung etwas abgeplattet ; ihre Dicke beträgt in der Höhe von 1.5 cm. oberhalb der Basis, die dünne Rinde mitgemessen, 1.5/1.0 mm., an einer anderen Stelle 1.8/1.0 mm.

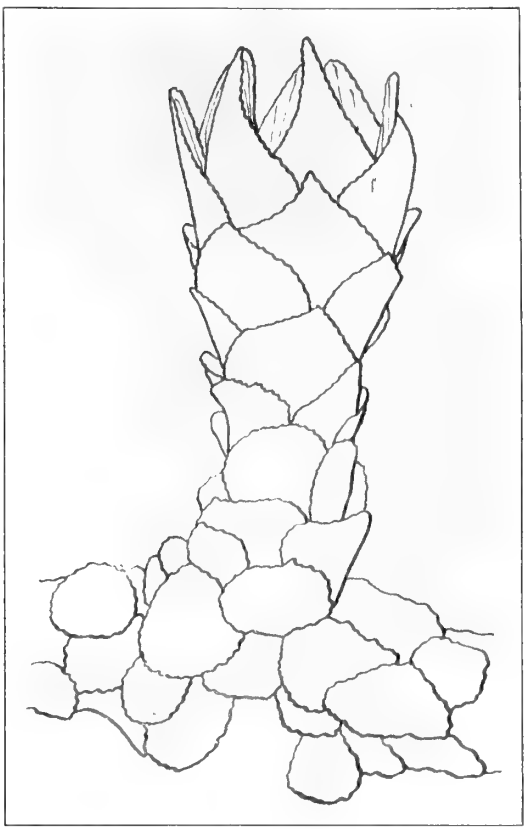


Fig. 4.

Thouarella (Diplocalyptra) coronata.
Polyp, Seitenansicht.
×50.

Die Achsen sind unten braun, in der Mitte gelblich mit grünlichem Metallglanz, in den Endabschnitten beinahe farblos.

Die Polypen stehen auf den dünnen Zweigen sowie auf den dickeren Aesten zu zwei oder drei, selten bis vier in einem Wirtel. Wenn sie in Paaren stehen, so sind sie meist in der Ebene der Verzweigung vorhanden. Diese Polypenpaare oder Wirtel kommen auf 3 cm. Länge der Aeste resp. der Zweige zu 17–20 vor.

Die Polypen (Fig. 4) stehen auf der Rinde starr nach aussen gerichtet wie bei *Stenella doederleini*. Diejenigen aber, welche sich in der Nähe der Zweigspitze befinden, zeigen meist die etwas kürzere adaxiale Wand und kehren sich etwas nach der Zweigspitze zu. Ihre Länge liegt zwischen 1 und 1.4 mm.

Die Längsreihen der Polypenschupen sind im distalen Ende sehr deutlich, im proximalen aber gehen sie verloren, wo der Rumpf sich bedeutend verschmälert.

Die Schuppen der I. und II. Querreihe (Opercularschuppen) sind, wie bei der vorigen Art und auch wie bei *Thouarella*, nicht gross genug, beim Contrahieren der Polypen die Mundscheibe vollständig zu schützen. Bei einem Polypen, welchen ich näher untersucht habe, sind sie sämmtlich erhalten (Fig. 5); bei einem anderen aber sind sie teilweise reduziert. Aehnlich wei bei der vorigen Art sind die Schuppen der III. Querreihe (innere Circumopercularschuppen) ganz vom Deckschuppentypus, während die Schuppen der IV. und V. Querreihe an ihrem freien Rande einen langen Stachel tragen. In der Seitenansicht der Polypen also sind die Schuppen der oberen drei Querreihen von denen der IV. und V. Reihen verborgen (Fig. 4), welch letztere für Circumopercularschuppen

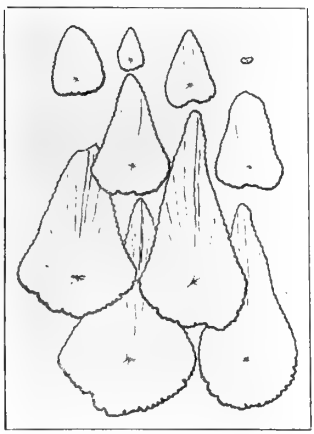


Fig. 5.

Thouarella (*Diplocalyptra*) *coronata*.

Schuppen des distalen Endes eines Polypen; von innen gesehen; die Zahlen deuten Querreihen an. × 50.

gehalten werden könnten. In einer Längsreihe sind da ca. 6 Schuppen (incl. Deckschuppen) vorhanden.

Die Deckschuppen sind bei den von mir untersuchten Polypen, sofern sie noch triangulare Form behalten, sehr fein gezähnelt und oft aussen etwas hohl; die Innenfläche ist unten wie gewöhnlich mit Granula, oben selten mit einer varierenden, doch geringen Anzahl radial gerichteter Runzeln bedeckt, während die Aussenfläche ganz sculpturlos bleibt. Die darauf folgenden Rumpfschuppen vergrössern sich allmählich bis zur V. Querreihe, indem sie am freien Rande je einen langen Stachel entwickeln. Dieser Stachel ist auf seiner Innenseite mit einigen Längsfalten und einem medialen Längskiel verstärkt und aussen etwas hohl. Die Aussenfläche dieser Schuppen ist frei von Sculptur, abgesehen von den kleinen Wärzchen, die sich nur gelegentlich zeigen. Die übrigen Schuppen des Polypenrumpfes unterscheiden sich von den letzteren nur im Fehlen des langen Stachels.

Die Grösse der Schuppen der IV. und V. Querreihe beträgt: 0.6/0.27—0.55/0.38—0.55/0.28—0.55/0.32—0.6/0.32 mm.

Die Grösse der Circumopercularschuppen der oberen Querreihe (III) beträgt: 0.25/0.17—0.32/0.2—0.22/0.17—0.17/0.12 mm.

Die Grösse der Deckschuppen variert sehr stark, nämlich zwischen 0.03 und 0.2 mm.

Die Rinde der Zweige ist sehr dünn. Die Rindenscleriten der dünnen Zweigabschnitte sind von rundlicher oder etwas elliptischer Gestalt; übrigens ähneln sie den Rumpfschuppen sehr und sind auch auf der Aussenfläche nicht mit Warzen versehen. Der längste Diameter misst meist 0.3, selten bis 0.4 mm. Die Scleriten der dicken Aeste (Fig. 6) sind, ebenso wie die der dünnen Zweige, meist rundlich oder elliptisch. Je-

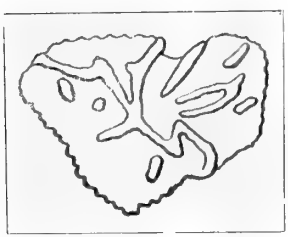


Fig. 6.
Thouarella (*Diplocalptra*) *coronata*.
Sclerit der Rinde des untersten Astabschnittes, von aussen gesehen.
× 200.

doch kommen öfters da auch etwas unregelmässig geformte vor. Ihre Aussenfläche ist mit meist unregelmässigen oder häufig vom Nucleus ausstrahlenden Falten bedeckt, welch letztere sich aber weniger dicht als bei der vorigen Art drängen. Selten ist die Fläche glatt. Ihre Grösse beträgt: 0.08—0.15 mm.

Farbe im frischen Zustande blass orange.

Fundort: Bei der Insel Udsi, Provinz Satsuma; 80 Faden.

Die Merkmale, wodurch diese Art sich von der vorigen unterscheidet, sind: erstens dass die Polypen starr abstehen; zweitens dass die Polypenschuppen, besonders die der IV. und V. Querreihe zu einem längeren Stachel ausgezogen sind; drittens dass die Polypenschuppen beinahe glatte Aussenfläche zeigen. Auch dass die Rindenscleriten der dicken Aeste schwächer entwickelte Falten auf der Aussenfläche aufweisen, kann wohl als ein wichtiges Merkmal angesehen werden.

Tokio, 10. October 1908.

Nachtrag.

Eben als das Manuskript zum Drucke fertig war, kam mir das Werk von Nutting* zur Einsicht, worin er beschreibt aus der Umgebung der Hawaii-Inseln eine den oben beschriebenen Arten sehr nahe verwandte Form, *Amphilaphis biserialis*. Seiner Beschreibung nach stimmt diese Art mit der angegebenen Diagnose der Untergattung *Diplocalyptra* sehr gut überein, bis auf die Angabe dass "The fragment.....consisted of a stem or branch giving off alternate branches at intervals.....". Die Type aber ist in der angegebenen Abbildung (l.c. Pl. XLIII, Fig. 3) mehr dichotom als fiederartig verzweigt, sodass die Art in meiner *Diplocalyptra* aufgenommen werden kann, ohne dass dabei eine Erweiterung der Diagnose nötig wäre. *Thouarella* (*Diplocalyptra*) *biserialis* (*Nutting*) ist von den vorliegenden Arten deutlich verschieden, nämlich von *parva* durch weniger zahlreiche Schuppen des Polypenrumpfes ("usually four longitudinal rows") und von *coronata* durch die schief nach dem Apex gerichteten Polypen ("Polyps.....form an acute angle with the stem or branch").

18. October.

---

* C.C. Nutting: Descriptions of the Alcyonaria collected by U. S. Bureau of Fisheries Steamer Albatross in the Vicinity of the Hawaiian Islands in 1902, in: Proceedings of the United States National Museum, Vol. XXXIV, No. 1624 (September 12. 1908.)

On
A New Echiuroid (Hamingia ijimai) from the Sagami Bay.

BY

I. Ikeda.

(With Plate I).

In the summer of 1908 I had a good opportunity to study an interesting deep-sea Echiuroid which was fished by Mr. K. Aoki, in February of 1907, from a 500 fathom basin of Outside Okinose in the Sagami Bay. Closer examination has revealed that the animal is undoubtedly a new form belonging to the genus *Hamingia*, a genus characterized by sexual dimorphism like the sister genus *Bonellia*. Only two species have been described in *Hamingia*, viz., *H. arctica* Danielsen et Koren[1] and *H. sibogae* Sluiter.[2] (*H. glacialis* Horst,[3] described from two specimens collected by the "Willem Barent," was later proved to be identical with *H. arctica*). It may here be noted that the two species have been obtained from localities widely separated and from different depths; *H. arctica* was obtained in comparatively shallow waters of the Arctic sea (a few hundred miles north of North Cape) and of Hardanger Fjord,[4] while *H. sibogae* came from an abyssal depth (4391 metres) of the Banda

1. Danielsen, D.C., and Koren, J.,—The Norwegian North Atlantic Expedition, 1876—1878; Gephyrea (Zoology), 1881, Christiania.

2. Sluiter, C. Ph.,—Die Sipunculiden und Echiuriden der Siboga Expedition (Siboga Expeditie, XXV, 1902).

3. Horst, R.,—Die Gephyrea gesammelt während der zwei ersten Fahrten des "Willem Barent" (Niederländ. Archiv für Zoologie, Suppl. Bd. 42 1881).

4. Lankester, E. R.,—On Specimens of the Gephyrean *Hamingia arctica* Kor. and Dan. from the Hardanger Fjord (Ann. and Mag. of Nat. Hist., 5, XI, 1883).

Sea (5° 44′ 7″ S and 126° 27′ 3″ E). The new species, to be presently described, comes from a depth (500 fathoms) intermediate between the above two. For it I propose the name *Hamingia ijimai* in honor of Professor Ijima of the Tokyo Imperial University.

Hamingia ijimai *nov. sp.*

The animal in the preserved state (Fig. 1) measures about 160 *mm* in total length, of which 60 *mm.* form the length of the proboscis. As is seen in the figure, the body proper is preserved in a somewhat unnatural state, the anterior half being considerably contracted, while the postior half is abnormally distended. According to the collector's remark, the animal when alive was of a bright yellowish red color, a faint trace of which is still preserved in the alcoholic specimen. The integument is thin, translucent and quite smooth, except on the proboscis and in the contracted region of the body. It is devoid of any sort of papillary structures and of hooks.

About 8 *mm.* behind the funnel-shaped mouth lies a small pit, situated at the posterior end of a narrow groove running from the posterior cleft of the mouth and along the median ventral line (see Fig. 1). This is the external opening of the single oviduct. The anus lies at the usual position, *i.e.*, at the apex of the conical hind region of the body.

The proboscis is relatively long and slender, measuring, when straightend, 60 *mm.* in length and 6 *mm.* in width. The organ was in the living state, as I was told, at least twice as long as it is now, and was performing an incessant undulatory movement recalling that of *Thalassema taenioides*.[1] It terminates rounded at the anterior end and has a deep groove along the entire length of the ventral side.

The alimentary canal winds and twists in a very complex way

1. Ikeda, I.,—On Three New and Remarkable Species of Echiuroids (*Bonellia miyajimai*, *Thalassema taenioides* and *T. elegans*): Journ. Coll. Sci., Imp. Univ., Tokyo, Japan, Vol. XXI, Art. 8, 1907.

and is fixed to the integument by very numerous thread-like and membraneous muscles, the latter being present especially at the places where it lies close to and nearly parallel with the ventral nerve-cord. The manner of winding and the relative length of different parts of the alimentary canal is, on the whole, as in *Hamingia arctica* and in many species of *Thalassema*. The whole canal may conveniently be divided into three parts; the fore-gut (incl. pharynx, œsophagus, crop, *etc.* of other workers), the mid-gut with the collateral intestine, and the hind-gut with the ciliated groove. These three parts are respectively 27.5 *cm.*, 30 *cm.* and 35 *cm.* long. Owing to the U-shaped bending of the posterior portion of the fore-gut, the junction of the latter with the mid-gut is brought considerably forwards (see Fig. 4). The description and figures given by Danielsen and Koren of the pharynx of *Hamingia arctica* may be said to be directly applicable to that of the present species. The pharynx (Fig. 4, *ph*) is a large oblong and highly muscular sac measuring 20 *mm.* in length and 11 *mm.* in maximum diameter, and is firmly fixed to the integument by numerous radial muscles.

The anal glands, which are found in the usual position, show some peculiarities. From the terminal portion of the rectum arise three main canals on each side, each giving off secondary and tertiary branches before ending with the funnels. Fig. 2 represents the main as well as the principal secondary and tertiary canals (see right-hand side) in natural position. There are on each side two larger, antero-ventral (*av*) and postero-dorsal canals (*pd*), and one smaller, mid-lateral (*ml*) main canal. The two antero-ventral canals run so ventral that they make very acute angles with the ventral nerve-cord (*vnc*). As may be seen on the left-hand side of the above figure, the three canals seem to originate independently from a narrow and thin-walled outgrowth (*rd*) of the rectum. It seems probable that this saccular outgrowth, one on each side, is homologous with the large vesicles described by myself in *Protobonellia mitsukurii*.[1] The long-stalked

1. Ikeda, I.,—Note on a New Deep-Sea Echiuroid, *Protobonellia mitsukurii*: *Annot.* Zool. Jap., Vol. VI, part 4, 1908.

funnels (Fig. 3, *fu*) are thickly clustered like a bouquet around the tertiary branches ; it often occurs that the tertiaries give rise to a few short quarteries, to which 2-5 funnels are attached (Fig. 3). Generally those funnels (*fu'*) directly attached to the apices of canal branches are the largest. Some long secondaries as well as all the main canals are fixed to the integument by long but slender muscle-strands (Figs. 2 and 3, *fm*).

The vascular system does not show any remarkable feature, and is of the same structural type as that of *Hamingia arctica* or of the genera *Thalassema* and *Bonellia*. At a spot about 15 *mm* behind the pharynx, the ventral vessel (Fig. 4 *vv*) gives off a short branch (*niv*), the neurointestinal vessel. This vessel, about 15 *mm* long, attaches itself to the beginning of the mid-gut, about 5 *mm* apart from the anterior boundary of the collateral intestine (*ci*). The vessel is then divided into two short branches embracing the collateral intestine. It is quite peculiar that these two vessels on the mid-gut and a short length of the neurointestinal vessel (near the intestine), are provided with numerous, short, villus-like processes (*vp*). It seems very probable that these structures are of the same nature as the contractile villi of the dorsal vessel found in the Sipunculids. The so-called heart is in this species indistinct. The dorsal vessel (*dv*) arises from the terminal part of the fore-gut (about 5 *mm* in front of the anterior boundary of the collateral intestine), and proceeds forwards along the mid-dorsal line of, and finally attaches to, the pharynx.

The ovary (*ov*) is found along the posterior three-fifths of the ventral vessel (Fig. 2). There the vasculo-peritoneal epithelium is thickly studded with small egg-cells, which are capped with a nutritive cell-mass (Fig. 5). In these ovarian eggs the cellular cap is larger than the egg itself and shows an irregular cocoon-like shape. In the coelomic fluid floats a large number of larger egg-cells still retaining the cellular cap (Fig. 6). This fact and that the oviduct contains no eggs but fully mature males as will be seen farther on, lead us

to a conclusion that this female specimen is full grown and had passed the spawning season.

The single unpaired oviduct (*ovd*) is found on the right side of, and very close to, the ventral nerve-cord (Fig. 7). Being very small (8 *mm.* long and 2 *mm.* thick) and completely hidden under the large pharynx, it can be seen only when the pharynx is removed. It consists of an elongate thin-walled sac and a short, narrow and thick-walled neck. It opens to the exterior by a pore situated, as already stated, about 8 *mm.* behind the anterior end of the body proper. A small fimbriated funnel (*of*) with a long stalk is present near the junction of the neck to the sac. No eggs are found in the oviduct. As we know in other Echiuroids, the small size of the oviduct indicates that this specimen was taken between breeding seasons.

Three males (Fig. 8) were found in the vesicular portion of the oviduct. They appear somewhat like a Nematode curled like S. The surface seems quite smooth to the naked eye. All are of the same size, being 4 *mm.* long and 0.173 *mm.* in maximum diameter. The entire surface is thickly and uniformly covered with short cilia. As in the female, no ventral hook is present.

The internal organization of the males is represented in Fig. 8 which is drawn from a borax-carmine preparation. The coelom is quite spacious throughout the greater part of the body (about 0.36 *mm.* long), excepting the two terminal portions where the parenchyme fills up the cavity.

The most conspicuous organ in the coelom is the spermatic reservoir (*sr*), a relatively long (2.3 *mm.*) and thick tubular sac filled with spermatozoa. Anteriorly the sac abruptly passes over into a narrow vas deferens (*vd*) which makes its way straightly forwards through the parenchyme to open to the exterior a little posterior and ventrad to the tip of body. Posteriorly the reservoir ends with a small, short-stalked, ciliated funnel (*sf*) which opens into the coelom.

The alimentary canal of the males are found in the same degenerated condition as in *Bonellia miyajimai* and *B. misakiensis*[1], that is to say, it is cut up into small pieces, of which there are ten to be seen in Fig. 8 (*al*). They float in the coelom and may take any position as the animal moves.

Other coelomic contents are the floating sperm cell-masses (*spm*). Some of them consist of quite young cells, while others are in the last stages of spermatogenesis.

The ventral nerve-cord (*vnc*) can be fairly distinctly made out in the stained preparation. No ring-nerve is found around the spermduct. Neither blood vessels nor any trace of segmental organs are present.

So far as the general external feature (as, f. i., the general shape and relative size of the proboscis[2] and the texture of the smooth and tranlucent integument devoid of any sort of hook-like structures) of the female specimen is concerned, the present species is in agreement with both the Arctic and the East Indian forms. There are however remarkable differences between the two known species and the present; *i.e.*, (1) the yellowish red integument, the known forms being said to be "durchscheinend grün" (*Hamingia sibogae*) or "hell grasgrün" (*H. actica*); (2) the absence of the papillary appendices on the proboscis-tip (*H. sibogae*) or around the genital openings (*H. arctica*). The internal anatomy of the female of the present species agrees in the main with that of *Hamingia arctica*, but little with that of *H. sibogae*. It must here be noted that Sluiter's description of the internal anatomy is not full, since in his single specimen some parts of the viscera seem to have been greatly torn; he could not detect any trace of the gonad, the anal glands, and the collateral intestine. Neither is a description of blood-vessels

1. Ikeda, I.,—The Gephyrea of Japan: Journ. Coll. Sci., Imp. Univ. Tokyo, Japan, Vol. XX, Art. 4, 1904.

2. The original description of Danielsen and Koren that *Hamingia arctica* is devoid of a distinct proboscis, was later corrected by Lankester, who observed a well developed proboscis nearly equal in length to the body proper.

given. Moreover, he could not discover any parasitic male in his specimen. Thus, the identification of his specimen with *Hamingia* had been based entirely on external characters. It therefore seems to admit of a doubt if Sluiter's description can be considered to be sufficient to establish a distinct species upon it.

The most conspicuous point of difference shown by the females of *Hamingia arctica* and of the present species, is in the structure of the anal glands; namely, the number of the main canals, the presence or absence of vesicular portions, and the mode of arrangement of the funnels.

Lastly as to the specific distinction of the male individuals of the present species, no special mentioning may be needed; they are characterized by the absence of ventral hooks, by the highly degenerated intestine, and by the extremely long spermatic reservoir.

The Zoological Laboratory, Normal College, Hiroshima.
September, 1908.

Explanation of the Plate.

Fig. 1.—Ventral view of the female. (*Nat. size*).

Fig. 2.—Terminal portion of the rectum (*rt*) with anal glands; in situ. *av*, antero-ventral main-canal of the analglands; *f.m*, fixing muscles of the rectum and anal glands; *ml*, mid-lateral main-canal of anal glands; *ov*, ovary on the ventral vessel; *pd*, postero-dorsal main-canal of anal glands; *rd*, rectal diverticulum from which the three main-canals of anal glands arise separately. On the right hand side only the tertiary branches of the anal glands are represented. × 1.5.

Fig. 3.—Terminal portion of a main-canal (postero-dorsal) of anal glands, which corresponds to a tertiary branch. Some of the funnels (*fn*) are seen arising from quartery branches. *fm*, fixing muscle; *fn'*, largest apical funnel. × × 55.

Fig. 4.—Anterior part of the viscera in situ. *Ci*, collateral intestine; *dv*, dorsal vessel; *fg*, fore-gut near the junction with the mid-gut (*mg*); *niv*, neurointestinal vessel; *oes*, œsophagus; *vp*, villus-like processes of the two vessels on the intestine; *vv*, ventral vessel. (Nat. size.)

Fig. 5.—Portion of the ovary (side-view). × 156.

Fig. 6.—Young floating egg with nutritive cell-cap. × 156.

Fig. 7.—Oviduct (*ovd*), the ventral nerve-cord (*vnc*) and the ventral vessel (*vv*); *of*, oviducal funnel opening into the coelome. × 2.

Fig. 8.—Male magnified; *al*, pieces of the alimentary canal; *sf*, funnel of the spermatic reservoir *sr*; *spm*, sperm cell masses; *vd*, vas deferens; *vnc*, ventral nerve-cord.

NOTICE.

Terms of subscription, $2.50 = 10s = 12^1/_2F = M10 = ¥5$ per volume, postage prepaid.

Remittances from foreign countries should be made by postal money orders payable in Tokyo to M. NAMIYE, Zoological Institute, Science College, Imperial University, Tokyo.

All manuscripts should be sent to THE EDITOR, ANNOTATIONES ZOOLOGICÆ JAPONENSES, College of Science, Imperial University, Tokyo.

All business communications should be sent to THE SECRETARY OF THE TOKYO ZOOLOGICAL SOCIETY, College of Science, Imperial University, Tokyo.

明治四十一年十二月二十三日印刷
明治四十一年十二月二十五日發行

東京市神田區美土代町二丁目一番地
編輯兼發行人　島連太郎

東京市神田區美土代町二丁目一番地
印刷人　小玉牧三

東京市神田區美土代町二丁目一番地
印刷所　三秀舍

東京市日本橋區通リ三丁目十四番地
大賣捌所　丸善書籍株式會社

第七卷第一冊　定價　金壹圓

郵便爲替ハ東京市本鄉區理科大學動物學教室波江元吉宛ニテ本鄉森川町郵便爲替取扱所へ御拂込有之度候

日本動物學彙報

第七卷第二册

明治四十二年六月二十日發兌

ANNOTATIONES

ZOOLOGICÆ JAPONENSES.

Vol. VII., Part II.

PUBLISHED

BY

The Tokyo Zoological Society.

TOKYO.

June, 1909.

CONTENTS

New and Unrecorded Species of Rhopalocera from Formosa.

BY

A. E. Wileman.

Fellow of the Entomological Society of London; His. Britannic Majesty's Consul at Tainan, South Formosa.

In continuation of my paper on Formosan Rhopalocera published in "Annotationes Zoologicae Japonenses", Volume VI, part 5, pp. 307–335, December, 1908, I am now able to supplement the new and unrecorded species mentioned therein with the following species collected in Formosa during the year 1908. Six of these are described by me as apparently new to science and eleven are recorded for the first time, as they do not appear in the lists of Professors Matsumura and Miyake, thus making a total of seventeen species.

New Species and Varieties.

1. *Abrota pratti*, Leech.
   var. candidii, var. nov.
2. *Curetis acuta*, Moore.
   var. brunnea, var. nov.
3. *Zephyrus arisanus*.
4. *Delias taiwana*.
5. *Papilio eurous*, Leech,
   var. koxinga, var. nov.
6. *Papilio rhetenor*, Westwood.
   var. matsumuræ, var. nov.

Unrecorded Species.

7. *Neope bremeri*, Felder.
8. *Euripus charonda*, Hewitson.
9. *Neptis pryeri*, Butler.
10. *Argynnis paphia*, Linnaeus.
11. *Vanessa xanthomelas*, Esper.
12. *Grapta c-album*, Linnaeus.
13. *Zephyrus comes*, Leech.
14. *Camena ctesia* (?), Hewitson.
15. *Rapala nissa*, Kollar.
16. *Papilio horatius*, Blanchard.
17. *Satarupa gopala*, Moore.

The following twenty species recorded by Rothschild, Fruhstorfer and Matsumura must also be included in the Formosan fauna, the majority of them are recorded in a "List of Japanese and Formosan Nymphalidae" published by Professor Matsumura in the "Entomologische Zeitschrift," December, 1908.

Additional Unrecorded Species and Varieties.

1. *Calinaga davidis*, Oberthür.
2. *Charaxes eudamippus*, Doubleday.
   var. formosanus, Rothschild.
3. *Charaxes narcaeus*, Hewitson.
   var. mandarinus, Felder.
   var. meghaduta, Fruhstorfer.
4. *Euthalia hebe*, Leech.
   var. shiushiu, Fruhstorfer.
5. *Euthalia sahadeva*, Moore.
   var. kosempona, Fruhstorfer.
6. *Euthalia pyrrha*, Leech.

7. *Sephisa chandra*, Moore.
var. androdamas, Fruhstorfer.
8. *Sephisa princeps*, Fixsen.
var. albimacula, Leech.
9. *Apatura subcaerulea*, Leech.
10. *Apatura fulva*, Leech.
var. chrysolora, Fruhstorfer.
11. *Athyma asura*, Moore.
var. elwesi, Leech.
var. baelia, Fruhstorfer
12. *Limenitis dudu*, Westwood.
13. *Neptis yerburii*, Butler.
14. *Neptis horishana*, Matsumura.
15. *Rahendra hordonia*, Stoll.
16. *Pyrameis indica*, Herbst.
var. asakurae, Matsumura.
17. *Symbrenthia brabira*, Moore.
var. scatina, Fruhstorfer.
18. *Prioneris thestylis*, Doubleday.
var. formosanus, Fruhstorfer.
19. *Papilio alcinous*, Klug.
var. loochooanus, Rothschild.
20. *Papilio jonasi*, Rothschild.
21. *Papilio castor* (?),
var. formosanus, Rothschild.

The following species have also been included as unrecorded. They are evidently new to the Formosan fauna as I am unable to identify them with any of the species mentioned in the lists of Professors Matsumura and Miyake. They cannot however be specifically named at present.

1. *Arhopala* sp. (?).
2. *Sephisa* sp. (?).

3. *Lethe* sp. (?).

4. *Lethe* sp. (?).

The following species are inserted for special observations.

1. *Euthalia thibetana*, Poujade.

2. *Apatura una*, Wileman.

3. *Phengaris atroguttata*, Oberthür.
var. daitōzana, Wileman.

4. *Zephyrus scintillans*, Leech.
var. taiwanus Wileman.

Of the above, *P. daitōzana* and *Z. taiwanus* were described in my former paper from female types and the males having now been discovered they are described in this paper.

Approximately the number of species of Formosan Rhopalocera recorded up to the present date stands as follows:

Recorded up to 1907 in the lists of Matsumura and Miyake	153 species
Recorded in Ann. Zool. Jap. VI, pt. 5, 1908, (previous paper).	27 ,,
Recorded in the present paper.	35 ,,
Total.	215 species

A month spent at Mount Ari (Arisan) during August, 1908, in investigating the lepidopterous fauna of Formosa has enabled me to make several interesting additions to the Rhopalocera. Here I discovered *Grapta c-album* Linn., *Vanessa xanthomelas* Esper, and *Argynnis paphia* Linn., at an altitude of 7,300 feet; probably this is the most southern limit of these species in the Oriental or Indo-Malayan region, to which Formosa belongs unless they should eventually be taken in some of the high mountains of the Philippine Islands farther south.

Family Nymphalidæ

Subfamily Satyrinæ.

1. Lethe sp. (?).

Collection Number 127. Four male specimens; Kanshirei, April 11, 28, 1908; Arisan 7300 feet, April, 1908; Juippun, Horisha, June 11, 1908.

This species seems to come very near *L. verma* Kollar, according to the description quoted by Leech, (Leech, Butt. China, Japan, Corea, p. 23, 1892–93) and agrees as regards upper side with the figure of *verma* given by Seitz, (Macro-Lepidoptera of the World, Part 1. pl. XXX, fig. e.), with the exception that the broad white transverse fascia of the forewing is narrower. Leech however remarks that "the width of the white fascia of primaries varies considerably". Seitz unfortunately does not give a figure of the underside and Leech also gives no figure. This species occurs at an altitude of from 2000 to 7000 feet.

Expanse. 64 millimetres.

2. Lethe sp. (?).

Collection Number 125. Three male and one female specimens; Karapin (Arisan district); August 2, 1908; Jujimichi (Arisan district) September 7, 1908; Kagi, August 21, 1906. This species somewhat resembles the preceding one having a white fascia on the forewing but is different on the underside and also has a large sexual patch in the second median interspace of hindwing.

Both this species and the foregoing one are unlike any of the Genus *Lethe* hitherto recorded from Formosa by Professors Matsumura and Miyake and are new to the fauna. It occurs in the Arisan district from 3000 to 7000 feet.

3. **Neope bremeri,** Felder.

Lasiommata bremeri, Felder, *Wien entom. Mon. VI. p. 28. (1862).*

Neope romanovi, Leech, *Entom. 23, p. 29 (1890).*

Neope bremeri, Leech, *Butt China, Japan, Corea, pt. 1, p. 51, pl. viii. fig. 7* ♂♀, *(1892–93).*

Collection Number 172. Three male specimens and one female specimen. ♂♀ Gahōzan, Lake Suisha, (Candidius), 4000 feet (?), July 15, 1908; Arisan, 7300 feet, August 5, 1908; Kasumigaseki, Horisha, July 19, 1908. ♀, Jūippun, Horisha, June 24, 1908.

One male specimen from Gahōzan agrees well with Leech's figure of the male. The two other males are evidently referable to the same species but have the ochreous markings of the upperside of fore and hindwings larger and more conspicuously marked.

Distribution. Western China (Omei-shan, Chia-ting-fu, Kwei-chow, Moupin); Central China, (Chang-Yang, I-chang); Formosa.

Expanse. Male, 68 to 74 millimetres; Female, 80 millimetres.

Subfamily Nymphalinæ.

4. **Calinaga davidis,** Oberthür.

Calinaga davidis, Oberthur, *Étud. d'Ént. iv. p. 107, (1879); Leech Butt. China, Japan, Corea, 1, p. 119. pl. xx. fig. 1.*, ♂♀, *(1892-93).*

Calinaga buddha, Oberthur, *op. cit. vi, p. 11, pl. viii, fig. 6, (1881).*

Collection Number 178. One male and one female specimen; Pun-ki-o, (Arisan district), 4300 feet; April 6, 1908.

These specimens agree well with Leech's figure of *davidis* but are rather darker in colour. There is a wider and more regular space of the black ground-colour between the submarginal and discal series of white spots on upperside of hindwing and three out of the six spots forming the discal series are reduced to mere dots.

Distribution. Western China, (Moupin, Wa-ssu-kow, Chow-pin-sa). Central China, (Chang-Yang); India (Sikkim); Formosa.

Matsumura also records *C. davidis* in Hakubutsu no Tomo, Jan. 15, 1909, p. 5. No. 20, from Tappan (3,500 feet) and Hoppo.

5. **Charaxes narcaeus,** Hewitson.

Charaxes narcaeus, Hewitson, *Exot. Butt, i, Nymph. pl. i, 4, (1854).*

Charaxes mandarinus, Felder, *Reise Nov. Lep. III, p. 437, (1867).*

Charaxes narcaeus, var. meghaduta, Fruhstorfer.

Var. *mandarinus* is recorded by Matsumura from Horisha and Taihoku in Hakubutsu no Tomo, p. 1, No. 1, Jan. 15, 1909. and var. *meghaduta* is also recorded by him in a "List of Japanese and Formosan Nymphalidæ", Entomologische Zeitschrift, December, 1908. I have specimens in my collection which are probably referable to this species.

Distribution. Eastern, Central and Western China from Ningpo to Moupin; Formosa.

6. **Charaxes eudamippus,** Doubleday.

Charaxes eudamippus, var. formosanus, Rothschild.

Recorded by Matsumura in a "List of Japanese and Formosan Nymphalidæ," Entomologische Zeitschrift, December, 1908.

Distribution. (?); Formosa.

7. **Euthalia hebe,** Leech.

Euthalia hebe, Leech, *Butt. China, Japan, Corea, pl. xxi. fig. 7, ♀, (1892-93).*

Euthalia hebe, var. shiushiu, Fruhstorfer.

Recorded by Matsumura in Hakubutsu no Tomo, Jan. 15, 1909, p. 3, No. 8, from Horisha. I have specimens which are probably referable to this species.

Distribution. China, (Chang-Yang, Omei-shan); Formosa.

8. **Euthalia sahadeva,** Moore.

Euthalia sahadeva, Moore, *Trans. Ent. Soc. Lond. pl. viii, fig. 3,* ♂, *p. 80, (1859);* Leech, *Butt. China, Japan, Corea, pl. xxi. fig. 2,* ♂. *(1892-93).*

Euthalia sahadeva, var. kosempona, Fruhstorfer.

Kosempona is recorded by Matsumura in a "List of Japanese and Formosan Nymphalidae," Entomologische Zeitschrift, December, 1908.

Distribution. India, (Nepal to Shillong, Sikkim); China (Omei-shan, Moupin); Formosa.

9. **Euthalia pyrrha** Leech.

Euthalia pyrrha, Leech, *Butt. China, Japan, Corea, p. 137, pl. xxi, fig. 4,* ♀, *(1892-93).*

Collection Number 184. Two female specimens; Jūippun, Horisha, June 11, 1908. Tabani, March 11, 1908. Identified from Leech's figure.

Distribution China. (Kwei-chow, Moupin; Omei-shan); Formosa.

Matsumura also records *E. pyrrha* in Hakubutsu no Tomo, Jan. 15, 1909, p. 3, No. 9, from Pinan and Horisha.

10. **Euthalia thibetana,** Poujade.

Adolias thibetana, Poujade, *Ann, Soc. Ent. Fr. 1885, p. 215.*

Euthalia staudingeri, Leech, *Entomologist, xxiv, Suppl. Jan. p. 4 (1891).*

Euthalia thibetana, Leech, *Butt. China, Japan, Corea, pt. 1, p. 138, pl. xxi, fig. 8* ♂, *(1892-93).*

Collection Number 185. One male and two female specimens. Bappōrei, (Chinese name Poat-po-nia), Lake Suisha (Candidius) July 14, 1908, July 17, 1908; Rei-ki-kutsu, Horisha, June 28, 1908.

The male specimen does not agree exactly with Leech's figure (fig. 8) but is evidently referable to *thibetana.* It has three apical spots instead of two, and the spots of discal band of forewing are

larger. The discal band of hindwing is also much broader than in the figure where it is narrow and attenuated. Leech however observes that the width of the bands is variable in both sexes.

Expanse. Male 94 millimetres, female 98 to 102 millimetres.

Distribution Western and Central China, July and August up to 7000 feet; Formosa.

Occurs in Formosa from 2000 to 4000 feet and I have seen a specimen at an altitude of 7000 feet.

Recorded by Miyake in his "Catalogue of the Butterflies of Formosa" No. 55 and in a "List of a Collection of Lepidoptera from Formosa" Annotationes Zool. Jap. Vol. VI. pt. 2. p. 63. No. 48 (1907).

11. **Euripus charonda,** Hewitson.

Diadema charonda, Hewitson, *Exot. Butt. iii, (Diadema), pl. 1. figs 2, 3, (1863).*

Euripus charonda, Pryer, *Rhop. Nihon. p. 22, pl. 5, fig. 6 (1888). Leech, Butt. China, Japan, Corea, 1, p. 148, pl. 16, fig. 8. var. (1892-93).*

Euripus coreanus, Leech, *Proc. Zool. Soc. Lond, 1887, p. 418, pl. 36, fig. 1* , .

In the collection of the Kokugo Gakkō, (National Language School), at Taihoku there is a specimen of a species labelled *Euripus charonda,* which Mr. Nagasawa, who has charge of the collection, states is one of three specimens which were taken in the neighbourhood of Taihoku. Mr. Nagasawa informs me that one specimen was taken by him in a bamboo grove at Manka, near Taihoku and that one of the school students caught two other specimens in the neighbourhood of Shinte, near Taihoku. One was given to Professor Matsumura and another was presented to the Imperial University collection at Tōkyo. Through the courtesy of Mr. Nagasawa I had an opportunity of examining the specimen in the Kokugo Gakkō and I have also received a coloured

figure of the same painted by Mr. Toba of Taihoku. The specimen is evidently referable to *charonda*.

Leech states that "the typical form is not uncommon in Japan", and I have myself often seen it in the vicinity of Yokohama and Tōkyo.

Distribution Chang-yang, (Central China), Mou-pin, (Western China); Corea; Japan; Formosa.

12. Sephisa chandra, Moore.

Sephisa chandra Moore, *var. androdamas*, Fruhstorfer.

Var. *androdamas* is recorded by Matsumura in a "List of Japanese and Formosan Nymphalidae", Entomologische Zeitschrift, December, 1908.

Professor Matsumura informs me that *Sephisa rex* described by me in Ann. Zool. Jap. Vol. VI. pt. 5, No. 9, p. 317, (1908), is identical with var. *androdamas*

Distribution. India (Himalayas); Formosa.

13. Sephisa princeps, Fixsen.

Apatura princeps, Fixsen, *Rom. Sur. Lep. iii, p. 289, pl. xiii, figs. 7 a, b, (1887).*

Apatura cauta. Leech, *Proc. Zool. Soc. Lond. p. 417, pl. xxxv, fig. 2 (1887).*

Sephisa princeps ♀ *et var. albimacula*, Leech, *Entomologist, xxxiii, p. 190, (1890).*

Sephisa princeps, Leech, *Butt. China, Japan, Corea, pl. xiv, figs. 5* ♀, *6* ♀ *var. (1892-93).*

Matsumura records var. *albimacula* from Horisha and Suisha Lake, in Hakubutsu no Tomo, Jan. 15. 1909, p. 2, No. 4.

Distribution China (Cang-yang, Omei-shan); Corea (Pung-tung, Gensan); Formosa.

14. Sephisa sp. (?).

Collection number 175. Two male specimens from Arisan, 6000

feet, June, 1908, and Lalachi, 3000 to 4000 feet (?), June, 1908. These specimens come very near *S. princeps ;* Fixsen, figured by Leech (Leech, Butt. China, Japan, Corea, pl. XIV, fig. 5 ♀), but do not agree exactly. Possibly they may be a local form of *princeps*. Matsumura records *princeps*, var. *albimacula*, but these specimens do not agree with Leech's figure of that variety, (pl. XIV, fig. 6 ♀).

Expanse 70 to 72 millimetres.

15. Apatura una, Wileman.

Apatura una, Wileman, *Ann. Zool. Jap. Vol. VI, Part 5, p. 320 No. 10. December, 1908.*

Collection Number 32. One female specimen ; Koshun, September 15, 1908.

Professor Matsumura informs me that female *A. una* described by me in Ann. Zool Jap. Vol. VI, part 5, p. 320, No. 10, December, 1908, is referable to *A. fulva*, Leech, var. *chrysolora*, Fruhstorfer. Since describing *A. una* my collector has captured a female specimen of *Apatura* which is evidently referable to *A. subcaerulea*, Leech, as it agrees very closely with Leech's figure of that species, (Leech, Butt. China. Japan, Corea, pl. XV, fig. 1, ♀). This specimen is smaller than the type only measuring 80 millimetres against 100 millimetres. The arrangement and shape of the markings are the same as in female *A. una* but the *fulvous* markings of *A. una* are replaced by *white* on the upperside. It would seem therefore that *A. una* is a variety of female *subcaerulea*, *not of fulva*, Leech. It agrees much better with female *A. subcaerulea* in markings than it does with *A. fulva*, Leech (Leech, id, pl. XV, fig. 2, ♀), but the colour of the upperside is the same as in *fulva*.

Distribution. Formosa.

16. Apatura subcaerulea, Leech.

Apatura subcaerulea, Leech, *Butt. China, Japan, Corea, pl. xv. fig. 1, p. 156*, ♀, *(1892–93)*.

This species is recorded by Matsumura in Hakubutsu no Tomo. Jan. 15, 1909, p. 2, No. 6, as taken at Hoppo.

Collection Number 32. One female specimen; Gahōzan, Suisha. Lake (Candidius), 4000 feet?, July 23, 1908.

This specimen is referred to under the heading of *A. una*, No. 15.

Distribution China (Omei-shan, Kweichow); Formosa.

17. **Apatura fulva,** Leech.

Apatura fulva, Leech, *Butt. China, Japan, Corea, pl. xv. fig. 2*, ♂, (*1892-93*).

Apatura fulva, var. chrysolora, Fruhstorfer.

Recorded by Matsumura in Hakubutsu no Tomo, Jan. 15, 1909, p. 2, No. 7.

Professor Matsumura remarks that I took this species at Tainan and that Herr Fruhstorfer has received it from Koshun. The only specimen of Genus *Apatura* in my collection which comes near *A. fulva* Leech, of which Leech only figures and describes the male, is femalle *A. una*, (also taken at Koshun). As remarked under No. 15 of this paper *A. una* seems to be a variety of *A. subcaerulea*, Leech.

Distribution. China (Omei-shan, Kweichow); Formosa.

18. **Abrota pratti,** Leech.

Var. candidii var. nov. ♀.

Abrota pratti, Leech, *Entomologist, xxiv, Suppl. Feb. p. 28*, (*1891*). *id, Butt. China, Japan, Corea, p. 167, pl. xiv, figs. 7* ♂, *8* ♀, (*1892-93*).

Collection Number 182. Two male and two female specimens; ♂, Lake Suisha, (Candidius), July 9, 1908, 3000 feet; Karapin, (Arisan district), June, 1908, 3,500 feet; ♂, Gahōzan, Suisha, 4000 feet, July 20, 1908; Shūshū, (Chinese name Chip-chip), June 11, 1908.

The male specimens agree well in colour and markings with

Leech's figure of male *Abrota pratti*, (fig. 7). The subbasal band of hindwing is rather broader and continued to the submedian nervure instead of ceasing at the first median nervule and on the underside of forewing there are three apical white spots instead of one as in the figure.

The female differs in some respects from Leech's figure of ♀ *pratti* (fig. 8) and is here described as a variety under the name of var. *candidii*, var. nov.

The markings of upper side are the same as in ♀ *pratti* but are white tinged with fulvous instead of being of a deep fulvous as in the former. The markings in cell of forewing are also more interrupted by the black ground-colour and in one specimen are divided into three distinct white streaks; there are also three apical white spots on forewing instead of two. The bands of hind wing are rather more parallel with costa than in the figure of ♀ *A. pratti* and on the underside there is a distinct cream coloured central band which extends from the hind to forewing. The underside is also more deeply suffused with violet grey than in *pratti*.

Expanse. Male 76 to 79 millimetres; female, 90 to 94 millimetres.

Distribution. China, (Omei-shan, Kwei-chow); Formosa.

The female variety has been named after Candidius, the first Dutch missionary to arrive in Formosa in 1627 and: after whom Lake Candidius, (Japanese name, Suisha), has been named. Matsumura also records *A. pratti*, in Hakubutsu no Tomo, Jan. 15, 1909, p. 2, No. 3, from Horisha.

19. **Athyma asura**, Moore.

Athyma asura, Moore, *Horsfield and Moore, Cat. Lep. Mus E.I.C. 1. p. 171, pl. v. a. fig. 1. (1857);* Wileman, Ann. Zool. Jap.

Vol VI. part, 5, No. 11. p. 321, December, 1908.

Athyma asura var. elwesi, Leech. *Butt. China, Japan, Corea, pl. xvii, fig. 7, ♀ var, p. 170, (1892-93).*

Matsumura records var. *elwesi* from Horisha and Suisha Lake in Hakubutsu no Tomo, January 15, 1909, p. 1. No. 3, and also records var. *baelia*, Fruhstorfer in a "List of Japanese and Formosan Nympalidae," Entomologische Zeitschrift, December, 1908.

Asura was also recorded by me in my previous paper.

20. **Limenitis dudu,** Westwood.

Recorded by Matsumura in Hakubutsu no Tomo, Jan. 15, 1909, No. 10, p. 3, from Horisha.

Distribution. Formosa.

21. **Neptis yerburii,** Butler.

Recorded by Matsumura in Hakubutsu no Tomo, Jan. 15, 1909, p. 4, No. 14, from Koshun. This species was recorded by Matsumura under the name of *duryodana* in the supplement to "Catalogus Insectorum Japonicorum" vol. 1, June, 1905.

Distribution Formosa.

22. **Neptis horishana,** Matsumura.

Described by Professor Matsumura in the Entomologische Zeitshrift, December, 1908 and recorded also in Hakubutsu no Tomo, p. 3 No. 13, from Horisha.

Distribution. Formosa.

23. **Neptis pryeri,** Butler.

Neptis pryeri, Butler, *Trans. Ent. Soc. Lond. 1871, p. 403*; *Lep. Exot. pl. 63, fig. 4, (1874)*; *Janson, Cist. Ent, ii, p. 155, (1877)*; *Pryer, Rhop. Nihon. p. 24, pl. vi, fig. 3, (1886)*; *Leech, Butt. China, Japan, Corea, i, p. 206, (1892-93)*.

Collection Number 166. One male; Suisha Lake, July. 25, 1908, 3000 (?) feet.

This specimen agrees well with Pryer's figure in Rhopalocera. Nihonica.

Distribution. China (Ningpo to Moupin); Corea; Japan; Formosa.

24. **Rahendra hordonia,** Stoll.

Recorded by Matsumura in Hakubutsu no Tomo, Jan. 15, 1909, p. 3, No. 12, from Horisha and Taito.

Distribution. Formosa.

25. **Argynnis paphia,** Linnaeus.

Papilio paphia, Linn, *Faun. Suec. p. 281 (1764); Hübner, Eur. Schmett. i, figs. 69, 70 (1793-1794), figs. 935, 936 (1829-1841).*

Argynnis paphia, Godart, *Enc. Meth. ix, p. 268, (1819); Lang, Butt. Eur. p. 214, pl. 52, fig. 1 (1884); Pryer, Rhop. Nihon. p. 29, pl. viii, fig. 4, ♀, (1889); Leech, Butt. China, Japan, Corea, pt. 1 pl. 23, fig. 2, var. ♀, p. 239 (1892-93).*

Argynnis paphioides, Butler, *Ann. and Mag. Nat. Hist. (5) viii, p 134, (1881).*

Var. Papilio valesina, Esper. *Schmett, i, pt. 2, pl. 107, figs. 1, 2 (1800?).*

Papilio paphia, Hübner, *Eur. Schmett. i, figs. 767, 768 (1824-1828).*

Collection Number 173. One female specimen; Arisan (Ogasawara Yama) 7500 feet; August 21, 1908.

The specimen agrees in markings but not in colour with ♀ var. *paphioides*, figured by Pryer. It is nearer the typical form of ♀ *paphia* than var. *valesina*, Esper and shows no dark greenish hue which is the ground colour of ♀ var. *valesina* and also of ♀ var. *paphioides*.

Distribution. Europe; China; Corea. Amurland; Isle of Askold; Japan; Formosa.

26. **Pyrameis indica,** Herbst.

Papilio atalanta indica, Herbst, *Naturs. Schmett. vii, p. 171, pl. 180, figs. 1, 2 (1794).*

Pyrameis indica, Leech, *Butt. China, Japan, Corea, p. 252, (1892-93).*

Var. *asakurae* is described by Matsumura in a "List of Japanese and Formosan Nymphalidae", Entomologische Zeitschrift, December, 1908, and recorded also in Hakubutsu no Tomo, Jan. 15. 1909, p. 4, No. 15.

In this variety the red fascia of forewing has only two black spots and the marginal border of hindwing is yellowish-red in colour and much broader than in the type.

Distribution. Formosa; Japan; China; Corea; Amurland; India.

27. **Vanessa xanthomelas.** Esper.

Papilio Xanthomelas, Esper, *Schmett, i, pt. 2, pl. 53, fig. 4 (1780?); Hübner, Eur. Schmett. i, figs, 85, 86, (1793?).*
Vanessa xanthomelas, Godart, *Enc. Meth. ix, p. 820, (1813); Horsfield and Moore, Cat. Lep. Mus. E.I.C. p. 137 (1857); Lang, Butt. Eur. p. 172, pl. 40, fig. 1, (1884); de Nicéville, Butt. Ind. 11, p. 235, pl. 18, fig. 73, ♀, (1886); Pryer, Rhop. Nihon. p. 26, pl. 6, fig. 10 (1888); Leech Butt. China, Japan, Corea, pt. I, p. 260, (1892-93).*

Collection Number 174. One male specimen; Arisan, 7300 feet; June 1908. Dr. Moltrecht informs me that he observed but did not capture a specimen of this species at Arisan in April, 1908.

Distribution. Europe, (confined to the eastern parts of Europe, including Germany, the north-east of Switzerland, Hungary and Central Russia to 60°), (Lang); India (Western Himalayas); Amurland; Corea; China, (Ichang and Chang-Yang in Central China); Japan; Formosa.

"De Nicéville is of opinion that there are no satisfactory characters by which this species can be specifically separated from *Vanessa polychloros*, which view is also shared by Dr. Staudinger," (Leech, p. 261).

28. Grapta c-album, Linnaeus.

Papilio c-album, Linnaeus, *Syst. Nat. x, p. 477 (1758).*
Vanessa c-album, Lang, *Butt. Eur. p. 170, pl. 39, fig. 4, (1884); de Nicéville, Butt. Ind. ii, p. 237, (1886); Pryer, Rhop Nihon. p. 27, pl. 6, figs. 6a,=form hamigera*, Butler, *6b=form lunigera*, Butler, *(1888); Leech, Butt. China, Japan, Corea, pt. 1, p. 263, pl. 25, fig. 5, var.* ♀ *(1892–93).*
Vanessa hamigera, Butler, *Ann. and Mag. Nat. Hist. (4) 19, p. 92 (1877).*
Vanessa fentoni, Butler, *Cistula Entom, ii, p. 281 (1878).*
Vanessa lunigera, Butler, *Proc. Zool. Soc. Lond. p. 850, (1881); Waterhouse, Aid Identif. Ins. pl. 106.*
Vanessa c-album, var. tibetana, Elwes, *Trans. Ent. Soc. 1888, p. 363, pl. x. fig. 1.*

Collection Number 170. Two male specimens; Arisan, 7,300 feet; July, August, 13, 1908. Both these specimens are referable to form *hamigera*, Butler, and agree well with Pryer's figure of that form.

Distribution. Europe; India, (Kashmir to Sikkim); Amurland; Corea; China, (Kiukiang, Tachien-lu); Japan, (Central Japan and Yezo); Formosa.

29. Symbrenthia brabira, Moore.

Matsumura records var. *scatina*, Fruhstorfer from Horisha in Hakubutsu no Tomo, Jan. 15, 1909, p. 4, No. 16 and gives *asthala*, Moore, as a synonym.

Family Lycaenidae.

30. Phengaris atroguttata, Oberthür.

var. daitozana, Wileman.

Lycaena atroguttata, Oberthür, Études d'Ént. *ii*, p. 21, pl. *i*, fig. 4 a, b, (1876).

Phengaris atroguttata, var. *albida*, Leech, Butt. China, Japan, Corea, pl. *xxviii*, fig. 5 ♀, p. 317, (1892–94).

Phengaris atroguttata, var. *daitozana*, Wileman, Ann. Zool. Jap. Vol. VI, part 5, p. 323 No. 15, December, 1908.

Phengaris atroguttata, Doherty, Journ. Asiat. Soc. Beng. 60, pt. 2, p. 36, (1891).

Collection Number 56,56 a. Four male and six female specimens, Arisan, 7300 feet; Daitōzan, 8500 feet; Jujimichi, 5000 feet; August and September, 1908.

A recent trip to Arisan in the month of August of 1908 enabled me to capture a long series of var. *daitozana*, numbering in all some thirty specimens. The female was described by me in a previous paper from two worn females and I now give for convenience of reference à description of both sexes. The wings are white in both sexes as in var. *albida*.

Male, var *daitozana*, differs from var. *albida*, Leech, as follows :— Only two greyish spots show on upperside, forewing, one at apex of discoidal cell, the other in first median interspace, these are merely transparent from below and are not dark blue as in *albida*, ♀. *Albida*, ♀, has seven spots on the upperside, forewing, which are dark blue and judging from Leech's figure transparent from below. On the underside there is no large black spot in centre of the cell as in *albida* and the sixth spot of the central discal band of forewing, which is present in *albida*, is absent in male *daitōzana*. This band is also more regularly curved in *daitōzana* from costa to first median interspace than it is in *albida*. Hindwing, upper and lower side as in *albida*, only the central band is straighter than in *albida*.

Female, var. *daitōzana*. Has three spots on upperside, forewing, the third being in second median interspace and generally only a dot; these spots are not transparent from below but are reproduced in black; a broad black submarginal border to hindwing with submarginal

lunules; no spot in cell on forewing, underside, which is the same as in the male, but the sixth spot of central band in *albida*, is present generally as a mere dot.

Oberthür remarks of typical *atroguttata*, "Le ♂ est en dessus d'un bleu très pâle, chatoyant, a travers duquel transparaissent les taches du dessous; la ♀ est plus blanche, et les taches du dessous sont effectivement reproduites en dessus, et non pas seulement transparentes du dessous."

I have one female specimen which I think must approach typical *atroguttata*. The wings are pale blue, more so at the base and seven black spots show prominently on the forewing, upperside. The spots on hindwing, upperside, with the exception of the submarginal series, are dark blue, not transparent from below. Of this form I captured about four specimens. Var. *daitōzana* may be easily distinguished from *atroguttata*, or *albida*, by the absence of the spot in centre of discoidal cell, underside, forewing, which is present in the two latter. It also seems to be the prevalent form at Arisan so far as I have examined the series taken of which ten have been retained for the cabinet. It occurs at Arisan from the end of July to end of September at an altitude of from 5000 to 8000 feet and is fond of settling on flowers where it will remain for a long time, quiescent, with closed wings. It can however fly very high when so disposed. I also observed a female laying eggs which were deposited on a species of low growing *Salix*.

Expanse. Male 38 to 54 millimetres; Female, 48 to 58 millimetres.

Distribution. India, (Naga Hills); Western China, (Moupin, Chia-ting-fu); Formosa.

31. Arhopala sp. (?).

Collection Number 84. One male specimen; Kanshirei (Chinese name Koan-na-nia), June 10, 1906.

This species is quite different to *Arhopala turbata*, Butler, which is taken in Japan, and figured by Pryer in Rhop. Nihon. pl. ii, fig. 16, (1886) and I am unable to identify it. Only one *Arhopala*, viz. *A. japonica*, Murray, is mentioned by Miyake in his "Catalogue of Formosan Butterflies" as being taken in Formosa, and my species does not agree with *japonica*.

Expanse. 49 millimetres.

32. **Curetis acuta,** Moore.

Var. brunnea, var. nov.

Curetis acuta, Moore, *Ann and Mag. Nat. Hist. (4) xx, p. 50 (1877); id, Leech, Butt. China, Japan, Corea, p. 349, (1892–94).*

Curetis truncata, Moore, *l.c., p. 51, (1877).*

Curetis dentata, Moore, *Kershaw, Butt. Hongkong, p. 77, pl. viii, figs. 8* ♀, *9* ♂, *errata, for C. dentata*, Moore, *read C. acuta*, Moore.

Collection Number 162. Five male specimens; Jūippun, Horisha (Chinese name, Polisia), June 18, 1908.

These specimens are almost entirely of a unicolorous brown the red area so conspicuous in *acuta* being entirely absent on the forewings and only faintly perceptible on the hindwings, more so in one specimen than in the others. They are, probably, varieties of *C. acuta*, Moore, which has been recorded from Formosa by Miyake in his "Catalogue of Formosan Butterflies," No. 118, and which is also in my collection.

It should be here mentioned that de Nicéville has separated. (in Journal Bombay N. H. Soc. Vol. XIV, No. 2, p. 248, No. 11, (1901), the species of the genus *Curetis* occurring in Japan, also figured by Pryer (Rhop. Nihon, p. 11, No. 26, pl. IV. figs, 1 a ♂, 1 b ♀, (1887),) and has named it *Curetis paracuta*. De Nicéville is also of opinion that *C. truncata*, Moore and *C. angulata*, Moore, (Proc. Zool. Soc. Lond, p. 522, pl. 48, fig. 2, 1883), are synonymous with *C. acuta*, Moore.

Distribution. Eastern coast of China, (Shanghai and Hongkong), to the Western Himalayas; Formosa.

Expanse. 46 to 48 millimetres.

33. **Zephyrus scintillans**, Leech.

Var. taiwanus, Wileman.

Zephyrus scintillans, Leech, *Butt. China, Japan, Corea, p. 376, pl. xxvii, figs. 10 ♀, 11 ♂, (1892-94).*

Zephyrus taiwanus, Wileman, *Ann. Zool. Jap. Vol. VI, part 5, p. 324, No. 16, December, 1908.*

Collection Numbers, 83, 159, 160. Two male specimens; Jūjimichi, (Arisan district), June, 1908, 5000 feet; four female specimens, Jūjimichi, September, 22, 1906; Arisan, July, 7300 feet.

In Annotationes Zoologicae Japonenses, Vol. VI, part 5, p. 324. No. 16, December, 1908 I described the female of *Zephyrus taiwanus* and remarked that if the male of *taiwanus* were captured it might happen to be identical with *Z. scintillans*, Leech. Two males of *Z. taiwanus*, which have since then been taken in the Arisan district, differ in several minor points from *scintillans*, but not enough to warrant the retention of *taiwanus* as a distinct species. It should, I think, be regarded merely as a local variety of *scintillans*.

Description of male *taiwanus*. (No. 83). Colour of upperside of rather a deeper golden green tinge than in Leech's figure of male *scintillans;* outer margins of the upperside, fore and hindwings more narrowly black, costa of hindwing about the same as in *scintillans;* towards anal angle is a pale blue submarginal line, (as in *scintillans*), which Leech remarks is a character occurring only in *Z. scintillans* and *Z. orientalis*.

Underside. Colour as in *scintillans;* discoidal bars on all wings very faintly present; discal band of forewing thinly white, slightly interrupted and curved from costa inwards to third median nervule, not transverse as in *scintillans;* in another specimen the discal band

is continued to the hind margin where it is highly angulated inwards at third median nervule; submarginal series of dark spots of forewing scarcely perceptible beyond second median nervule; discal white line of hindwing slightly curved outwards, not straight as in *scintillans*. W towards anal angle incomplete at third median nervule, thinner than in *scintillans* and the submarginal band more diffuse; the black pupilled orange spot in second median interspace does not extend to third median interspace which is filled in with silvery bluish grey scales near hind margin; anal black spot larger and the two anal orange spots smaller than in *scintillans*; these two spots and the fulvous abdominal streak are bordered above by a streak of silvery bluish grey scales (white in *scintillans*) which is interrupted at third median nervule and does not extend as far as the large black pupilled fulvous spot in second median interspace.

Female *taiwanus*. *Taiwanus* was described from female specimens, one with a blue patch and the other with a blue patch and two fulvous spots on the forewings, (No. 83). I then remarked that "it is not improbable that *scintillans* may have a dimorphic from of the typical female, which is figured by Leech with three fulvous spots on the forewings (fig. 10), this dimorphic form being *taiwanus*. Since then, however, two specimens of a *Zephyrus* have been captured in the Arisan district which are, in my opinion, referable to female *scintillans*, Leech. One specimen (No. 159) agrees with Leech's figure (fig. 10) in having three fulvous patches, one at apex of cell and two in first and second median interspaces, also a fulvous patch above tail rather fainter than in the figure. The fulvous patches on forewing are rather more elongate and not so close together as in the figure. They are also almost of exactly the same size and are in the same position as the spots on the forewing of female *Z. brillantina*, Staudinger (Mem. sur Lép. III, pl. VI, fig. 3, b, ♀), those of *brillantina* being somewhat closer together. The expanse of wings is the same as in

brillantina and the Formosan specimen might, as regards markings of upper side, be easily mistaken for *brillantina*, were it not for the fact that in *brillantina* the characteristic blue anal line and fulvous anal patch on hindwing of *scintillans* are absent. *Brillantina* and *scintillans* however differ on the underside but both species have green males. The second specimen taken as Arisan (No. 160) has only two, much smaller, fulvous patches, less orange in colour than in the first female (No. 159), the patch in second median interspace being absent. This specimen as regards upper side is quite similar to female specimens of *Z. arisanus*, sp. nov. described under No: 20. On the underside it agrees very well with Leech's figure, (Fig. 10), but has more fulvous at anal angle. Both specimens have the characteristic pale blue submarginal line near anal angle of upperside of hindwing.

The different forms of the female of *scintillans* known to me so iar as occurring in Central China and Formosa may be summed up as follows :—

Typical female *scintillans*, Leech, three fulvous patches, one at apex of cell and two in first and second median interspaces of forewing, from Central China and Formosa.

Female, *scintillans*, Leech, with two fulvous patches, one at apex of cell and one in first median interspace of forewing, from Formosa.

Female, *taiwanus*, Wileman, with large blue patch in cell and median interspaces of forewing.

Female, *taiwanus*, Wileman, with large blue patch in cell and median interspaces, and two fulvous spots, one at apex of cell and the other in first median interspace. Expanse. Male 46 to 49 millimetres ; female, 40 to 46 millimetres. Distribution Central China (Chang-yang) ; Formosa.

34. **Zephyrus arisanus,** sp. nov.

Collection Number 158. Four female specimens; Arisan, 7300 feet; June and July, 1908.

These four female specimens must, I think, belong to the male of a species closely allied to *Z. scintillans*. They may possibly be a dimorphic female form of that species, or else they may be varieties of *Z. orientalis*. In all four specimens there is, (as in *Z. taiwanus*), near anal angle of upper side of forewing a paleblue submarginal line which Leech observes is a character only occurring in *Z. scintillans*, Leech and *Z. orientalis*, Murray. As the male has, so far, not been captured I have for the present treated the species as a separate one.

Upperside, colour similar to female, *Z. orientalis*. In three specimens there are two fulvous spots on the forewings, one at apex of cell and the other in first median interspace. Another specimen has no such spots and is of a dull, unicolorous brown. In one of the specimens having fulvous spots there is, on the forewing, a faint streak of blue scales near and parallel to the outer margin running from the middle of first median interspace to third median nervale. Fringes broadly white chequered with grey at anal angle. Pale blue anal line in three specimens stops at second median nervule and is conspicuous. In a fourth specimen with fulvous spots it is continued from anal to outer angle as a submarginal interrupted line.

Underside. Silvery white as in *Curetis acuta*, Moore.

Forewing. Almost the same as in *Z. orientalis* Pryer, Rhop Nihon. pl. IV, fig. 8 b), only the discal line is rather broader and longer, being continued to submedian nervure instead of stopping at third median nervule as in *Z. orientalis*.

Hindwing. Discoidal spot prominent, discal line, (judging from Pryer's figure which is not good), straighter and thinner and more highly angled than in *Z. orientalis*, a sub-discal, more or less conspicuous grey band curved from outer angle to second median nervule. Submarginal band absent or almost imperceptible.

In the unicolorous specimen previously mentioned, the markings

of underside, with the exception of anal yellow spots, are only faintly perceptible on the white ground. Tails as in ♀ *Z. taiwanus*, Wileman. Angulation of W about the same as in *taiwanus* but the discal line is rather more oblique in relation to costa. One of the female specimens of *scintillans* (No. 159) taken at Arisan has two fulvous spots of same colour, size and position as those in female, *Z. arisanus*, but the underside is different.

Expanse. 40 to 46 millimetres.

35. Zephyrus comes, Leech.

Dipsas comes, Leech, *Entomologist*, *xxiii*, *p. 41*, (*1890*).
Zephyrus comes, Leech, *Butt. China*, *Japan*, *Corea*, *1*, *p. 388*, *pl. 28*, *fig. 9*, ♀, (*1892–94*).

Collection number 153. One female specimen; Heishanna, (Arisan district), June, 1908; 6000 feet.

This female specimen closely resembles the female of *comes*, Leech, with a few minor differences which are not important enough to warrant a varietal name. *Comes*, was described from a female the male being so far unknown. These differences are as follows:—

Black apical area of forewing, upperside, extends a little farther on costal margin and outer margin, and on the underside of the same wing the edge of the submarginal silver line is not so regular and that line is not edged with black internally. There is also in the Formosan specimen the commencement of a second silvery line between the submarginal line and the outer margin which, however, only extends as far as the centre of the second median interspace. On the underside the indentations of the discal waved silver line in second and third median interspaces are rather deeper than in figure; also the submarginal curved and waved silver line is interrupted altogether in the second median interspace in Leech's figure, but in the Formosan specimen is only interrupted in the centre of the arch which is occupied by a black spot, as in figure.

Distribution, Central China (Chang-yang, 6000 feet); Western China, (Wa-ssu-kow); Formosa, 6000 feet.

Expanse, 37 millimetres.

36. **Camena ctesia** (?), Hewitson.

Camena ctesia, Hewitson, *Ill. Diurn. Lep. p. 48, pl. xx, figs. 1, 2* ♂, *(1865); Elwes, Trans. Ent. Soc. Lond. 1888, p. 394, pl. viii, fig. 6; de Nicéville, Butt. Ind. iii, p. 340, pl. xxviii, fig. 215,* ♂, *(1890); Leech, Butt. China, Japan, Corea, p. 351, (1892-94).*

Collection Number 156. Two male specimens; Jūippun, Horisha, June 16, 1908.

These two specimens are probably referable to *Camena ctesia*, and seem to coincide with Hewitson's description of that species quoted by Leech. They evidently belong to Genus *Camena*, Hewitson =*Pratapa*, Moore.

Distribution. India; Western China (Chia-kou-ho); Formosa (?).

Expanse, 38 to 40 miilimetres.

37. **Rapala nissa,** Kollar.

Thecla nissa, Kollar, *Hügel's Kaschmir, 1, pl. 2, p. 412, pl. iv, figs. 3, 4 (1848).*

Deudorix nissa, var. (part.), Hewitson, *Ill. Diurn. Lep. p. 23, pl x, figs. 42, 43* ♂, *44* ♀, *(1863).*

Rapala nissa, de Nicéville, *Butt. Ind, iii, p. 433, (1890); id. Leech, Butt. China, Japan, Corea, pt. ii, p. 413, pl. xxix, figs. 12* ♂, *15* ♀, *(1892-94).*

Rapala subpurpurea, Leech, *Entomologist, xxiii, p. 42, (1890).*

Collection Number 155. Two male specimens; Jūjimichi, (Arisan district), 5000 feet; August 5 and 10, 1908.

These specimens agree well with Leech's figure of the male.

Distribution. Himalayas; Assam; Sumatra; Western and Central China; Formosa.

It should be noted that this species is quite distinct from *Lycaena nisa*, Wallace and Moore, already recorded from Formosa.

Family Papilionidae.

Subfamily Pierinae.

38. **Delias taiwana,** sp. nov.

Collection Number 177. Five male and two female specimens Arisan, 7,300 feet, July and August, 1908.

A comparison of the fine plate of *Delias* given by Leech, (Leech, Butt. China, Japan, Corea, pl. XXXVIII, figs. 1 to 8) shows that the male and female of this species are nearer to *Delias sanaca*, Moore, var. *adelma*, Leech, fig. 5 ♂, 6 ♀) than to any other of the species figured. The distinctive features of *taiwana* are the large spear-headed discoidal patch of the hindwings, (in this characteristic it approaches *D. patrua*, var. *lativitta*, Leech, pl. XXXV, fig. 1 ♂), the yellow markings of the hindwings on *both the upper and undersides*, and the general boldness, size and clearness of the markings of both wings.

Description. Male, ground colour black.

Upperside—forewing. Spots and streaks larger and more conspicuous in some specimens than in others and either of a bright or dull canary yellow. White discoidal streak more conspicuous than in var. *adelma*. Discal band of streaks and spots seven in number, curved from near costa to near submedian nervure, where they take the form, in the third median interspace, of two elongated streaks arising from the base which are generally more or less confluent; a broad, black uninterrupted space between the discal and submarginal bands; the latter has either seven or eight spots irregularly placed in a curve from near costa to third median interspace in which there are two spots sometimes almost confluent.

Upperside—hindwing. All markings of a bright or dull canary-

yellow ; a yellow patch at base as in *adelma*, Leech, but apparently longer ; curved, discal series of five spots from near basal patch to second median interspace, followed in the third median interspace by two elongated streaks from near base which are generally more or less confluent with the corresponding spots of the curved submarginal series of seven yellow spots ; interspaces from abdominal margin to submedian interspace generally paler in colour.

Underside—forewing. Same as upper side but spots etc. more conspicuous and there are eight spots in the submarginal band instead of seven, those near apex and costa being generally tinged with yellow and all the other spots white.

Underside—hindwing. A patch at base intersected by the precostal ; all markings bold, regular large and all of a deep or dull canary-yellow, more conspicuous than on upper side eight spots in submarginal band instead of seven, neither of the elongated streaks in the third median interspace ever being confluent with the submarginal series ; an uninterrupted black space runs between the discal and submarginal bands from submedian nervure to costa.

Female. Uepperside-forewing. Discal band curved much as in var. *adelma* (fig 6 ♀) but with eight spots and streaks instead of seven.

Upperside-hindwing. Only the elongated streaks, one in second median interspace and two in the third median interspace, are of a canary-yellow, all other markings are white, or very slightly tinged with yellow.

Abdominal fold to submedian white. Underside, very similar to female var. *adelma*, Leech.

This species appears at Arisan from May to August. When I was at Arisan in August, 1908 there were only a few worn specimens flying about the last seen having been captured on August 16. It has a slow, deliberate, graceful flight and I observed it up to 8000 feet, but it does not seem to occur below 6000 feet.

Named after the Japanese name for the Island of Formosa, Taiwan.

Expanse. Male 89 to 90 milimetres; female, 88 to 100 millimetres.

39. **Prioneris thestylis,** Doubleday.

Var. formosanus, Fruhstorfer.

Kershaw, Butt. Hongkong. pl. ix, fig. 13 ♀, *p. 97, (1907); Wileman. Ann. Zool. Jap. Vol. vi. pt. 5, p. 329, No. 22, (1908).*

Collection Number 152. Two male and one female specimens; Suisha, (Lake Candidius), July 17, 19, 1908.

I am informed by Professor Matsumura that the variety of *thestylis* occurring in Formosa is referable to var. *formosanus,* Fruhstorfer.

Distribution, Macao; Formosa.

Subfamily Papilioninae.

40. **Papilio eurous,** Leech.

Var. koxinga, var. nov.

Papilio erous, Leech, *Butt. China, Japan, Corea, ii, p. 521, pl. 32 fig. 3* ♀, *(1892-94); id, Seitz, Macro-Lep. of the World, pt. 1, pl. 8, A, p. 15* (=*panopaea*, de Nicéville), *(1908).*

Papilio panopaea. de Nicéville, *Journal Bombay Nat. Hist. Soc. Vol. 13, p. 172, No. 18, pl. EE, fig. 20* ♀, *(1900).*

Collection Number 190. Two male and one female specimens; Arisan, 7300 feet, June, 1908; Gahōzan, Lake Suisha (Candidius), 4000 feet?, July 21, 1908.

This Papilio does not agree with the figures given in Seitz's "Macrolepidoptera of the World" (Part 1, pl. 8, fig. A) of the three allied species *alebion*, Gray, *tamerlanus*, Oberthür and *mandarinus*, Leech. It agree better with the figure of *eurous*, Leech, of which it seems to be a local variety.

Description. Male. Forewing-upperside. Markings the same as

in *eurous*; only the black bands are rather broader; the dark outer marginal band is broader and does not stop at third median nervule but is continued to outer angle. The female agrees better with the figure given by Leech than the male. In the female and one of the males the fifth band from the base crossing the cell before apex is interrupted in the centre.

Hindwing-upperside. The black discal and inner bands forming a V of the yellow ground colour have not such irregular edges as in *eurous*, are broader and more vertical in relation to costa, the faint line (exterior to discal band), which is reproduced from the underside and ends at median nervure, straighter and not with such irregular edge; the first and second median nervular interspaces are more suffused with fuscous and are divided by a black spur which joins the discal band at the median nervule reducing the yellow expanse of these interspaces; submarginal black band more oblique, broader and suffused centrally with fuscous, edge of outer line of band not so irregular; space between submarginal band and marginal black line much suffused with fuscous; tails rather longer being 15 millimetres against $8\frac{1}{2}$ millimetres in Leech's figure of *eurous*.

Underside-hindwing. Upper part of double lines of discal band not so chain like as in *eurous*, outer line of discal band interrupted at median nervure as in *eurous* and between first and second median nervules, but continued from second to third median nervules, dividing upper yellow space of second median interspace diagonally into two.

Expanse. Two males, 82 to 86 millimetres; female 83 millimetres. Female. The female does not differ from the male in markings but only as regards shape of forewings which are more rounded at apex and costal margin.

Distribution. Central China (Chang-yang); Moupin; Formosa.

41. **Papilio alcinous,** Klug.

Papilio alcinous, Klug, *Neue Schmett. p. 1, pl. 1, figs. 1–4 (1836);*

Leech, Butt, China, Japan, Corea. p. 539 (1892-1894); id, Pryer, Rhop. Nihon, pl. iii, fig. 3 ♀, (1888); id, Dōbutsu Gaku Zasshi (5), No. 34, August, (1891), pl. 1, figs 1,2 Imago, 3,5 larva, 4, Pupa.

Papilio alcinous, var, Gray, *Cat. Lep. Ins. B.M. 1. p. 12, pl. iv. figs. 2,3 (1852).*

Papilio mencius, Felder, *Wien. ent. Mon. vi, p. 22 (1862).*

Papilio spathatus, Butler, *Ann and Mag. Nat. Hist. (5), vii, p. 139 and (1881).*

Papilio haematostictus, Butler, *loc cit.*

Collection Number 192, One female specimen presented by Mr. Nagasawa of the Kokugo Gakkō who captured it at Kō-kei-nai (Chinese name, Hon-ke-lai) about fourteen miles north of Taihoku, near Taiton-zan, elevation 1200 feet. In the collection of the Kokugo Gakkō there are also two male specimens of this species which is evidently referable to one of the forms of *alcinous*, Klug, probably to var. *loochooanus*, Rothschild, described in Nov, Zool III, p. 421. and taken at Kelung. The tails, both in male and female, are much shorter than in Japanese specimens of *alcinous*. My female specimen is also much smaller only expanding 92 millimetres.

Distribution. Western and Central China ; Corea ; Japan ; Loochoo Islands ; Formosa.

42. **Papilio jonasi,** Rothschild.

Papilio jonasi, Nov. Zool. XV. p. 168, No. 19, June 25 (1908).

Collection Number 109. One male and one female specimen of a species which is probably referable to *Papilio jonasi*. Kanshirei, July 14, August 18, 1908.

Rothschild describes *P. jonasi* as follows :—

" ♂ ♀. Similar to *P. mencius*, Feld, (1862) ; the scent-pouch of the ♂ shorter, the shape of the clasper as in *P. impediens*, Rothsch. (1895), and the submarginal spots of the hindwing very much en-

larged above and below and pale red, the spot situated beyond the apex of the abdominal fold also being marked above, though here narrow. In the ♀ the posterior spots touch each other. On the *underside* my only specimen of this sex bears a reddish grey, submarginal double patch on the forewing, as sometimes happens also in *P. dasarada*, Moore (1857). Hab. Northern Formosa, one pair."

Distribution. Formosa.

43. **Papilio rhetenor** Westwood.

Var. matsumurae var. nov.

Papilio rhetenor, Westwood, *Arc. Ent. 1, p. 59, pl. xvi, figs. 1, 1 a*, ♂ (*1842*).

Papilio icarius, Westwood, *Cab. Orient. Ent. p. 5, pl. ii*, ♀ (*1848*).

Papilio (*Panosmiopsis, subg. nov.*) *rhetenor*, *Wood-Mason and de Nicéville, Journ. Asiat. Soc. Beng. 1886, p. 374; Leech, Butt. China, Japan, Corea, pt. ii, p. 549, (1892-94); Seitz, Macro-Lep. of the World, pt. 1, p. 10, pl. 3, b* ♂, *c* ♀ (*1908*).

Collection Numbers 187, 188. Three male specimens; Suisha Lake (Candidius), March 25, 1908, July 23, 1908; Gya-kan-ron, (Suisha district), June 15, 1908. Two female specimens; Arisan, 7300 feet, April, 1908; Tabani, March 11, 1908.

These male specimens agree well with the figure given by Seitz of male (fig. b) in so far as markings of the underside at base of forewings and hindwings and in third median and submedian interspaces are concerned. The upperside of forewings is darker in colour than in Seitz's figure, darker even than in *protenor*, Cramer, and the anal ocellus is scarcely perceptible in two specimens. In all of the specimens the markings of the third median interspace of hindwings, underside, (fig. b), are repeated in the second median interspace except in one specimen, (Suisha, July 23), where the ocellus is incomplete, and there is, as observed by Leech in Chinese examples of this

species, a complete series of three red submarginal lunules. In the specimen from Suisha, (March 25, 1908), which only expands 100 millimetres, an ocellus in the first median interspace takes the place of a lunule, a red lunule on the outer margin at excavation of wing being placed above it. This specimen, which was presented to me by Dr. Moltrecht, shows a broader red streak at base of discoidal cell of forewing, underside, as mentioned by Leech in Chinese specimens and it also has three red spots on outer margin of hindwing, underside.

I have a female specimen taken at Tabani, March 11, 1908, which is evidently the female of the foregoing males whichs have referred to *rhetenor*. It agrees with Seitz's figure of female *rhetenor* (fig. c) as regards forewing, upperside, but is *not tailed*. As regards the hindwing upperside, it differs as follows :—

White central patch not so large or compact, being divided into two distinct spots by the second subcostal nervule and does not extend into the discoidal cell and first and second median interspaces ; ocelli more complete than in figure (fig. c ♀). Seitz does not give the underside of female *rhetenor* but thus specimen resembles his figure of the male in the shape of the hindwing and in being *tailless*, also in the colour of forewing. The markings of the third median and submedian interspaces of Setz's figure (fig. b ♂) are repeated in all the median and submedian interspaces of this specimen and it has also a conspicuous reddish white lunule at the outer angle of hindwing, underside.

In the second female specimen, April, 1908, Arisan, the white central patch (divided by the veins) expands into a central discal band of a reddish white tinge from the second subcostal nervule to the submedian nervure where it meets the anal ocellus patch of the same colour ; from the second subcostal to submedian there are three wedge shaped black patches, forming, with the black spot of the anal ocellus, a band of black spots enclosed between the central band and the almost complete submarginal ocelli, thus making a black

band from outer angle to anal angle ; from lower apex of discoidal cell to anal fold there is an oblique series (in relation to costa) of four black spots, one in each interspace, surmounting the discal band ; apex of cell crossed by a white streak. On the underside, hindwing, the submarginal and central black spots in the first and second median interspaces are confluent the submarginal ocelli being absent ; the discoidal cell is two thirds filled in with red and the oblique series of four supra-discal band spots are very conspicuous being reproduced on the upper side. *P. icarius*, Westwood, is the female of *P. rhetenor* and has a short, broad tail. I am not aware whether a tailless female form of *rhetenor* has so far been described or observed, but neither Leech, nor Seitz, makes any mention of such a fact. *P. memnon*, Linn, has two very distinct forms of female, one tailed=*phoenix* and the other tailless=*agenor*, so that it is not surprising to find that *rhetenor* also possesses a dual form of the female.

Expanse, male 100 to 120 millimetres ; female, 108 to 116 millimetres.

Distribution. North India ; Central, Southern and Western China ; Formosa.

I have named this variety of *rhetenor* after my friend Professor Matsumura who has done so much to disseminate a knowledge of the lepidopterous fauna of Japan and Formosa.

44. **Papilio horatius,** Blanchard.

Papilio horatius, Blanchard, *Comptes Rendus, 72, p. 809, note (1871). Macrolep. of the World (Eng. Ed.) Seitz, pt. 1, p. 13, pl. vii, fig. b, (1908).*

Collection number 193. One male specimen presented to me by Mr. Nagasawa of the Kokugo Gakkō, Taihoku, who captured it on March 31, 1903 at Kō-kei-na (Chinese name Hon-ke-lai), at an elevation of 1200 feet, about 14 miles north of Taihoku, near Taitonzan (Taiton Mountain).

This Papilio as Blanchard observes, greatly resembles a Danaid in appearance. Leech refers *horatius* to *epycides* Hewitson, which is taken in Sikkim, India.

This specimen agrees extremely well with the figure of *horatius* given by Seitz.

Distribution. Western China (Mou-pin, Omei-shan, Chow-pin-sa); Formosa.

45. Papilio castor, (?),

Var. formosanus, Rothschild.

Papilio castor formosanus, Rothschild
Nov. Zool. iii, p. 423, (1896).

Recorded by Rothschild from Loochoo.

Distribution. Loochoo; Formosa.

Family Hesperidae.

46. Satarupa gopala, Moore.

Satarupa gopala, Moore, *Proc. Zool. Soc. Lond. pl. 42, fig. 1, ♀, p. 780.*
Goniloba gopala, Moore, *Cat. Lep. E.I.C. i, p. 246.*

Collection Number 171. One male and one female; ♂, Nampino, Shūshū, June 29, 1908; ♀, Arisan, July, 1908, 7,300 feet.

The male agrees well with Moore's figure with the following exceptions.

Upperside-forewing. This shows in the male *ten* semitransparent irregular-shaped white spots composing the recurved discal band of white spots. Moore in the description of his type *gives the number of these spots as eight but figures nine.* In the Formosan male the apical spots of this discal series consist of four instead of three spots the superior one, which almost touches costa and is a mere linear dash, being absent in the figure. The discal series is straighter and apparently not quite so much recurved as in figure; the spots in the median interspaces are also larger and squarer and are ranged in a

straighter line. The spot in the discoidal cell is rather more of a squarish shape than triangular.

In the female the spots are larger and those in median interspaces are more transverse than in the male ; there are also only nine spots in the discal series the extra apical dash which almost touches the costa in the male being absent. In both sexes the white streak on hind margin is longer and larger than in figure.

Expanse. Male, 68 millimetres ; female 76 millimetres.

Distribution. India (Darjeeling) ; Formosa.

Supplementary Remarks.

Since writing the foregoing remarks I have received a paper published by Professor Matsumura in the "Entomologischen Zeitschrift" for December, 1908, p.p. 53–58, entitled "Die Papilioniden Japans", in which he describes four species from Formosa as new to science.

1. *Papilio koannania.*
2. *Papilio hoppo.*
3. *Papilio gotonis.*
4. *Papilio asakurœ.*

The following species which have not appeared in previous Formosan lists are recorded by Professor Matsumura as occurring in Formosa, two of them, *rhetenor* and *horatius* are also mentioned by me n the present paper.

1. *Papilio rhetenor*, Westwood.
2. *Papilio prexaspes*, Felder.
3. *Papilio agestor*, Gray.
4. *Papilio horatius*, Blanchard.

The approximate number of species of Formosan Rhopalocera now amounts to two hundred and twenty one.

Report on a Collection of Freshwater Sponges from Japan.

BY

N. Annandale, D. Sc.,

Indian Museum, Calcutta.

(With Plate II).

Thanks to the kindness of Prof. I. Ijima and Prof. A. Oka I have recently had the opportunity of examining a collection of Japanese freshwater sponges which these gentlemen have generously presented to the Indian Museum. Little is known of the Spongillinae of Japan, and I have great pleasure in responding to Prof. Ijima's request for a report on the collection.

Three species[1] have hitherto been recorded from Japan, *viz. Ephydatia fluviatilis*, *E. japonica* (as *E. fluviatilis* var. *japonica*) and *E. mülleri*. In the collection under review two of these (*E. japonica* and *E. mülleri*) are represented, and also one other known species and one which I take to be new to science. The known species is the widely distributed *Spongilla fragilis*. Three of the five species now known to occur in Japan, have therefore an extensive geographical range, while two have not as yet been found elsewhere. Of the former, *S. fragilis* and *E. fluviatilis* have been recorded from tropical Asia, Australia and Siberia as well as from Europe and N. America, while *E. mülleri* is widely distributed in the Holartic Region and is represented in India by a closely allied form, namely *Ephydatia meyeni*.

Although other species of Spongillinae doubtless still remain to be discovered in Japan, the apparent prevalence of the genus *Ephydatia* is noteworthy, for this genus is represented by no less

1) Weltner, "Spongillienstudien III", in *Archiv f. Naturgesch.*, 1895, Bd. I.

than four of the five known species. In Europe about a dozen species of the subfamily are known, and of these only three represent *Ephydatia ;* while in India I have examined specimens of twenty-one species, of which three also belong to *Ephydatia.*

The following is a detailed account of the collection sent by Prof. Ijima :—

Genus **Spongilla,** auctorum.

Subgenus *Spongilla*, Wierzejski.

Spongilla fragilis, Leidy. (Pl. II, fig. 1).

S. fragilis, *Potts, Proc. Acad. Nat. Sci. Philadelphia*, 1887, p. 197, pl. V, fig. ii ; pl. VIII, figs. i, ii, iii, iv.

As the Japanese specimens perhaps differ in some slight particulars from those found in Europe and America, it will be well to describe them carefully.

SPONGE moderately hard and brittle, forming a thin layer on solid objects ; its external surface covered with minute ridges and projections ; the oscula small but conspicuous, being situated on low, broadly conical eminences from which branching canals radiate beneath the dermal membrane ; pores inconspicuous, minute, scattered. *Colour* (in alcohol) pale sepia-brown.

SKELETON consisting of broad but not very coherent primary fibres and distinct transverse ones.

SPICULES.— *Skeleton spicules* smooth, stout, sharply pointed, as a rule feebly curved. *Gemmule spicules* slender, blunt or bluntly pointed, feebly curved, often somewhat swollen in the middle and at the ends, covered with minute spines.

GEMMULES bound together in groups of various sizes ; each

gemmule small, spherical, provided with a thick coating of relatively large polygonal "air-cells" arranged in several or many tiers; with a single aperture, to which is attached a long, stout foraminal tubercle; the *foraminal tubule* projecting outwards from the side and then bending downwards, expanding slightly towards the distal end. *Gemmule spicules* somewhat scanty, arranged irregularly, sometimes forming two layers, one of which is in contact with the chitinous coat of the gemmule, while the other lies on the external surface of the outermost tier of "air-cells".

MEASUREMENTS:—

Average length of skeleton spicule	0.2924	mm.
Greatest diameter of skeleton spicule.	0.016	,,
Length of gemmule spicule	0.088–0.1	,,
Greatest diameter of gemmule spicule.	0.004	,,
Diameter of single gemmule (without "air-cells")	0.272–0.306	,,

HABITAT: Pond in the grounds of the University of Tokyo, Japan November, 1908.

The specimens, containing many immature gemmules and having clearly been in a vigorous condition when killed, would suggest that in Japan, as in other temperate climates, gemmules are produced at the approach of winter. In India, on the other hand, gemmules are produced, in most species, mainly at the approach of the hot weather although the winter months are here the driest as well as the coolest.

One of the specimens has its substance pervaded by the tubes of a Polyzoon of the genus *Plumatella*, as is often the case as regards freshwater sponges of many species in Europe, Africa and Asia.

Genus **Ephydatia**, Lamouroux.

Ephydatia semispongilla, sp. nov. (Pl. II, fig. 2).

SPONGE forming filmy layers of small extent and generally of a

more or less circular outline on the leaves of water-plants; *consistence* soft, friable, very delicate; *dermal membrane* extremely delicate. Often, owing to the dropping out of the gemmules, the sponge has a honeycomb-like appearance. In alcohol there is practically no colour except that derived from the gemmules, which are yellow.

SKELETON quite incoherent.

SPICULES. *Skeleton spicules* long, very slender, sharply pointed, smooth but occasionally a little irregular in outline, as a rule feebly curved. *Gemmule spicules* long and slender; the rotulae feebly developed, consisting merely of a circle (or more usually of a couple of circles) of more or less recurved spines, which are considerably longer and stouter than the straight or nearly straight spines sparsely scattered on the shaft; the shaft more or less curved, of the same width throughout. *Free microscleres* absent.

GEMMULES relatively large and numerous, adherent to the support of the sponge but not strongly so; the *granular layer* well developed except on the extreme top of the gemmule, which presents an almost bare surface; the *spicules* arranged vertically and tangentially in the granular layer (from which they often project considerably), in a single row; the single *aperture* situated at the base of the gemmule, provided with a short, stout, straight *foraminal tubule*, which expands at the distal extremity.

MEASUREMENTS:—

Length of skeleton spicule	0.289-0.391	mm.
Greatest diameter of skeleton spicule	0.008-0.01	,,
Length of gemmule spicule.....	0.076	,,
Diameter of shaft of gemmule spicule	0.004	,,
Diameter of rotule of gemmule spicule.....	0.002	,,
Diameter of gemmule	0.425-0.561	,,

HABITAT:—Kasumi-ga-Ura, Hitachi Province, Japan (Dr. A. Oka); November 1906. Some specimens from the locality taken a month earlier probably belong to the same species but are devoid of gemmules.

This sponge resembles some of the species of the subgenus *Euspongilla* (genus *Spongilla*) in more than one respect but is clearly an *Ephydatia*. The feeble development of the rotules of its gemmule spicules is a character which it shares with some forms of *Ephydatia crateriformis*, a North American species with which the Indian *E. indica* is probably identical. I have pointed out elsewhere, however, that there is considerable seasonal variation as regards the form of the birotulates in *E. indica* [1].

Ephydatia japonica (Hilgendorf). (Pl. II, fig. 3).

Spongilla fluviatilis *var.* japonica, *Hilgendorf, S.-B. Ges. Naturforsch. Freunde Berlin* 1882, p. 26.

Ephydatia fluviatilis *var.* japonica, *Weltner, Archiv f. Naturgesch.* 1895, Bd. I, pp. 123, 134.

This sponge was originally described from Tokyo by Hilgendorf, who regarded it as a variety of *Ephydatia fluviatilis*. Weltner apparently examined the type, which is in the Berlin collection, and also assigned it to *E. fluviatilis*. After examining a specimen collected by Dr. Oka in Lake Aoki, Shinano Province, however, I find myself forced to regard the form as distinct species, which may be recognized by its smooth skeleton spicules and short-shafted birotulates with no spines on the shaft but with deeply serrated rotules. The following are the measurements of the spicules and gemmule in the specimen I have examined, compared with those given by Hilgendorf:—

		(Hilgendorf)
Length of skeleton spicule..	0.238–0.272 mm.	—0.343–0.38 mm.
Greatest diameter of skeleton spicule	0.012–0.02 ,,	.—0.014–0.017 ,,
Length of birotulate	0.016' ,,	.—0.029 ,,

1) Rec. Ind. Mus vol. I, p. 273.

Diameter of rotule	0.018	mm.—0.023 mm.
Diameter of shaft of birotulate	0.0004	„ .—0.0006 „
Diameter of gemmule.....	0.68	„ .—0.441 „

The gemmule has a short, straight, broad but very delicate foraminal tubule.

Dr. Oka's specimen, which was taken in December 1899, was evidently dead or moribund when obtained. Few cells remain and I am unable to say whether vesicular cells, the presence of which in the parenchyma is characterestic of *E. mülleri*, were present or not.

Ephydatia mülleri Lieberkühn.

E. mülleri, *Weltner, op. cit.* p. 125.

This species is recorded by Weltner from Yedo. There is a small but typical specimen in the collection sent me by Prof. Ijima It was collected by Dr. Oka at Kameido near Tokyo in October, 1901 and was evidently in a vigorous condition when killed, although. it contains numerous gemmules.

The following "key" to the Japanese species of *Ephydatia* may be useful to naturalists in Japan, but it must be used with caution in view of the fact that other species may yet be found.

Key to the species of Ephydatia recorded from Japan.

A. *Shafts of the birotulates curved; rotulae feebly developed.*

a. Skeleton spicules smooth, very slender. Gemmules adherent, with the aperture at the base .....*E. semispongilla.*

B. *Shafts of birotulates straight.*

a. Skeleton spicules smooth. Shafts of birotulates much longer than the diameter of the rotulae, which are not deeply indented ..... *E. fluviatilis.*

b. Skeleton spicules smooth. Shafts of birotulates smooth, not much longer than the diameter of the rotulae, which are deeply serrated ..... *E. japonica.*

c. Some or all the skeleton spicules rough in the middle. Shafts of some of the birotulates bearing spines, of all not much longer than the diameter of rotulae, which are deeply and irregularly serrated ..... *E. mülleri.*

Explanation of Plate II.

Figs. 1, 1a, 1b. *Spongilla fragilis* from Tokyo

Fig. 1. Skeleton spicules.

Fig. 1 a. Young gemmule spicules.

Fig. 1 b. Fully formed gemmule spicules. All × 240.

Figs. 2, 2 a, 2 b, 2 c. *Ephydatia semispongilla*, sp. nov.

Fig. 2. Fragment of skeleton, × 70.

Fig. 2 a. Gemmule from above, × 70.

Fig. 2 b. Skeleton spicules, × 240.

Fig. 2 c. Birotulates, × 240.

Fig. 3, 3 a. 3 b. *Ephydatia japonica*.

Fig. 3. Gemmule, × 70.

Fig. 3 a. Skeleton spicules, × 240.

Fig. 3 b. Birotulates, × 240.

Telestidae von Japan.

von

Kumao Kinoshita, *Rigakushi*.

Zool. Inst. der Kaiserl. Univ. zu Tokio.

(*Hierzu Tafel III*).

Telestidae (Milne Edwards).

Telestidae Milne Edwards, Histoire naturelle des coralliaires, tome I, 1857, p. 112.

Telestidae May, Jena. Zeitschr. f. Naturwiss., Vol. 33, 1899, p. 53.

Telestidae Bourne, Treatise on Zoology, part 2, Anthozoa, 1900, p. 29.

Telestidae Versluys, Siboga-Expeditie, Monogr. XIIIc, 2. Teil, 1907, p13.

Betreffs der Geschichte sowie der Diagnose der Familie Telestidae verweise ich resp. auf Laackmann (Zool. Jahrbücher, Supplement 11, Heft 1, 1909) und auf Versluys (l. c. p. 15).

Der letztgenannte Autor rechnet zu dieser Familie folgende vier Gattungen: *Telesto* Lamouroux, *Coelogorgia* Milne Edwards, *Pseudogorgia* Kölliker und *Pseudocladochonus* Versluys.

Die Telestidae in der Sammlung des Zoologischen Museums der Tokioer Universität sind durch 4 Arten repräsentiert; nämlich *Telesto tubulosa*, n. sp., *Telesto sagamina*, n. sp., *Telesto rosea*, n. sp., und *Pseudocladochonus hicksoni* Versluys.

Telesto Lamouroux.

(*Telesto* Lamouroux, Nouveau Bull. Soc. Philom., 1812).[1]

(*Synoicum* Lamarck, Ann. Mus. d'Hist. Nat., 1813).

1) Diejenige Litteratur, welche mir unumgänglich war, wird in Klammern angegeben.

Telesto Lamouroux, Hist. Polyp. flexibles, 1816, p. 232.
(*Telesto* Blainville, Actinologie, 1834, p. 498).
(*Telesto* Dana, Zoophytes, 1846, p. 632).
(*Telesto* M. Edw. et Haime, Dist. method., p. 181).
Telesto M. Edwards, Coralliaires, 1857, p. 112.
Telesto Verrill, Mem. Bost. Soc. Nat. Hist., 1, 1866, p. 5.
(*Carijoa* F. Müller, Arch. f. Naturgesch., 33, 1, 1866, p. 330).
Telesto + *Alcxella* Gray, Ann. Mag. Nat. Hist., (4), 3, 1869, p. 21.
Telesto Wright and Studer, Challenger Rep., 1889, p. 259.
Telesto May, Jena. Zeitschrift f. Naturwiss. 33, 1899, p. 59.
Telesto Hickson, Alcyonaria of Maldives, part 1, 1900, p. 480.
Telesto Laackmann, Zool. Jahrbücher, Supplement II, Heft 1, 1909, p. 49.

Ganz neulich hat Laackmann eine auf ein reiches Material basierte, ausführliche Arbeit über die Gattung *Telesto* veröffentlicht. In derselben führt er 14 bekannte Arten auf, von welchen nur 10, mitunter eine neue, als sichere anerkannt wurden.[1]

Nutting (Proc. United States National Museum, XXXV, 1909, p. 686) berichtet auch ganz neulich eine neue Art, *Telesto ambigua*.

1. *Telesto tubulosa*, n. sp.

(Taf. III. Fig. 1—6).

Kagoshima-Bai, vor Yamakawa in Prov. Satsuma, 70 Faden, gesammelt von Herren Prof. Mitsukuri und Hara (8. April 1896).

Ein einziges vollständiges Exemplar stellt die Art dar (Fig. 1). Dasselbe ist mit den sich wenig verzweigenden, oft breiter als 1 mm. sich abflachenden, wurzelförmigen Stolonen auf einem kleinen Steine gewachsen. Aus den Stolonen kommen einige Polypen in mässigen Abständen hervor, von welchen nur einer sich in die Höhe entwickelt (10.5 cm.) und einen Mutterpolypen darstellt.

1) *Telesto africana* Verrill ist von May und Laackmann negligiert. Die Arbeit von Verrill (Amer. Journ. Sc., XLIX., 1870), in welcher diese Art beschrieben stehen soll (Zool. Record, VII, 1870, p. 492), ist mir unumgänglich geblieben.

Die Stolonen, der Stamm mit Ausname des kleinen apikalen Abschnittes und der proximale Abschnitt der Seitenpolypen sind gelblich bis braun, welche Färbung nach der Basis der Kolonie zu an Tiefe zunimmt. Die apikalen Abschnitte sowohl des Axial- als auch der Seitenpolypen sind weiss. Als Schmarotzer werden Foraminiferen, Silicispongien, Hydrocorallien und Bryozoen gefunden; diese jedoch fallen dem Auge nicht auf, sodass die Kolonie beinahe rein gehalten erscheint.

Der Stamm, welcher durch einen primären Polypen dargestellt wird, ist etwas gebogen, jedoch ohne irgend eine Regel. Derselbe ist 10.5 cm. hoch und in der Mitte der Kolonie 1.2 mm. dick. Die Dicke nimmt aber unterhalb des ersten Seitenpolypen etwas ab, während dieselbe im Apex beinahe gleich bleibt.

Der Axialpolyp zeigt am Apex, wo die bräunliche Farbe des unteren Abschnittes sich gänzlich verbleicht, deutliche, weite, seichte Furchen innerhalb einer Strecke von ca. ein Centimeter. Unten jedoch verschwinden sie, obgleich sehr unbedeutende Furchen noch öfters bemerkbar sind. Die acht Mesenterien ziehen sich ganz bis Basis, indem sie etwas verdickt werden. Die Stammwand nimmt in Dicke nach der Basis zu, nämlich ist sie 5 mm. oberhalb der Basis 0.2 mm., und etwas oberhalb der Stammmitte 0.1 mm., dick.

Die Skleriten des Stammes sind in zwei Schichten angeordnet. Die äussere Schicht besteht aus dicken spindelförmigen, bis 0.2 mm. langen Skleriten. Sie zeigen sehr oft in der Mitte eine Schnürung; die Warzen der inneren Seite sind hoch und am Apex gezackt, während die der Aussenseite mehr gerundet und niedriger sind (Fig. 3, vergl. mit Fig. 9). Ihre längster Diameter ist meist parallel der Hauptachse gelegt. Am Apex des Stammes, wo die Längsfurchen deutlich erkennbar sind, sind die Skleriten deutlich schlänker. Die Skleriten messen: 0.15/0.05—0.15/0.06—0.15/0.07 mm.

Während die eben beschriebenen Skleriten der Peripherie sehr dicht gedrängt einlagern, sind diejenigen der inneren Schicht ziemlich

locker angeordnet. Diese sind gerade oder etwas gebogene oder auch gegabelte Stäbe mit geringer Anzahl Warzen (Fig. 4). In den Mesenterien oder in den Hornleisten (Laackmann) sind noch etwas gestreckte Skleriten vorhanden (Fig. 5). Die Scleriten der inneren Schicht greifen mit den am Scheitel gezackten Fortsätze an einander; ich konnte jedoch weder eine vollständige Verschmelzung derselben noch eine Hornscheide um dieselben, nachweisen.

Der Axialpolyp trägt Seitenpolypen. Stämme 2. Ordnung sind nicht vorhanden. Von der Anordnung der Seitenpolypen dürfte vielleicht die zweireihige Abwechselung betont werden. Die gegenständigen Polypen aber kommen bald in derselben Höhe, bald bis 1 cm. entfernt. Auch geschieht die Verschobung der Polypen, in der Weise dass es scheint, als ob die Anordnung beinahe eine allseitige wäre. Die Polypen gehen unter einem Winkel von ca. 45° aus. Die Dichtigkeit der Polypen ist, wie oben angegeben, in Stellen variabel; da aber im ganzen 29 Polypen abgehen, so misst die Entfernung in der Mitte 3.6 mm.

Die Seitenpolypen sind beinahe zylindrisch, meist aber nach der Basis zu etwas verschmälert. Sie sind 1—1.2 mm. dick und meist 5 mm. lang, oft jedoch können bis 5 mm. verlängert sein. Die Seitenpolypen zeigen nur ganz in der Nähe der Spitze weite seichte Längsfurchen und sind unten vollkommen zylindrisch. Bei einigen Polypen ist in dem Kelche eine ringförmige Stufe erkennbar, die wohl als eine Linie der Regeneration anzusehen ist (Fig. 2). Unterhalb dieser Stufe sind die Scleriten sehr gut entwickelt und sind denselben des Stammes ähnlich. Oberhalb derselben aber sind die Skleriten schlänker. Bei den Polypen, welche diese Stufe nicht zeigen, ist der Übergang ein allmälicher. Auf dem Apex des Kelches, wo die Wand sich umbiegt um sich einzustülpen, sind die Skleriten immer mehr schlänker und fangen an interseptal sich zu gruppieren, um bald zu verschwinden.

Die Grösse der Skleriten der basalen Abschnitte beträgt: 0.17/0.08—0. 16/0. 08— 0. 12/0.05 mm.; die der apikalen Abschnitte: 0.22/0.09

—0. 17/0. 07—0. 19/0. 05—0. 25/0. 05 mm.; die in den Längsbändern gelegenen: 0. 16/0.04—0.19/0.02—0.16/0.02—0.07/0.01 mm.

Die Wand des Kelches ist dünn, nur 0.6 mm. dick, und zeigt keine innere Skleritenschicht. Die Oesophagealportion zeigt nur kleine Skleriten, meist in den interseptalen Feldern, in einer sehr geringen Anzahl. Die Länge dieses Abschnittes kann ich nicht genau angeben, die Anthocodia aber war bei den meisten Polypen beinahe bis in den Grund der Magenhöhle eingezogen.

Die Anthocodia zeigt eine reiche Spikulation. An der Basis der Tentakeln sind die schlanken, etwas flachen Spikula in Doppelreihen angeordnet, auf dem Rücken des basalen Abschnittes der Tentakeln konvergieren sie stark, sodass im ganzen eine trianguläre Anordnung zustande kommt (Fig. 6 und 7). Wenn die Tentakeln über die Mundscheibe eingezogen werden, so bilden die acht triangulären Spikulagruppen ein vollständiges Operkulum darüber. Die apikalen Abschnitte der Tentakeln, oberhalb der Umbiegungsstelle bei Kontraktion, zeigen auch ähnliche, jedoch kleinere Spikula, welche sich dicht in zwei Reihen anordnen.

2. *Telesto sagamina*, n. sp.

(Taf. III, Fig. 8–11).

Zwei Fragmente, welche vielleicht einem Rasen gehörten; aus Doketsuba, Sagami Bai, 60 Faden, gesammelt vom Verfasser Oktober 1908.

Die zwei Exemplare, denen beiden die Basis fehlt, sind resp. 4 cm. und 5 cm. lang. Der Stamm des einen Exemplares (No. 1) ist etwas gebogen. Er bleibt steril in dem untersten Abschnit für einer Strecke von 12 mm., wo er nur 1.2 mm., während die übrigen Abschnitte des Stammes 1.8 mm., in der Dicke messen (Fig. 8).

Die beiden Exemplare sind von Hydroiden, Bryozoen, Hydrocorallien und Kalkschwämmen überzogen, welch letztere besonders so massiv sind, dass die Seitenpolypen, wenn kontrahiert, kaum ihre Kelchspitze ersehen lassen können. In Fig. 8 ist dieser Ueberzug ganz weggelassen.

Der Stamm ist zylindrisch und unten in Dicke abgenommen. Die Längsfurchen sind in der Nähe des Apex weit, unten aber ziehen beinahe bis zu Basis, indem sie sich stark verschmälern. Die Mesenterien laufen bis in den untersten Abschnitt des Stammes, indem sie sich etwas verdicken. Die Wand des Axialpolypen ist unten 0.25 mm., in der Mitte 0.22 mm. dick.

Die Skleriten sind in zwei Schichten angeordnet; die äussere Schicht besteht aus spindelförmigen Spikula mit zahlreichen gezackten Dornen, welche aber auf der äusseren Seite viel gerundet und niedrig sind und also den Spikula in der äusseren Ansicht ein knolliges Aussehen verleihen (Fig. 9). Der längste Diameter ist gewöhnlich längsgerichtet. Die Grösse einiger Skleriten in der Mitte des Stammes beträgt: 0.12/0.08—0.10 / 0.07—0.12/0.05—0.18/0.08—0.15/0.07—0.15/0.07 - 0.14/0.06—0.15/0.09—0.14/0.07 mm.

Diese Skleriten der Aussenschicht sind lachsrot, während die der Innenschicht etwas rötlicher gefärbt sind. Diese letzteren sind stabförmig oder stark gegabelt und sind durch hohe, apikal gezackte Warzen ausgezeichnet, mit welchen die Skleriten einander greifen (Fig. 10). Eine vollständige Verschmelzung konnte ich nirgends beobachten. Die Grösse beträgt: 0.16—0.16—0.14—0.13—0.13—0.09 mm. Die dichte innere Schicht von Mesogloea (Hornzylinder, Laackmann[1], welche die Axialhöhle umgeben, enthält auch Spikula, wie in der vorigen Art. Dieselben sind besonders glatt und oft beträchtlich lang.

Es fehlt der Stamm 2. Ordnung. Die Seitenpolypen werden beim Exemplare No. 1 unten beinahe abwechselnd in zwei Seiten, oben aber in drei Seiten, abgegeben. Beim Exemplare No. 2 ist die Anordnung der Seitenpolypen eine ganz unregelmässige. Der mittlere Abstand der Seitenpolypen ist ca. 3 mm.

Die Seitenpolypen sind meist über 3 mm., in einem Falle sogar bis 10 mm., lang und 1-1.8 mm. dick. Die Längsfurchen sind nur am Apex ersichtlich. Es ist nun auffallend, dass ein Seitenpolyp (im Exemplar No. 2) abgeflacht worden ist, ebenso wie der Stolon,

der mit der Spitze an einer blattförmigen Bryozoenkolonie angeheftet ist.

Die Anthocodia zeigt eine ähnliche Spikulation wie bei der vorigen Art (Fig. 11). Oberhalb der Stelle, wo die Tentakeln sich knicken, sind die Spikula in zwei Reihen angeordnet. Die Tentakelfiederchen zeigen auch kleine Nadeln. Die Spikula der Kelche sind denen des Stammes ähnlich. Sie sind nämlich dicke Spindeln und zeigen oft in der Mitte eine seichte Schnürung. Nach dem Apex der Kelche zu werden die Spikula immer schlänker und spitziger, und die Warzen werden auch höher. Die Spikula des unteren Abschnittes der Kelche messen: 0.13/0.07—0.13/0.05—0.11/0.06—0.12/0.06—0.09/0.04—0.12/0.06—0.12/0.06—0.12/0.08 mm.; die des apikalen Abschnittes: 0.24/0.07—0.19/0.04—0.15/0.04—0.16/0.04—0.19/0.06—0.2/0.06—0.24/0.07—0.17/0.07 mm.; diejenigen, welche am Apex in acht Längsbändern konvergieren: 0.23/0.04—0.24/0.4—0.22/0.035—0.18/0.02—0.2/0.03—0.14/0.025—0.15/0.02 mm.

3. *Telesto rosea*, n. sp.

Eine Kolonie, bei Insel Miyake, südlich von Provinz Izu, gesammelt von Herrn S. Hirota (30. Aug. 1893).

Es liegt eine vollständige Kolonie vor.

Von dem membranösen Stolon erhebt sich ein Mutterpolyp. Derselbe ist 5.5 cm. hoch und sendet zahlreiche Seitenpolypen aus, von welchen vier sich zu bis 2 cm. langen Stämmen 2. Ordnung entwickeln. Diese letzteren und der Axialpolyp können auch diejenigen Seitenpolypen zeigen, welche auch eben begriffen sind, kurze Seitenpolypen resp. 4. und 3. Ordnung auszusenden. Die Kolonie ist durch dünnen Schwammüberzug bis zur Spitze der Polypenkelche umhüllt.

Die Stämme 1. und 2. Ordnung sind zylindrisch und zeigen am Apex deutliche Längsstreifung, welche nach unten immer etwas undeutlicher wird. Der Stamm ist unten 2 mm., in der Mitte 1 mm. dick. Die Wand desselben, 1.5 cm. oberhalb der Basis, ist 0.5—0.7 mm., und noch oben ca. 0.3 mm. dick. Die Axialhöhle, welche durch den dicken

Hornzylinder umgeben wird, ist unten besonders verschmälert, sodass sie kaum 0.1 mm. misst.

Die oberen Wand des Axialpolypen weist Skleriten auf, welche, obgleich nicht deutlich, in zwei Schichten angeordnet sind. Die Skleriten der äusseren Schicht sind dick, spindelförmig oder oft keulenförmig oder etwas gebogen, mit den gezackten Warzen dicht besetzt, unter einander nicht verschmilzt und rosenrot in Farbe. Sie sind auf den Längsrippen besonders gut entwickelt, und da sie ihr oberes End etwas nach aussen richten, so ist die Oberfläche des Stammes etwas rauh. Die Masse einiger Skleriten sind: $0,3\times0,13-0,29\times0,12$ $-0,35\times0,11-0,31\times0,10-0,32\times0,11-0,35\times0,11-0,29\times0,12$ mm.

Die Skleriten der inneren Schicht sind auch spindelförmig, oft am Ende gegabelt und mit einander verschmolzen. Ihre Farbe ist schwächer als die der äusseren Skleriten.

Die Skleriten des unteren Stammabschnittes unterscheiden sich nicht von denen des oberen Abschnittes. Sie werden jedoch öfters mit Hornsubstanz umhüllt. Eigentümlicherweise kommt hier ausserhalb der durch dicken Spindeln gebildeten, äusseren Schicht noch eine Schicht zum Vorschein, welche aus bis 0.22×0.08 mm. grossen, freien Spindeln besteht. Zwischen diesen zwei Spikulaschichten ist ein spikulaloser Zwischenraum vorhanden, der viele, oft in Grösse selbst die Axialhöhle überschreitende Solenia enthält. Um die Axialhöhle ist sehr gut entwickelter, beinahe spikulaloser Hornzylinder vorhanden.

Die Seitenpolypen gehen allseitig dicht, unter einem Winkel von ca. 60° aus. Sie sind kaum 2 mm. lang und 1 mm. dick. Die als 2 mm. längeren und öfters auch noch kürzeren Seitenpolypen können schon warzenförmige Seitenknospen tragen.

Der Kelch zeigt nur eine Schicht von Spikula; die letzteren sind schlank, bis 0.30×0.07 mm. gross. Ungefähr vier Spikula bilden eine Längsrippe, die an dem Apex allmälich konvergieren, um endlich den getrennten Längsbändern überzugehen. Dort in den Längsbändern sind die Spikula besonders schlank und kurz.

Die Oesophagealportion ist ganz frei von Spikula.

Die Spikulation der Anthocodia verhält sich ganz wie bei den anderen *Telesto*-Arten (Taf. III, Fig. 6 und 11). Die Spikula sind spindelförmig, bis 0.2×0.03 mm. gross, locker bedornt und dicht in Doppelreihen angeordnet. Oben ist die Konvergierung am stärksten, sodass sie beinahe parallel angeordnet erscheinen. Die Spitze der Spikula, die am Scheitel dieser triangulären Spikulagruppe gelegt ist, ist oft etwas angeschwollen.

Am Rücken des oberen Abschnittes der Tentakeln sind distalwärts sich immer mehr verkleinernde, den vorigen ähnlich gebaute Spindeln in zwei Reihen vorhanden. Die Tentakelfiederchen weisen auch je ein schlankes, gebogenes Spikulum auf.

Pseudocladochonus Versluys.

Pseudocladochonus Versluys, Siboga-Expeditie, Monogr. XIIIc, 2. Teil, 1908.

4. Pseudocladochonus hicksoni Versluys.

(Taf. III. Fig. 12–16).

Pseudocladochonus hicksoni Versluys, ibid.

1. Fragmente, bei Nijima, südlich von Provinz Izu, gesammelt von Herrn S. Hirota (10. Aug. 1893).
2. Fragment, aus Mochiyama, Sagami Bai, 400 Faden, gesammelt von K. Aoki (10. Aug. 1897).
3. Fragment, aus Korallengrund bei Insel Chikura, südwestlich von Provinz Satsuma (60-90 Faden ?), gesammelt von Herrn M. Miyajima (Aug. 1899).
4. Eine vollständige Kolonie und einige Fragmente, aus Korallengrund bei Insel Uji, südwestlich von Provinz Satsuma (ca. 80 Faden), gesammelt vom Verfasser (Juni 1908).

Die vorliegenden Exemplare stimmen im Aufbau der Kolonie sowie der einzelnen Polypen mit der Angabe von Versluys so sehr überein, dass ich keinen Anstand nehme, sie als *Pseudocladochonus hicksoni* zu identificiren. Es muss jedoch die folgenden Detailsverhältnisse Erwähnung gemacht werden.

1) Die vollständige Kolonie aus dem Korallengrunde bei Insel

Uji zeigt feine, mannigfach sich verzweigende Stolonen, welche eine tote Gorgonidenachse überziehen.

2) Das Exemplar aus dem Korallengrunde bei Insel Chikura zeigt zwei solche Polypen, welche drei, anstatt zwei, Seitenpolypen aussenden. Der eine ist nicht von der Seite, sondern vom Apex eines apikal wahrscheinlich abgebrochenen Polypen regeneriert worden. Da in diesem Falle der letztere daneben zwei Seitenpolypen besitzen, so scheint es, als ob ein sehr langer Polyp fünf Seitenpolypen zeige. Wahrscheinlich ist dies eine abnormale Bildung, welche durch einen massiven Schwammüberzug verursacht wurde.

3) Die Skleriten der Kelche, welche mit den seitlichen Fortsätzen mit einander verschmelzen, sind auf der Aussenfläche mit runden, meist 2—3 zählenden Warzen besetzt (Fig. 12). Versluys giebt dies nicht an.

4) Die Skleriten der Anthocodia sind, wie bei den eben beschriebenen *Telesto*-Arten, sehr dicht angeordnet (Fig. 13; vergl. Fig. 6 und 11). Das apikale End der oben liegenden ist oft ein wenig erweitert und zeigt die Warzen dichter gedrängt als die übrigen Abschnitte (Fig. 14). Diese erreichen oft über 0.4 mm. in der Länge, sind also viel grösser als es Versluys angiebt. Oberhalb der Stelle, wo die Tentakeln sich bei Kontraktion knicken, sind die Skleriten in zwei Reihen dicht angeordnet, indem der längste Diameter nach seiten und oben hin gerichtet sind (Fig. 15), ganz wie bei den drei anderen *Telesto*-Arten. Auf den Tentakelfiederchen sind auch kleine gebogene Skleriten vorhanden (Fig. 16).

Die Type wurde vom "Siboga" in der Nordküste der Insel Salomakiee (Damar) in 45 M. und in Ceram See in 118 M. erbeutet.

Tokio, 3. Mai 1909.

Erklärung der Tafel III.

Fig. 1-6. *Telesto tubulosa*, n. sp.

1. Kolonie in natürlicher Grösse.
2. Polyp von der Seite gesehen. × 20.
3. Sklerit der äusseren Schicht in der Mitte des Mutterpolypen, von innen gesehen. × 200.
4. Skleriten der inneren Schicht in der Mitte des Mutterpolypen. × 200.
5. Sklerit in der Mesenterie des Mutterpolypen. × 200.
6. Skleriten der Anthocodia; die Skulptur ist weggelassen. × 50.
7. Sklerit aus derselben Region. × 200.

Fig. 8—11. *Telesto sagamina*, n. sp.

8. Kolonie (No. 1) in natürlicher Grösse.
9. Sklerit der äusseren Schicht in der Mitte des Mutterpolypen, von aussen gesehen. × 200.
10. Skleriten der inneren Schicht des Mutterpolypen. × 200.
11. Skleriten der Anthocodia; die Skulptur ist weggelassen. × 50.

Fig. 12—16. *Pseudocladochonus hicksoni* Versluys.

12. Sklerit der Kelchspitze, von aussen gesehen. × 200.
13. Skleriten der Anthocodia; die Skulptur ist weggelassen. × 50.
14. Sklerit derselben Region. × 200.
15. Sklerit des oberen Tentakelrückens. × 200.
16. Sklerit des Tentakelfiederchens. × 200.

Notes on Fresh-water Fishes from the Province of Shinano, Japan.

BY

Shigeho Tanaka, *Rigakushi.*

Research Scholar, Science College, Imperial University of Tokyo.

For some time past Mr. Teisuke Yagi, instructor of natural history in the middle school of Nagano (Province Shinano), has been making an extensive collection of fresh-water fishes from several parts of the province. It was sent to me for study. In addition to it I have examined several other collections made in the same province; amongst these the one made by Mr. R. Kōno of the Girls' Normal School in Matsumoto must be specially mentioned on account of its importance. A study of the rich material, thus brought together, besides giving me an idea of the local fish-fauna, has enabled me to regard several species, considered to be distinct by many authors, to be simply synonymous with certain other species. The material at my disposal may be referred to twenty-five species in all, which I propose to record and to annotate upon in the present paper.

A few words here about the physical character of the district in question may not be amiss. Shinano is one of the largest provinces of Japan, situated in about the middle of Japan proper (Hondō). It is strictly an inland province, no part of it bordering on the sea-coast. A system of mountain ranges covers the entire province, and offers water-sheds towards both the Pacific and the Japan Sea. The streams draining the northern parts of the province, among which are to be mentioned the Adsusa, the Sai, the Hirose, the Hotaka, the Takase, the Chikuma, etc., take generally a northward course; nearly all of

them flow into and help to form the Shinano River, which, after running through the Province of Echigo, empties itself into the Japan Sea. Lake Suwa, River Mibu, etc., situated in the southern parts of the province, directly or indirectly discharge into the Tenriu River which finds outlet in the Tōtōmi Sea. The Kiso River originates from western parts of the province and, after passing through the Provinces of Mino and Owari, empties itself into the Owari Bay. It is then easy to account for the fact that the fish fauna of the province shows affinity to that of the Pacific as well as of the Japan Sea side. So far as the material on hand go, one may draw therefrom the following conclusions:

1. The fish fauna of the province is not very rich in species, lacking several species which are common in many other districts.

2. *Cottus pollux* Günther is very common, while the closely allied species, *Cottus kazika* Jordan & Starks, is entirely absent.

3. *Leuciscus jouyi* Jordan & Snyder and *Leuciscus hakuensis* Günther live together. Some specimens I have seen appear to be the hybrid of the two species.

4. *Odontobutis obscurus* (Schlegel), *Fluvidraco ransonnetii* (Steindachner), *Sarcocheilichthys variegatus* (Schlegel) and certain other common species are not represented in the material, but, whether these are really absent or not, needs to be determined by further observations.

Petromyzonidæ.

1. **Lampetra japonica** (Von Martens).

Local name: Gina; Giname; Ginami; Ginayatsume; Suigina; Sunayatsume.

Numerous specimens, the largest being 14.5 cm. long as measured to tip of tail. Most of them are still in the larval form.

The snout is distinctly shorter than in *Lampetra mitsukurii*

Hatta. The two dorsals are continuous with a deep notch between, often showing a strong inclination to separate from each other. Some specimens of about 13 cm. in length are much nearer to *Lampetra mitsukurii* than to *Lampetra japonica*.

Siluridæ.

2. **Liobagrus reini** (Hilgendorf).

Liobagrus sugubii Regan, 1908.

Local name: Sasuri; Sasori; Akaze.

Numerous specimens, the largest being 10.6 cm. long as measured to the root of middle caudal rays.

Dark brown above, lighter below; rather sparsely sprinkled with pale spots much smaller than the diameter of eye. Caudal extending forward to unite with dorsal, with a rather obtuse notch at the boundary of the latter fin.

The species shows individual variations in the slenderness of body, in the width of interorbital and the length of fin spines, even in specimens from same locality. Measurements of some examples are as follows:

Specimen	A	B	C	D	E	F
Length as measured to root of middle caudal rays	9.1 cm.	7.4 cm.	7.0 cm.	6.4 cm.	8.6 cm.	8.5 cm.
Height of body	1.4 „	1.2 „	1.5 „	1.2 „	1.5 „	1.7 „
Length of head	2.2 „	1.6 „	1.7 „	1.3 „	2.0 „	1.9 „
Interorbital width	0.85 „	0.6 „	0.7 „	0.55 „	0.8 „	0.8 „

Judging from the numerous specimens on hand, *Liobagrus reini* described by Jordan and Fowler in 1903 seems to differ so very slightly from *Liobagrus sugubii* Regan that I hesitate to draw specific distinction between the two, although most of the specimens stand nearer to *sugubii*.

3. **Parasilurus asotus** (Linnæus).

Local name: Namazu.

Numerous specimens, the largest being 19.5 cm. long as measured to root of middle caudal rays.

Upper part very dark; the under surface of head and belly whitish. Sometimes pale patches scattered over the body, but without definite markings.

Cobitidæ.

4. **Misgurnus anguillicaudatus** (Cantor).

Local name: Dojō; Numadojō; Tadojō; Hondojō; Nomadojō; Numanusutto; Ajime; Hebidojō.

Numerous specimens, the largest being 13.1 cm. long as measured to root of middle caudal rays.

D. 8 (9)*; A. 7; P. I, 8; V. 6; number of scales in lateral series 140 to 150; in transverse series 30 to 35.

One specimen, 10.3 cm. long as measured to root of middle caudal rays, is very slender; its height $9\frac{2}{3}$ in the length of body measured as above, the slenderness being probably due to bad feeding.

5. **Cobitis tænia** (Linnæus).

Local name: Yanagidojō; Ajime; Ajimedojō; Kawadojō; Tsurumakidojō; Sasanohadojō; Gomadojō; Takanohadojō; Kirime; Girime; Shimadojō; Tsuchidojō.

Numerous specimens, the largest being 8.5 cm. long as measured to root of middle caudal rays.

A row of dark blotches larger than diameter of eye and 14 to 16 in number, runs along the middle line of the side of body. A narrow dark blue line runs throughout the upper parts of the row. Between this row and the back is present a lateral row of blotches, which are smaller but longer than those mentioned above. Space between the middle lateral blotch and the back is profusely sprinkled

* The figure in bracket shows the number of the fin rays counted inclusive of last smaller ray which is close to that preceding to it.

with spots and short curved lines, that bring about a vermiculated appearance. A row of dark spots about equal in diameter to that of eye runs along the middle line of back; about 6 of them are present in front of dorsal and about 7 behind it; the spots in this row are connected by another narrower dark blue line. Upper part of head profusely spotted. Lower part of head and body pale, without marking. Above mentioned markings greatly variable; in some specimens the rows of blotches on side of body are substituted by dark lines which are surrounded by a zone of lighter shade. Dorsal and caudal with several rows of spots. Pectoral, ventral and anal pale or with very few spots.

6. **Lefua echigonia** (Jordan & Richardson).

Local name: Okamedojō; Okame; Yamadojō; Sakudojō; Hashi.

Numerous specimens, the largest being 5.5 cm. long as measured to root of middle caudal rays.

Scales 85 to 90 in a longitudinal series; about 18 in a transverse series counted backward and downward from origin of dorsal; about 22 counted in the same direction from origin of anal.

Color and markings variable to some extent; some three longitudinal rows of blackish spots, each nearly as large as eye, run more or less irregularly. In a specimen 3.2 cm. long as measured in the same way as above, much smaller spots are arranged in somewhat longitudinally running rows; a longitudinal row of larger spots, which here and there form short lines by confluence, runs along the sides without the caudal spot. Measurements of some examples are as follows:

Specimen	A	B	C	D	E	F	G
Length of head	1.1 cm.	1.0 cm.	1.05 cm.	1.0 cm.	1.0 cm.	1.0 cm.	1.05 cm.
Diameter of eye	0.2 „	0.2 „	0.2 „	0.2 „	0.2 „	0.2 „	0.2 „
Interorbital width	0.4 „	0.4 „	0.5 „	0.45 „	0.45 „	0.45 „	0.4 „
Length of snout	0.4 „	0.4 „	0.35 „	0.3 „	0.3 „	0.35 „	0.4 „
Length of ventral	0.6 „	0.55 „	0.6 „	0.5 „	0.6 „	0.55 „	0.5 „

Cyprinidæ.

7. **Cpyrinus carpio** (Linnæus).

Local name: Koi; Sarasa (individuals with certain peculiar coloration).

Five specimens, the largest being 9 cm. long as measured to root of middle caudal rays.

Specimen	A	B	C	D	E
L. lat.	32	33	32	33	31
L. trans.	7+1+7	6+1+7	7+1+6	6+1+7	6+1+6
D.	III, 18(19)	III, 17(18)	III, 19(20)	III, 18(19)	III, 17(18)
A.	III, 5 (6)	III, 5 (6)	III, 5 (6)	III, 5 (6)	III, 5 (6)

8. **Carassius auratus** (Linnæus).

Local name: Funa; Yomebuna; Dorobuna; Koppa.

Numerous specimens, the largest being 8.9 cm. long as measured to root of middle caudal rays.

Specimen	A	B	C
L. lat.	30	31	29
L. trans.	7+1+7	6+1+7	6+1+7
D.	II, 14(15)	II, 14 15)	II, 15(16)
A.	II, 5 (6)	II, 5 (6)	II, 5 (6)

9. Hemibarbus barbus (Schlegel).

Local name: Aramegoi.

Thirteen specimens, the largest being 13.5 cm. long as measured to root of middle caudal rays.

Dark gray above, pale beneath; free edge of each scale black-punctate. Several faint longitudinal streaks, consisting of blackish dots, run on upper parts of body. Two longitudinal rows of blackish spots, somewhat concurrent with contour of back; the lower row runs anteriorly just above the lateral line, but posteriorly right on that line, the spots of the row being smaller in size than pupil. The upper row much fainter than the lower; its spots above the interspace of those of the lower row. All the spots are more distinct in the smaller specimens. In small specimens, a black longitudinal line runs on back from the beginning of nape to caudal base; it forks into two at the insertion of dorsal, to surround this at the base; the line is sometimes represented by a row of blackish spots. Head brown above, pale beneath; dorsal and caudal brownish, the edges much darker; anal pale or brownish, the free edge being darker in some specimens than in others; ventral and pectoral pale. Pharyngeal teeth 4,3,1—1,3,5. Gill rakers on first gill-arch 4+8.

10. Leucogobio jordani (Ishikawa).

Local name: Moroko; Morokko; Morokobaya; Moro; Muro; Ishibaya; Doteppaya; Dotchaya; Ishimuro; Tarekan.

Numerous specimens, the largest being 7.7 cm. long as measured to root of middle caudal rays.

Head $4\frac{1}{3}$, height of body $4\frac{2}{3}$ in length as measured to root of middle caudal rays. Dorsal originating midway between tip of snout and root of middle caudal rays. In his original description* of the species Dr. Ishikawa says that "the height of the body is nearly one-sixth of the total length (evidently inclusive of caudal), the length of the head one-third". But from his drawing it appears that in his

* Annot. Zool. Jap. vol. III, pt. IV, 1901, p. 163, tab. III.

species the height of body is about 5 in length as measured to root of middle caudal rays and the head is slightly less than 3 in the same length. In this district I have not found any form which resembled *Leucogobio mayedæ* (Jordan & Snyder), a species very common in Lake Biwa.

Specimen	A	B	C
Total length as measured to root of middle caudal rays	7.7 cm.	6.15 cm.	6.3 cm.
Height of body	1.6 „	1.4 „	1.3 „
Length of head	1.8 „	1.4 „	1.5 „
Diameter of eye	0.45 „	0.35 „	0.35 „
Length of snout	0.45 „	0.4 „	0.4 „
Interorbital width	0.65 „	0.55 „	0.5 „
L. lat.	39	38	40
L. trans.	6+1+5	6+1+5	6+1+5

11. **Pseudogobio esocinus** (Schlegel).

Local name: Kamadsuka; Kamatsuka; Sunamoguri; Sunamuguri; Zukō; Zugō; Zugonbo; Zugonbō; Kisu; Tsuchimuguri; Zimuguri.

Numerous specimens, the largest being 13.6 cm. long as measured to root of middle caudal rays.

Pharyngeal teeth 4,2–2,5. Gill-rakers on first gill-arch 1+8 or 9. Maxillary barbel shorter or longer than the diameter of eye; color of the barbel whitish or brownish. Dorsal and caudal spotted, but ventral and anal without spots. Pectoral dusky or with several rows of spots.

12. **Acheilognathus lanceolata** (Schlegel).

Local name: Tanago; Tanogo; Nigaza.

Numerous specimens, the largest being 6.8 cm. long as measured to root of middle caudal rays.

Maxillary barbel longer than in *Acheilognathus limbata* (Schlegel); a faint lateral band above lateral line, without shoulder spot. Four or five scales between lateral line and origin of anal. In this respect it resembles *Acheilognathus shimazui* Tanaka, but differs in physiognomy and coloration.

The species lives together with *Acheilognathus limbata* (see below). From this fact the two species are mistaken for one and the same species by most natives not only of this district, but also of other parts of Japan.

13. **Acheilognathus limbata** (Schlegel).

Local name: Tanago; Tanogo; Nigaza; Kozikinigaza.

Eight specimens, the largest being 6 cm. long as measured to root of middle caudal rays.

Maxillary barbel very short; lateral band and shoulder spot very distinct. Some of them have dermal protuberances which seem to serve for nuptial ornamentation.

14. **Zacco platypus** (Schlegel).

Local name: Haya; Hae; Gago; Gagota; Akazu (male); Otokokago (male); Onnakago (female); Shirahaya (female).

Numerous specimens, the largest being 12 cm. long as measured to root of middle caudal rays.

The nuptial ornamentation of the male is represented by horny protuberances on snout, circumorbital parts, opercle, and even on supra-anal parts of body and on anal and pectoral.

Specimen.	A	B	C	D
Sex	♂	♂	♂	♀
L. lat.	47	46	47	45
L. trans.	9+1+5	9+1+4	9+1+5	9+1+5

15. Zacco temminckii (Schlegel).

Local name: Yanagibaya.

A single specimen, 8.4 cm. long as measured to root of middle caudal rays.

L. lat. 51; L. trans. 11 + 1 + 5.

16. Pseudorasbora parva (Schlegel).

Local name: Aburafuna; Yamafuu.

Four specimens, the largest being 3.9 cm. long as measured to root of middle caudal rays.

17. Leuciscus hakuensis (Günther).

Local name: Akauwo; Akao; Hae; Hai; Haya; Gamota.

Numerous specimens, the largest being 22.5 cm. long as measured to root of middle caudal rays.

Scales 75 in lateral line; 15 scales between the origin of dorsal and lateral line, and 15 between the latter and middle of belly. Ground color dark in some specimens, pale in others. Each scale with narrow edging of a dark color.

18. Leuciscus jouyi (Jordan & Snyder).

Leuciscus dorobaë Ishikawa, 1004.

Local name: Aburahaya; Aburabai; Aburappai; Aburahae; Nigappaya; Dobuhaya; Ishibaya; Numahai; Nigahae; Tanabira; Haya; Hae; Tarekan; Manakatsuwo; Zakko.

Numerous specimens, the largest being 9.8 cm. long as measured to root of middle caudal rays.

Body dark above, pale below; speckled with black. A black lateral line on mid-dorsal line. In our specimens height of caudal peduncle much lower than that of head, being $2\frac{1}{2}$ to $2\frac{1}{3}$ in head.

The species lives together with *Leuciscus hakuensis* Günther. Some specimens are intermediate between the two species; they seem to be hybrids.

Our specimens have not so high a caudal peduncle as described for *Leuciscus jouyi* by Jordan and Snyder (1901) and by Jordan and

Fowler (1903), but the identity of the specimens with the species cannot be doubted. *Leuciscus dorobæ* of Ishikawa is evidently identical with *Leuciscus jouyi*.

Specimen	A	B	C	D
Length of head	2.5 cm.	2.5 cm.	1.9 cm.	2.2 cm.
Height of caudal peduncle.	1.0 „	1.15 „	0.8 „	1.0 „
L. lat.	76	72	76	76
L. trans.	18+1+12	18+1+12	19+1+12	18+1+13

Anguillidæ.

19. **Anguilla japonica** (Schlegel).

Local name: Unagi.

I have no specimens of this species from the district, but from several reports, it is clear that the species occurs in the province.

Salmonidæ.

20. **Salvelinus malma** (Walbaum).

Local name: Iwana.

Twelve specimens, the largest 25 cm. long as measured to root of middle caudal rays.

The whitish spots and the extension of maxillary are variable to some extent in our specimens, so that *Salvelinus kundscha* (Pallas) and *Salvelinus pluvius* (Hilgendorf) seem to me to be merely local variations of *malma*.

21. **Oncorhynchus masou** (Brevoort).

Local name: Ameuwo; Amenouwo; Ameo; Amego; Yamame; Amemasu; Endokko; Amemasu; Kokure; Masu; Masunoko.

Numerous specimens, the largest being 26.5 cm. long as measured to root of middle caudal rays.

Ground color varies from dark brown to light brown. All specimens with distinct parr-mark except the largest one which shows the mark very faintly and is supplied with more or less distinct spots.

22. Plecoglossus altivelis (Schlegel).

Local name : Ayu.

No specimen of the species is represented in the collection, but several reports attest to the presence of the species in the province.

Pœciliidæ.

23. Oryzias latipes (Schlegel).

Local name : Medaka ; Mezaka ; Komekura ; Mekugi ; Urume.

Sixteen specimens, the largest being 3.3 cm. long as measured to root of middle caudal rays.

Cottidæ.

24. Cottus pollux (Günther).

Local name : Kazika ; Kazikanbō ; Ubakazika ; Ōkazika ; Kyara.

Numerous specimens, the largest being 9.5 cm. long as measured to root of middle caudal rays.

Rays of pectoral all simple, the longest rays reaching to vertical through origin of anal ; ventral may or may not reach beyond vent. Coloration variable to some extent ; five cross-bars on side of body always present. Vomer toothed, but palatines without teeth. One preopercular spine present, the spine being simple, very short, and curved inward and upward. Sometimes the spine is concealed in the skin, but is always visible from outside. In this district *Cottus kazika* Jordan & Starks, which is easily distinguished from *Cottus pollux* by having 4 preopercular spines instead of 1, seems not to occur in the district. By the way, I think it probable that no species of *Uranidea* occurs in Japan although Dr. Hilgendorf had described two species from our country, *reini* and *dybowskii*.

Specimen	D.	A.	P.
A	VIII–16 (17)	12 (13)	13
B	VIII–16 (17)	12 (13)	13
C	IX–16 (17)	12 (13)	13
D	IX–16 (17)	12 (13)	13
E	IX–16 (17)	12 (13)	13
F	IX–17 (18)	12 (13)	14
G	IX–15 (16)	11 (12)	13 or 14
H	IX–17 (18)	13 (14)	12 or 13
I	IX–16 (17)	12 (13)	13 or 14
J	IX–16 (17)	12 (13)	13
K	IX–17 (18)	13 (14)	13
L	VIII–16 (17)	12 (13)	13
M	IX–16 (17)	12 (13)	13

Gobiidæ.

25. **Ctenogobius similis** (Gill).

Rhinogobius nagoyæ Jordan & Seale, 1906.

Local name; Yoshinobori; Yona; Yonappe; Yaaranbo; Suitsuki.

Numerous specimens, the largest being 5.4 cm. long as measured to root of middle caudal rays.

Nape naked, with 3 elongate scaly areas, but the scaliness variable to some extent. In most specimens the naked area stretches to near origin of first dorsal, while in the rest the nakedness is more or less indistinct, the outstretching of the naked area toward origin of first dorsal being more or less distinctly recognizable. Scales in a lateral series 31 to 35. Height of body about 5 to $4\frac{1}{4}$ in length as measured

to root of middle caudal rays, but in two specimens $6\frac{1}{3}$. Head about 3. Judging from the large series of specimens before me, *Rhinogobius nagoyæ* Jordan & Seale seems to be identical with *Ctenogobius similis*. In this connection I may state that *Ctenogobius katonis* Tanaka very closely resembles the present species, but, whether the two species are identical or not, needs to be decided by further investigations. Color variable to a comparatively large extent; some specimens have dark ground color without distinct marking, while others are of a lighter color and show distinct cross-blotches.

April, 1909.

NOTICE.

Terms of subscription, $2.50 = 10s = 12^1/_2F = M10 = ¥5$ per volume, postage prepaid.

Remittances from foreign countries should be made by postal money orders payable in Tokyo to M. NAMIYE, Zoological Institute, Science College, Imperial University, Tokyo.

All manuscripts should be sent to THE EDITOR ANNOTATIONES ZOOLOGICÆ JAPONENSES, College of Science, Imperial University, Tokyo.

All business communications should be sent to THE SECRETARY OF THE TOKYO ZOOLOGICAL SOCIETY, College of Science, Imperial University, Tokyo.

明治四十二年六月十七日印刷
明治四十二年六月二十日發行

東京市神田區美土代町二丁目一番地
編輯兼發行人　島連太郎

東京市神田區美土代町二丁目一番地
印刷人　小玉牧三

東京市神田區美土代町二丁目一番地
印刷所　三秀舍

東京市日本橋區通リ三丁目十四番地
大賣捌所　丸善書籍株式會社

第七卷第二冊　定價　金壹圓

郵便爲替ハ東京市本鄉區理科大學動物學教室波江元吉宛ニテ本鄉森川町郵便爲替取扱所へ御拂込有之度候

日本動物學彙報

第七卷第三册

明治四十三年三月廿七日發兌

ANNOTATIONES

ZOOLOGICÆ JAPONENSES.

Vol. VII., Part III.

PUBLISHED

BY

The Tokyo Zoological Society.

TOKYO,

March, 1910.

CONTENTS.

Report on Japanese Stomatopoda with Descriptions of Two New Species.

BY

T. Fukuda.

(*With Plate IV*).

The present report is based mainly upon the material contained in the collection of the Zoological Institute of the College of Science, Imperial University of Tokyo, to which some specimens from other sources were supplemented. In all I have been able to examine fourteen species, referable to six genera, as follows: *Protosquilla* 2, *Gonodactylus* 3, *Odontodactylus* 1, *Pseudosquilla* 1, *Lysiosquilla* 3, and *Squilla* 3 species. Of these one species each of *Gonodactylus* and *Lysiosquilla* seems to be new to science. The larval forms are not included in this report.

I wish here to express my hearty thanks to Prof. A. Oka for his kind supervision during the course of my study as well as for enabling me to consult most of the literature on the subject.

Genus ***Protosquilla*** Brooks.

1. **Protosquilla cerebralis** Brooks.

Protosquilla cerebralis Brooks, Rep. Voy. Challenger XVI, ii, p. 72, PL. XIV. Fig. 2, 3; Pl. XVI. Fig. 2, 3 (1886).—Borradaile, Proc. Zool. Soc. London, p. 33, Pl. V, Fig. 6 a (1898).

Remarks.—The specimens examined, although agreeing in essential points with the orginal description and figures given by Brooks, present following differences:—

i) The telson is only a little broader than long, whereas it is twice as broad as long in Brook's specimens.

ii) The fifth thoracic segment at least is exposed dorsally, whereas this segment is completely covered by the carapace in his specimens.

iii) The antero-lateral corners of the carapace are somewhat angular, while they are more rounded in his specimens.

Locality.—One male and three females from Okinawa.

2. **Protosquilla brooksii** de Man.

Pl. IV., Figs. 1, 1 a.

Protosquilla brooksii de Man, Arch. f. Naturg. 53. Jahrg. I p. 579, Pl. XXII a, Fig. 8 (1887).

Remarks.—In the present specimen the spinules on the last two segments are much more numerous than in the original specimens described by de Man; viz., there are upon each of the submedian tubercles of the sixth segment more than ten spinules, and upon each of the lateral tubercles more than twenty spinules, whereas the original specimens are recorded to possess only one or two spinules upon the former and only one upon the latter. The anterior margin, instead of being smooth, bears several spinules. The median tubercle on the telson, the tip of which does not reach the base of the median notch, is provided with about thirty spinules (about nine in the type-specimens), and the lateral tubercles are each provided with about thirty spinules (about ten in the type-specimens). Moreover, the inner lobe of the posterior margin of telson is armed with nearly ten, instead of two, and the lateral margin of the large triangular notch each with eleven or twelve, instead of six, spinules. Lastly, more than twenty spinules are present on the area between the lateral tubercle and the outer margin, the latter being also beset with thirteen or fourteen spinules, while in the type-specimens there are present only from six to eight and from four to five spinules respectively. These differences,

however, do not seem to be conspicuous enough to justify the establishing of a distinct species, and I prefer to regard my specimen as belonging to the species referred to, with which it agrees nearly in all other details.

While living the whole dorsal surface of body and of the longest segment of raptorial limb is coloured brownish green, sprinkled with dark green spots. The lateral portions of the carapace, the exposed thoracic and abdominal segments as well as the dorsal surface of the longest segment of raptorial limb are marked by a pattern of light bluish green colour. The antennules and antennae are vermilion fading into light blue. The flagellae are of a vermilion colour also. Lively green colouring of the tubercles on the last two segments does not occur in the specimen.

The single female specimen measures 395 mm in length.

Locality.—Takanoshima in the gulf of Tateyama, Prov. Awa.

Genus ***Gonodactylus*** Latreille.

3. **Gonodactylus chiragra** (Fabricius).

Gonodactylus chiragra, Miers, Ann. and Mag. Nat. Hist. (5) V, p. 118, (1880)—Brooks, Rep. Voy. Challenger, XVI, ii. p. 56, Pl. XV. Fig. 4 (1886)—Jurich, Die Stomatopoden der Deutschen Tiefsee-Expedition, p. 375, Pl. XXVI [II], Figs. 4, 5 (1904).

Gonodactylus smithii, Pocock, Ann. and Mag. Nat. Hist. (6) XI, p. 475. Pl XX, B, Fig. 1 (1893)

Locality—Nineteen males and seven females from Okinawa; two females from the Ogasawara (Bonin) Islands; one male and one female from the Seven Islands, Prov. Idzu. There are also one male and two females from Okinawa, which show in the ornamentation of the last two segments the characteristic features of *G. smithii* Pocock.

4. **Gonodactylus glabrous** Brooks.

Gonodactylus glabrous, Brooks, Rep. Voy. Challenger, XVI, ii, p. 62, Pl. XIV. Fig. 5; Pl. XV, Figs 7, 9 (1886)—Jurich, Die Stomatopoden der Deutschen Tiefsee Expedition, p. 376 (1904).

Gonodactylus graphurus, de Man, Arch. für Naturg. 53 Jahrg. I, p. 573 (1887)

Remarks.—Brooks, when he first founded this species, gave several points of detail, by which this species might be distinguished from *G. graphurus*. Among them the following seem to be the more important:—

i) Sutures upon the first five abdominal segments absent.

ii) Dorsal median carina absent upon the sixth abdominal segment.

iii) All the dorsal carinæ upon the last two segments more sharply defined and less swollen and rounded than they are in *G. graphurus*.

In all my specimens (one male and seven females) the length of telson is nearly equal to its width and its general outline resembles Brook's figure of *G. glabrous*. The transverse sutures on the first five abdominal segments are lacking. But the median carina, characteristic of *G. graphurus* occurs upon the sixth abdominal segment also, though it is in some cases only very faintly marked. Besides, some specimens show the lateral longitudinal sutures upon the first five abdominal segments; and the five carinæ upon the dorsal elevation of the telson are in some individuals like those of *G. glabrous* as described and figured by Brooks. In some other specimens these carinæ rather resemble those of *G. graphurus*. Thus, many of the chief distinctive characteristics between the two species appear to be of doubtful value, and consequently it would be more advisable to regard these two forms as varieties of one and the same species.

Locality.—Five females from Okinawa; one male and two females from the Ogasawara Islands.

5. **Gonodactylus spinosocarinatus** n. sp.

Pl. IV. Figs 2, 2 a.

Diagnosis.—Body elongated. Antennules and antennae short, antennal scales small. Rostrum with a slender median spine and acute antero-lateral angles. Carapace slightly vaulted, with rounded corners. Hind body strongly convex; first five abdominal segments smooth above, with marginal carinæ, the sixth provided with six unarmed longitudinal carinæ. The whole dorsal surface of telson, except the flattened submedian marginal spines, covered with nine broad longitudinal carinæ, which are smooth above but beset with numerous minute spinules on the sides. Only the submedian spines well developed, the others being obsolete. Basal prolongation of uropod with broad and flattened outer spine; some of the marginal spines on the proximal segment of exopodite large and curved.

Description.—The rostrum is transverse, with acute median spine, the tip of which does not reach halfway the length of eye-peduncle; antero-lateral spines also with acute terminations. The carapace is slightly convex; its length about 1/5 the total length of body, and $1^1/_2$ the width between the antero-lateral angles, which is about equal to that of the sixth thoracic segment. The gastric sutures are well-marked, diverging a little posteriorly. All angles are obtuse and rounded. The posterior margin is straight, but the antero-lateral lobes project forward. The hind body is strongly convex and elongated; the fifth thoracic segment slightly narrows laterally; the lateral edges of the next two segments are truncated, while the last segment produces a blunt process on each side. The first abdominal segments increase gradually in length backwards; they are smooth above and are provided with lateral marginal carinæ. All the postero-lateral angles are rounded and do not project backward. The length of the sixth segment is almost equal to that of the second and is provided with six somewhat irregularly-marked longitudinal carinæ, the space

between them being uneven. The submedian carinæ are parallel and broad; the intermediate carinæ divergent, with their ends scarcely reaching the posterior margin; the lateral carinæ run nearly parallel to the latter. All carinæ are devoid of spines at their extremities.

The telson is a little longer than broad, the maximum length being 2/15 the total length; the vertical diameter exceeds half the horizontal diameter as in *G. spinosus* Bigelow. The whole dorsal surface except on the submedian spines, is completely covered with nine broad longitudinal carinæ, of which the median one is the broadest. In the median carina three parts are recognizable: a prominent smooth part on the median line and a pair of spinulated parts lying postero-lateral to the former. This carina alone reaches the base of the median notch posteriorly, the others stopping at some distance in front of its margin. The next three pairs, of which the inner two unite posteriorly, are nearly equal in breadth. The marginal carina is the narrowest and is shorter than the others. All these carinæ are smooth except at the lateral borders where they are provided each with a row of minute prickles. The posterior end of the carinæ is also armed with a few spinules directed obliquely backward. The postero-lateral margins of telson are divided each into three teeth, though at first sight they appear to be simple. The outermost tooth is the end of the marginal carina, the intermediate that of the laterial, while the innermost tooth represents the submedian spine. The last mentioned is the only well developed marginal spine, having no carina upon it and the movable tip being directed upward. The lateral margins of the large triangular median notch are armed each with thirteen minute spinules. Besides, there is a spinule on the outer margin of the submedian spine.

The basal segment of uropod bears on the dorsal surface a row of three or four spines besides the terminal one. The outer spine of the basal prolongation is broad and flattened, curved inward, and has

no teeth on the inner margin; the inner one is nearly straight and acute. The marginal spines on the proximal segment of exopodite are five to six in number, of which the first two or three are slender and straight, lying at some distance from one another; the others are stout, curved forward and diminish gradually iu size backward. The distal segment articulates with the dorsal surface of the proximal segment. The endopodite is somewhat curved outward. Antennules and antennae short, nearly equal in length; the antennal scales are much shorter than the length of eye, which is equal to 5/13 the length of the carapace. The manus of raptorial limb is beset with a row of minute spinules on the inner margin and near the base.

Colour.—The alcoholic specimens show no characteristic colouring except on the dactylus of raptorial limb and the marginal spines of uropod, all which are rosy red.

Size.—The larger female measures 28.5 mm in length.

Locality.—Two female specimens from Jōgashima, Prov. Sagami.

Genus ***Odontodactylus*** Bigelow.

6. Odontodactylus japonicus (de Haan)

Gonodactylus japonicus, de Haan, Faun. Japon. Crustacea, p. 225, Pl. LI. fig. 7 (1849)—Miers, Ann. and Mag. Nat. Hist. (5) V, p. 116 (1880)

Odontodactylus japonicus, Bigelow, Proc. U.S. Nat. Mus. XVII, p. 496 (1894)

Locality.—One female from Tateyama, Prov. Awa; one male and two females from Sagami Sea.

Genus ***Pseudosquilla*** Guérin.

7. Pseudosquilla ciliata Miers.

Pseudosquilla stylifera, Dana, U. S. Expl. Exp., XIII, Crustacea I, p. 622 Pl. XLI, fig. 4 (1852)

Pseudosquilla ciliata, Miers, Ann. and Mag. Nat. Hist. (5) V, p. 108, Pl. III, figs 7, 8 (1880)—Brooks, Rep. Voy. Challenger XVI, ii, p. 53, Pl. XV, fig. 10 (1886)—de Man, Zool. Jahrb. Abt. Syst. X, p. 694 (1898).

Locality.—Two females from Ogasawara Islands.

Genus ***Lysiosquilla*** Dana.

8. Lysiosquilla acanthocarpus (Gray).

Lysiosquilla acanthocarpus, Miers, Ann. and Mag. Nat. Hist. (5) V, p. 11, Pl. I, figs 7-9 (1880)—Jurich, Die Stomatopoden der Deutschen Tiefsee-Fxpedition, Pl. XXVI [II], fig. 3 (1904).

Locality.—One male from Tateyama, Prov. Awa.

9. Lysiosquilla maculata (Fabricius).

Pl. IV. fig. 3.

Lysiosquilla maculata, Miers, Ann. and Mag. Nat. Hist. (5) V, p 5, Pl. I, figs 1, 2 (1880)—Brooks, Rep. Voy. Challenger, XVI, ii, p. 45, Pl. I, figs 1-7 (1886).

Remarks.—The sexual character observed by various authors in this species is not very apparent in the present specimen, for, in spite of its being a female, the dentition on the dactylus of raptorial limb looks like that of the male, as figured by Miers and Brooks. This, however, may be due to immaturity, as the individual examined measures only 17. 5 cm. in length.

Locality.—Okinawa (?)

10. Lysiosquilla crassispinosa n. sp.

Pl. IV., figs 4, 4 a.

Diagnosis.—Eyes with the corneal region nearly globular. The manus of raptorial limb bearing, besides the usual serration, ten or more acute jointed spines on the inner margin; the dactylus armed

with ten teeth including the terminal one. Rostrum triangular, terminating in an acute median spine. Carapace smooth, with all its angles rounded. Last two thoracic and first two abdominal segments provided with a pair of inconspicuous carinæ. All abdominal segments with their postero—lateral angles ending in spines. The whole dorsal surface of the last two segments and a part of that of the fifth abdominal segment, covered with irregularly shaped granules. Eight stout spines or lobes on the postero-lateral margin of telson, the median crest of which is broad and somewhat obscurely defined. The inner spine of the dorsal prolongation of uropod much longer than the outer.

Description.—The rostrum is of a long triangular shape with the apex terminating in an acute spine. The carapace is smooth; its length measures about $^1/_6$ the total length, the maximum breadth about $1^1/_3$ the length. The gastric sutures are obvious and diverge posteriorly, while the cervical suture is only faintly marked. The anterior margin is nearly straight, the posterior sinuate, with all the angles evenly rounded and without spines. The lateral parts of the carapace are bent downward, so that the lateral margins are not visible from the dorsal side. There is a shallow groove along the margin throughout the whole length. Of the thoracic segments the last two are provided each with an obscurely defined longitudinal carina running near the margin. Lateral edges of the sixth segment bear each a flattened triangular spine, and those of the seventh are produced into a short acute spine at their extremities. All the segments of the abdomen have each an acute spine at the postero-lateral angles, and there is a conspicuous impression along the anterior margin. The first two segments possess a faintly marked carina close to the lateral margin. The sixth segment is covered with granules of irregular shape throughout the entire dorsal surface; further there exist a pair of low submedian carinæ which posteriorly converge a little and the terminal spines of which do not reach the posterior margin. The fifth segment is likewise ornamented with granules in its postero-intermediate parts.

The length of the telson, measured on the median line, is a little more than 1/6 the total length, the maximum breadth being about 2/5 the length. The median crest is low and broad with a short terminal spine. The postero-lateral margin is armed with eight thickened spines or lobes, which are covered with minute perforations and have each a short jointed spinule at the extremity. The median notch is beset with minute spinules along its lateral borders. The whole dorsal surface of the telson, except on the median crest and the marginal spines, is covered with irregularly shaped granules, similar to those on preceding segments, The basal segment of the uropod bears a curved acute spine at the posterior extremity. Of the two prolongations, the inner one is much longer and broader than the other. The two segments of the exopodite are about equal in length. There are eleven marginal spines on the proximal segment, of which the last two or three terminate bluntly. The surface of the distal segment bears a strongly defined elevation and depression. The endopodite is comparatively large and its surface is irregularly sculptured.

The eyes are directed obliguely forward; the corneal region is nearly globular and without constriction, its axis making an acute angle with that of the peduncle on the inner side of the latter The ophthalmic segment is entirely covered by the rostrum. The antennules have broad and flattened basal segment. The carpus of the raptorial limb bears two acuminate spines on its anterior surface. The inner margin of the manus is provided with a row of ten (left) or eleven (right) acute jointed spines besides the usual serration; moreover, there are two long movable spines at the base. The dactylus bears ten long curved teeth, the terminal one being much longer and more strongly curved than the others.

All appendages of the exposed thoracic segments are styliform with the distal parts somewhat flattened.

The genital openings of the female presents a somewhat characteristic appearance as shown in fig. 4 a.

Colour.—The alcoholic specimen is without any characteristic colouring.

Size.—Total length 29, 7 cm.

Locality.—The single female specimen was taken in the Sagami Sea.

Genus ***Squilla*** Fabricius.

11. Squilla fasciata de Haan.

Squilla fasciata, de Haan, Fauna Japon. Crustacea, p. 224, Pl. LI, fig. 4 (1849)—Miers, Ann. and Mag. Nat. Hist. (5) V, p. 29 (1880)—Brooks, Rep. Voy. Challenger, XVI, ii, p. 37, Pl. III, fig. 4, 5; Pl. II, fig. 8. (1886).

Chloridella fasciata, Rathbun, Proc. U. S. Nat. Mus. XXVI, p. 54 (1903).

Colour.—The ground colour is grayish, besprinkled with minute dark spots. All the carinæ upon the exposed thoracic segments as well as the intermediate carinæ of abdominal segments are dark yellowish green. There is a pattern of light red colour upon each of the spaces between the three lateral pairs of carinæ in the first five abdominal segments. Besides, the following parts are also coloured light red:—the lateral spines of the sixth thoracic segment, the marginal spines of the telson, the movable spines at the margin of the uropod, the margins of the endopodite and of the distal segment of the exopodite of the uropod, and the outer surface of the more proximal segments of from the second to fifth maxillipedes.

Locality.—One male and two females from Prov. Harima.

12. Squilla leptosquilla Brooks.

Squilla leptosquilla, Brooks, Rep. Voy. Challenger, XVI, ii, p. 30, Pl. I, fig. 1, 2 (1886)—Jurich, Die Stomatopoden d. Deutschen Tiefsee-Exped. p. 370, Pl. XXV [I], fig. 1, 2 (1904)

Remarks.—Jurich has founded a variety (var. *dentata*) upon his specimens taken at a depth of 296 metres near Great Nicobar, which

differed from the type in the more slender form of the intermediate and lateral spines of the telson. The specimens before me stand in this respect between the type and the said variety; particularly the three smaller individuals (59-64 mm. in length) seem to be nearer the var. *dentata* than to the typical species.

Locality.—Five males from Kagoshima.

13. **Squilla affinis** Berthold.

Squilla oratoria, de Haan, Fauna Japon. Crustacea, p. 223, Pl. LI, fig, 2 (1849)

Squilla nepa, Brooks, Rep. Voy. Challenger, XVI, ii, p. 25 (1886)

Squilla affinis, Bigelow, Proc U. S. Nat. Mus. XVII, p. 538, fig. 22 (1894)

Chloridella affinis, Rathbun, Proc. U. S. Nat. Mus. XXVI, p. 55 (1903).

Colour.—In the live state the ground colour of the body is grayish, besprinkled with minute dark spots. The dorsal surface is marked with brillant colours in the following manner:— The lateral margins and a part of the anterior margin of the carapace is light green; the median carina as well as a part of the posterior margin dark red. Anterior and posterior margins of exposed thoracic and abdominal segments light green, the submedian carinæ reddish, the intermediate carinæ of the abdominal segments partly also reddish. The median tubercles upon the abdominal segments are purple. The telson has the dorsal median crest bluish green, the marginal spines red, the carinæ upon these dark purple, and the secondary spinules bluish green. In the basal segment of the uropod the longitudinal carina is green and the spines of its prolongation reddish, the space between the bases of these spines being light blue. The proximal segment of the exopodite is light green and its marginal spines are red, the distal segment being orange yellow, bordered with dark markings on the inner margin. The corneal region of the eye is brilliantly coloured

with greenish black. Antennules and antennae are marked with bands of light red and light black; the antennal scales are light blue with a yellow tint near the extremity. The raptorial limb is also coloured blue and orange. There is no sexual difference in colour,

Locality.—One male from Tokyo; one female from Prov. Sagami; several males and females from Prov. Harima; two males and one female from Oita, Prov. Bungo; two males and one female from the Ogasawara Islands; one male and two females from Formosa; one male from the Pescadores Islands; and three males and females from unknown locality.

14. **Squilla costata** de Haan.

Squilla costata, de Haan, Faun. Japon. Crustacea, p. 223, Pl. LI, fig. 5 (1849).—Miers, Ann. and Mag. Nat. Hist. (5) V, p. 21 (1880).

Chloridella costata, Rathbun, Proc. U. S. Nat. Mus. XXVI, p. 55 (1903).

Locality.—One male from Misaki.

Explanation of Plate IV.

Fig. 1. *Protosquilla brooksii* de Man. Dorsal view of the last three segments, ♀. ×3.

Fig. 1 a. Lateral view of the last four segments of the same specimen. ×3.

Fig. 2. *Gonodactylus spinosocarinatus* n. sp., ♀. ×4.

Fig. 2 a. The last two segments of the same specimen. ×8.

Fig. 3. *Lysiosquilla maculata* (Fabricius). Dactylus of the right raptorial limb, ♀. ×1.

Fig. 4. *Lysiosquilla crassispinosa* n. sp., ♀. ×1/2.

Fig. 4 a. Female genital opening of the same specimen. ×1.

On a New Species of Corymorpha from Japan (*C. tomoensis*).

BY

Dr. Iwaji Ikeda.

Higher Normal School, Hiroshima.

(*With Plate V*).

During a short stay, in September of 1907, at Tomo in the Province of Bingo, about fifty specimens of a solitary hydroid of the genus *Corymorpha* were collected by me by means of a trawl. Through assistance of Mr. A. Izuka of the Tokyo Imperial University and of Dr. H. B. Torrey of the California University, I was enabled to ascertain that this form is new to science. It is my pleasant duty here to express my hearty thanks to both the gentlemen for their kindness rendered me. I also owe a great obligation to Mr. Arii, post-graduate of the Hiroshima normal school, who assisted me not only in collecting the material but also in investigating the mode of budding, the discovery of which should be credited to him.

Corymorpha tomoensis n. sp.

The general aspect of the entire hydrosome (Fig. 1) bears a great deal of resemblance to that of *Corymorpha nutans*.[1] The measurements of the larger individuals in the fresh state are as follows:

Total height of the hydrosome ..... 40–50 mm.
Height of the hydranth ..... 8–10 mm.
Maximum breadth of the hydranth ..... 4.5 mm.
Maximum breadth of the hudrocaulus ..... 3–4 mm.

According to Allman's description, *C. nutans* seems to be a little

1) Allman, G. J.,—A. Monograph of the Gymnoblastic or Tubularian Hydroids. (1871).

larger than the present species, as the hydrocaulus of the former is said to be 2–3 inches (50–75 mm) long and 2 lines (4. 5 mm) thick in the most swollen parts. As to the colouration of the hydrosome, the present species differs remarkably from any of the species hitherto known. The ground colour is light pink, as in some other species *e. g.*, *C. nutans* and *C. pendula* Ag.[1] but differing in this respect from *C. carnea* Clarke[2] (coral-red) and also from *C. nana* Alder[3] (white or yellowish). On the swollen part of the hypostome, on the hydranth-basis, and along the boundary between the non-papillated upper and the papillated lower regions of the hydrocaulus, a deep pink colour with a yellowish tint is prominent. A fine streak of the same color is found on the inner side of each proximal tentacle. Numerous small round or elliptical spots of a light red colour are scattered over the non-papillated region of the hydrocaulus, more thickly in the lower half of this region. The general features and characteristic color-markings of the hydrosome may be seen in fig. 1, which represents one of the larger specimens drawn from life. Here it must be noted that the proportion of the different regions of the hydrocaulus is not always the same as is shown in the figure But the figure will give a fairly good idea of an average individual fully expanded. The filament-tuft borne by the proximal bulbous end of the hydrocaulus is represented in the figure in a greatly reduced state

Hydranth. In the majority of the larger specimens the hydranth is 8–10 mm. in diameter at the base. The proximal tentacles, 38–40 in number and 12–15 mm. long, are arranged in a single circlet. In the number of the tentacles the species agrees well with *C. carnea.* The distal tentacles are much shorter, more slender and more numerous (about 70) than those just mentioned, and are arranged in 6–7 verti-

1) Agassiz,—Contributions to the Natural History of the United States. (Vol. 4, 1862).

2) Clarke, S. F.,—The Hydroids of Alaska (published by the Academy of Natural Sciences in Philadelphia), 1872; An Alaskan Corymorpha-like Hydroid. (Proc. of the U. S. Nat. Mus., vol. 26, 1903).

3) Hincks, T.,—A History of the British Hydroid Zoophyte. (London, 1868).

ciles as in *C. nutans*. The gonosomes, which arise from the hyposomal basis just above the proximal tentacular row, are comparatively long (7-10 mm.) and slightly thicker than proximal tentacles. They are not very contractile, so that they remain almost unchanged in length after being killed. The number of the gonosomes vary to some extent according to age of the hydroid; in the larger individuals it ranges from 8 to 15. They are arranged in a single circlet. All the specimens examined by me possessed 8-11 medusa-bearing gonosomes, the rest being still rudimentary and devoid of medusæ. The number and arrangement of the above organ clearly distinguish the species from its nearst from, *C. nutans*, which has 15-20 gonosomes arranged in two alternate rows. The stem of a full grown gonosome gives off 10-15 short branches, which all lie on the outer side of the stem in two alternate rows. To the free end of such a side branch a certain number of medusoid gonophores are attached in a cluster. The latter are in quite various stages of development (fig. 2), some being simple bud-like prominences, others being bell-shaped, and still others already bearing a single tentacle. The general shape of the umbrella resembles considerably that of *C. palma* Torrey,[1] but the manubrium is nearly as long as the umbrella. Some old medusae still in attachment have the mouth and long, somewhat moniliform tentacles, but seem to be destitute of gonads. Unfortunately such advanced medusae dropped off and were lost when killed.

As is the case with other *Corymorpha* species as well as with *Branchiocerianthus* and many tubularian hydroids, the hydranth-cavity is divided into an upper and a lower, less spacious compartment (fig. 3, *hp. c.* and *l. h. c.*). The two cavities communicate with each other, as was pointed out by Allman in *C. nutans*, by means of a narrow vertical passage. This canal-like passage is produced, it may be said, by an extensive development of the thick parenchymatous tissue (*p. t.*)

1) Torrey H. B.,—Biological Studies on Corymorpha; II The Development of C. palma from the Egg. (Univ. of Calif. Public., Zool., vol. 12, 1907).

roofing the lower cavity. The septal structures separating the two hydranth-cavities as also that which separtes the lower hydranth-cavity from the hydrocaulus-cavity, are essentially the same as in *Tubvloria* and *Branchiocerianthus*. The upper septum is supported interiorly by a membraneous sheet of the mesogloea arising from that of the body-wall just inside the row of proximal tentacles. The upper surface of the septum is lined by the glandular endoderm, while the lower surface, *i. e.*, the roof of the lower cavity, is made up of the parenchymatous endoderm. The latter projects in the middle of the upper surface of the septum in the form of a small protuberance. The lower septum, or the perforated membrane of Torrey, and its mesoglœal support are far less developed than the upper septum and its supporting membrane respectively. The upper surface of the septum is lined by a thin sheet of pacenchyme. Thus, both the channel and the lower hydranth-cavity differ from those of *C. nutans*, as described by Allman in being lined entirely by parenchymatous, instead of glandular, endoderm. In the present species the glandular endoderm is, so far as concerns the hydranth, confined to the hypostomal cavity and its gonosomal prolongation (fig. 3, *gs.*). The glandular endoderm forming the floor of the hypostomal cavity is always radially folded so as to produce a large number of ridges arranged with some regularity in relation to proximal tentacles.

Apparently peculiar to the present form is a structure, which is found in the hypostomal endoderm and which produces certain free cells (Fig. 3, *l. gl.*). It is situated between the gonosomal and tentacular (proximal) rows in the form of a narrow ring measuring about 0.11 mm. in breadth. The zone is easily detected in sections as a remarkably thin and highly stainable epithelium. Under a high power of the microscope one finds that the epithelium here consists of a compact mass of polygonal cells of a remarkably small size (7 μ in diameter) and having finely granular and highly staining cytoplasm. Those cells lying in contact with the mesogloea are somewhat taller

and are arranged in a more or less regular row, while those in the mass are polygonal owing to mutual pressure (fig. 4). further, the cells near the free surface are roundish and loosely aggregated; and those most internally situated are quite free, presenting a spherical shape. Free cells of strikingly similar nature to those just mentioned are found not only in the vicinity of the glandular epithelium, but also in a large number in every part of the hydranth-cavity, in gonosomal-cavities as well as in longitudinal canals of the hydrocaulus. All these free cells are readily distinghuishable from ordinary tissue-cells by their small size and their remarkably small nucleus. Nevertheless, the nucleus is structurally quite the same as that of tissue-forming cells, *i. e.*, it has a distinct nuclear membrane, peripheral chromatin granules, and a central nucleolus. Thus there is little doubt that the wandering cells referred to are derived, so to say, budded off, from the zone of the modified epithelium in question, Most wandering cells, especially those in the hyposomal cavity, are found to differ slightly from the cells composing, or in the vicinity of, the formative epithelium, in being of a larger size and in showing a feebler staining capacity. Judging from the results of differential staining, it is plain that the swelling of the wandering cells is apparently due to imbibition of fluid, which accumulates in the narrow space between the pellicle and the periplasma. The cytoplasm of such wandering cells is also characterized by containing a few minute granules of a brown color. Various sorts of such cells, which I take to represent degenerating stages, are abundantly met with in the hypostomal cavity mingled with food detritus. Although I take it for certain that the modified epithelium of the hypostomal endoderm gives rise to those wandering cells, yet it is altogether uncertain whether or not the cells arise by mitosis from the epithelial cells, since division figures have not been met with in any part of the structure in both adult and young individuals.

Hydrocaulus. The hydrocaulus becomes gradually narrower to-

wards the hydranth-basis and thicker towards the bulbous end invested with filaments. Its non-papillated and papillated parts are externally sharply demarkated from each other by the characteristic colored ring. A close examination reveals the fact that the boundary corresponds with the lower end of the perisarc, which is found in the papillated region. The relative lengths of the two regions vary a great deal with the state of contraction of the parts; when fully extended, the non-papillated region makes up nearly one-third the length of the entire hydrocaulus. The ten longitudinal canals are seen through the integument. Anastomosis between these canals is not so frequent as in *C. nutans*, *C. pendula* or *C. nana*; it occurs in the non-papillated region at four or five places at most, and most frequently near its lower end. The papillae are arranged nearly in the same way as in other known forms, forming, as they do, two apparently alternating longitudinal rows along each canal. Their number and the mode of distribution vary considerably with different individuals; generally speaking, they are most thickly and regularly distributed in the middle part of the papillated region, though in many individuals they may be found uniformly over the greater part of the papillated region. The papillæ become gradually larger and taller downwards, and finally at the cuticular bulb they take the form of moderately long threads ending with a small swelling.

As to the internal anatomy of the hydrocaulus, there is little to be added to the observations of previous writers. The ten longitudinal canals coalesce anteriorly into a common cavity, the central space of which is occupied by a parenchymatous mass. The outer endodermal wall of the longitudinal canal consists of a single layer of conspicuously tall epithelial cells, while all the remaining parts consist of the parenchyme. It is to be noted that the epithelial cells contain numerous spherical granules which are uniformly scattered throughout the finely granular cytoplasm.

It need scarcely be mentioned that the papillæ consist of

three layers, the ectoderm, the endoderm and the mesoglœa ; they are nothing other than outbulgings of the body-wall. In a quite small papilla, the cytoplasm of the ectodermal cells is homogeneously granular ; the outer part of it stains considerably deeper. The mesoglœa is only feebly developed as compared with that of the general body-wall. Inside the mesogloea is a sigle row of endodermal cells which proximally pass over insensibly into the epithelium of longitdinal canals. At the apex of papillae we find a narrow space which invariably shows a flattened endodermal cell closely applied to the mesoglœa. The same space is found also in the more elongated papillæ. As the papilla grows longer, ectodermal cells with much cytoplasm become restricted to the tip only, they being replaced in other parts by those with coarsely reticulated cytoplasm. The axial endodermal cells become more vacuolated towards the basis of papilla. Finally let it be only added that ectodermal cells differ greatly in their character in the papillated and non-papillated regions, as has already been observed by other writers.

To compare the present form with other species of the genus :

1). *Corymorpha nutans* Sars is undoubtedly more closely allied to the present species than any others. However, several important points of difference are to be noticed : in coloration of the hydrosome, the number of proximal tentacles, the number and arrangement of gonosomes, the shape of the medusa-umbrella, the mode of anastomosis of longitudinal canals in the hydrocaulus, *etc.*

2). *Corymorpha nana* Alder differs markedly from the present species in being of a diminutive size and of a white or yellowish color, in the less number of tentacles of both sorts (16-18 distal tentacles in two imperfect rows and 15-20 proximal tentacles), and in sessile or unbranched gonosomes.

3). *Corymorpha carnea* Clarke differs from the present species in being of a coral-red color and in having about 30 gonosomes.

Also in other respects, the two species differ widely from each other. *C. carnea* may be said to resemble more closely the next species.

4). *Corymorpha pendula* Agassiz is distinguished from the present species by its bright color, by the gonosomes numbering about 30, and by the more frequently anastomosing longitudinal canals of hydrocaulus.

5). *Corymorpha palma* Torrey exhibits several noticeable peculiarities which are not found in the present species; for instance, the nearly colorless hydrosome, proximal tentacles numbering less than 30, the medusa devoid of any tentacle and having a manubrium of considerable length (at least twice as long as the height of umbrella), *etc.*

6). *Corymorpha appeloefi* Bonnevie[1] is a remarkable form with rudimentary tentacles

Budding in Corymorpha tomoensis.[2]

While Mr. Arii was examining some preserved specimens of *C. tomoensis* he discovered among the tangled mass of the filaments of basal bulb a very small individual (fig. 5), which in a degree resembled the adult *Corymorpha*. Later careful search has led to the discovery of some thirty small individuals in various stages of development. Fig. 5 represents the youngest stage with four distal and seven proximal tentacles; fig. 6 a much more advanced stages provided with ten distal and seventeen proximal tentacles.

Whether or not these young animals were really those budded off from the adult *Corymorpha*. was a question of high interest to me. In vain have I tried to get information on the subject from the literature. Dr. Torrey of the California University has kindly informed me that he also had often observed similar small animals attached to the filaments of adults, but was inclined to believe that they were always

1). Bonnevie, Kr.,—Hydroiden (Meeresfauna von Bergen, 1901); in Zool. Centralbl., Jahrg. 8, 1901, pp. 464-465.

2). The fuller account of the budding will be published later.

simply attached to the filaments. It is, indeed, a very difficult task to trace a bud-bearing filament to the adult hydrocaulus, because of the entangled condition of the delicate filaments. Nevertheless, I was lucky enough to have observed indubitable cases of organic connection existing between the bud and the filament of the mother animal. However, owing to the very delicate nature of the bud-filaments, the buds easily fall off while handling, so that I have not been able to sketch one standing in direct continuity with a filament of the adult. As is the case with ordinary full grown filaments, the greater part of a bud-bearing perisarc is usually nearly quite empty. Sometimes the slender perisarc tube adjoining the bud is seen to give off a few delicate filamentous processes (fig. 6.) and to contain remnants o disintegrated cœnosare in the form of wavy or discontinuous solid cords of varying thickness (fig 7).

In order to observe the budding in a more conclusive way, I went last April to Abutozaki, where in September 1907 *Corymorpha tomoensis* was found in abundance. Unfortunately, all my efforts to rediscover the species were in vain, not coming across even a single specimen. According to the fisherman who accompanied me, Mr. Owatari, Professor of Biology in the Okayama Higher School should have collected in July 1908 a large number of specimens of the species at a spot near Kajiko Island and about 7 miles off to east of Tomo. The majority of his specimens were said to have been much smaller than those collected by me before at Abutozaki in the month of September. Kajiko-Island was also visited by me during April last, but an entire day's search ended without bringing a single specimen under observation. After all my experience I am inclined to assume that the hydrosome annually perishes, probably during the winter.

Should the filamentous appendices on the hydrocaulus of *Corymorpha* be homologous with the creeping hydrorhiza of other forms as Torrey asserts [1], the budding from the filaments seems to fall in the

1. H. Torrey; The Hydroids of the Pacific Coast of North America, 1902, p. 43.

ordinary category of Hydrozoan asexual reproduction.

Judging from the stages I have collected, the buds of the present species may be said to be practically of the same structural plan as *Corymorpha palma* described by Torrey. It is very much to be regreted that the present investigation could not be extended to the early stages of the bud development.

The earliest stage (fig. 5) that came under my observation is about 1.3 mm. long. It already shows the definitive shape of a hydrosome; both the hydrocaulus and hydranth are well diffenentiated. The former is, as already remarked, provided with four distal and seven proximal tentacles, but is as yet without any gonosomal rudiment; the latter shows four longitudinal canals each ending proximally with a rudimentary papilla. Sections of the stage show conditions sumilar to what Torrey has described of the corresponding stage of young *C. palma*. The hydranth-cavity is alredy divided into the upper (hypostomal) and the lower cavity by the characteristic endodermal septum; also a second septum, the fenestrated membrane of the adult, is already present but is not yet perforated. A point worth mentioning is that even in such an early stage there is the rudiment of the free-cell forming structure located just above the insertion of the septum. There one notices a narrow zone (about 20 μ in width) of the hypostomal endoderm, which is represented by a remarkably thin epithelium (about 6μ thick) consisting of a row of cubical and deeply staining cells (5-7 in a longitudinal section). As the buds grow larger, both sorts of tentacles gradually increase in number; so also the longitudinal canals and the papillæ on hydrocaulus. In an intermediate stage bearing seven distal and fourteen proximal tentacles, a single gonosome was found in the incipient condition, there being present the definitive mouth and the perforated membrane while the longitudinal canals numbered as yet only four. The rudiment of the lymphoid structure remians in this stage, in nearly the same state as in the youngest stage observed by me,

excepting that the constituent cells have become slightly taller and more numerous. The oldest development alstage obtained is represented in fig. 6. It measures about 2.5 *mm.* in length, and shows essenltialy the same feature as the adult; six gonosomal prominences, the upper hydranth-septum and the lower fenestrated membrane, have come into more distinct existence; the longitudinal canals have much increased in number (at least 8), and the most proximally situated papillæ have assumed a filamentous shape. The first indication of the increase in thickness is seen at this stage in the epithelium of the future free-cell forming struture. Fig. 8 represents a portion of a sagittal section through the hydranth of the oldest bud; in it the epithelium in question is seen as a layer two-cells thick, which is sharply differentiated from other cells of the endoderm by its deeply staining capacity.

Zoological Laboratory,
Higher Normal School, Hiroshima.
May, 1909.

Explanton of Plate V.

Fig. 1. A full-grown hydrosome. Enlarged 1 $^1/_2$ times.

Fig. 2. A side-branch of gonosome bearing a cluster of medusoid buds in various stages of development. Greatly magnified.

Fig. 3. Semidiagrammatic representation of the median longitudinal section of the hydranth and of a part of the hydrocaulus, Greatly magnified.

d. t., distal tentacle; end. c., endodermal core; g. s, gonosome; hy. c., hypostomal cavity; l c. longitudinal canal of hydrocaulus; l. gl., lymphoid gland; l. h. c., lower hydranth-cavity; p. t., proximal tentacle; p. y., parenchyme; u. h. c., upper hydranth-cavity.

Fig. 4. A small portion of a section of the lymphoid struture of an adult animal. Highly magnified.

Fig. 5. Youngest bud observed, with four distal and seven proximal tentacles.

Fig. 6. Oldest bud observed, with ten distal and seventeen proximal tentacles; already provided with six gonosomal rudiments.

Fig. 7. Magnified view of a stained hydrocaulus close to the free end of hydrocaulus.

Fig. 8. A small portion of the median longitudinal section of the hydranth wall of the bud represented in Fig. 6. Highly magnified.

ect., ectoderm; end., endoderm; l. gl., lymphoid gland; sp, septum.

Synopsis der Japanischen Hirudineen, mit Diagnosen der Neuen Species.

VON

Asajiro Oka.

In Nachstehendem gebe ich eine Übersicht der sämtlichen japanischen Hirudineen, soweit sie mir bekannt sind, um eine leichte Identifizierung und bequeme Verzeichnung dieser Tiere bei faunistischen Forschungen zu ermöglichen. Als Unterscheidungsmerkmale habe ich, im Gegensatz zu fast allen neueren Autoren, die Somitengrenzen nicht in Betracht gezogen, denn diese gehören bekanntlich bei unseren Tieren zu denjenigen Charakteren, die nicht ohne Weiteres erkannt werden können, sondern erst durch eingehende anatomische Untersuchung festgestellt werden müssen. Eine genaue Darstellung der äusseren Morphologie, des Metamerismus, der Ringelbildung und der Homologie der Körperregionen bei den Hirudineen gedenke ich in Bälde an anderm Ort zu publizieren.

Im Ganzen sind mir zur Zeit 31 Arten und 3 Varietäten bekannt. Davon sind 11 Arten bereits beschrieben, während 6 andere zu bekannten Species gehören, obwohl ihr Vorkommen in Japan noch nirgends erwähnt worden ist. Neu für die Wissenschaft sind die übrigen 14 Arten und 3 Varietäten.

Ich ergreife die Gelegenheit, allen Freunden und Fachkollegen, die mich durch Übersendung von lebendem resp. konserviertem Material in meinen Studien unterstützt haben, meinen verbindlichsten Dank auszusprechen.

Die Hirudineen lassen sich in folgende 3 Unterordnungen und 5 Familien einteilen:

A. Somite in vorderem Körperteil mit Haken versehen .. .. Subordo ACANTHOBDELLÆ.

Mit einer einzigen Familie .. Fam. ***Acanthobdellidæ.***

B. Sämtliche Somite ohne Haken

a. Schlund mit vorstreckbarem Rüssel .. .. Subordo RHYNCHOBDELLÆ.

α. Süsswasserformen mit abgeflachtem Körper, vielfach auf Mollusken schmarotzend .. .. Fam. ***Glossiphonidæ.***

β. Meeresbewohner (mit wenigen Ausnahmen) mit verschieden gestaltetem Körper, in der Regel auf Fischen schmarotzend : .. .. .. Fam. ***Ichthyobdellidæ.***

b. Schlund ohne vorstreckbaren Rüssel .. .. Subordo GNATHOBDELLÆ (Syn. *Arhynchobdellæ* BLANCHARD)

α. Schlund ohne bezahnte Kiefer, Augen 2–8 .. .. Fam. ***Herpobdellidæ.***

β. Schlund mit bezahnten Kiefern, Augen 10 (oder 8) .. .. Fam. ***Hirudinidæ.***

Die Familie Acanthobdellidæ mit der einzigen Species *Acanthobdella peledina* GRUBE ist bisher in Japan nicht beobachtet worden.

Fam. ***Glossiphonidæ.***

Syn. *Clepsinidæ.*

Diagnose: Körper abgeflacht, nicht in Regionen geteilt; Haut glatt oder mit Papillen; vorderer Saugnapf an der Rückenseite geringelt, nicht vom Körper gesondert; hinterer Saugnapf deutlich abgesetzt, bauchständig; Augen 2–8; es gehen 3 Ringe auf 1 Somit. Süsswasserbewohner, meist auf Mollusken, selten auch auf anderen Tieren schmarotzend.

Diese Familie ist durch folgende 3 Gattungen vertreten: *

* In dieser und folgenden Tabellen sind die in Japan nicht vorkommenden Gattungen und Arten nicht berücksichtigt.

A. Mit einer Chitintasche an der Rückenseite des Halses .. .. Gen. ***Helobdella.***

B. Ohne Chitintasche an der Rückenseite des Halses

a. Kopfscheibe nicht breiter als Hals .. .. Gen. ***Glossiphonia.***

b. Kopfscheibe breiter als Hals.. .. Gen. ***Hemiclepsis.***

Gen. ***Helobdella*** BLANCHARD 1896.

Syn. *Glossiphonia* JOHNSON 1816 (partim).

Clepsine SAVIGNY 1820 (partim).

Diagnose: Körper klein, Vorderteil schlank; Papillen nicht deutlich; Augen 2; eine Chitintasche an der Rückenseite des Halses.

Von dieser Gattung kommt nur eine Species vor: .. ***H. stagnalis.***

1. Helobdella stagnalis (LINNÉ) 1758.

Syn. *Hirudo stagnalis* LINNÉ 1758.

Clepsine bioculata CARENA 1820.

Fundort. Hondō, Shikoku, Kyūshū, Hokkaidō. Ziemlich häufig.

Gen. ***Glossiphonia*** JOHNSON 1816.

Syn. *Clepsine* SAVIGNY 1820.

Diagnose: Körper klein bis mittelgross, Haut glatt oder mit regelmässig angeordneten Papillen; vorderer Saugnapf nicht breiter als Hals; Augen 4 oder 6; Blindsäcke des Magens nicht verzweigt.

Hierher gehören folgende 3 Arten:

A. Augen 4 .. .. ***Gl. smaragdina.***

B. Augen 6

a. Augen in 2 Längsreihen angeordnet .. .. ***Gl. complanata.***

b. Augen in 3 Gruppen zu je 2 gestellt.. .. .. ***Gl. lata.***

2. Glossiphonia smaragdina n. sp.

Diagnose: Körper klein, meist von schöner grüner Farbe; Rücken mit schwach entwickelten Papillen; Augen 4, auf zwei benachbarten Ringen gelegen, die des vorderen Paares sehr klein, die hinteren ziemlich gross, derart angeordnet, dass die Augen derselben Seite dicht beisammen sind. Länge 10–13 mm, Breite 3–4 mm.*

Fundort. Hondō (Tokio, Shimizu, Gifu), Shikoku (Tokushima). Ziemlich häufig.

3. Glossiphonia complanata (LINNÉ) 1758.

Syn. *Hirudo complanata* LINNÉ 1758.
Clepsine complanata SAVIGNY 1820.
Glossiphonia sexoculata MOQUIN-TANDON 1846.

Fundort. Hondō, Shikoku, Kyūshū. Sehr häufig.

4. Glossiphonia lata n. sp.

Diagnose: Körper mittelgross, abgeflacht, wenn zusammegezogen fast so breit wie lang, weisslich, mit spärlich auftretenden schwärzlichen Längsstreifen; Rücken mit deutlichen Papillen, diejenigen an der Mittellinie eine kielartige Längsreihe bildend; Kopfscheibe klein; Augen 6, gleich gross, derart gestellt, dass sie 3 Gruppen zu je 2, eine vordere mediane und zwei hintere laterale, bilden. Länge 12–13 mm, Breite 6–6½ mm.

Fundort. Hondō, Shikoku (Tokushima).

Anmerkung. Die eigentümliche Augenstellung teilt diese Species mit der in Europa weit verbreiteten *Glossiphonia heteroclita*, von welcher sie sich sowohl durch die gut entwickelten Rückenpapillen, wie auch durch die bedeutend breitere Körpergestalt sofort unterscheiden lässt.

---

* Die Masse beziehen sich auf grössere, in nicht kontrahiertem Zustande konservierte Exemplare der betreffenden Species.

Gen. ***Hemiclepsis*** VEJDOVSKY 1883.

Syn. *Glossiphonia* JOHNSON 1816 (partim).

Clepsine SAVIGNY 1820 (partim).

Diagnose: Körper mittelgross, Rücken glatt oder mit deutlichen Papillen; Kopfscheibe breiter als Hals, wenigstens bei japanischen Arten; Augen 2–8; Blindsäcke des Magens verzweigt.

Zu dieser Gattung gehören folgende 2 Arten:

A. Rücken grünlichgrau, Papillen deutlich, Augen 4 .. .. ***H. marginata.***

B. Rücken rötlichbraun mit weissen Längs- und Querstreifen, Papillen nicht deutlich, Augen 2 .. .. ***H. kasmiana.***

5. **Hemiclepsis marginata** (O. F. MÜLLER) 1774.

Syn. *Clepsine marginata* F. MÜLLER 1884.

Fundort. Hondō (Tokio, Gifu).

6. **Hemiclepsis kasmiana** n. sp.

Diagnose: Körper keulen- oder spindelförmig, nur wenig abgeflacht; Rücken glatt, rötlichbraun mit weissen Längs- und Querstreifen; Augen 2; Kopfscheibe breiter als Hals, deutlich abgegrenzt. Auf *Dipsas* und *Anodonta* schmarotzend. Länge 12–13 mm, Breite 3–4 mm.

Fundort. Hondō (Kasumiga-Ura, Owari, Bizen).

Fam. ***Ichthyobdellidae.***

Diagnose: Körper länggestreckt, zylindrisch bis abgeflacht, meist deutlich in Hals und Rumpf geschieden, letzterer vielfach mit Seitenanhängen versehen; Augen fehlend oder in verschiedener Anzahl vorhanden; vorderer Saugnapf meist deutlich abgesetzt und nicht geringelt, hinterer Saugnapf endständig. Mit Ausnahme einer Gattung

Meeresbewohner, auf Fischen, selten auch auf anderen Tieren schmarotzend.

In diese Familie gehören folgende 7 Gattungen:

A. Somite aus 2, 3, 5 oder 6 Ringen bestehend

a. Ohne Seitenanhänge

α. Haut warzig, Hals nicht deutlich gesondert, hinterer Saugnapf klein .. .. Gen. ***Pontobdella.***

β. Haut glatt, Hals deutlich gesondert, hinterer Saugnapf gross .. .. Gen. ***Ichthyobdella.***

b. Mit deutlichen Seitenbläschen

α. Somite aus 5 Ringen bestehend, Körper abgeflacht .. .. Gen. ***Trachelobdella.***

β. Somite aus 6 Ringen bestehend, Körper meist zylindrisch .. .. Gen. ***Callobdella.***

c. Mit büschelförmigen Kiemenanhängen .. .. Gen. ***Ozobranchus.***

B. Somite aus 12–14 Ringen bestehend

a. Meeresbewohner, meist auf Krabben schmarotzend.. .. .. Gen. ***Carcinobdella.***

b. Süsswasserformen, auf Fischen schmarotzend .. .. Gen. ***Piscicola.***

Gen. ***Pontobdella*** LEACH 1815.

Diagnose: Körper langgestreckt, spindelförmig oder zylindrisch; Haut warzig; Hals und Rumpf nicht deutlich gesondert; vorderer Saugnapf nur mässig gross, kreisförmig, deutlich abgesetzt, nicht geringelt; hinterer Saugnapf klein, endständig, meist kleiner als der vordere; Augen fehlen; es gehen 3 Ringe auf 1 Somit. Meeresbewohner.

Diese Gattung enthält folgende 3 Arten:

A. Haut stark warzig

a. Vorderer Saugnapf nicht gefleckt.. .. .. ***P. moorei.***

b. Vorderer Saugnapf mit zwei grossen dunkelroten Flecken .. .. ***P. bimaculata.***

B. Warzen nur schwach entwickelt .. .. ***P. tatejamensis.***

7. **Pontobdella moorei** n. sp.

Diagnose: Körper spindelförmig, Mitte der hinteren Körperhälfte am dicksten, gelblich; Warzen stark entwickelt, mit je 7–10 Papillen an der Spitze; vorderer Saugnapf kreisrund, mit glattem Rande; hinterer Saugnapf klein; Somite aus 3 gleich breiten Ringen bestehend. Schmarotzt auf Haifischen. Länge 12–14 cm, Breite 13–14 mm.

Fundort. Hondō (Küste von Sagami, Awa).

Anmerkung Diese Species lässt sich von der einzig sicher bekannten Art dieser Gattung, *P. murricata*, der sie auf den ersten Blick ähnlich aussieht, durch das Fehlen der schmalen interkalierten Ringe leicht unterscheiden.

8. **Pontobdella bimaculata** n. sp.

Diagnose: Körper langgestreckt, zylindrisch, gelblich; Warzen wohl entwickelt; vorderer Saugnapf kreisrund, am Rande mit 6 in gleichen Abständen angebrachten Wärzchen versehen; auf Rückenseite des vorderen Saugnapfes zwei grosse, wie riesige Augen erscheinende dunkelrote Flecke; hinterer Saugnapf wenig grösser als der vordere. Schmarotzt auf Haifischen. Länge 3–4 cm, Breite 3–4 mm.

Fundort. Hondō (Küste von Sagami, Awa).

9. **Pontobdella tatejamensis** n. sp.

Diagnose: Körper langgestreckt, spindelförmig, hintere Körperhälfte meist bauchartig aufgetrieben, rötlichbraun bis dunkelgrün; Warzen nur schwach entwickelt; beide Saugnäpfe klein; Andeutung von Seitenbläschen äusserlich erkennbar. Schmarotzt auf Knochenfischen. Länge bis 2 cm, Breite bis 3 mm.

Fundort. Hondo (Küste von Awa, Suruga, Sagami).

Gen. ***Ichthyobdella*** DE BLAINVILLE 1827, emend.*

Diagnose: Körper zylindrisch bis abgeflacht, deutlich in Hals und Rumpf gesondert, ohne Seitenanhänge; Haut glatt oder fein gerunzelt; Saugnäpfe gross, deutlich vom Körper abgegrenzt, hinterer Saugnapf bedeutend grösser als vorderer; Augen 6, mindestens bei allen japanischen Arten; 6 äussere Ringe entsprechen zusammen 1 Somit. Meeresbewohner.

Zu dieser Gattung gehören folgende 3 Species:

A. Körper mehr oder minder abgeflacht, Rumpfsomite unregelmässig quer gerunzelt . . . . . ***I. uobir.***

B. Körper zylindrisch, Rumpfsomite deutlich geringelt

a. Körper weisslich, 2 Ringe zwischen 2. und 3. Augenpaare . . . . . ***I. pagri.***

b. Körper rötlichbraun mit weissen Längs- and Querstreifen, 1 Ring zwischen 2. und 3. Augenpaar . . ***I. virgata.***

10. Ichthyobdella uobir n. sp.

Diagnose: Körper etwas abgeflacht, weisslich, weder mit Flecken noch Streifen; Rumpfsomite unregelmässig quer gerunzelt; vorderer Saugnapf scheibenförmig, an der Rückenseite undeutlich geringelt; hinterer Saugnapf halbkugelförmig, gegen den Körper durch Abschnürung deutlich abgegrenzt; Augen 6, in 2 Längsreihen. Schmarotzt auf Knochenfischen. Länge 4–4.5 cm, Breite 6–7 mm.

Fundort. Hondō (nördlicher Teil), Hokkaidō, Kurilen.

11. Ichthyobdella pagri n. sp.

Diagnose: Körper zylindrisch, weisslich, weder mit Flecken noch

* Die Gründe, weshalb ich diesen wie auch die zwei folgenden Gattungnamen, die von manchen Autoren als Synonymen betrachtet werden, aufrecht halte, werde ich an anderm Ort angeben.

Streifen; vorderer Saugnapf scheibenförmig, an der Rückenseite undeutlich geringelt; hinterer Saugnapf kreisförmig, Ansatzstelle nicht geschnürt; Augen 6, in 2 Längsreihen angeordnet, 2 Ringe zwischen dem 2. und 3. Augenpaar. Schmarotzt auf Knochenfischen (*Pagrus major*).

Fundort. Hondō (Tokio-Bai), Shikoku (Matsuyama). Selten.

12. **Ichthyobdella virgata** n. sp.

Diagnose: Körper zylindrisch, Rücken rötlichbraun, mit 5 weissen Längsstreifen und somitenweise sich wiederholenden weissen Querstreifen; beide Saugnäpfe kreisförmig, deutlich abgegrenzt; Augen 6, in 2 Längsreihen angeordnet, 1 Ring zwischen dem 2. und 3. Augenpaar. Schmarotzt auf Knochenfischen. Länge 3.5–4 cm, Breite 4 mm.

Fundort. Hokkaidō, Kurilen, Sachalin.

Gen. ***Trachelobdella*** DIESING 1850, emend.

Diagnose: Körper abgeflacht, deutlich in Rumpf und Hals gesondert; Haut fein gerunzelt; Rumpf mit 13 Paaren Seitenbläschen, deren Grösse sich nach hinten zu stets abnimmt; Saugnäpfe klein; es gehen 5 Ringe, 1 breiterer, 2 mittelbreite und 2 schmalere, auf 1 Somit.

Hierher gehört nur eine Species: .. .. ***Tr. sinensis.***

13. **Trachelobdella sinensis** BLANCHARD 1896.

Diagnose: Körper dunkelbräunlich, weisslich wenn jung; vorderer Saugnapf nicht breiter als Hals, hinterer wenig breiter; Augen 2. Schmarotzt auf Knochenfischen. Länge 10–11 cm, Breite 20–22 m.

Fundort. Hondō (Tokio-Bai, Küste von Awa, Sagami, Kaga).

Anmerkung. Eine genaue Untersuchung von zahlreichen lebenden Exemplaren überzeugte mich, dass die Angabe Blanchard's, es bestehe jeder Somit aus 6 Ringen, auf einem Irrtum beruht. In Wirklichkeit

bestehen die Rumpfsomite aus 1 breiteren, 2 mittelbreiten und 2 schmalen Ringen, welch letztere die Seitenbläschen tragen; so bald als das Tier sich zusammenzieht, tritt eine Querfurche sekundär auf, wodurch der breitere Ring als doppelt erscheint.

Gen. ***Callobdella*** VAN BENEDEN et HESSE 1864, emend.

Diagnose: Körper meist zylindrisch, deutlich in Hals und Rumpf gesondert; Haut glatt oder fein gerunzelt; Rumpf mit 13 Paaren Seitenbläschen, von denen die hinteren nur schwach entwickelt sind; Saugnäpfe nur mässig gross; Augen nicht erkennbar; Somite aus 6 Ringen, 4 breiteren und 2 schmaleren, bestehend. Meeresbewohner.

Hierher gehören folgende 2 Species:

A. Farbe dunkelbräunlich bis dunkelgrünlich, Seitenränder und Seitenbläschen weiss, Haut fein gerunzelt.. .. ***C. livanovi.***

B. Farbe weisslich bis gelblich, Haut glatt .. .. ***C. hastae.***

14. Callobdella livanovi n. sp.

Diagnose: Körper dunkelbräunlich bis dunkelgrünlich; Haut fein gerunzelt; Seitenränder und Seitenbläschen weiss; Rücken- und Bauchfläche meist mit in regelmässigen Abständen gelagerten weissen Punkten geziert. Schmarotzt auf Knochenfischen. Länge 3 cm, Breite 4 mm.

Fundort. Hondō (Tokio-Bai, Küste von Awa, Hiroshima), Hokkadō.

15. Callobdella hastae n. sp.

Diagnose: Körper weisslich oder gelblich, Haut glatt, weder mit Flecken noch Streifen; Ringelfurche deutlich. Schmarotzt auf Knochenfischen (*Chrysophrys hasta*). Länge 3 cm, Breite 3.5 mm.

Fundort. Hondo (Tokio-Bai). Selten.

Gen. ***Ozobranchus*** DE QUATREFAGES 1832.

Diagnose. Körper klein, deutlich in Hals und Rumpf gesondert,

letzterer mit 5 oder 7 Paaren büschelförmiger Kiemenanhänge versehen; Haut glatt; vorderer Saugnapf klein und nicht vom Hals abgegrenzt, auf der Rücken seite geringelt; hinterer Saugnapf gross, halbkugelförmig, deutlich abgesetzt; Somite des Halses aus 2 gleich breiten, die des Rumpfes aus 2 ungleich breiten Ringen bestehend. Schmarotzt auf Seeschildkröten.

Von dieser Gartung ist nur 1 Art beobachtet.. .. .. ***Oz. branchiatus.***

16. Ozobranchus branchiatus (MENZIES).

Syn. *Hirudo branchiata* MENZIES.

Ozobranchus menziesi DE QUATREFAGES.

Fundort. Bonin-Inseln (auf *Chelonia viridis*), Hondō (Küste von Izu, auf *Delphinus*).

Gen. ***Carcinobdella*** nov. gen.

Diagnose: Körper langgestreckt, zylindrisch, nicht deutlich in Hals und Rumpf gesondert; Haut glatt; Saugnäpfe scheibenförmig, nur mässig gross, wohl abgegrenzt; es gehen 14 Ringe auf 1 Somit. Meeresbewohner, meist auf Krabben schmarotzend.

Zu dieser Gattung gehören folgende 2 Arten:

A. Körper gross, Augen fehlen.. .. ..***C. kanibir.***

B. Körper klein, Augen 6.. .. .. ***C. tigrina.***

17. Carcinobdella kanibir n. sp.

Diagnose: Körper von ansehnlicher Grösse, fleischfarbig, mit somitenweise sich wiederholenden bräunlichen Flechen; Augen fehlen. Auf Krabben schmarotzend. Länge 9–10 cm, Breite 7–8 mm.

Fundort. Hondō (Küste von Fukui-Ken, auf *Chionecetes* sp.). Häufig.

18. Carcinobdella tigrina n. sp.

Diagnose: Körper klein, weisslich, mit dunkelbraunen Querstreifen; Augen 6. Auf Knochenfischen schmarotzend. Länge bis 2 cm, Breite 2.5 mm

Fundort. Hokkaidō (Oshoro).

Gen. *Piscicola* de Blainville 1818.

Diagnose: Körper dünn, zylindrisch, nicht deutlich in Hals und Rumpf gesondert; Saugnäpfe gross, Augen 4. Auf Süsswasserfischen schmarotzend.

Diese Gattung ist durch eine einzige, und zwar sehr weit verbreitete und wohl bekannte Art vertreten: .. .. ***P. geometra.***

19. Piscicola geometra (Linné) 1761.

Fundort. Hondō (Tokio, auf Karpfen). Selten.

Fam. *Herpobdellidae.*

Syn. *Nepdelidae.*

Diagnose: Körper langgestreckt, mit ovalem Querschnitt, nicht in Regionen geteilt; Haut glatt, Papillen undeutlich; vorderer Saugnapf nicht vom Körper abgegrenzt, deutlich geringelt; hinterer Saugnapf klein, bauchständig; Schlund ohne bezahnte Kiefer, sondern mit fleischigen Pseudognathen versehen; Augen 2 oder 8; Somite aus 5–11 Ringen bestehend. Süsswasser-oder Landbewohner.

In diese Familie gehören folgende 4 Gattungen:

A. Sämtliche Ringe beinahe gleich breit

a. Augen 8, Somite aus 5 Ringen bestehend.. .. ..Gen. ***Herpobdella.***

b. Augen 2, Somite aus, 4, 6 oder 8 Ringen bestehend.. .. .. Gen. ***Orobdella.***

B. Breitere und schmalere Ringe regelmässig abwechselnd, Augen 2

a. Somite aus 7 Ringen, 3 breiteren und 4 schmaleren, bestehend . . . . . Gen. ***Mimobdella.***

b. Somite aus 9 Ringen, 2 breiteren und 7 schmaleren, bestehend . . . . . Gen. ***Scaptobdella.***

Gen. ***Herpobdella*** DE BLAINVILLE 1818.

Syn. *Nephelis* SAVIGNY 1820.

Diagnose: Somite aus 5 gleich breiten Ringen bestehend; Augen 8, in 2 Querreihen zu je 4 angeordnet. Süsswasserformen.

Hierher gehören 2 Arten, die auch in Europa weit verbreitet sind:

A. Rücken bräunlich oder grünlich, mit Längsstreifen, Geschlechtsöffnungen um $2\frac{1}{2}$ Ringelbreite von einander entfernt . . . . . ***H. atomaria.***

B. Rücken dunkelrötlich, ohne Längsstreifen, Geschlechtsöffnungen um 4 Ringelbreite von einander entfernt . . . . . ***H. octoculata.***

20. Herpobdella atomaria (CARENA) 1820.

Syn. *Hirudo atomaria* CARENA 1820.

Fundort. Hondō, Shikoku, Kyūshū. Diese Art ist überhaupt die häufigst vorkommende Hirudinee in Japan.

21. Herpobdella octoculata (LINNÉ) 1758.

Syn. *Hirudo octoculata* LINNÉ 1758 (partim).

Nephelis vulgaris MOQUIN-TANDON 1826 (partim).

Fundort. Hondō (Nikko, Musashi, Shimizu, Kyoto). Viel seltener als die vorige Art.

Gen. ***Orobdella*** OKA 1895.

Diagnose: Körper meist zylindrisch Augen 2; Somite aus 4, 6 oder 8 gleichbreiten Ringen bestehend. Lebt in feuchter Erde.

Diese Gattung enthält folgende 3 Arten:

A. Somite aus 4 Ringen bestehend.. .. .. ***Or. whitmani.***
B. Somite aus 6 Ringen bestehend.. .. .. .. ***Or. ijimai.***
C. Somite aus 8 Ringen bestehend.. .. .. ***Or. octonaria.***

22. Orobdella whitmani (IJIMA) 1895.

Fundort. Hondo (Tokio, Gifu), Hokkaidō.

23. Orobdella ijimai OKA 1895.

Fundort. Hondō (Nikkō), Kyūshū, Amami-Oshima.

24. Orobdella octonaria OKA 1895.

Fundort. Hondo (Tokio, Hakone, Gifu, Ise).

Gen. ***Mimobdella*** BLANCHARD 1897, emend.

Diagnose: Körper etwas abgeflacht, nach vorn zu allmählich verjüngt, Haut glatt, Papillen nicht deutlich; Saugnäpfe klein; Augen 2; typische Somite aus 3 breiteren und 4 schmaleren Ringen bestehend. Lebt sowohl im Wasser wie in feuchter Erde.

Diese Gattung hat nur einen Vertreter:.. .. ***M. japonica.***

25. Mimobdella japonica Blanchard 1897.

Diagnose: Rücken grünlich bis bräunlich, dunkel marmoriert; Bauch hellrötlich.

Fundort. Hondō (Tokio, Nikkō, Shimizu, Kanazawa, Gifu). Nicht selten.

Anmerkung. Die Angabe Blanchard's, dass jeder typische Somit aus 1 breiteren und 8 schmaleren Ringen bestehe, beruht offenbar auf einen Irrtum, herrührend von dem schlechten Zustande des von ihm untersuchten einzigen Exemplares, das auch die Augen nicht erkennen liess.

Gen. ***Scaptobdella*** BLANCHARD 1897, emend.

Diagnose: Körper zylindrisch oder mehr oder minder abgeflacht; Haut glatt, Papillen undeutlich; Saugnäpfe klein; Augen 2; typische Somite aus 2 breiteren und 7 schmaleren Ringen bestehend. Lebt sowohl in Wasser wie in feuchter Erde.

Diese Gattung ist ebenfalls nur durch eine Species vertreten ... . ***Sc. blanchardi.***

26. Scaptobdella blanchardi n. sp.

Diagnose: Körpergestalt sehr wechselnd, je nach dem Grade der Kontraktion, täuschend regenwurmartig wenn ausgestreckt, dick-zylindrisch oder stark abgeplattet wenn zusammengezogen, wobei die Seitenränder des hinteren Körperteils bei kleineren Exemplaren flossenartig verdünt und wellenförmig geschlängelt erscheinen können; Farbe variabel, bläulich, bräunlich, dunkelrötlich bis fast ganz schwarz, Bauchseite entweder heller oder ebenso dunkel gefärbt als Rücken. Länge 12–15 cm, Breite 10–12 mm.

Fundort. Hondō, Shikoku, Kyūshū, Okinawa. Ziemlich häufig.

Anmerkung. In der Original-Diagnose dieser Gattung giebt Blanchard an "Somitus integer e sex annulis constat, quinto breviori, ceteris inter se aequalibus." Nach meiner Meinung ist die eigentümliche Ringelung dieser Gattung dadurch zu Stande gekommen, dass von dem ursprünglich 5-ringeligen Herpobdella-Somit 2 Ringe sekundär in je 2, und 1 Ring in 3 schmale Ringe geteilt worden sind, was schon aus dem Breitenverhältnisse der einzelnen Ringe sofort zu erkennen ist.

Fam. *Hirudinidae.*

Syn. *Gnathobdellidae* BLANCHARD.

Diagnose: Körper langgestreckt, mit ovalem Querschnitt, nicht in Regionen gesondert; Haut glatt oder mit deutlichen Papillen; verderer Saugnapf nicht vom Körper abgegrenzt, geringelt; hinterer Saugnapf nur mässig gross, bauchständig; Augen 10; Schlund mit

bezahnten Kiefern; Somite stets aus 5 gleich breiten Ringen bestehend. Süsswasser- oder Landbewohner.

In diese Familie gehören folgende 3 Gattungen:

A. 1 Ring zwischen 3. und 4. Augenpaare
  a. 24 Ringe zwischen dem letzten Augenpaar und der männlichen Geschlechtsöffnung .. .. Gen. *Whitmania.*
  b. 22 Ringe zwischen dem letzten Augenpaar und der männlichen Geschlechtsöffnung .. ..Gen. *Hirudo.*

B. 3. und 4. Augenpaare auf benachbarten Ringen .. .. Gen. *Haemadipsa.*

Gen. ***Whitmania*** BLANCHARD.

Syn. *Leptostoma* WHITMAN 1886.

Diagnose: Körper nach vorn allmählich verjüngt, Kopf sehr klein; 24 Ringe zwischen dem letzten Augenpaar und der männlichen Geschlechtsöffnung; Kieferzähne nicht wohl entwickelt. Süsswasserformen.

In dieser Gattung sind folgende 3 Arten und 1 Varietät enthalten:

A Rücken olivengrün oder grau, Körper von ansehnlicher Grösse
  a. Rücken mit 5 dunklen Längsstrefen, Geschlechtsöffnungen in den Ringelfurchen.. .. .. ***Wh. pigra.***
  b. Rücken mit 5 hellen Längsstreifen, Geschlechtsöffnungen auf den Ringen .. .. ***Wh. pigra*** var. ***formosana.***

B. Rücken dunkelgrün, mit einem gelblichen Längsstreifen .. .. ***Wh. edentula.***

C. Rücken bräunlich, mit dunkleren Längsstreifen .. .. ***Wh. acranulata.***

27. **Whitmania pigra** (WHITMAN) 1886.

Syn. *Leptostoma pigrum* WHITMAN 1886.

Fundort. Hondō, Shikoku, Kyūshū. In Teichen und Reisfeldern ziemlich häufig.

27 a. **Whitmania pigra** var. **formosana** nov. var.

Diagnose: Rücken grau, mit 5 hellen Längsstreifen; Geschlechtsöffnungen nicht in den Ringelfurchen, sondern auf den Ringen selbst; sonst mit typischer *Whtimania pigra* übereinstimmend.

Fundort. Formosa (Taihoku).

28. **Whitmania edendula** (WHITMAN) 1886.

Syn. *Leptostoma edendulum* WHITMAN 1886.

Fundort. Hondō, Shikoku, Kyūshū. Nicht selten.

29. **Whitmania acranulata** (WHITMAN) 1886.

Syn. *Leptostoma acranulatum* WHITMAN 1886.

Fundort. Hondō (Tokio, Kasumiga-Ura, Mito). Selten.

Gen. ***Hirudo*** LINNÉ 1758.

Diagnose: Kiefer mit zahlreichen scharfen Zähnen versehen; es befinden sich 22 Ringen zwischen dem letzen Augenpaar und der männlichen Geschlechtsöffnuug. Süsswasserbewohner, saugt an Warmblütern.

Zu dieser Gattung gehören 1 Species und 1 Varietät:

A. Körperlänge his 4 cm, Kopf mehr als halb so breit wie Rumpf . . . . . ***H. nipponia.***

B. Körperlänge bis 8 cm, Kopf weniger als ein Viertel so breit wie Rumpf. . . . . ***H. nipponia*** var. ***jaejamana.***

30. **Hirudo nipponia** WHITMAN 1886.

Fundort. Hondō, Shikoku, Kyūshū, Hokkaidō. In Teichen und Reisfeldern sehr häufig.

30 a. **Hirudo nipponia** var. **jaejamana** nov. var.

Diagnose: Körperlänge bis 8 cm, Kopf bedeutend schmaler als bei typischer *Hirudo nipponia*, wodurch der Körperumriss dem der *Whitmania* sehr ähnlich erscheint,

Fondort. Yaeyama.

Gen. ***Haemadipsa*** Tennent 1861.

Diagnose: Körper zylindrisch, Haut mit wohl entwickelten Papillen; Kiefer mit scharfen Zähnen; 3. und 4. Augenpaare auf zwei benachbarten Ringen gelegen. Echter Landblutegel.

Zu dieser Gattung gehören 1 Art und 1 Varietät:

A. Rücken gelblichbraun, mit 3 dunklen Längsstreifen .. .. ***H. japonica.***

B. Rücken duukelbraun, mit unregelmässig zerstreuten schwarzen Punkten.. .. .. .. ***H. japonica*** var ***rjukjuana.***

31. **Haemadipsa japonica** Whitman 1886.

Fundort. Hondō, Shikoku, Kyūshū. In Gebirgen nicht selten.

31 a. **Haemadipsa japonica** var **rjukjuana** nov. var.

Diagnose: Rücken dunkelbraun, mit unregelmässig zerstreuten schwarzen Punkten, Bauch dunkelbraun. Diese Varietät unterscheidet sich von der typischen *Haemadipsa japonica* nur in der Färbung, in dieser Hinsicht aber recht augenfällig und konstant,

Fundort. Yaeyama.

Tokio, den 20. Dezember 1909.

Nachtrag.

Kurz nach Absendung der Korrektur dieses Artikels erhielt ich von Herrn M. Oshima in Taihoku, Formosa, einige Exemplare eines Landblutegels, welcher im Süden dieser Insel vorkommt und dort den Menschen wie auch den Hunden grosse Schaden anrichtet, indem er in die Nasenhöhle hineinkriecht und sich an der Schleimhaut ansaugt. Da derselbe, wenn auch in allen wesentlichen Zügen mit dem japanischen Landblutegel, *Hæmadipsa japonica* übereinstimmend, sich durch die abweichende Rückenzeichnung sofort von dem letzteren unterscheiden lässt, erachte ich es für zweckmässig, ihn als eine Varietät dieser Species aufzuführen. Ich lasse hier eine kurze Diagnose folgen:

31 b. **Hæmadipsa japonica** var. **taiwana** nov. var.

Diagnose. Rücken gelblich, entweder mit 4 dunklen, unregelmässig und unsymmetrisch geknickten Längsstreifen oder unregelmässig zerstreuten bräunlichen Flecken; sonst mit der typischen Form von *Hæmadipsa japonica* übereinstimmend.

Fundort. Formosa (südlicher Teil).

Den 30. Januar, 1910.

An Annotated List of Formosan Snakes, with Descriptions of Four New Species and One New Subspecies.

By

Masamitsu Oshima,

Bureau of Scientific Researches, Taihoku, Formosa.

In Dr. Stejneger's "Herpetology of Japan and Adjacent Territory" (published in 1907), there are mentioned in all 29 species of snakes as being known from the island of Formosa. My studies on Formosan snakes from specimens contained in the Formosan Museum at Taihoku (or Taipeh) and in the collection of the Medical School as well as in that of the Bureau of Scientific Researches in the same city, have enabled me to make 12 additions to the list. Of that number, I consider 5, viz., 4 species and 1 subspecies, to be new to science. In the following I propose to give a complete list of the Formosan snake fauna as known at present, together with descriptions of the new forms and with what notes and measurements I have taken from specimens of those already known. In the systematic arrangement I have followed Dr. Stejneger.

Here I beg to tender my thanks to Prof. Ijima and Mr. Namiye for assistance in various ways. My thanks are also due to Mr. Kawakami of the Formosan Museum and to Mr. Horiuchi of the Medical School for permissions to examine the specimens under their care.

ORDER SQUAMATA.

Suborder Serpentes.

Family Typhlopidae.

1. **Tyhlops braminus** (Daudin).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector	Scale rows.	Total length.	Length of tail.	Diameter.
						m.m.	m.m.	m.m.
B. Sci. Res	1	Kontei, Kōshun	May 30, 1909	Oshima	20	163	3,5	4
,,	2	,,	,,	,,	20	155	3	4
,,	3	,,	,,	,,	20	181	3	4,5
Formosan Mus.	1	....	....	Kikuchi	20	141	3	2
,,	2	....	....	,,	20	160	4	4
Medical School	1	Tainan	1904	....	20	158	4	4
,,	2	,,	1904	....	20	165	4	4

2. **Typhlops leucoproctus** (Boulenger).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Total length.	Length of tail.	Diameter.
						m.m.	m.m.	m.m.
B. Sci. Res	4	Kuraru, Koshun	May 29 1909	Oshima	20	287	3	6
,,	5	,,	,,	,,	20	273	4	7

Remark.—Tail comparatively shorter than in typical *T. leucoproctus*.

Family Natricidæ.

Subfamily Natricinæ.

3. **Natrix stolata** (Linnaeus).

Measurements of the specimene.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals	Supra-labrals.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	6	....	....	....	19	148	2	71	1,3	1+2	8	445	105
„	3	Horisha	Nov. 1, 1907	Kikuchi	19	142	2	36	1,4	1+2	8	580	80
„	4	Kagi	June 5, 1907	„	19	150	2	76	1,3	1+2	8	539	143
„	5	„	„	„	19	152	2	79	1,4	1+2	8	626	156
„	6	„	„	„	19	151	2	....	1,3	1+2	8	.....	.....
„	7	„	„	„	19	150	2	76	1,3	1+2	8	704	154
„	8	....	....	„	19	147	2	73	1,4(R) 1,3(L)	1+2	8	578	142
„	9	Shūshū, Nantō	March 1908	„	19	147	2	41	1,3	1+2	8	729	120
Medical School	3	Shinchiku	1905	Matsuyama	19	150	2	25	1,3	1+2	8	524	46

4. **Natrix vibakari** (Boie).

A specimen of this species, said to have been collected by Swinhoe in Formosa, should exist in the British Museum. According to Stejneger the locality seems however to be open to doubt.

5. **Natrix piscator** (Schneider).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	7	....	....	....	19	142	2	62	1,2(R) 1,1(L)	2+2	9	543	122
„	8	Kokwangai, Taihoku	....	....	19	129	2	82	1,3	2+2	8(R) 9(L)	555	64
„	9	„	....	....	19	143	2	75	1,3	2+2	9	610	155
„	10	„	....	....									
Formosan Mus.	10	Taihoku	Oct. 1908	Kikuchi	19	142	2	71	1,3	2+2	9	653	152
„	11	„	Sept. 1908	„	19	145	2	62	1,3	2+2	9	793	182
„	12	„	May 1907	„	19	141	2	60	1,3	2+2	9	787	165
Medical School.	4	„	....	....	19	132	2	85	1,3	2+2	8	605	193
„	5	„	1900	....	19	141	2	76	1,3	2+2	9	631	167
„	6	„	Sept. 1900	....	19	142	2	16	1,3	2+2	9	620	57
„	7	„	„	....	19	141	2	71	1,3	2+2	9	753	164

6. **Natrix annularis** (Hallowell).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of Tail.
												m.m.	m.m
B. Sci. Res.	11	Akō	June 4, 1909	Oshima.	19	157	2	60	1,3	2+3	9	682	125
„	12	Taihoku	....	....	19	157	2	48	1,3	2+3	9	657	97
„	13	„	....	....	19	162	2	61	1,3	2+3	8	513	103
Formosan Mus.	13	„	Sept. 1908	Kikuchi	19	145	2	73	1,4	2+3	9	216	53

7. **Natrix swinhonis** (Günther).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
Formosan Mus.	14	Banshiro, Kagi	May 14, 1907	Kikuchi	15	137	2	62	1,3	1+2 (L) 1+3 (R)	6	463	122
„	15	„	„	„	15	142	2	58	1,2	1+2	6	550	111

8. **Natrix trianguligerus** (Boie).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector	Scale rows.	Ventrals.	Anal	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length	Length of tail.
												m.m.	m.m.
Formosan Mus.	86	....	....	Kikuchi	19	144	2	71	1,3	2+2	9	420	100

9. **Natrix namiei** n. sp.

Rostral twice as broad as deep, just visible from above; nasal semidivided; internasal much narrowed in front, with convex outer border, as long as prefrontals which are broader than long and broadly in contact with supraocular; frontal once and a half so long as broad, longer than the distance from tip of snout but considerably shorter than parietals; loreal divided into two shields, the upper one very small; three pre-and three post-oculars; three suboculars separating the eye from labials; anterior temporals 3, the following ones differentiated into minor shields; 7 supralabials, the fifth, sixth and seventh largest; four lower labials in contact with anterior chin-shields, which are shorter than the posterior. Scales very strongly keeled, in 25 rows; 149 ventrals; anal divided; 52 pairs of subcaudals.

Colour above (in alcohol) drab with a median series of irregular transverse, dark brown, blackrimmed spots, consisting of two halves, one on each side of median line, a whitish zigzag band occupying the interspace ; top of head of a uniform dark brown colour ; lips uniformly pale ; underside pale drab, with numerous irregular blackish brown spots, which become paler anteriorly.

Dimensions.

Total length ..... 765 m.m.

Length gf tail..... 138 m.m.

Type : The Museum of the Government of Formosa, No. 85 ; locality and collector unknown.

Subfamily Homalopsinæ.

10. **Enhydris plumbia** (Boie).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals	Supra-labials.	Total length	Langth of tial.
												m.m.	m.m.
B. Sci. Res.	14	....	....	....	19	126	2	37	1,2	1+2	8	284	34
„	15	....	....	....	19	128	2	23	1,2	1+2	8	380	38
„	16	....	....	....	19	123	2	35	1,2	1+2	8	207	27
Formosan Mus.	16	Horisha	Nov. 1, 1907	Kikuchi	19	131	2	40	1,2	1+2	8	428	51
„	17	Shinko	Jan 21, 1908	„	19	124	2	31	1,2	1+2	8	560	51
„	18	Taihoku	April 1908	„	19	131	2	35	1,2	2+2 (L) 1+2 (R)	8	458	55
„	19	Banshiro, Kagi	May 8, 1907	„	19	127	2	40	1,2	1+2	8	475	58
„	20	„	„	„	19	128	2	35	1,2	1+2	8	431	48
„	24	Taihoku	May 10, 1909	„	19	125	2	37	1,2	1+2	8	384	51
Medical School.	8	....	1904	....	19	127	2	41	1,2	3+2 (R) 1+2	8	142	22

11. **Enhydris bennetti** (Gray).

Dr. Stejneger mentions in his " Herpetology of Japan and Adjacent

Territory" that a specimen of the species from Formosa is contained in the Indian Museum (No. 12693). I myself have never yet come across a specimen.

12. **Hurria rynchops** (Schneider).

Dr. Stejneger mentions that a specimen of this species, collected by Mr. Navara in Formosa, exists in the zoological museum of the University of Christiania (Herpetol. Japan and Adj. Terr., p. 306).

Subfamily Coronellinæ.

13. **Elaphe carinata** (Günther).

Measurements of the specimens.

Collection.	No.	Locality	Date.	Collector	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	55	....	....	....	23	213	2	92	1(+1),2	2+3	8	510	100
„	56	....	....	....	23	214	2	90	1(+1),2	2+3	8	500	109
Formosa Mus	25	....	....	....	23	213	2	90	1(+1),2	2+3	8	1683	360
„	34	Taihoku	May 1908	Kikuchi	23	214	2	91	1(+1),2	2+3	8	640	178
Medical School	13	....	....	....	23	211	2	93	1(+1),2	2+3	8	1547	335
„	14	....	....	....	23	216	2	87	1(+1),2	2+3	9(L) 8(R)	1740	340

Remark:—The specimens in the Bureau of Scientific Researches and the specimen No. 34 in the Formosan Museum are young forms. First row of temporals in specimen No. 13 of the Medical School Collection indistinctly divided into two parts.

14. **Elaphe rufodorsata** (Cantor).

Swinhoe should have obtained two specimens at Tamsui, which were sent to the British Museum.

15. **Elaphe taeniurus** (Cope).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal	Subcaudals	Oculars.	Temporals	Supra-labials	Total length.	Length of tail.
												m.m.	m.m.
Formosan Mus.	27	Shushu, Nanto	April 25, 1908	Kikuchi	25	251	2	105	1(+2),2	2+3	9	1910	338
,,	28	Kagi	July 1908	,,	25	243	2	113	1(+2),2	1+3	9	2368	457
,,	29	Sanshichō, Kagi	April 23, 1908	,,	25	258	2	114	1(+2),2	2+3	9	2055	450
,,	26	Taichu	Oct. 1908	,,	25	250	2	112	1(+1),2	2+3	9	522	107
Medical School.	12	....	....	....	25	250	2	96	1(+1),2	2+3	9	1695	345

Remark :—A variation in the number of temporals seems to be very common. Thus, specimen No. 27 of the Formosan Museum has the upper shield of first row nearly divided into three portions ; the same shield in specimen No. 28 of the same collection is semidivided on the right side ; that in specimen No. 29 is divided into two shields, while the lower shield is coalescent with the third of second row.

16. **Liopeltis major** (Günther).

Meusurements oj the specimens.

Collection	No.	Local'ty.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	17	....	....	....	15	164	2	92	1,2	1+2	8	935	240
,,	18	Koshun	....	....	15	169	2	89	1,2	1+2	8	724	262
Formosan Mus.	21	Horisha	May 1908	Kikuchi	15	165	1	91	1,2	1+2	8	785	206
,,	22	,,	,,	,,	15	169	2	88	1,2	1+2	8	1013	252
,,	23	Urai, Shinko	Dec. 1908	,,	15	169	2	89	1,2	1+2	8	788	205
,,	31	Kwannonzan	Feb. 1909	Suganuma	15	170	2	92	1,2	1+2	8	753	204
,,	32	Taihoku	Sept. 1908	Kikuchi	15	164	2	64	1,2	1+2	8	296	66

Continued from last page.

Collection.	No	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
Formosan Mus.	33	Taichu	Oct. 24, 1908	Kikuchi.	15	165	2	92	1,2	1+2	8	350	90
Medical School.	9	Taikokan, Tōen	Nov. 13, 1907	Governor Oshima	15	162	2	61	1,2	1+2	8	973	200
,,	10	Shinko	1904	....	15	162	2	89	1,2	1+2	8	1057	270

17. **Liopeltis kawakamii** n. s.p.

Rostral much broader than high, just visible from above; internasal quadrangular, nearly as long as broad and very much smaller than prefrontal which is in contact with narrow supraocular; frontal as long as its distance from tip of snout and longer than interparietal suture, broader in front than behind, its posterior portion ending in an acute angle; parietal one-third longer than distance of frontal from tip of snout; nostril large, vertically elliptic, between two nasals, of which the posterior is much larger than the anterior; loreal longer than high; one preocular, not in contact with frontal; two postoculars; temporals 1+2; supralabials 8, the fourth and fifth entering the eye, the sixth in contact with lateral angle of parietal; five lower labials in contact with superior chin-shields which are as long as the posterior; 19 rows of smooth scales without pore; ventrals 201, sharply angulated laterally; anal divided; 64 pairs of subcaudals.

Colour (in alkohol) pinkish brown, with 12 brown and black-edged cross-bars on body and 2 such on tail; each bar about four scales wide; a longitudinal brown stripe runs along both sides of vertebral line, interrupted anteriorly; top of head of the ground colour; a dark brown stripe from eye obliquely backward across upper temporal, continuous with the first cross-bar of body; a straight stripe of same colour from tip of snout across the median line of head and ending at the posterior border of parietals.

Dimensions.

Total length ..... 494 m.m.

Length of tail..... 76 m.m.

Type.--Bureau Sci. Res., Formosa, specimen No. 60. Locality and collector unknown.

Remark.—The species is named for Mr. T. Kawakami, Director of the Museum of the Formosan Government.

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	60	....	....	....	19	201	2	64	1,2	1+2	8	494	76
Medical School.	31	Shinchiku	1903	....	19	214	2	65	1,2	1+2	8	810	120
„	32	„	„	....	19	205	2	67	1,2	1+2	8	877	153

18. **Ptyas mucosus** (Linnaeus).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m	m m
B. Sci. Res.	19	Koshun	....	....	17	197	2	117	2,2	2+2	8	663	196
Formosan Mus.	37	Kagi	July 1907	Kikuchi	17	191	2	115	2,2	2+2	8	2023	500
„	38	Horisha	May 1908	„	17	191	2	117	2,2	2+2	8	2410	615
Medical School.	11	Hoppo	1903	Mitsuyama	17	190	2	104	2,2	2+2	8	840	200

19. **Ptyas korros** (Schlegel).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
Formosan Mus	35	Horisha	May, 1908	Kikuchi	15	165	2	128	2,2	2+2	8	1540	512
„	36	„	„	„	15	165	2	129	2,2	2+2	8	1600	553
Medical School	12	Shinchiku	....	....	15	163	2	59	2,2	2(+1)+2	8	900	222

20. **Zaocys dhmnades** (Cantor).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	20	....	....	....	16	197	2	140	1,2	2+2	8	1432	452
Formosan Mus	39	Shūshū, Nanto	April 1908	Kikuchi	16	197	2	140	1,2	2+2	8	1855	540
„	40	„	„	„	16	195	2	143	1,2	2+0	8	1857	636

Remark.—The specimen No. 20 in the Bureau Sci. Res. and the specimen No. 40 in the Formosan Museum have a small sub-preocular. The latter specimen shows a great variation in the number of temporals, the second row of these being non-existent owing to confluence. The upper shield of second row is coalescent with parietal, forming a quadrangular shield.

21. **Holarchus formosanus** (Günther).

Measurements of the specimens.

Collection.	No.	Locality.	Date;	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	21	Mansu, Koshun	June 28, 1909	Oshima	19	164	1	45	1,2(L) 2,2(R)	1+2	8(R) 7(L)	555	85
Formosan Mus.	41	Tailoku	Aug. 1908	Kikuchi	19	167	1	45	2,2	1+2	8	519	84
Medical Schools	15	„	1904	....	19	167	1	41	2,2	1+2	8	640	76

Remark.—Specimen No. 41 of the Formosan Museum shows a small additional temporal on both sides.

22. **Holarchus torquatus konishii** n. subsp.

Rostral higher than broad, projecting, turned over on top of head, the portion visible from above being shorter than the distance from frontal ; internasals oblique, much broader than long, suture between them shorter than that between prefrontals which are broadly in contact with supraoculars ; frontal longer than broad, longer than its distance from tip of snout, a little shorter than parietals which are broad and truncate behind ; nostril a quadrangular hole in the middle of a single nasal ; loreal a little higher than broad, lower edge much shorter than the upper ; one preocular, not in contact with frontal ; two postoculars ; temporals 2+2 ; six-supralabials, nearly all higher than long, the fifth and the sixth largest, the third and the fourth entering the eye ; four lower labials in contact with anterior chin-shields which are much longer than the posterior ; 15 rows of smooth scales ; 159 ventrals, with sharp lateral angles ; anal divided ; 35 pairs of subcaudals.

Colour (in formalin) grayish brown above, with four darker, rather indistinct longitudinal bands, of which the two middle are much broader ; tail darker ; body with reddish brown and black-edged cross-bars, nine on trunk and two on tail ; two pairs of small black spots between the cross-bars in the anterior three-fourths of body ; head pale above, with two dark-brown and inverted V-shaped marking edged with black ; one of them with the apex on prefrontal suture and passing through eye, the other with the apex in the posterior parts of frontal, the opening resting behind commissure ; similar but broader markings on nape ; labials and lower parts whitish, the latter with an ill-defined vinaceous-cinnamon streak in the middle line reaching to anal, flanked by numerous black quadrangular spots ; subcaudals grayish white, each scale edged with dark-green.

Dimensions.

Total length ..... 455 m.m.
Length of tail..... 65 m.m

Type.—The Museum of the Formosan Government, specimen No. 84; Urai, Shinkō, in the northern part of Formosa; August, 1909; late Mr. S. Konishi collector.

Remark.—Similar to typical *Simotes torquatus*, but with different markings on head and body.

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
Formosan Mus.	84	Urai, Shinkō.	August 1909	Konishi.	15	159	2	35	1,2	2+2	6	455	65
Middle School.		Botankō, Keelung.	....	....	15	172	2	30	1,2	2+2	6	247	17

23. **Dinodon septentrionale rhustrati** (Fischer).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
Medical School	16	Shinchiku	....	Matsuyama	17	217	1	103	1,2	2+3	8	810	182
,,	17	Koroton	June 18, 1908	Chōkinpō	17	218	1	81	1,2	2+3 (L) 2+2 (R)	8	810	165

24. Dinodon rufozonatum (Cantor).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
B. Sci. Res.	22	....	....	....	17	205	1	86	1,2	2+2 (L) 2+3 (R)	8	900	189
„	23	Akō	....	....	17	194	1	71	1,2	2+3	8	912	147
„	24	Kōshun	....	....	17	193	1	—	2,2	2+3	8	536	....
„	25	„	....	....	17	190	1	86	1,2	2+3	8	623	138
„	26	„	....	....	17	194	1	81	1,2	2+3	8	648	125
„	27	„	....	....	17	193	1	84	1,2	2+3	8	710	134
„	28	„	....	....	17	193	1	84	1,2	2+3	8	703	153
„	29	„	....	....	17	193	1	61	2,2	2+3	8	960	155
„	30	„	....	....	17	196	1	83	1,2	2+3	8	860	190
„	31	„	....	....	17	195	1	82	1,2	2+3	8	244	54
Formosan Mus.	42	Kagi	....	Kikuchi	17	198	1	79	1,2	2+3	8	929	184

Remark.—In the specimens No. 26, 29, 30 and 31 of the B. Sci. Res. and also in No. 42 of the Formosan Museum, loreal reaches the eye.

25. Dinodon multitemporalis n. sp.

Rostral just reaching the upper side of snout; internasal slightly broader than long, shorter than prefrontal, somewhat narrowed in front.

Supraoculars triangular, broadly in contact with prefrontals; frontal pentagonal, nearly as broad as long, shorter than interparietal suture; parietals large, twice as long as prefrontal; nostril between two subequal nasals; loreal somewhat higher than long, upper edge shorter than and parallel with the lower; two preoculars, of which the upper one extends to the dorsal surface of head, but not reaches

the frontal; two postoculars, the lower one of the left side coalescent with the fifth supralabial; temporals numerous, the upper smaller and scale-like, the lower somewhat larger; nine supralabials, the third, fourth and fifth entering the eye; five lower labials in contact with anterior chin-shields which are larger than the posterior, the latter separated by two pairs of elongated scale; 21 rows of smooth scales; 245 ventrals with sharp lateral angle; anal divided. Colour (in alcohol) pinkish gray with 56 reddish brown cross-bars on body and about 32 on tail, the bars having darker margins and being continuous in the posterior parts; top of head yellowish brown, with ill-defined markings; a brown short band from tip of snout reaches to the posterior border of prefrontal; side of head of the ground colour, with a brown, broad, horizontal postocular band extending to nape; a similar band from the posterior corner of supraocular reaches to the level of the posterior border of parietals; under side dusky white.

Dimensions.

Total length ..... 1040 m.m.

Length of tail ..... 290 m.m.

Type.—Bureau Sci. Res., specimen No. 57; locality and collector unknown.

Variation.—The lower preocular occasionally confluent with loreal.

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m	m.m
B. Sci. Res.	56	Kōshun	....	....	21	234	2	154	2,2	.	8(L) 9(R)	1120	320
,,	57	....	....	....	21	245	2	15	1,2(R) 2,1(L)	....	9	1040	290
,,	58	Kōshun	....	....	21	234	2	144	2,2	....	9	1122	310
,,	59	,,	....	....	21	235	2	158	2,2	....	9	510	142
Medical School.	18	Shinchiku	1903	Matsuyama	21	247	2	145	2,2	....	9	1058	290
,,	19	,,	,,	....	21	233	2	123	2,2	....	10(L) 9(R)	1280	320

26. **Caramaria berezowskii** (Günther).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
Formosan Mus.	43	Taichū	Oct. 1908.	Kikuchi	13	167	1	19	1,1	....	4	285	20
B. Sci. Res.	32	Kuraru, Koshun	June 29, 1909	Oshima.	13	167	1	23	1,1	....	5(R) 4(L)	280	25

Subfamily Boiginæ.

27. **Boiga kraepelini** Stejneger.

Stejneger mentions in his work, p. 387, that two specimens of this species were collected by Dr. Warburg, one at Keelung and the other near South Cape, while the third specimen from Formosa is contained in the Honkong Museum. I have seen no specimens of the species.

28. **Psammodynastes pulverulentus** (Boie).

Measurements of the specimens.

Collection.	No	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	33	Koshun.	....	Kurokawa	17	173	1	62	2,2	2(+1 +3	8	625	125
„	34	Mansu, Koshun	....	....	17	168	1	70	2,2	2+3	8	436	116
Formosan Mus.	44	Urai, Shinkō	Dec. 1908	Kikuchi	17	171	1	55	2,2	2+3	8	286	36
„	45	Horisha	Nov. 1908	„	17	172	1	60	2,3(L) 2,2(R	2+3 2+3	8	430	80
..	46	Taichu	Oct. 1908	„	17	175	1	60	2,2	2+2 (R) 2+3 (L)	8	550	100
..	47	Kōtōsho	Jan. 10, 1909	„	17	167	1	47	1,2	2+3 (L) 2+2 (R)	8	502	89
„	48	„	„	„	17	164	1	79	2,2	2+3	8	547	128
„	49	„	„	„	17	161	1	72	1,2	2+3	8	321	76
Medical School.	21	Shinchiku	1923	Matsuyama	17	167	1	64	1,2	2+2 (L) 2+3 (R)	8	520	102

29. **Psammodynastes compressus** n. sp.

Body laterally compressed, tail prehensil. Rostral higher than borad, not visible from above; internasal small, only one third the size of prefrontal, abruptly truncated anteriorly, with convex outer border; prefrontals very large, broadly in contact with supraocular, loreal and preocular, their posterior outer border in contact with eye; frontal nearly pentagonal, its posterior outer margin sharply angulated; supraocular moderate; parietals large, suture between them longer than frontal; nostril a round hole in the middle of a single nasal; canthus rostralis overhanging the concave loreal region; loreal nearly quadrangular, with convex posterior margin; a single concave preocular; two postoculars; lower parts of pre-and post-oculars in contact with each other, separating the eye from supralabials; temporals 2+3; 8 supralabials on the right, 7 on the left; 5 lower labials, 3 in contact with the first pair of chin-shields, of which there are three pairs, the first pair being triangular and the following two laterally elongated; scale smooth, without pits, in 15 rows; ventrals 182; anal single; subcaudals 75. Colour (in alcohol) vinaceous cinnamon, paler inferiorly, with ill-defined brown cross-bars; each scale having numerous fine dots of the same colour; top of head of the ground colour, spotted with dark brown small patterns; lip and underside paler; narrow dark brown stripe from eye backward across the temporal region ending on nape; ventrals spotted with brown.

Dimensions.

Total length	608 m.m.
Length of tail.....	135 m.m.

Type.—Bureau of Sci. Res., specimen No. 61; from Kokwangai, Taihoku.

Family Elapidæ.

Subfamily Elapinæ.

30. **Calliophis macclellandi** (Reinhardt).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	35	....	....	....	13	234	2	34	1,2	1+1	7	470	42
Medical School.	46	Shinchiku	1903	Matsuyama	13	234	2	32	1,2	1+1	7	485	45

31. **Naja naja atra** (Cantor).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows neck.	Scale rows body.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
													m.m.	m.m
B. Sci. Res.	37	Kontei, Kōshun	June 2, 1907	Nagamine	24	19	168	1	48	1,3	2+1	7	1384	209
„	38	Koshun	....	....	25	21	174	1	48	1,3	2+1	7	580	83
„	39	„	....	....	24	21	170	1	50	1,2	2+1	7	518	80
„	36	....	....	....	24	21	172	1	44	1,2	2+1	7	453	67
Formosan Mus.	51	....	Oct. 1908	Kikuchi	24	21	168	1	46	1,3	2+1	7	840	144
„	52	Keelung	Sept. 5, 1908	....	24	21	172	1	44	1,3	2+1	7	550	178
„	53	Horisha	May 1908	Kikuchi	25	21	168	1	51	1,3	2+1	7	1082	176
„	54	„	„	„	25	21	169	1	46	1,3	2+1	7	1654	232
Medical School	23	Tamsui	....	Mackey	24	21	169	1	45	1,3	2+1	7	1067	152
„	24	Hoppo.	1903	Matsuyama	24	21	169	1	45	1,2	2+1	7	572	60
„	25	Tamsui.	....	Mackey	23	19	165	1	47	1,2	1+1 (L) 1+2 (R)	7	723	122

32. **Bungarus multicinctus** (Blyth).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
												m.m.	m.m.
Formosan Mus.	55	Taihoku	June 1908	Kikuchi	15	211	1	44	1,2	1+2	7	1349	131
„	56	„	Aug. 1908	„	15	218	1	49	1,2	1+2	7	764	92
„	57	„	April 1908	„	15	209	1	43	1,2	1+2	7	380	40
„	58	Horisha	May 1908	„	15	213	1	46	1,2	1(+1)+1	7	1141	124
„	59	Taihoku	June 1908	„	15	215	1	44	1,2	1(+1)+2	7	916	100
„	60	„	May 18, 1908	„	15	211	1	43	1,2	1+2	7	1022	112
„	61	„	April 1905	„	15	209	1	46	1,2	1+2	7	1320	136
B. Sci. Res.	40	Koshun	....	....	15	204	1	42	1,2	1+2	7	306	39
„	41	„	....	....	15	208	1	40	1,2	1+2	7	404	45
„	42	„	....	....	15	209	1	47	1,2	1+2	7	673	80
„	43	„	....	....	15	212	1	41	1,2	1+2	7	1088	111
Medical School	26	Taihoku	June 1905	....	15	212	1	48	1,2	1+2	7	1250	160
„	27	Hoppo	1903	Matsuyama	15	210	1	48	1,2	1+2	7	1398	177
„	28	Taihoku	1903	....	15	215	1	43	1,2	1+2	7	369	46
„	29	„	1903	....	15	210	1	46	1,2	1+2	7	294	43
„	30	„	....	....	15	214	1	48	1,2	1+2	7	740	90

Remark.—The lateral head shields are subject to a considerable variation, viz., both postoculars (sometimes only the lower one) may be confluent with the fourth supralabial, forming an irregular large shield.

Subfamily Hydrinæ.

33. **Laticaudata laticaudata** (Linnaeus).

Two specimens in the University Museum of Christiana, collected

by Mr. Navara on the coast of Formosa and one specimen in the United States National Museum.

34. **Laticaudata semifasciata** (Reinwardt).

Measurements of the specimen.

Collection	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Dark rings on the body.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.
													m.m.	m.m.
Formosan Mus.	64	Kwashōtō	July 1, 1908	Kikuchi	23	190	2	37	38	1,2	2+3	7	1222	133

35. **Disteira melanocephala** (Gray).

Measurements of the specimen.

Collection.	No.	Locality.	Date.	Collector.	Scale rows on neck.	Scale rows on body.	Ventrals.	Subcaudals.	Oculars.	Temporals.	Supra-labials.	Total length.	Length of tail.	Width of head.	Diameter of neck.	Greatest height of body.	Greatest height of tail.
												m m.	m.m.	m.m.	m.m.	m.m.	m.m.
Formosan Mus.	63	Ajinkotō	Oct. 1, 1908	....	27	38	342	47	1,2	1+3	8	1203	110	14	13	31	20

36. **Disteira godeffroyi** (Peters).

Measurements of the specimen.

Collection.	No.	Locality.	Date.	Collector.	Scale row on neck.	Scale row on body	Ventrals.	Subcaudals.	Oculars.	Anterior temporals.	Supra-labials.	Total length.	Length of tail.	Width of head.	Diameter of neck.	Greatest height of body.	Greatest height of tail.
												m.m.	m.m.	m.m.	m.m.	m.m	m m.
Medical School.	33	Keelung.	1908	Hattori	32	40	279	40	1,2	2	7	810	73	11	9	27	13

Remark.—The posterior pair of chin-shields separated by two scales which are pointed anteriorly.

37. **Hydrus platurus** (Linnaeus).

Measurements of the specimen.

Collection.	No.	Locality.	Date.	Collector.	Scale rows on body.	Total length.	Length of tail.	Width of head across center of eye.	Length of shield portion of head.	Greatest height of body	Greatest height of tail.	Preocular.	Subocular.	Postocular.	Supra-labials.	Anterior temporals.
						m.m.	m.m.	m.m.	m.m	m.m.	m.m.					
Formosan Mus.	65	Keelung	....	Kawakami	53	749	72	12	30	32	19	2(R) 1(L)	1(L) 0(R)	2(L) 3(R	7	3
Medical School.	34	Tamsui	....	Mackey	46	710	72	10	25	35	15	1	0	2	7	3
„	35	Keelung	Oct. 1903	Takayanagi	54	578	64	10	22	20	13	1	2	2	7	2
„	36	„	....	....	48	707	70	11,5	21,5	27	15	1	0	2	9	3

Remark.—The lateral shields of head are subject to various modifications, viz., the fourth supralabial may enter the eye when subocular is not present; the number of supralabials is variable. Chin-shields in specimen No. 65 of the Formosan Museum and in specimen No. 35 of the Medical School are differentiated, while in the two other specimens, there are recognizable two pairs of enlarged scales not in contact with each other.

Family Cobridæ.

38. **Agkistrodon acutus** (Günther).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rews.	Ventrals.	Anal.	Subcaudals.	Oculars.	Supra-labials.	Total length.	Length of tail.
											m.m.	m.m.
B. Sci. Res.	55	Koshun	....	....	20	163	1	54	2,2	7	980	125
Medical School.	37	Hoppo	1903	....	21	166	1	48	2,2	7	450	60
Formosan Mus.	67	Taichū	July 2, 1908	Kikuchi	21	156	1	54	3,2	7	818	106
„	68	Horisha	May 7, 1908	„	21	167	1	48	2,2	7	830	104
„	69	„	Sept. 10, 1908	„	21	166	1	46	2,2	7	1380	139
„	70	Shinkō	May 15, 1908	„	21	165	1	49	2,2	7	1290	163

39. **Trimeresurus mucrosquamatus** (Cantor).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Interorbitals.	Supralabials.	Total length.	Tail length.
											m.m.	m.m.
B. Sci. Res	53	Koshun	...	....	27	219	1	88	14	9	1025	159
„	54	Taihanroku, Koshun	May 30, 1909	Oshima	27	202	1	92	15	8(R) 10(L)	787	150
Medical School.	41	Shinchiku	1903	Matsuyama	27	210	1	86	18	10	915	165
„	42	„	„	„	25	212	1	79	14	10	1012	155
„	43	„	„	„	27	207	1	82	14	9	844	146
„	44	Nanshō, Shinchiku	„	Honda	27	212	1	88	15	10	905	170
„	45	Jukirin	„	....	27	206	1	64	15	9	1015	155
Formosan Mus.	81	Horisha	Nov. 1, 1908	Kikuchi	27	213	1	84	15	9(L) 8(R)	1005	165
„	82	Urai	Dec. 1908	„	29	215	1	73	17	10(R) 8(L)	1439	188
„	83	Taihoku	May 1904.	....	27	214	1	76	15	8(R) 7(L)	1185	200

40. **Trimeresurus flavoviridis** (Hallowell).

Measurements of the specimen.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Interorbitals.	Supralabials.	Temporals.	Total length.	Length of tail.
B. Sci. Res.	52	....	....	....	34	226	1	77	12	8	2+2	565	80

Remark.—The single specimen examined is said to have been collected near Taihoku, but the locality is somewhat doubtful.

41. **Trimeresurus gramineus** (Shaw).

Measurements of the specimens.

Collection.	No.	Locality.	Date.	Collector.	Scale rows.	Ventrals.	Anal.	Subcaudals.	Oculars.	Interorbitals.	Supralabials.	Total length.	Length of tail.
												m.m.	m.m.
B. Sci. Res.	44	Kuraru, Koshun	June 29, 1909	Oshima.	21	159	1	72	2,3	13	10	532	140
„	45	„	„	„	21	161	1	63	2,2	14	10	650	140
„	46	Koshun	....	....	21	159	1	68	2,3	12	10	608	105
„	47	„	....	....	21	164	1	73	2,3	12	9	632	136
„	48	„	....	....	21	161	1	72	2,3	12	9(R) 10(L)	723	155
„	49	„	....	....	22	131	1	66	2,3	12	9	487	95
„	50	„	....	....	21	165	1	71	2,3	12	10(L) 8(R)	595	219
„	51	„	....	Kurokawa	21	164	1	67	2,3	11	9	652	116
Formosan Mus.	71	Horisha	Nov. 1, 1908	Kikuchi	20	167	1	72	2,3	14	10	739	152
„	72	„	„	„	21	168	1	63	2,3	14	12(L) 11(R)	800	122
„	74	„	„	„	21	168	1	64	2,2	13	12(L) 11(R)	782	113
„	75	Banshiro, Kagi	May 14, 1908	„	21	163	1	64	2,3	14	9	630	114
„	76	....	May 1908	„	21	164	1	68	2,2	13	11(L) 10(R)	575	104
„	77	Kwanonsan	Feb. 1909	Suganuma	21	159	1	65	2,2	12	10	300	70
„	78	Taichū	Oct. 1908	Kikuchi	21	169	1	70	2,2	13	10(R) 9(L)	739	140
Medical School.	39	Hoppo	1903	Matsuyama	21	161	1	65	2,2	12	9	505	81
„	40	„	„	„	21	158	1	67	2,2	13	9	622	120

Notiz über Telesto rosea.[1]

Von

Kumao Kinoshita, *Rigakushi.*

Zool. Inst., Kaiserl. Univ., Tokio.

Unter den zahlreichen Alcyonarien, welche ich im Korallengrunde von Tosa, Shikoku, sammeln konnte, finden sich zwei Telesto-Arten. Die eine ist durch einige Exemplare repräsentiert, die mit dem Typ von Telesto rosea eine grosse Ähnlichkeit zeigen, sodass sie der letzteren Art zugerechnet werden dürften.

Die grösste Kolonie misst 12 cm. in der Höhe, 11 cm. in der Breite, und weist Äste auf, die alle nur in einer Ebene sich ausbreiten. Der unterste Abschnitt des Stammes misst im Diameter beinahe 4 mm. Dicke.

Bei der ursprünglichen Beschreibung dieser Art habe ich bezüglich der Skleriten der inneren Schicht des Stammpolypen einen Irrtum begangen, nämlich dass dieselben mit einander verschmelzen. Bei einer nochmaligen, näheren Untersuchung habe ich gefunden, dass sie, wie es bei den anderen Arten geschieht, nur mit ihren Warzen an einander greifen.

Soweit die bisherigen Kenntnisse reichen, geht die Verdickung der Stammwände bei Telesto, mit welcher der Kolonienstamm seine Stabilität erwirbt, nur monoton vor sich. Bei der vorliegenden Spezies jedoch ist die Art und Weise in welcher die Axialpolypen sich verdicken, eine ausgesprochen seltsame und sogar in den Alcyonarien ganz einzigartige.

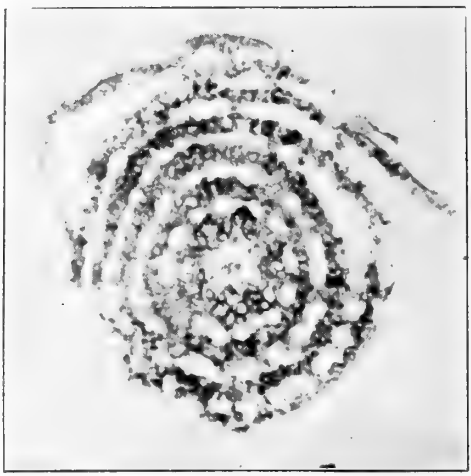
---

(1) Annot. Zool. Japon., Vol. VII., Part 2, p. 113, 1909.

Bei dieser Art nämlich tritt, sobald die Kolonie eine gewisse Grösse erreicht hat, ausserhalb der originalen äusseren Spikulaschicht noch eine dritte auf, welche durch die einschichtig angeordneten, anfänglich spindelförmigen Spikula gebildet ist. Diese Spikulaschicht entwickelt sich von der Basis des Stammes an allmählich aufwärts, und die Spikula werden immer dicker und, wie es bei der originalen äusseren Spikulaschicht geschieht, durch Hornsubstanz mit einander verbunden.

Innerhalb dieser neuen Spikulaschicht befindet sich eine spikulafreie Schicht von Mesoglœa, in welcher parallel mit der Achse mehrere, oft in Grösse sogar die zentrale Axialhöhle übertreffende Solenia durchlaufen.

Was ich bei der erstmaligen Beschreibung als eigentümlich nur kurz angegeben habe, handelt von diesen Schichten. Bei den Exemplaren von Tosa sind diese Spikula- und Mesoglœaschicht im untersten Abschnitte des Stammes sechs-mal an Zahl wiederholt aufgetreten. Die beigefügte Abbildung stellt einen mit freier Hand angefertigten Querschnitt dieses Abschnittes dar. Wie ersichtlich ist, erinnern die konzentrischen Ringe sehr gut an die Jahresringe eines Baumes. Da aber zwischen den Ringen mehrere Trabekulæ vorhanden sind, so scheinen die hyalinen Mesoglœaschichten in mehrere Areæ, in deren Zentrum je ein Solenium sich befindet, geteilt zu werden. Diese Struktur jedoch verschwindet in dünnen Mikrotomschnitten meist gänzlich oder bleibt sehr schwer nachzuweisen, und das ist äusserst wahrscheinlich der Grund, weshalb diese Struktur bis jetzt unserem Auge entgangen war Wenn man nach den Abbildungen



× 13

von H. Laackmann[1] (Taf. 7, Fig. 27; Tat. 8, Fig. 33) schliesst, scheint T. smithii und T. rupicola auch eine ähnliche Komplikation zu zeigen, welche jedoch mit derjenigen der T. rosea kaum zu vergleichen ist. Nach Wright und Studer zeigen die Stammwände von Coelogorgia palmosa[2] auch mehrere grosse Längssolenia. Die Verdickung derselben jedoch geht ihrer Meinung nach nur monoton vor sich, indem die Solenia immer mehr nach der Peripherie hin geschoben werden.

Tokio, 23. Feb. 1910.

(1) Zool. Jahrb., Suppl. 11, Heft 1, p. 41. 1908.
(2) Challenger Report, p. 266, Pl. XLIII, 1889.

NOTICE.

Terms of subscription, \$ 2 50 = 10s = 12 1/2 F = M10 = ¥ 5 per volume. Postage prepaid.

Remittances from foreign countries should be made by postal money orders payable in Tokyo to M. NAMIYE, Zoological Institute, Science College, Imperial University, Tokyo.

All manuscripts should be sent to THE EDITOR ANNOTATIONES ZOOLOGICÆ JAPONENSES, College of Science, Imperial University, Tokyo.

All business communications should be sent to THE SECRETARY OF THE TOKYO ZOOLOGICAL SOCIETY, College of Seience, Imperial University, Tokyo.

明治四十三年三月廿四日印刷
明治四十三年三月廿七日發行

東京市神田區美土代町二丁目一番地
編輯兼發行人　島連太郎

東京市神田區美土代町二丁目一番地
印刷人　小玉牧三

東京市神田區美土代町二丁目一番地
印刷所　三秀舍

東京市日本橋區通り三丁目十四番地
大賣捌所　丸善書籍株式會社

第七卷第三册　定價金壹圓

郵便爲替ハ東京市本鄉區理科大學動物學敎室波江元吉宛ニテ本鄉森川町郵便爲替取扱所ヘ御拂込有之度候

日本動物學彙報

第七卷第四冊

明治四十三年十二月卅日發兌

ANNOTATIONES

ZOOLOGICÆ JAPONENSES.

Vol. VII., Part IV.

PUBLISHED

BY

The Tokyo Zoological Society.

TOKYO,

December, 1910.

CONTENTS.

Extraovate Experiments on the Egg of Sea-urchin.

By

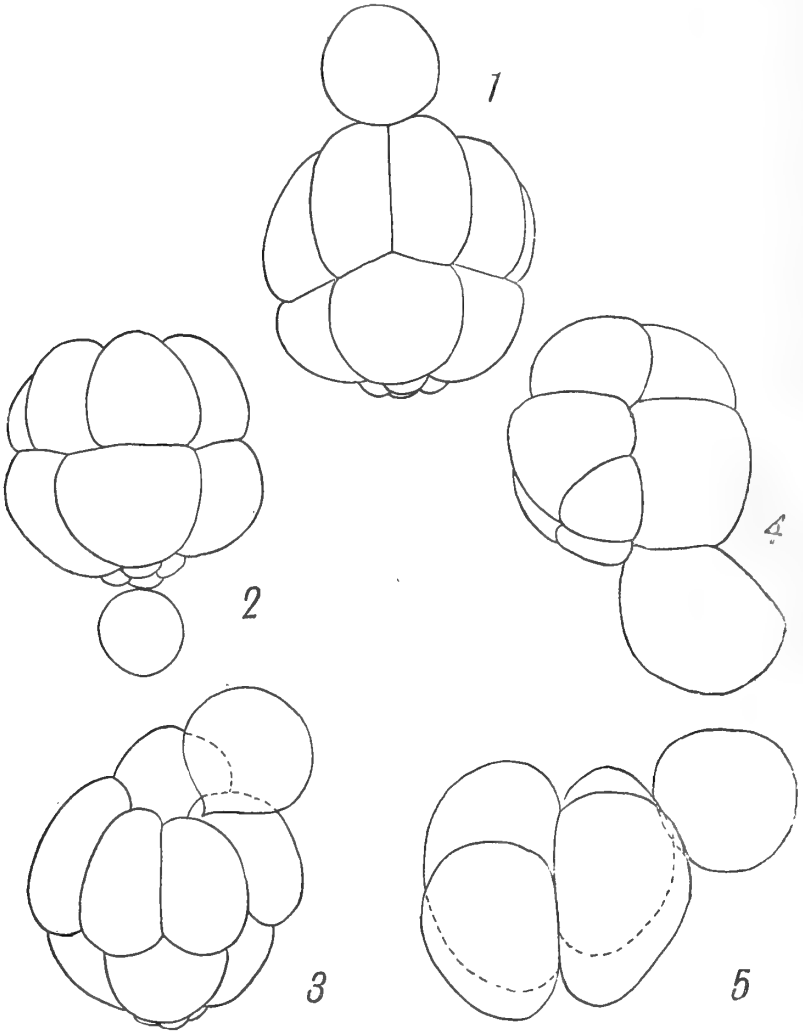
Naohide Yatsu.

Zool. Inst., Tokyo Imp. Univ.

In treating the eggs of *Arbacia* ten minutes after fertilization with diluted sea-water and in replacing them into ordinary sea-water, LOEB had the good fortune to obtain double or triple larvæ developed from the eggs with extraovates ('94a, '94b and '95). The same experiments were repeated by RAWITZ at Rovigno on the egg of *Strongylocentrotus* ('96) and by JANSSENS on the egg of Neapolitan *Arbacia* ('03 and '04). Both the investigators obtained extraovates, but did not succeed in getting multiple embryos.

While at Naples I also tried some extraovate experiments on the egg of *Echinus*, *Arbacia* and *Strongylocentrotus* with the view that they might give interesting evidence in reference to the developmental physiology of multiple embryos. Under the same treatment the fertilization membrane of the first named form did not burst and consequently no extraovates were formed. This is due, I think, to the fact that in *Echinus* the space between the egg and the membrane is so wide that the turgid egg does not reach the membrane while in a hypotonic solution. In both *Arbacia* and *Strongylocentrotus* I was able to obtain extraovates. In using sea-water of various degrees of dilution I found out that a mixture of sea-water 40 + fresh-water 60 is the best for the present purpose. Eggs with extraovates, however, failed to develop into double- or triple-plutei. The experiments, therefore, were a failure as regards the above problem. Yet incidentally they yielded a result worth recording in respect to clea-

vage physiology, that is, such eggs with extraovates, some in *Arbacia* and all in *Strongylocentrotus*, cleaved more or less abnormally, furnishing DRIESCH'S conclusion ('96 p. 112)[1] a new datum through a different, perhaps more satisfactory, method.

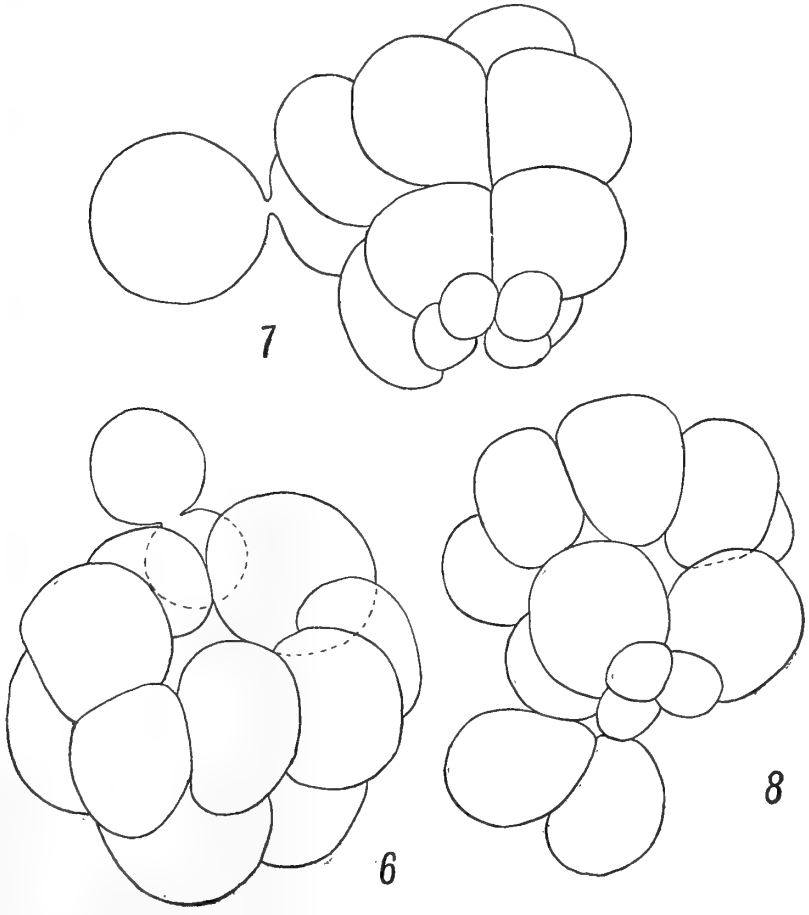


Figs. 1–5. Early cleavage stages of *Arbacia* egg provided with an extraovate. ×540.

1) "Eibruchstücke [of *Echinus*].....furchen sich sehr verschieden und zwar fast immer in Bruchstücken der Ganzfurchung, was auf eine Abhängigkeit des Furchungstypus von der Eiorganisation schliessen lässt."

Experiments on the Egg of *Arbacia*.

In eight eggs with an extraovate, cleavage was followed up to the formation of the micromeres. Of these, four segmented normally (Figs. 1 and 2), while the rest showed some deviations from the normal mode of cleavage. The difference in size of extraovate cannot be taken as the cause of abnormal cleavage, since an egg with a large extraovate was divided normally. It should be remarked that in abnormally cleaved eggs their abnormality lies always near the region where the extraovate is attached (Figs. 3, 4 and 5).



Figs. 6–8. Early cleavage stages of *Strongylocentrotus* egg with an extraovate. ×540.

Experiments on the Egg of *Strongylocentrotus*.

The cleavage of twelve eggs with extraovates was followed up to the fourth division. Contrary to RAWITZ'S results ('96 p. 78) all of them cleaved more or less in deviation from the normal mode, irrespective of the size of extraovates. As was the case in *Arbacia*, the disturbance took place in this form at the place where extraovates were found. Thus in twelve eggs, I examined, four types could be distinguished. In case an extraovate was on the animal region, either one of the eight macromeres was smaller than the others (three cases, one of which is represented in Fig. 6) or it was entirely lacking (three cases, Fig. 7). When an extraovate was situated near the equator, one of the mesomeres was found to be smaller than the other three (two cases). In case an extraovate was attached near the vegetal pole, only three mesomeres and consequently three micromeres were formed (four cases, Fig. 8).

Conclusions.

For the study of cleavage of egg-fragments, extraovate experiments seem to be in one way more favorable than shaking method, since in the former one can tell at once the exact location and amount of cytoplasm taken off from the egg, while in the latter these matters remain as an inference from the resulting cleavage stages. Of course in both cases, nothing is known about the actual happenings in the egg, *i. e.*, during the flowing-out of the extraovate at the height of turgor of the egg and during the process of breaking-up into pieces while shaken in a test tube.

It should be especially mentioned that the disturbance of cleavage pattern in the egg with an extraovate is not due to the action of diluted sea-water (*cf.* DRIESCH '93), because under the same treatment, all other eggs (without an extraovate) in the same vessel cleaved normally, and because the disturbance in cleavage, as stated above,

is found at the spot where the extraovate is situated. From the foregoing experiments it can safely be concluded that the deprivation of a portion of cytoplasm as an extraovate induces the egg to manifest certain disturbances in cleavage-pattern, and that the cleavage-pattern is already established in the fertilized egg of *Echinus*,[1] *Arbacia* and *Strongylocentrotus*. Furthermore it is interesting to note that the cleavage of the egg of *Strongylocentrotus* is more affected by extraovate than that of *Arbacia*.

It is hardly necessary to add that an egg with an extraovate gives rise to a perfect pluteus.

Misaki Marine Biological Station.
July 19, 1910.

Literature.

DRIESCH, H., '93.—Entwicklungsmechanische Studien. III Über Variation der Mikromerenbildung (Wirkung von Verdünnung des Meerwassers): Mittheilungen aus der Zool. St. zu Neapel. 11.

DRIESCH, H., '96.—Betrachtungen über die Organisation des Eies und ihre Genese: Arch. Entm. 4.

JANSSENS, F. A., '03.—Production artificielle de larve geante chez un échinide: CR. Jan. 27.

JANSSENS, F. A., '04.—Production artificielle des larves geantes et monstreuses dans l'*Arbacia*: La cellule 21.

LOEB, J., '94 a.—On some facts and principles of physiological morphology. IV The artificial production of double and multiple monstrosities in sea-urchin: Woods Holl Biol. Lec. for 1893.

LOEB, J., '94 b.—Über eine einfache Methode, zwei oder mehr zusammenwachsene Embryonen aus einen Ei hervorzubringen: PFLÜGER'S Arch. 55.

1) *Driesch's* result ('96).

LOEB, J., '95.—Über die Grenzen der Teilbarkeit der Eisubstanz: PFLÜGER'S Arch. 59.

RAWITZ, B., '96.—Über den Einfluss verdünnten Seewassers auf die Furchungsfähigkeit der Seeigeleier: Arch. f. Anat. u. Phys., Phys. Abth.

A Note on the Polarity of the Primary Oocyte of *Asterias forbesii*

By

Naohide Yatsu.

Zool. Inst., Tokyo Imp. Univ.

While studying the artificial parthenogenesis of the egg of *Asterias forbesii* at Woods Hole, I was struck by the fact that the axis of the primary oocyte does not coincide with that of matured egg but the axes make a certain angle to each other. So far this fact does not seem to have been described, though perhaps it did not escape notice previously.

Most eggs, as soon as shed into the water, assume a spherical or an approximately spherical shape. The follicular membrane usually disappears soon after a thin layer of gelatinous substance is formed (*cf.* HARTMANN '02 p. 802). "The nucleus [germinal vesicle] often holds an eccentric position as regards the egg cell, though not infrequently it is located centrally" (JORDAN '08 p. 43). The germinal vesicle begins to fade away on the part nearest to the surface of the egg, as has been observed by MATHEWS, KING and others. And the polocytes are formed there. In such eggs the spherical shape makes it impossible to find any land-mark to determine the axial relation between unmatured and matured eggs.

Very seldom one comes across pyriform eggs with a thin follicular membrane (Figs. 5–7). The membrane is usually drawn out a little at the pointed end. Why they retain such a shape and their follicles remain intact I do not know. Probably they are somewhat younger than ordinary rounded eggs, though they go through the maturation processes just as normally as the latter. At any rate the polocytes

are invariably formed half-way between the equator and the rounded pole of the egg. In such eggs, therefore, the maturation axis, that is, the axis through the centre of the egg and the polocytes, makes a certain angle with the longitudinal axis of the egg as is seen in Figs. 6 and 7. As far as my observation goes, the first cleavage plane passes through the maturation axis, as has been noticed by MATHEWS ('95 p. 338); the maturation axis corresponds in this species to the egg axis and also to the embryonal axis. In the egg of *Asterias glacialis* the relation seems to be quite different according to GARBOWSKI ('04 pp. 816 and 819).

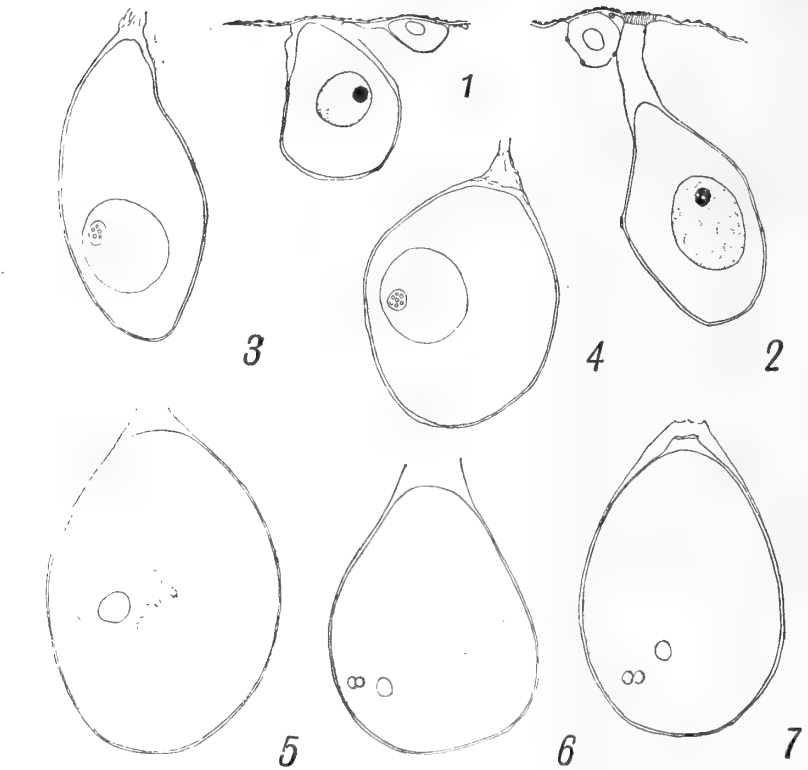


Fig. 1. Young ovarian egg (section). Fig. 2. Nearly full grown ovarian egg (section). Figs. 3. and 4. Primary cocytes just shed (total preparation). Fig. 5. Primary oocyte with a fading germinal vesicle (from life). Figs. 6 and 7. Two matured eggs (from life). All the figures are camera drawings × 190.

In studying total preparations of the ovarian eggs one soon finds that the projected portion of the follicles is more conspicuous than the discharged eggs, and so much so that one can hardly deny that it represents the portion that was attached to the ovarian wall (Figs. 3 and 4). Sections through the ovary has confirmed this surmise. As shown in Figs. 1 and 2, the follicular membrane, with nuclei here and there, is produced over the pointed end of the egg; unquestionably it is the attachment surface to the ovarian wall (*cf.* LUDWIG and HAMANN. Taf. VI, Fig. 2.)

From what has been described it may be concluded that in the egg of *Asterias forbesii* the point of attachment of the primary oocyte coincides neither to the animal pole as in *Strongylocentrotus*, nor to the vegital pole as in *Cerebratulus*. In this case, the longitudinal axis of the germ-epithelial cell, therefore, does not correspond to either the egg-axis or the embryonal axis. This conclusion has been reached from examination of the pyriform eggs, but may safely be extended to all the eggs.

Zoological Institute,
Imperial University, Tokyo,
Sept, 27, 1910.

Literature.

GARBOWSKI, T., '04.—Über parthenogenetische Entwickelung der Asteriden: Bull. de l'academie des sciences de Cracovie, No 10. Art. 56.

HARTMANN. M., '02.—Studien an tierischen Ei. I. Ovarialei und Eireifung von *Asterias glacialis:* Zool. Jahrb. 15.

JORDAN, H. E., '08.—The relation of the nucleolus to the chromosomes in the primary oocyte of *Asterias forbesii:* Carnegie Institution Publication 102.

LUDWIG, H. and HAMANN O., '99.—BRONN'S Klassen und Ord. des Tierreichs. 2.

WILSON, E. B. and MATHEWS A. P., '95.—Maturation, fertilization, and polarity in the echinoderm egg: Journ. Morph. 10.

On the Keroeididæ, a New Family of Gorgonacea, and Some Notes on the Suberogorgiidæ.

By

Kumao Kinoshita, *Rigakushi.*

Zool. Inst., Tokio Imp. Univ.

(*With Plate VI.*)

I.

Suberogorgiidæ[1] Studer.

This group was originally founded by Kölliker, on the basis of genus *Sclerogorgia* (=*Suberogorgia* Gray), as a subfamily of Gorgonidæ under the name of Sclerogorgiaceæ. The diagnosis given by him runs as follows:—

> "Gorgoniden mit ungegliederter Axe, die aus Hornsubstanz und verschmolzenen Kalkkörpern besteht. Cœnenchym wie bei Gorgonia."

Subsequently Studer raised this subfamily to the rank of a family, altering the name into Suberogorgidæ, and added to it a new genus *Keroeides* considered to be very closely allied to *Suberogorgia*. The family diagnosis was so drawn up as to cover both the genera. It runs as follws:—

> "Eine deutlich gesonderte Axe und Hornsubstanz, welche die zahlreichen dicht gelagerten Kalkkörper umgiebt. Die Axe wird von Längskanälen umgeben, in whelche die netzartig verzweigten Cœnenchymkanäle, welche Polypen unter-

1) Subfamily Sclerogorgiaceæ Kölliker, Icones Histologicæ, 1865, p. 142.; Suberogorgidæ Studer, Arch. f. Naturgesch., Bd. 53. 1, 1887, p. 29; Sclerogorgidæ Wright & Studer, Challenger Rep., 1889, p. XXXVI & p. 165.

einander verbinden, einmünden. Die Polypen differenziren in einen warzig vorspringenden Kelchtheil, in den sich der vordere, tentakeltragende Abschnitt vollkommen retrahiren kann."

The family Suberogorgiidæ in the Alcyonarian collection of the Zoological Institute, Science College, is represented by a pretty large number of specimens belonging to one or the other of the two genera referred to. While engaged in examining these forms I have found in the axis of *Keroeides* a remarkable character, which decidedly interferes with the inclusion of that genus among the Scleraxonia, but places it in the order Gorgonacea (=Holaxonia Studer). On the other hand, genus *Suberogorgia* shows in the axis a central cord consisting of cœnenchymatous spicules, a character that is totally different from that found in *Keroeides* but is universally found in all the Scleraxonian genera[1] examined by me. All these forms, it seems to me, may be reduced in the fundamental structure of stems and branches to the primary tubular type that we see in *Solenocaulon*.[2] The genus *Suberogorgia* may therefore be made to remain alone in the order Scleraxonia, forming a family by itself.

Quite recently, there appeared a paper by J. J. Simpson,[3] containing the description of a new genus *Dendrogorgia* referred by the author to the family Suberogorgiidæ. Judging from the illustrations given, that genus seems to have a central cord of apparently the same character as that of *Keroeides*. If it be so, the genus must be placed in the Keroeididæ, which I am going to introduce in the following chapter.

Now, excluding *Kerocides* and provisionally *Dendrogorgia* also, the family Suberogorgiidæ may be characterised as follows :—

Scleraxonians with distinct axis; the latter not jointed, formed of fused spicules and horny matrix, with a rudimentary cent-

1) *Corallium*, *Melitodes*, *Acabaria*, *Mopsella*, *Parisis*, *Paragorgia*.

2) Compare Studer, Arch. f. Naturgesch., 53, 1. 1887, p. 5 and p. 25.

3) On a new pseudaxonid genus *Dendrogorgia* ; Proc. Roy. Phys. Soc. Edinburgh Vol. XVIII, No. 1, 1910, pp. 62–67.

ral cord composed of cortex spicules; cortex with some main longitudinal solenia and smaller reticulated ones; polyps retractile within more or less developed calyces; spicules spindle-like.

II.

Keroeididæ nov. fam.

The genus *Keroeides* was founded by Wright and Studer upon a form called by them *K. koreni* and obtained by the Challenger on the *Hyalonema*-ground off Japan. The genus was diagnosed by them as follows[1]:—

> "Die Colonie aufrecht in einer Ebene verzweigt, die Polypen bilden warzenförmige Kelche, die namentlich von zwei Seiten der abgeplatteten Aeste abgehen, dazwischen einen polypenfreien Raum lassend. Die Spicula des Cœnenchyms sind grosse breite Spindeln und polygonale, oft dreiseitige Platten, welche, dicht an einander gelagert, im Cœnenchym eine einfache Schicht bilden. Die Polypenkelche sind mit polygonalen Platten dicht gepflastert, ebenso enthalten die Tentakelblasen breite glatte Spicula. Der ganze Habitus, sowie die Spicula, erinnern an *Acis* Duch. & Mich. Die Axe ist weiss und besteht aus dicht parallel gelagerten Kalkspindeln, welche durch ein hornig fasriges Gewebe verbunden sind, das nach Ausziehen der Kalksalze zurückleibt und die Form der Axe erhalt."

Owing to the sclerogorgic structure of the axis, the genus was referred to the Suberogorgiidæ by the authors. Subsequently two more species were added to the genus by Whitelegge and Hiles. Thomson and Simpson,[2] however, considered both these to be referable to the type species *koreni*, on the ground of the existence of intermediate forms that render specific distinction scarcely practicable.

1) Studer, Arch. f. Naturgesch., 53,1, 1887, p. 30.

2) Thomson and Simpson, Alcyonarians of the Investigator, II, 1909, p. 168.

The *Kerocides* specimens at my disposal show, at the first sight, such a diversity among themselves that they seem to be separable into several forms or species. A close examination, however, has led me to accept the view that the differences are not strong enough to be employed for specific distinction.

Without going into the systematic status of the specimens, I shall, in this paper, content myself with giving a note on the structure of the axis, the unique character of which is entirely unknown in the known Gorgonians.

The axis is cylindrical in form, not jointed; it runs centrally through the stem and branches. It is rigid and brittle except in the terminal parts which are soft and flexible. The colour is yellowish or dark brown, owing to that of the horny matrix. In all the cases examined, the spicules participating in the construction of the axis, are not at all colored.

The axis consists of two parts, viz., a central cord and a cortical layer (respectively the Centralstrang and the Rindenlage of Kölliker).

The central cord is structurally exactly the same as that of true Gorgonians (figs. 1 and 2). The cortical layer is composed, as already described by Wright and Studer, of smooth spindle-like spicules arranged longitudinally and of a fibrous horny matrix, which tightly binds up the spicules (fig. 4). The latter sometimes show an arrangement in concentric rings. The horny substance of the axis runs out into the hyaline mesogloea without any distinct contour. The axis is surrounded by wide and narrow solenia, which take no regular arrangement.

Tracing the axis towards the tip of the twigs, it comes to lie in the partition between the two terminal polyps which are placed usually nearly opposite to each other, and ends beneath the superficial spicule layer of the very tip (fig. 1). For some variable length the axis is composed of the central cord only and is entirely devoid of the cortical layer. The central cord, so far as it remains naked, is

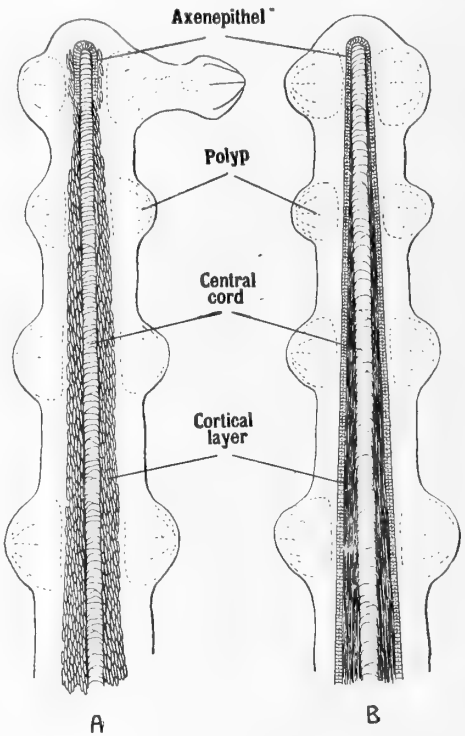
covered with an epithelium, which can not be anything else than the *Axenepithel*. The development of this epithelium differs very much in different colonies. In most cases it is limited nearly to the apex of the axis, so that the cortical portion of the axis reaches close up to the tip. Sometimes however I have met with such cases, in which the epithelium reached nearly to the lower end of the uppermost polyps. In typical cases, one of which is shown in fig. 1, the cells composing the said epithelium at the tip of the axis are very tall (0.02 mm.), but become gradually less tall below. The final fate of this epithelium has not become quite clear to me. In one case met with, the cells of the epithelium seemed to lose themselves in the horny matrix binding the spicules of the cortical layer. The latter develope even in the mesogloea of the partition between two terminal polyps. A little downwards the horny matrix appears between the spicules, binding these to the central cord, while the epithelium disappears, the cells becoming lost in the horny matrix (fig. 2). In most cases this stage is not to be found; probably it transpires with rapidity.

In the majority of the specimens examined, the *Axenepithel* is very difficult to detect, owing to its limited extent at the tip of axis and its proximity to densely crowded solenia of various caliber, but especially to the shrunken state of the tissues, whereby the distinction between the epithelia of solenia and the *Axenepithel* is rendered extremely difficult.

Now a word about the mode of branching of the colonies. Generally the branching takes place near the tip of branches. However it often happens that a branch seems to have been produced as a lateral bud from a larger stem or branch. In examining the origin of such a branch, I have found that the central cord of the branch may be separated from that of the stem by a thin cortical layer containing spicule-lacunæ. It does not necessarily follow from this fact, that the central cord is not an epithelial secretion, since the possibili-

ty can not be entirely excluded that there remain somewhere in the mesoglœa, undegenerated epithelium fragments which at times may resume secretory activity.

As before stated, genus *Kerocides* is no true Scleraxonian ; it must be removed into the order Gorgonacea. Since now all the known Gorgonians[1] are in possession of an axis, which, whether calcified or not, is the secretory product of *Axenepithel*, the present genus must be said to occupy an isolated position in the group. The genus may therefore be made to represent a special family, the Keroeididæ, with the following diagnosis :—



Diagrams showing the general make-up of the colonies of *Keroeides* (*A*) and of hitherto known Gorgonid species with continuous axis (*B*).

> Colony erect ; axis rigid, consisting of a central cord and of a cortical layer composed of smooth spicules conglomerated together by a horny matrix ; *Axenepithel* enepithel remaining only at the tip of branches ; polyps retractile into more or less well-developed calyces ; spicules not scaly.

Whether or not the genus *Dendrogorgia* Simpson can really be taken up in this family, can only be decided by reexamination of the specimen representing it.

---

1) According to J. J. Simpson, the Juncellids seems to be in some relation with Suberogorgiidæ, the paper, in which the matter would be discussed, is not yet accessible.

Finally let it be noted that in Gorgonian colonies there never exists an axial polyp, which might have taken lead in forming the stems and branches. As I could prove in a previous paper, the axis does not protrude into the cœlenteron, but lies always beneath the entoderm that covers the pedal disc of the mother or axial polyp. In the case of *Keroeides* the relation between axis and terminal polyp is likewise never so intimate that the conception of a leading polyp is scarcely admissible. That the coenenchyma should be regarded in the light of stolons, seems to stand almost beyond question.

Zoological Laboratory, Science College,
Tokio Imperial University,
May 24, 1910.

Explanation of Plate VI.

Keroeides koreni Wright and Studer.

1. Longitudinal section of the apex of a twig. × 150.
2. Longitudinal section of a twig a little below tip, where the *Axenepithel* has been lost and the cortical layer of the axis has just formed itself. × 150.
3. Spicules of the cortical layer of axis. × 150
4. Transverse section of axis. × 150.

ax axis.
cc central cord of axis.
cx cortical layer of axis.
ec ectoderm.
en entoderm.
hs horny substance.
lc lacuna of spicule.
mg mesoglœa.
ms mesentery.
pc polyp cavity.
sl solenium.
sp spicule.
xe Axenepithel.

On a New Antipatharian Hexapathes heterosticha, n. g. et n. sp.

By

Kumao Kinoshita, *Rigakushi.*

Zool. Inst. Science College, Tokio Univ.

Among the collection of Antipatharia in the Zoological Institute, Science College, there is an interesting species which cannot be referred to any of the known genera of the group. It is represented by several specimens, some being labeled as having been obtained in the Sagami-Bay from a depth of 400 fathoms. Superficial examination points that this form is very closely allied to the genus *Bathypathes*, especially in reference to the mode of branching and to the form of polyps, so that I took it at first for an aberrant form of that genus. But upon further examination of the polyp body, I have found that it does not possess sulco- and sulculolateral mesenteries,[1] the presence of which, according to Schultze's system, constitutes a highly important character of the above mentioned genus. The specimens in question can not therefore be referred to *Bathypathes*. Hence I propose to institute for them a new genus, *Hexapathes*, placing it in the Cladopathinæ[2], the third subfamilyof Antipathidæ.

The following description is based upon a specimen which was taken as the type.

The stem is simple, almost cylindrical and arises from a small basal expansion. Its total length is 20 cm.; the basal stem is 2 cm. in length, and 2 mm. in diameter in the upper parts. The remaining parts of the stem are provided with numerous simple branchlets. Of these branchlets

1) Abhandl. der Senckenbergischen Naturforschenden Gesellschaft, 23.

2) In accordance with the rules of nomenclature of 1904, I propose the new name Cladopathinæ for the subfamily Hexamerota Schultze.

two kinds may be distinguished: (a) branchlets probably homologous with the pinnules of *Bathypathes* and *Schizopathes*, 14 cm. in maximum length, 0.65 mm. in maximum diameter, arranged in two lateral longitudinal rows at intervals of 2.5–6 mm., and mostly directed obliquely above, the tips of these branchlets describing an ellipse of 16 × 19 cm.; (b) those which are directed horizontally and are very densely set on the anterior surface of the stem in the same parts as the former kind, some of them growing to a length of 10 cm., but the majority remaining quite short.

The axis of all the branchlets has 6–9 longitudinal rows of spines which are arranged at intervals of 0.35–0.6 mm. No definite mode of

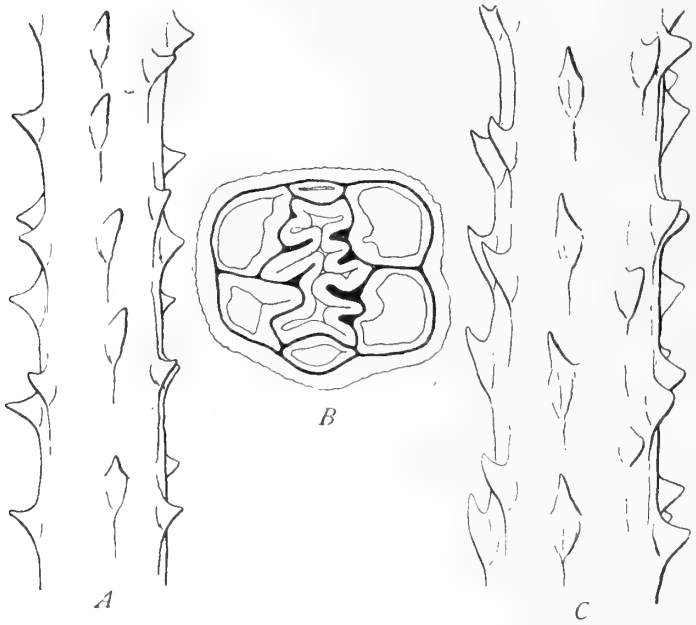


Fig. A. Portion of the axis of a branch, viewed laterally, anterior side to the right (type). × 50

Fig. B. Transverse section of a polyp through the peristomal projectien immediately beneath the tip (type). × 50

Fig. C. Portion of the axis of a branch of a larger specimen, viewed laterally, anterior side to the left. × 50

their arrangement can be made out. The spines on the anterior side of the axis (polyp-bearing side) are conical, laterally compressed and more or less turned upwards, while those on the posterior side are usually not so tall as those on the anterior side and stand perpendicularly to the axis. The anterior spines measure 0.05–0.10. mm., the posterior ones not more than 0.07 mm. in height.

As to the soft parts, the polyps are arranged on the anterior side of both the stem and branchlets in an uniserial manner. They are large, and their transverse axis is longer than the sagittal, being elongated to a length of 5–9. mm. (usually 7 mm.). The median portion of polyps (=gastrozooid of Brook) is provided with a high cylindrical projection of peristome, the tentacles being given off at about the level of the lower end of the long stomodæum (which almost reaches the axis sheath). With regard to the mesenteries there exist only two pairs of directives and a pair of laterals. Even in the upper parts of the peristomal projection, no other mesenteries are found.

The entoderm and mesoglœa are found very much contracted in the specimen[1], while the ectoderm remains in a distended state, leaving a wide space between the mesoglœa and the ectoderm. The ectoderm has batteries of very large nematocysts, the largest of these reaching to a length of 40 μ. The mesoglœa is poorly developed, containing no stellate cells, such as were described by Brook from *Cladopathes plumosa*. The other specimens agree very well in their salient features with the type specimen above described.

As is obvious from the foregoing description, the new form cannot be referred to any of the known genera. Between this form and *Cladopathes plumosa*, the only hitherto known species of Cladopathinæ, there exists no similarity respecting the mode of branching—the latter species being characterized by irregular pinnules which are very probably to be homologized with the pinnules of other genera, such as *Schizopathes*. It is interesting to note that *Bathypathes* contains a

1) The specimen has been kept in formalin.

form, *B. lyra* Brook, which resembles the specimens under consideration with respect to the mode of branching In addition to lateral pinnules, this species has a median inconspicuous row of bristle-like branchlets, which give the colony an appearence quite similar to that of *Hexapathes*. The resemblance seems to indicate an intimate natural relationship between these two forms, rather than a mere accidental convergence. And now there remains to be confirmed whether or not *Bathypathes lyra* has really ten mesenteries as was stated by Brook in the diagnosis of the Schizopathinæ. Nowhere in his report have I been able to find any special description of that species concerning this point. If the latter species has really ten mesenteries, it will be reasonable to doubt, that the presence or absence of he sulco- and sulculolateral mesenteries is a characteristic of great taxonomic value. In the present state of our knowledge, however, we have but to follow Schultze's system and I may place *Hexapathes* in the Cladopathinæ, as the second genus of the subfamily. In conclusion I will draw up a diagnosis of the new genus, selecting the main characteristics of the form for the purpose.

Hexapathes n. g.

Stem simple, with simple lateral pinnules arranged in two longitudinal rows, and with simple branchlets borne on the anterior surface of stem; spines of axis short, turned upwards; polyps elongate in transverse axis; mouth situated on a high projection of peristome; stomodæum long, nearly reaching the axis sheath; sagittal tentacles given off from the level of the lower end of stomodæum; mesenteries six in number.

Oct 21, 1910,

On Three New Species of *Hymenolepis* found in Japan.

By

S. Yoshida.

Zoological Institute, Sci. Coll., Tokyo.

With Plate VII.

In my studies on avian Cestodes found in Japan, no less than six species of *Hymenolepis* have thus far been met with. Of these, three are well represented by mature and well preserved specimens, enabling me to study them in some detail. The three species, two from the chicken and one from common teal, I consider to be new and will be described in this paper. They are all remarkably small-bodied species,—much smaller than most of the numerous known species of the genus.

I beg here to express my thanks to Professor Ijima for the many useful advice given me during my work in the Zoological Institute.

1. *Hymenolepis exigua* n. sp.

Pl. VII, figs. 1–10.

The cestode species here described as new under the above name occurs in abundance in the duodenal parts of the intestine of chickens in Tokyo. The specimens were obtained chiefly on three occasions, viz., Sept. 23, 1905; April 6, 1906; and April 27, 1908. They were found either attached by the scolex or free in the chyme.

Diagnosis.

Length 2–7 mm. Rostellum with a single circle of 10 hooks at apex. Head variable in shape, 0.17–0.21 mm. broad as well as long.

Sucker oval, 0.1 mm. by 0.08 mm. on an average. Neck short and very thin. Segments gradually increase in size posteriorly to the few last segments which again grow narrower towards the very end. Widest segment may be 0.4 mm. broad and 0.06 mm. long Genital pores unilateral. Cirrus long, slender, armed with minute spines. Cirrus pouch a long muscular sac reaching to lateral canals of the aporose side. Three testes arranged in a transverse row dorsal to cirrus pouch. Seminal vesicle dorsal to the inner end of cirrus pouch, connected to the latter by short vas deferens. Yolk-gland in median postero-ventral position. Ovary extending transversely, between cirrus pouch and yolk-gland. Vagina running straight inwards from genital cloaca along ventral side of cirrus pouch; its inner end tortuous, opening into oval, medianly situated seminal receptacle. Uterus sac-like, in the last segments occupying all the available space within segment.

Description.

External characters.—The cestode may reach a length of 7 mm. The smallest specimen obtained was only 2 mm. long. The widest segments, which may be 0.3–0.4 mm. broad, are found a short distance in front of the posterior end. The narrowest part which is just behind the head, may be 0.07 mm. or less broad. All the segments are constantly broader than long, the maximum length being reached by the posteriormost segment which may be 0.07–0.1 mm. long and 0.08–0.25 mm. broad. Segments of the widest parts of the body are 0.04–0.06 mm. long. The posterior border of each segment overlaps the anterior border of the next following segment; consequently, the lateral margins of the worm present a serrated appearance. The serrated condition is most distinct in the contracted state of the worm; it is frequently scarcely noticeable in the posterior parts (fig. 6), as is also the case with fully extended specimens generally.

In the live state, the head is very mobile, and is consequently

very variable in shape and size. It may present a spherical, truncate-conical or cordate shape, measuring 0.17–0.21 mm. in both length and greatest breadth. The rostellum in the protruded state may be 0.11 mm. long and 0.05 mm. broad. It is sometimes found retracted into the rostellum-sac (fig. 4). Its armature consists of a single circle of hooks, 10 in number and each 0.03–0.05 mm. long (fig. 3). The suckers are of an oval shape, measuring 0.07–0.12 mm. by 0.06–0.09 mm. The neck is but little marked in contracted specimens; even in the extended state it is short, measuring 0.1-0.2 mm. in length by a breadth of 0.05-0.07 mm.

The genital pores are all unilaterally situated. In each segment the pore opens at about the middle of the anterior half of the lateral margin.

Male reproductive organs.—The cirrus pouch (figs. 6, 8 & 10, *cp*) is long and nearly cylindrical, being somewhat thicker in the proximal than in the distal parts. Length about 0.3 mm.; greatest thickness 0.02–0.027 mm. From the genital cloaca it runs transversely, passing both the dorsal and ventral excretory vessels of the porose side on the dorsal side, and reaching with its inner end the level of the excretory vessels of the aporose side. In its course the pouch is gently bent so as to present concavity on the ventral side. The wall is seen to be made up of longitudinal or more or less obliquely running muscular bundles measuring 0.0075 mm. in thickness. They are closely set together in young segments, but in the older segments they leave distinct spaces between them (fig. 7).

The slender cirrus is armed with minute spines. It is often found externally protruded from the genital opening (fig. 6, *c*).

The vas deferens is short and thin (0.004 mm. thick). It connects the inner end of cirrus pouch with the seminal vesicle, which is situated directly dorsal to the former. The seminal vesicle is ovoid or spherical, 0.02–0.037 mm. in diameter, looking very much like a testis. It occurs even in the last segments in which the testes have atrophied (figs. 8 & 10, *sv*).

The testes are three in number to each segment (figs. 8 & 9, *t*). They are spherical, generally measuring 0.03–0.04 mm. in diameter, and are arranged in a transverse row on the dorsal side of cirrus pouch. In the immature state they are represented by compact nucleated spheres (fig. 9, *t*); when fully mature, they assume a granular and fibrous appearance due to the development of spermatozoa.

Female reproductive organs.—The ovary is a transversely elongate sac-like organ, situated postero-ventrally in the segment (figs. 5 & 8, *ov.*).

The yolk-gland is a distinct cell-mass, situated ventrally in the median line (figs. 5 & 8, *yg.*).

The vagina pursues a straight course mediad along the ventral side of cirrus pouch, crossing the excretory vessels of the porose side on the dorsal side. It is thickest (0.007–0.01 mm. thick) in the distal parts. In mature segments it is a very thin-walled tube. Proximally the caliber gradually decreases. The proximal end makes a few windings before it opens into the seminal receptacle (fig. 8, *vg*).

The seminal receptacle, situated mainly in the median line between cirrus pouch and yolk-gland, is an ovoid body, measuring 0.04–0.05 mm. by 0.025–0.03 mm. (fig. 8, *sr*).

The uterus is sac-like, lying transversely anterior to ovary (fig. 10, *ut*). In the posterior segments it is greatly distended and occupies all the available spaces in the segment, being filled up with eggs in advanced stage of embryological development. The uterine wall is a thin membrane consisting of flattened cells with distinct nucleus.

Musculature.—There is only one longitudinal muscle layer, corresponding to the outer longitudinal muscle layer of certain other *Hymenolepis* species. That layer consists of about one hundred or more muscular bundles regularly arranged in a row along the entire body margin (fig. 8, *lm*). Each bundle is thin, being only 0.0025 mm. in diameter.

Excretory canals.—As usual there are seen two main excretory

vessels on each side, dorsal and ventral. In the posterior segments the latter is much wider than the former; in the neck region both are of about equal width. The two vessels run separated from the lateral margin of the same side by a distance equal to about 1/6 the breadth of the segment containing them.

2. *Hymenolepis inermis* n. sp.

Pl. VII., figs. 11–16.

This new species is also from the duodenal parts of the intestine of chickens reared up in or about Tokyo. Numerous specimens were collected on April 9 (1906), April 23 (1907) and Oct. 3 (1907).

Diagnosis.

Length 5–10 mm. Rostellum very small, globular. Head globular, 0.15 mm. long and broad. Suckers oval, 0.07 mm. by 0.04 mm. Neck may be extended to 0.3 mm. length by 0.05 mm. thickness. Segments gradually increase in size posteriorly; largest segments 0.06 mm. long and 0.35 mm. broad. Genital pores unilateral. Cirrus pouch pyriform, shorter than half the breadth of segment. Three testes dorsal to female glands, one on porose and two on aporose side of the median line. Female glands forming a mass in median ventral position. Seminal receptacle in a line along porose side of segments. Vagina short, thin.

Description.

External characters.—All the specimens on hand are small but fully mature, measuring 5–10 mm. in total length. The segments number 150 or more; of these about one-fifth in the posterior parts are ripe and contain onchospheres. The segments are all and always broader than long, gradually increasing in dimensions posteriorly. Segments of the middle parts 0.05 mm. long and 0.25 mm. broad Largest segments in the posterior parts 0.07 mm. long and 0.35 mm. broad.

The head is globular, measuring about 0.15 mm. across. The rostellum is very small and likewise globular. The suckers, oval in shape, are comparatively large, being 0.07 mm. long and 0.04 mm. wide. A remarkable feature of the species lies in the fact that neither the rostellum nor the suckers are armed with hooks. This negative character was found to be constant with all the specimens examined, and can not be due to loss. It seems the rostellum is too small and weakly developed as to be able to bear any hook. I may mention that *Hymenolepis* without hooks on rostellum is not new: I refer to *H. carioca* (Magalhæs) and *H. megalops* (Nitzsch).

The neck is subject to considerable variation as regards its dimensions, according to the state of contraction of the worm. Generally it is 0.1–0.15 mm. long by a breadth of 0.08 mm.; sometimes it may reach a length of 0.3 mm., the breadth decreasing at the same time to about 0.05 mm.

Genital pores unilateral.

Male reproductive organs.—The testes, 3 in number to each segment, are spherical, measuring 0.018–0.023 mm. in diameter. They are most distinct in the younger segments in which the cirrus pouch and seminal vesicle have not yet fully developed; they are more or less obliterated in segments of the middle as well as posterior parts, in inverse proportion as the uterus enlarges. Two of the testes are found side by side in the dorsal part of the aporose side, in transverse line with the seminal vesicle and the cirrus pouch; while the third testis is situated ventral to seminal vesicle and the proximal end of cirrus pouch (fig. 13, *t*).

The seminal vesicle is a spherical body, measuring 0.025–0.03 mm. in diameter and situated dorsally in the median line. In the posterior segments containing ripe onchospheres the seminal vesicle is no longer visible.

The cirrus pouch is pyriform or club-shaped, situated in the dorsal side. Length 0.06–0.07 mm. Greatest breadth in the proximal parts

0.018–0.02 mm. It is always shorter than half the breadth of the segment. The proximal broad parts contain an oval dilatation of the lumen, which probably serves as the second seminal vesicle. (Figs. 13–15).

Female reproductive organs.—Ovary, yolk-gland and shell-gland form a compact mass in the median ventral side, in which the said several glands can not be clearly distinguished. From that mass a winding duct passes laterally to the seminal receptacle, situated on the ventral side of cirrus pouch. The seminal receptacle (*sr*) is ovoid or spherical, 0.03–0.05 mm in diameter, and looks very much like the seminal vesicle. In consecutive ripe segments the receptacles form a series of dots along the porose side, presenting a very characteristic appearance (fig. 12. A, B).

The vagina runs in a nearly straight line from the seminal receptacle. It opens externally directly behind the male opening by a pore, which is too small to be easily observed. (Figs. 23 & 14, *vg.*).

Onchospheres contained in posterior segments measure 0.05 mm. in diameter (fig. 16).

Musculature.—The muscular system is very weakly developed. There exists only a single layer of longitudinal muscles which are so thin as to readily escape observation.

3. ***Hymenolepis trichorhynchus*** n. sp.

Pl. VII., figs. 17–25.

This new species was obtained Febr. 15, 1906, in numerous quantity from the duodenum of common teal (*Anas crecca* L.) killed in Tokyo or in the neighborhood.

Diagnosis.

Length 4–4½ mm. Slender in the anterior parts, much broader in the posterior. Rostellum long and thin when fully extended, with a circle of 10 hooks (0.04 mm. long) before evagination. Rostellum sac

large, with distinct circular muscle-fibers in wall. Head subspherical. Suckers oval. Neck short. Length of segments increases posteriorly ; anterior segments broader than long ; middle segments quadrate ; posterior segments longer than broad. Genital pores unilateral, situated nearer to anterior than to posterior end of lateral segment edge. Cirrus pouch longer than half the breadth of segment, antero-dorsal in position ; its wall with 12–14 muscular bundles. Cirrus stout, armed with short spines. Seminal vesicle dorsal to the inner end of cirrus pouch. Testes dorsal to cirrus pouch. Ovary ventral in the middle of segment. Vagina along ventral side of cirrus pouch. Seminal receptacle between ovary and cirrus pouch. Uterus in posterior segments wide, containing onchospheres. Longitudinal muscle fibers discontinuous and wide apart.

Description.

External characters.—The worm measures 4-4½ mm. in total length. It is very slender in the anterior three-fifths of its length, measuring only 0.07–0.1 mm. in breadth ; much broader in the remaining posterior parts. The head is subspherical, 0.18–0.25 mm. long, 0.18–0.22 mm. broad, slightly angulated at the four suckers. These are oval, measuring 0.1–0.2 mm. by 0.07–0.1 mm. The rostellum, when fully extended, is very long, measuring 0.3 mm. in length and 0.025 mm. in thickness ; it is slightly broadened at the frontal end (fig. 21). In many specimens the rostellum is half protuded, and then a circle of 10 hooks, each 0.04 mm. long, is found in the rostellum, sac (fig. 18). On fully protruded rostellum hooks are nowhere to be seen, evidently as the result of loss (fig. 21). The rostellum sac is 0.18–0.25 mm. long and 0.06–0.09 mm. broad, showing well-developed circular and longitudinal muscle fibers in the wall.

The neck is very short. 0.08 mm. long and 0.07 mm. broad. Anterior segments 0.02–0.03 mm. long and 0.7–0.1 mm. broad. Some segments in the middle parts quadrate in shape, measuring 0.1 mm. or

more in length of sides. Widest segment in the posterior parts 0.14–0.2 mm. long and 0.2–0.32 mm. broad. The very last segment longer than broad, 0.25 mm. in length and 0.15–0.2 mm. in breadth.

Genital pores are all unilaterally situated. In each segment, the pore opens in the anterior parts of the lateral margin.

Male reproductive organs.—The long cirrus pouch extends over halfway across the segment. It lies in the anterior parts of segments, the proximal parts being gently curved ventrally (fig. 23). The wall shows more or less obliquely running longitudinal muscular bundles, 12–14 in number and each about 0.0025 mm. thick (fig. 25).

The cirrus is stout, 0.01 mm. thick and is armed with short spines (fig. 23). From its inner end the vas deferens can be traced to the seminal vesicle, situated on the antero-dorsal side of the former (*sv*).

The testes are found on the antero-dorsal side of cirrus pouch, but are generally not clearly visible.

Female reproductive organs.—Only a few segments in the middle parts of the entire worm are fit for the examination of female reproductive glands (fig. 19), the same being either immature or atrophied in other parts.

The ovary lies transversely in a median ventral position in the segments (fig. 23, *ov.*). From the genital opening, the vagina proceeds inwards, taking a somewhat winding course, passing the excretory vessels of the porose side on the dorsal side and along the ventral side of cirrus pouch until it joins the seminal receptacle. The latter (*sr*) is of an oval shape and lies between cirrus pouch and ovary. Eggs in the segments referred to are found in the aporose lateral as well as posterior parts of each segment.

In segments of the posterior parts (figs. 20, 24), the uterus is greatly distended, containing a number of onchosperes in it.

Onchospheres 0.03–0.04 mm. in diameter; with 6 hooks 0.014 mm. long.

Musculature.—Some longitudinal muscle fibers run directly beneath the cuticula in an interrupted layer, presenting an appearance of discontinuous and widely isolated longitudinal streaks. They are distinctly visible in fresh specimens and are most conspicuous in the anterior parts of the worm, to which they give a very characteristic appearance.

Explanation of Plate VII.

an.	Anlage of genital organs.	*r.*	Rostellum
c.	Cirrus.	*rs.*	Rostellum sac.
cp.	Cirrus pouch.	*sr.*	Seminal receptacle.
dv.	Dorsal vessel	*sv.*	Seminal vesicle.
eg.	Eggs.	*t.*	Testes.
exc.	Excretory Canal	*ut.*	Uterus.
lm.	Longitudinal muscle.	*vd.*	Vas deferens.
m.	Muscle.	*vg.*	Vagina.
n.	Neck.	*vv.*	Ventral vessel
ov.	Ovary.	*yg.*	Yolk gland.

Figs. 1—10.

Hymenolepis exigua n. sp.

Fig. 1. Drawn from compressed total preparation of a contracted specimen.

Fig. 2. Another specimen, extended. × 20.

Fig. 3. A hook from rostellum. × 390.

Fig. 4. Scolex and some anterior segments. × 140.

Fig. 5. Some widest segments from near the posterior end. × 140.

Fig. 6. Posteriormost segments. × 140.

Fig. 7. Cross-section of cirrus pouch. × 390.

Fig. 8. Combination figure of transverse sections, somewhat diagrammatic.

Fig. 9. Cross-section of an anterior segment. × 240.

Fig. 10. Cross-section of a posterior segment. × 140.

Fig. 11—16.

Hymenolepis inermis n. sp.

Fig. 11. Drawn from a total preparation. × 20.

Fig. 12. A, anterior segment with scolex. B, middle segment. C, posterior segments. × 100.

Fig. 13. Combination figure of transverse sections. × 390.

Fig. 14. Cross-section of a middle segment. × 390.

Fig. 15. Cross-section of a posterior segment. × 390.

Fig. 16. Oncosphere. × 390.

Figs. 17—25.

Hymenolepis trichorhynchus n. sp.

Fig. 17. A specimen magnified 20 times.

Fig. 18. Anterior segments with scolex. × 140.

Fig, 19. Segments from the middle parts, at the junction of the anterior slender parts with the posterior broader parts. × 140.

Fig. 20. Posterior segments. × 140.

Fig. 21. Scolex with fully protruded rostellum. × 140.

Fig. 22. A hook from unprotruded rostellum. × 390.

Fig. 23. Cross-section of a segment in which fertiliged eggs have just appeared. × 390.

Fig. 24. Cross-section of a posterior segment containing oncospheres. × 390.

Fig. 25. Cross-section of cirrus pouch. × 390.

Notes on Japanese Schizopoda.

By

K. Nakazawa, *Rigakushi.*

With Plate VIII.

In my studies of the Japanese Schizopoda I have been able thus far to collect seventeen species in all. Of that number, five are referable to species already known, viz., *Neomysis intermedia* Czerniavsky, *Euphausia pellucida* Dana, *Euphausia splendens* Dana, *Rhoda inermis* (Kröyer) and *Rhopalophthalmus egregius* Hansen; while the remaining twelve seem to be new to science. It is proposed in this paper to give diagnoses of these new species and, in addition, of *Rhopalophthalmus egregius* Hansen, since this species has been but imperfectly known.

I beg here to express my thanks to Prof. Dr. Ijima for the kind encouragement given me during my studies and also to all those gentlemen who helped me in collecting the material.

Order MYSIDACEA

Genus **Neomysis** Czerniavsky, 1883.

1. *Neomysis japonica* n. sp.

Plate VIII., fig. 2, 25.

Diagnosis.—— Carapace with rounded rostrum provided with a curved ridge (fig. 2). Antennal scale 9–10 times as long as broad. Flagella of both antennae shorter in female than in male. Third and all following legs with propodites consisting of 8–12 joints; last

leg always with a less number of propodite joints than in other legs. Outer branch of fourth pleopod (fig. 25) with the proximal joint about seven times as long as the distal joint, and the latter about one-fourth as long as terminal filaments. Telson elongate, triangular with 30–35 uniform spines on each lateral margin; the tip rather acute, provided with four spines of which the lateral two are longer than the median two or other marginal spines. Both branches of uropods longer than telson; the inner branch with a group of densely packed spinules, 25–37 in number, situated near the inner margin just below the large otocyst. Larger individuals of the species reach 16 mm. in length.

Localities.—— Brackish waters of the Pacific coast of Japan. The material in my hand hail from Teisanbori, a canal near Sendai; the Gulf of Tokyo, near the mouth of River Kiso, Prov. Ise; the Kojima Gulf in the Inland Sea. In all these localities the species is caught by fisherman in quantities almost at all seasons of the year.

Notes.— This species is closely allied to *N. vulgaris*, but the rounded rostrum and different proportional lengths of the joints of fourth pleopod in male, should serve to easily distinguish the two species.

2. *Neomysis nigra* n. sp.

Plate VIII., figs. 3, 17, 30.

Diagnosis.—— Carapace with pointed rostrum. Eye reniform (fig. 3). Antennal scale 8–9 times as long as broad. Thoracic legs moderately slender, with basal joint well developed and with propodite segmented into 3–6 joints; last leg with a greater number of joints than the two legs preceding (fiig. 17). Outer branch of fourth pleopod in male reaching to middle of telson, its proximal joint about 4 times as long as the distal, the latter shorter than terminal filaments. Telson (fig. 30) shorter than twice the breadth at base, armed with 16–20 uniform spines on each lateral margin; apex truncate, rather wide and armed with four spines, of which the two lateral are longer than the two median as in *N. japonica*. Inner branch of uropods provided

with a large otolith; with a dense row of spines closely ventral to otocyst as in the species just mentioned. Average length of body 7.8 mm.

Locality.—— The species is found in abundance in the so-called Lake of Hamana, Prov. Tōtōmi, which is in fact a brackish inlet of the sea. It also occurs in the Gulf of Tokyo.

Notes.— This species closely resembles *N. japonica*, but is distinguishable from it by the pointed rostrum. It differs from *N. kadiakensis* of Alaska in the shape of antennal scale and in the structure of propodite.

3. *Neomysis spinosa* n. sp.

Plate VIII., figs. 4, 10, 31.

Diagnosis.—— Carapace with acutely pointed rostrum (fig. 4). Each of the four anterior abdominal segments with a tranverse ridge in the middle; the fifth abdominal segment with two and the last segment with four, transverse rows of short spines. Eye globose; eye-stalk rather long, its proximal half densely beset with spinules (fig. 4) and with an elevation on the dorsal side of the distal half. Antennular peduncle (fig. 10) very robust; male sexual appendage of an elongate and somewhat triangular shape. Propodite of all legs consisting of 5 joints; dactylopodite distinctly claw-like. Outer branch of fourth pleopod in male, scarcely reaching the middle of last abdominal segment, the two terminal filaments about three times as long as the distal joint of the branch. Telson (fig. 31) much longer than last abdominal segment, linguiform, somewhat constricted near to base, gradually tapering towards truncate tip; lateral spines strong and uniform in the proximal half of margin, but in the distal half of same arranged in about eight successive sets, each set being composed of two or three equally long spines followed with a longer and stronger spine. Inner branch of uropod shorter than telson; spines on the ventral side near otocyst 6–7 in number. Outer branch of uropods a little longer than the inner. Average length of entire body 10. mm.

Locality.—— Misaki, 10–20 fathoms.

Notes.— This species resembles *N. americana* in the spinulation of telson, but the latter species has rounded rostrum and shorter antennal scale. It also resembles *N. mirabilis* in the shape of telson, but in this species the lateral spines of telson are all of a uniform size, while the propodites are more numerously segmented than in the present species.

Metamysis n. gen.

Antennal scale slender, obliquely truncate at apex, setose on both margins, jointed at the second serration from apex. Labrum pointed anteriorly. Posterior 6 pairs of legs with multiarticulated propodite; meropodite longer than carpopodite and very stout. Telson elongate, linguiform; apex entire, provided with several uniform spines. In male, fourth pleopod composed of a short basal joint, an inner branch of one joint and an outer branch of two joints; the latter with two long terminal filaments; other pleopods rudimentary. Marsupium composed of two pairs of lamellae springing from bases of the posterior two pairs of thoracic limbs.

4. ***Metamysis mitsukurii*** n. gen. & n. sp.

Plate VIII., figs. 9, 11, 13, 18, 26.

Diagnosis.—— Carapace with pointed rostrum. Anterior three abdominal segments with 2 or 3 transverse grooves on each; fourth and fifth segments armed with 3, and the last segment with 7, rows of spinules (fig. 9). Antennular peduncle stronger in male than in female. Antennal scale extending scarcely beyond antennular peduncle, about six times as long as broad (fig. 11). Labrum with an acute anterior projection reaching the end of the middle joint of mandibular palp (fig. 13). Legs rather slender, all propodites made up of 6 joints; basal joint of expodite of all thoracic limbs strong and provided with many minute spinules on the outer margin (fig. 18). Fourth pleopod of male (fig. 26) with the outer branch reaching far beyond

middle of last abdominal segment. Telson longer than last abdominal segment; apex obliquely truncate and provided with about 7 uniform spines; lateral margin with spines which in general grow longer posteriorly and are divided into about seven sets by repeated occurrence of markedly shorter spines at intervals of some five or more longer ones in succession. Inner branch of uropods nearly equal in length to telson; spines on the ventral side near otocyst 3 in number.

Average length of body 8.2 mm.

Localities.—— Off Ōarai on the coast of Prov. Hitachi. Off Maisaka on the coast of Prov. Tōtōmi.

Notes.— Characteristic to the species is the fact that the abdomen is grooved and spinulated.

5. *Metamysis sagamiensis* n. sp.

Plate VIII., fig. 32.

Diagnosis.—— Carapace with acutely pointed rostrum. Abdomen smooth. Antennal scale extending far beyond antennular peduncle. Labrum with a short anterior projection. Each leg with a strong meropodite and a short ischiopodite. Basal joint of the exopodite of thoracic limbs provided with only a few short spines at the antero-lateral corner. Fourth pleopod of male slightly exceeding in length the penultimate abdominal segment; the two terminal filaments about three times as long as the joint bearing them. Telson (fig. 32) equal in length to that of the two posteriormost abdominal segments taken together; gently tapering behind to the broad apex with four uniform and remarkably strong spines; lateral margin of telson with 5–6 spines near base, thereafter spineless for a short length, and finally again with a row of spines, of which every third one is much longer than the rest. Inner branch of uropod reaching to tip of telson, slightly dilated at the position of otocyst; seven spines on the ventral side near otocyst. Outer branch of uropod reaching a little beyond the four spines at the apex of telson, 5 times as long as broad. Length of body 12. mm.

Locality.—— Near Enoshima in Sagami Bay.

Notes.— A characteristic point of this species lies in the armature of telson

Anisomysis Hansen, 1910.

The genus was recently established by Dr. Hansen in "The Schizopoda of the Siboga Expedition" for the single species *A. laticauda*. In my material there are two species which are referable to that genus. Both the species have the posterior margin of telson entire, instead of showing a deep median incision as does Hansen's species. The generic diagnosis needs amendment in relation to this point only.

6. ***Anisomysis ijimai*** n. sp.

Plate VIII., figs. 5, 14, 27, 33.

Diagnosis.—— Carapace with obtuse rostrum. Eye remarkably large. Antennular peduncle stout, its third joint much shorter than basal joint. Antennal scale 7-8 times as long as broad; antennal peduncle composed of three short and nearly equal joints. The three pairs of flagella greatly differ in length according to sex; the two flagella of antennule more than twice longer in male than in female. Labrum truncate anteriorly. Mandibular palp (fig. 14) with a peculiar middle joint provided with a row of 7 or 8 short knobs on the inner side, comparable to the serration of the same part in *Lycomysis spinicauda* Hansen. Posterior six pairs of legs rather short, armed with a sparse number of spines; the propodite divided into two joints near distal end. Fourth pleopod of male (fig. 27) with the outer branch reaching to middle of telson; distal two joints of the outer branch nearly equal in length, the terminal joint provided with two spines just as in *A. laticauda* Hansen. Telson (fig. 33) about two-thirds of the last abdominal segment in length, distinctly constricted in the posterior parts, the portion behind that constriction being represented by a round plate fringed with about 18 spines. Inner branch of

uropod about one and a half times as long as telson, much dilated at base; spines on the ventral side quite invisible. Average length of body 7.3 mm.

Localities.—— Misaki in Prov. Sagami; Enoura in Prov. Suruga; Tateyama in Prov. Awa. In all these localities the species is taken in great quantities by fishermen.

Notes.— This species can be easily distinguished from others of the genus by the armature of the mandibular palp and by the characteristic features of telson. In other points the species closely resembles *A. laticauda* Hansen.

7. *Anisomysis mixta* n. sp.

Plate VIII., figs. 28, 34.

Diagnosis.—— Carapace with distinct rostrum. Third joint of antennular peduncle nearly equal in length to basal joint. The three pairs of flagella markedly different in length according to sex; more than twice longer in male than in female. Eye large, somewhat reniform. Antennal peduncle half as long as the scale. Propodite in posterior six pairs of legs shorter than carapace, composed of two joints. Fourth pleopod of male (fig. 28) reaching down to end of telson; the last joint of its outer branch more than twice as long as the middle joint. Telson (fig. 34) about one-third as long as the last abdominal segment, triangular in shape; its posterior half fringed with about 24 spines which increase in size posteriorly. Uropod as in *A. ijimai*. Average length of body 5. mm.

Locality.—— Misaki in Prov. Sagami.

Notes.— The characteristic features of this species consist in the jointed structure of the fourth pleopod in male and in the triangular shape of telson. The species is of a smaller size than *A. ijimai*, with which it occurs together but always in a less number.

Gastrosaccus Norman, 1892.

8. *Gastrosaccus vulgaris* n. sp.

Plate VIII., figs. 6, 23, 24, 29, 35.

Diagnosis.—— Carapace narrowed anteriorly, with obtusely pointed rostrum, deeply emarginated at the posterior edge so as to form round and smooth lateral lobes (fig. 6). Eye round, with short eye-stalk. Antennular peduncle very strong; its middle joint with two spines above; base of outer flagellum swollen and with olfactory hairs in both sexes. Antennal scale reaching to second joint of antennular and antennal peduncles, with apex rather straightly truncate. Legs with propodite made up of 10–11 joints; dactylopodite invisible. Epimera remarkably large. First pleopod of female (fig. 23) composed of a long basal joint and two branches; other female pleopods rudimentary and one-jointed. Third pleopod of male (fig. 29) reaching to end of last abdominal segment, its outer branch segmented into four distinct joints, the first joint being indistinctly subdivided into four joints in the distal parts where numerous hairs grow on the inner side. Telson (fig. 35) a little longer than last abdominal segment, about three times as long as broad at base; lateral margin with 7–8 strong spines. The two branches of uropod nearly equal in length, reaching to tip of telson; inner branch with 5–6 spines along its inner margin, with remarkably small otolith; outer branch armed with 14 short but strong spines along outer margin. Average length of body 10.4 mm.

Localities.—— Sandy beaches of: Ōhara in Prov. Shimosa; Zushi in Prov. Sagami; Ōarai in Prov. Hitachi.

Notes.— This species differs from *G. indicus*, *G. spinifer*, and *Haplostylus normani* by the structure of pleopods and by the shape of telson, amongst many other points. Apparently it is most nearly allied to *Archaeomysis grebnitzkii* Czerniavsky of Behring Sea, though differing in no small degree in the structure of the pleopods of female individulas.

9. *Gastrosaccus kojimaensis* n. sp.

Plate VIII., fig. 7, 20.

Diagnosis.—— Carapace narrowed anteriorly; with rostrum more distinct than, but posterior margin of carapace emarginate as, in *G.*

vulgaris, though with more oval-shaped lateral lobes. Antennular peduncle strong, its middle joint with 3 spines above (fig. 7). Outer flagellum of antennule swollen at base in both sexes, more distinctly so in male than in female. Antennal scale obliquely truncate at tip, which reaches beyond outer spine of the scale. Labrum pointed anteriorly, its anterior margin armed with 4 spines on each side of a median projection. Legs stout; propodite segmented into 8–15 joints, that of last leg with most numerous joints; meropodite of all legs very strong and longer than carpopodite; dactylopodite invisible (fig. 20). First pleopod in male with broad basal joint armed with long plumose spines along one side; outer branch of all pleopods normal and multiarticulated; third pleopod very long and with outer branch segmented into four joints; inner branch of second and third pleopods normal and multiarticulated; that of first, fourth and fifth pleopods rudimentary and one-jointed. Telson gently tapering to apex, three times as long as broad at base; lateral margin armed with 14 spines, the last of these being remarkably strong. Both branches of uropod longer than telson; ventral inner margin of inner branch armed with 10 strong spines; otolith small; outer branch armed with 19–20 strong spines along outer margin. Body length 11 mm. in average.

Locality.—— Kojima Bay in Inland Sea.

Notes.— This species differs from *G. vulgaris* in the rostrum being more distinct and in the telson being more spiny.

Rhopalophthalmus Hansen, 1910.

10. ***Rhopalophthalmus egregius*** Hansen.

Plate VIII., fig. 12, 22.

Carapace not covering four posterior thoracic segments; its anterior margin rounded, with a pair of pointed process instead of being augulated as given by Hansen. Antennal scale reaching to tip of antennular peduncle, about five times as long as broad (fig. 12). The

five pairs of legs preceding the last slender; their propodite indistinctly segmented into 3 joints in the distal parts, each of the joints armed with two remarkably long spines; meropodite shorter than carpopodite. All exopods of thoracic limbs well developed; outer distal corner of their large first joint rounded and spineless. Last pair of legs markedly reduced, papilliform and one-jointed in both sexes. Marsupium composed of three pairs of lamellae springing from bases of three posterior thoracic limbs. Pleopods of male, telson and uropod just as decribed by Hansen. Body 14 mm. in average length.

Locality.—— Port Shimizu (Suruga Bay).

Notes.— The original description of the species by Hansen in "The Schizopoda of the Siboga Expedition" was drawn up from a single male individual and is therefore necessarily incomplete. The diagnosis I have given above has been prepared after a study of numerous well preserved specimens of both sexes.

Genus **Siriella** Dana, 1852.

11. *Siriella watasei* n. sp.

Plate VIII., figs. 8, 36.

Diagnosis.—— Carapace with acute rostrum (fig. 8). Eye large, globose. Inner flagellum of antennule dilated at base. Antennal scale about four times as long as broad in the broadest part, scarcely reaching to tip of antennular peduncle. Posterior six pairs of legs rather slender; carpopodite strongly developed and longer than meropodite; propodite segmented into two joints, the distal joint about twice as long as the proximal; dactylopodite remarkably long and rather straight; last pair of legs much shorter than preceding five pairs; exopodite in anterior seven pairs of thoracic limbs with the first joint pointed at distal outer corner, but that of the last pair rounded at the same part. All pleopods of male like same of *Siriella vulgaris* Hansen 1910. Telson (fig. 36) shorter than three times its breadth at base, somewhat constricted near base; its lateral margin anterior to

the constriction with three spines; same behind the constriction with numerous spines which regularly grow larger posteriorly; the last pair of spines remarkably strong, between which grow 2 hairs and 3 small spines smaller than lateral ones. Outer branch of uropod much longer than the inner and articulated at two-thirds of its length from base, the distal joint shorter than twice its breadth; the outer distal margin of proximal joint provided with 9–12 spines, beginning a short distance behind the middle of that margin. Inner branch of uropod densely beset with spines, of which there are about 10 long ones, separated from one another by about 3 much shorter ones. Average length of body 9.2 mm.

Locality.—— Near the Misaki Marine Laboratory. Also discovered in the stomach of *Clupea* sp. caught off the coast of Odawara in Sagami Bay.

Notes.— This species closely resembles *Siriella vulgaris* Hansen obtained by the Siboga in the Indian Sea, but differs from it in the peculiar form of the inner flagellum of antennule and in the greater difference in length of the two branches of uropods.

12. *Siriella longipes* n. sp.

Plate VIII., fig. 19.

Diagnosis.—— Carapace with sharply pointed rostrum. Eye globose. Antennular peduncle with the third segment longer than the first. Antennal scale reaching to middle of the last segment of antennular peduncle, about four times as long as broad. Legs conspicuously slender, especially the fifth, the sixth and the seventh; propodite of the posterior three pairs of legs segmented into two joints in the middle of its length, that of more anterior legs somewhat nearer to base; dactylopodite strongly curved (fig. 19). Last leg shorter and more feebly developed than other preceding legs. Telson linguiform, its lateral margin armed with about 34 short and uniform spines. Outer branch of uropod segmented at a point more proximal than

two-thirds of its length from base, distal joint longer than twice its breadth at base; outer distal margin of the proximal joint provided with a row of 8–10 spines, the row not extending into posterior half of the margin. Inner branch of uropod much shorter than the outer. Length of body 10. mm.

Locality.—— Near Misaki.

Notes.— The characteristic points of this species lie in the third joint of antennules being longer than the first and in the strongly curved dactylopodtie.

Order **EUPHAUSIACEA**

Genus **Stylocheiron** G. O. Sars, 1883.

13. *Stylocheiron orientalis* n. sp.

Plate VIII., figs. 1, 15, 16, 21.

Diagnosis.—— Carapace short, slightly keeled above, with long and sharply pointed rostrum (fig. 1). Antennular peduncle sexually different; in the female it is longer, the two last joint being especially more slender than in the male; basal joint stout, longer than the other two joints taken together, but considerably flattened above, with a short stout spine on the outer distal margin. Mandible with reduced masticatory surface and no mandibular palp (fig. 15). Second maxilla lamellose, its exopodite elongate. Exopodite of first thoracic limb composed of many joints with a few long spines, while that of other thoracic limbs is two jointed. First and second pairs of legs feebly developed (fig. 16); meropodite of second leg much lengthened. Third leg (fig. 21) very slender, its meropodite longer than any other joint of the leg, the terminal joint with three long and two short spines, not chelate; propodite longer than carpopodite. Gills and luminous organs as in other species of the genus. Average length of body 9.3 mm.

Locality.—— Near Bonin Islands.

Notes.— Peculiar to this species is the fact that the propodite is longer than carpopodite in the third leg, the reverse being the case in all the other species hitherto known.

Explanation of the Plate VIII.

Fig. 1. Anterior parts of *Stylocheiron orientalis.* × 16.
„ 2. „ „ „ *Neomysis japonica.* „
„ 3. „ „ „ *N. nigra.* „
„ 4. „ „ „ *N. spinosa.* „
„ 5. Male of *Anisomysis ijimai.* × 12.
„ 6. Female of *Gastrosaccus vulgaris.* „
„ 7. Anterior parts of *G. kojimaensis.* × 16.
„ 8. „ „ „ *Siriella watasei.* „
„ 9. Male of *Metamysis mitsukurii.* × 12.
„ 10. Antennule of *Neomysis spinosa.* × 35.
„ 11. Antenna of *Metamysis mitsukurii.* „
„ 12. „ „ *Rhopalophthalmus egregius* Hansen. „
„ 13. Labrum and mandible of *Metamysis mitsukurii.* „
„ 14. Mandible of *Anisomysis ijimai.* „
„ 15. „ „ *Stylocheiron orientalis.* „
„ 16. First thoracic limb of *Stylocheiron orientalis.* „
„ 17. Eighth „ „ „ *Neomysis nigra.* „
„ 18. Sixth „ „ „ *Metamysis mitsukurii.* „
„ 19. „ „ „ „ *Siriella longipes.* „
„ 20. Eighth „ „ „ *Gastrosaccus kojimaensis.* „
„ 21. Third „ „ „ *Stylocheiron orientalis.* „
„ 22. Eighth limb of *Rhopalophthalmus egregius* Hansen. „
„ 23. First pleopod of female *Gastrosaccus vulgaris.* „
„ 24. Second „ „ male „ „ „
„ 25. Fourth „ „ „ *Neomysis japonica.* „
„ 26. „ „ „ „ *Metamysis mitsukurii.* „
„ 27. „ „ „ „ *Anisomysis ijimai.* „
„ 28. „ „ „ „ „ *mixta.* „

Fig. 29. Third pleopod of male *Gastrosaccus vulgaris.* × 35.
„ 30. Telson of *Neomysis nigra.* „
„ 31. „ „ *N. spinosa.* „
„ 32. „ „ *Metamysis sagamiensis.* „
„ 33. „ „ *Anisomysis ijimai.* „
„ 34. „ „ *A. mixta.* „
„ 35. „ „ *Gastrosaccus vulgaris.* „
„ 36. „ „ *Siriella watasei.* „

NOTICE.

Terms of subscription, $ 2.50 = 10s = 12½ F = M10 = ¥ 5 per volume. Postage prepaid.

Remittances from foreign countries should be made by postal money orders payable in Tokyo to M. NAMIYE, Zoological Institute, Science College, Imperial University, Tokyo.

All manuscripts should be sent to THE EDITOR ANNOTATIONES ZOOLOGICÆ JAPONENSES, College of Science, Imperial University, Tokyo.

All business communications should be sent to THE SECRETARY OF THE TOKYO ZOOLOGICAL SOCIETY, College of Seience, Imperial University, Tokyo.

明治四十三年十二月廿七日印刷
明治四十三年十二月三十日發行

東京市神田區美土代町二丁目一番地
編輯兼發行人　島連太郎

東京市神田區美土代町二丁目一番地
印刷人　前田宗松

東京市神田區美土代町二丁目一番地
印刷所　三秀舍

東京市日本橋區通リ三丁目十四番地
大賣捌所　丸善書籍株式會社

第七卷第四冊　定價　金壹圓

郵便爲替ハ東京市本鄉區理科大學動物學敎室波江元吉宛ニテ本鄉區森川町郵便爲替取扱所へ御拂込有之度候

日本動物學彙報

第七卷第五册

明治四十四年八月卅日發兌

ANNOTATIONES

ZOOLOGICÆ JAPONENSES.

Vol. VII., Part V.

PUBLISHED

BY

The Tokyo Zoological Society.

TOKYO,

August, 1911.

CONTENTS.

(Published August 30th, 1911).

Ueber die Variabilität und den Dimorphismus des japanischen Neunauges.

Von

S. Hatta.

Prof. an der kaiserl. Univ., Sapporo.

(Hierzu Tafel IX).

Bekanntlich unterscheidet man bei denjenigen Knochenfischen, welche zur Laichzeit die Flüsse und Bäche hinaufsteigen, um darauf die Eier abzulegen, zwei oder seltener drei Formen in denselben Arten, welche Tatsache neuerdings besonders auch bei mehreren japanischen Salmonidenarten vielfach konstatiert worden ist. Einen ähnlichen Fall beobachten wir bei den Cyclostomen, insbesondere bei den Neunaugen. Vor neun Jahren wies ich[1] darauf hin, dass die auf den japanischen Inseln einheimischen Neunaugen durch nur zwei Arten vertreten sind: einer kleinen und einer grossen, welche resp. *Lampetra mitsukurii* und *Lampetra japonica* genannt werden.

Die Individuen der letzteren Art sind in ihrem morphologischen Charakter miteinander ziemlich übereinstimmend: in der Tat kann man bei der in Rede stehenden Art die geschlechtlichen Verschiedenheiten kaum äusserlich wahrnehmen (Fig. 9), während die Körpergrösse nur innerhalb einer sehr schmalen Grenze schwankt, indem die Totallänge der kleineren Exemplare 45 cm. und die der gewöhnlichen Formen 48 cm. misst. Sehr selten finden sich 50,7 cm. lange Individuen.

Dagegen ist die kleinere Art, *Lampetra mitsukurii*, nicht nur geschlechtlich unterscheidbar, sondern zeigt auch einen merklichen

1) Hatta, S., On the lampreys of Japan, together with notes on a specimen from Siberia. Annot. Zool. Jap., Vol. IV, Part I. 1901.

Grössenunterschied (Figg. 1–4). Einmal ist bei dem weiblichen Tiere (Figg. 4, 8) die Analflosse mächtig entwickelt, während das männliche Tier (Figg. 3, 7) statt deren nur einen sehr verkümmerten Hautsaum besitzt, dafür aber mit einem penisartigen Spritzrohr versehen ist, das bei dem weiblichen Exemplare gänzlich fehlt. Zweitens ist die erste Rückenflosse (Figg. 3, 4) auch geschlechtlich verschieden, indem ihr Saum beim weiblichen Individuum einen eckigen Umriss zeigt, während dieselbe beim männlichen mit einer abgerundeten Kontour versehen ist. Nicht minder merkwürdig ist die zweite Rückenflosse, indem dieselbe beim weiblichen Tiere vor allem niedriger als diejenige des männlichen, und an ihrer schiefen vorderen Kante, wie besonders zur Laichzeit der Fall ist, durch starke Fettablagerung ziemlich verdickt wird (Figg. 4, 8). Ferner schwankt je nach den Fundorten die Grösse der Tiere. Am kleinsten sind die Exemplare aus Gifu, welche gewöhnlich 8 cm. und ausnahmsweise 9 cm. Länge besitzen. Die in Sapporo gesammelten Individuen (Figg. 3, 4) vertreten die grössten Exemplare dieser Art; dieselben sind 14 cm. lang. In der folgenden Tafel mache ich die auffallendesten Beispiele der verschiedenen, aus weit voneinander entfernten Fundorten herstammenden Exemplare anschaulich.

Lokalität.	Totallänge in cm.	Lokalität.	Totallänge in cm.
Sapporo	14,0 (16,5)	Kawagoye	11,2
Tsuyama	14,0	Yamagata	11,2
Takayama	13,5	Kumamoto	9,2 (?)
Akita	13,0	Yamaguchi	9,2
Aganogawa	12,5	Sakura	9,0
Tamagawa	12,2	Hamamatsu	9,0
Matsuyama	12,0	Gifu	8,0

Wie man aus dieser Tafel ersehen kann, sind die grössten Exemplare, wie z. B. diejenigen aus Sapporo, mehr als zweimal so lang wie die kleinsten, die durch die Exemplare aus Gifu vertreten sind. Die Grössenvariationen sind jedoch keineswegs eine sprungsweise, sondern sozusagen eine fluktuierende: die lokalitätsbezüglichen Verlängerungen bzw. Verkürzungen der Tierkörper also sind ununterbrochen

und findet sich ganz allmählich statt. Somit kann man nicht leugnen, dass dieselben Variationen als Lokalvariationen von ein und derselben Art auftreten.

Ferner ist auch bemerkenswert, dass die von ein und demselben Bach entlehnten Exemplare sehr mannigfaltige Gestaltungen und Färbungen zeigen. In dieser Hinsicht verdient Sapporo als eine wichtige Lokalität genannt zu werden. Dort kommen die Tiere besonders in überaus grosser Menge vor, und zwar sind sie fast individuell charakterisiert. Sehr selten stimmen die Individuen in Länge, Dicke und Färbung ihrer Körper überein. In einer Sorte, wie ich sie klassifizieren will, sind sie schlank und im Querschnitt des Körpers annähernd kreisrund; in der anderen Sorte dick und so komprimiert, dass der Querschnitt einen ovalen oder fast elliptischen Umriss darstellt. In einzelnen Fällen können die dickgebauten Individuen nach den Stufen von Verkürzung und Komprimierung des Körpers wieder in mehrere Gruppen eingeteilt werden. In der folgenden Tafel will ich die Körperlänge sammt der Höhe und Querdicke des Körpers in der Gegend knapp vor der vorderen Rückenflosse, geben, damit man auf die etwaige Gestaltung des Körpers in auffallenderen Fällen einen Schluss zu ziehen imstande sei.

	Körperlänge in cm.	Höhe in cm.	Querdicke in cm.
Schlanke Sorte	11,5	0,8	0,6
	11,6	0,9	0,6
	13,6	0,9	0,7
	15,3	1,0	0,8
Dicke Sorte	11,0	0,9	0,7
	13,6	1,2	0,8
	15,0	1,3	0,9
	15,3	1,2	0,9
	16,0	1,3	1,0

Ausserdem gibt es nicht selten Exemplare, bei denen die stark verdünnte Kiemenregion plötzlich in das bauchig hervorragende Abdomen übergeht und somit nicht minder die Umgestaltung des

Körpers hervorgerufen hat. In der Mehrzahl ist aber der Kiemenkorb, der sich mit dem plötzlich verjüngten Abdomen verbindet, tonnenförmig aufgeschwollen.

Was die Körperfärbung anlangt, die an lebenden Exemplaren beobachtet werden muss, so schwankt dieselbe auf den Rücken- und Lateralseiten zwischen dunkelbraun und kastanienbraun, ja variiert sie sogar bis zu hellgelb, sodass in der Tat jedes Individuum seine eigene Färbung zu zeigen scheint. Dazu kommen die Befleckungen, die sowohl durch die Breite, als auch durch die Umriss der variabelgeformten Flecken je nach den einzelnen Fällen voneinander äusserst verschieden sind. Ausserdem finden sich oft auch flecklose Tiere. Auf der Ventralseite ist die gelbweisse Farbe vorherrschend ; manchmal begegnet man aber auch dunkelweissen und schmutzigweissen Färbungen.

Auf diese Weise lässt die vorliegende Species des Neunauges eine grosse Neigung zu Variationen nach verschiedenen Richtungen hin erkennen. Nach Grösse, Gestaltung und Färbung des Körpers mag somit diese Art in mehrere Gruppen und Untergruppen eingeteilt werden.

Bemerkenswert ist ferner, dass ausser der obengeschilderten Art eine scheinbar verschiedene Neunaugenart in den Gewässern um Sapporo herum vorkommt (Figg. 1, 2, 5, 6). Dieselbe ist, mit der obenangegebenen Art Sapporos in Vergleich gebracht, enorm gross, indem ein gewöhnliches Exemplar 40 cm. misst. Unter keinen Umständen darf man aber diese Neunaugenart mit der grossen japanischen Species *Lampetra japonica* verwechseln, weil die fragliche Art sich von dieser in morphologisch wichtigen Punkten unterscheidet, die soeben angegeben werden sollen.

Was die äusserlich bemerkbaren unterscheidenden Merkmale betrifft, so sind folgende Punkte anzugeben (siehe Figg. 1, 2, 5, 6): bei dem männlichen Individuum ist die erste Rückenflosse überaus höher als diejenige beim weiblichen, und zeigt nicht wie beim letzteren einen eckigen, sondern einen abgerundeten Umriss (Figg. 1, 2). Dazu

kommt, dass die zweite Rückenflosse, die mit ihrem dicken vorderen Saum knapp nach der ersten folgt, insbesondere bei den weiblichen Tieren (Figg. 2, 6) während der Laichzeit an ihrem schief abgeschnittenen Saum durch Fettablagerungen stark verdickt wird. Die Analflosse ist beim männlichen Exemplare niedrig, beim weiblichen jedoch ziemlich hoch. Andererseits ist das männliche Tier im Gegensatz zum weiblichen mit dem vor der Analflosse hervorspringenden, penisartigen Spritzrohr (Figg. 1, 5) versehen, das bei *Lampetra japonica* (Fig. 9) gänzlich fehlt. Endlich sind die Ober- und Unterkieferzahnkegel in ihren freien Enden nicht scharf zugespitzt wie bei *L. japonica*, sondern abgerundet. In Bezug auf die inneren Organe ist vor allem der sehr verdünnte, fadenartige Darmkanal als auffallendestes Merkmal hervorzuheben, wodurch diese Art sich von dem mit einem relativ dicken Darmkanal ausgerüsteten grossen japanischen Neunauge (*L. japonica*) unterscheidet.[1]

Ferner erscheint die in Rede stehende Art zur Laichzeit im Frühjahre früher als *L. japonica*, d. h. Ende April in Sapporo, während die letztere Species Ende Mai oder Anfang Juni eintrifft, um die Eier abzulegen.

Durch die obenerwähnten Tatsachen werden wir gezwungen anzunehmen, dass trotz ihrer Grössenähnlichkeit mit *L. japonica*, die fragliche Art nicht in diese Species angereiht werden kann, sondern dass sie zur kleineren Species, *L. mitsukurii*, gehört. In der Tat leben die Individuen der in Frage gestellten Art niemals mit *L. japonica* nebeneinander in Flüssen zusammen; sondern finden sie sich gleich *L. mitsukurii* in Bächen, ja halten sie sich sogar oft mit den Individuen der letzteren Species gemengt auf.

1) Ebenso nicht haltbar ist die Auffassung, wodurch man die zwei Petromyzonarten (*P. planeri* und *P. fluviatilis*), welche resp. den 2 japanischen Species sehr nahe stehen, in eine zusammenzustellen sucht, wie Leopold Wejgel (Die Zusammenziehung der zwei Arten von *Petromyzon*, *P. planeri* und *P. fluviatilis*, in Eine, 1883); Anton Schneider (Beiträge zur vergleichenden Anatomie und Entwicklungsgeschichte der Wirbelthiere, Berlin, 1879), u. A. taten, die sich mit dieser Frage beschäftigt hatten.

Somit scheint die Annahme nicht unberechtigt zu sein, dass die zwei in Bächen nebeneinander lebenden Formen ein und dieselbe Species, *Lampetra mitsukurii*, vertreten.

Nun handelt es sich darum, dass in derselben Species einerseits kein Exemplar länger als 16,5 cm. angetroffen wird, andererseits die Individuen der obengenannten grossen Abart mindestens 35 cm. messen. Diese Tatsache weist offenbar darauf hin, dass der Grössenunterschied dieser Species keineswegs durch die ganze Reihe von Individuen hindurch ein fluktuierender ist, sondern dass die zwischen den beiden (grossen und kleinen) Formen stehenden Verbindungsglieder gänzlich fehlen, obgleich unter den Individuen der kleineren Art, wie oben angegeben wurde, ununterbrochene Stufen in der Körpergrösse zu beobachten sind. Demnach wird es berechtigt sein, die erörterten grossen und kleinen Formen der vorliegenden Species als zwei Abarte einander gegenüberzustellen und sie nach meinem Vorschlag *Lampetra mitsukurii major* und *Lampetra mitsukurii minor* zu benennen. *Daraus geht hervor, dass man bei L. mitsukurii in Bezug auf die Körpergrösse einen Fall des Dimorphismus vor sich hat, gerade wie bei gewissen Knochenfischen. Aus dem oben gesagten ist ferner einleuchtend, dass die beiden Abarten von L. mitsukurii sich geschlechtlich unterscheiden, d. h. geschlechtlich dimorph sind.*

So weit mir bewusst, wurde nur ein einziger paralleler Fall bei den Neunaugen durch S. H. Gage[1] hervorgehoben: dieser Forscher gibt an, dass in den Landseen und Flüssen vom Staat New York eine kleinere Spielart von *Petromyzon marinus* sich aufhält, die weniger als halb so gross ist wie das eigentliche Seeneunauge und "Lake Lamprey" genannt wird. Ich hatte durch die Güte Dr. A. Okas Gelegenheit ein Exemplar von "Lake Lamprey" zu sehen, und ich kann die Angabe Gages völlig bestätigen.

Sonst ist diese Tatsache noch von niemand bekannt gemacht

1) Gage, S. H., The Lake- and Brooklampreys of New York, especially those of Cayuga and Senega Lakes. The Wilder Quarter-Century Book. 1893.

worden. Unter den in Europa und in Amerika gedeihenden Neunaugenarten stehen, wie ich früher nachwies,[1] *Petromyzon planeri* und *Petromyzon wilderi* zu *L. mitsukurii* sehr nahe. Nach Leopold Wejgel[2] ergab sich dennoch von 17 ausgebildeten Bachneunaugen eine mittlere Länge von 15,97 cm., indem das grösste Exemplar 19 cm. und das kleinste 14,3 cm. mass. Gage[3] hat gezeigt, dass *Petromyzon wilderi* durchschnittlich 153,3 mm. mass; er erhielt dieses Ergebnis von 10 erwachsenen Exemplaren, von denen das grösste 170 mm. und das kleinste 140 mm. lang war. In diesen beiden Fällen ist somit die Variation ziemlich auffallend; trotzdem geht dieselbe nicht so weit, wie dies bei der japanischen Art der Fall ist.[4]

1) loc. cit.

2) Wejgel, L., Die Zusammenziehung der zwei Arten von *Petromyzon* (*P. planeri* und *P. fluviatilis*) in Eine. 1883.

3) loc. cit.

4) Eine europäische Neunaugenart, die als *Petromyzon omalii* van Beneden bekannt ist und oft mit *Petromyzon planeri* gruppiert wird, entspräche, wie ich glaube, der grösseren Abart von *L. mitsukurii*, das in der europäischen Neunaugenreihe den Platz von *P. planeri* einnimmt. Wäre diese Auffassung gültig, so liegt die Annahme nahe, dass *L. planeri* eine mit *L. mitsukurii* parallel gehende Entfaltung durchgemacht hat.

Tafelerklärung.

(Figg. 1–4. 1/2 natürl. Grösse; die übrigen, natürl. Grösse).

Fig. 1 und 2. *Lampetra mitsukurii major.*

Fig. 1. Männchen; Fig. 2. Weibchen; die beiden Individuen stammen aus ein und demselben Neste her, wo sie paarig zusammenlebten.

Fig. 3 und 4. *Lampetra mitsukurii minor.*

Fig. 3 Männchen und Fig. 4 Weibchen, aus ein und demselben Grübchen.

Fig. 5. Analgegend des in Fig. 1 bezeichneten Exemplars.

Fig. 6. Dieselbe Gegend des Individuums, das in Fig. 2 wiedergegeben wird.

Fig. 7. Dieselbe Region des in Fig. 3 repräsentierten Tiers.

Fig. 8. Dieselbe Gegend des in Fig. 4 wiedergegebenen Exemplars.

Fig. 9 zeigt die Analregion eines männlichen grossen japanischen Neunauges (*L. japonica*); die beiden Geschlechter sind nicht leicht äusserlich von einander unterscheidbar.

A Preliminary Report on the Source of the Human Liver Distome, *Clonorchis endemicus* (Bälz) (=*Distomum spathulatum* Leuckart).

(*From the Imp. Gov. Institute for Infect. Diseases, Tokio*).

BY

H. Kobayashi.

(*With Plate X.*).

There have been many researches concerning the liver distome in Japan and various suggestions have been made as to its mode of infection, e. g. the drinking of raw water, the eating of raw molluscs, etc. The experiments recorded below practically prove the baselessness of these suggestions.

With the hope of elucidating the life history of certain trematodes, I have examined a number of molluscs, fishes and aquatic arthropods for larval stages of this group, and have discovered among others a species of young distome encysted in the muscle of some freshwater fishes. It is found most abundantly in the fishes obtained at Kōjo and Sanban, Okayama Prefecture. These villages are known to be the places where liver distomiasis is most prevalent, and I naturally suspected that the distome in question might prove to be the young of the common liver distome, and the experiments on cats described below appear to me to prove the correctness of my supposition.

It is well known that the cats are often infested by the human liver distome, and therefore this animal was used for the purpose of my experiments. To them was given the flesh of fish which contained the above mentioned encysted distome. They were mostly kittens which

were ascertained beforehand to be free from distomes by repeated examinations of the fæces. They were fed exclusively on boiled rice and disinfected milk, while the experiments were carried on.

So far I have experimented with nine kittens and two adult cats. To the first kitten was given some flesh of *Pseudorasbora parva* (this fish and *Leucogobio güntheri* containing in largest number the encysted distome in question) on May 17th (1910); and one month afterward (on June 16th), examination of fæces showed the presence of distome eggs. On dissection innumerable distomes were found in the bile duct, gall bladder, hepatic ducts, pancreas and even in the duodenum. The parasites were smaller than the human liver distome ordinarily met with, but there can scareely be any doubt as to their specific identity with the latter, as will be shown below. To two other kittens was given some flesh of *Leucogobio güntheri* on June 23rd (1910). One of them was killed and examined on June 29th, and the liver was found infested by immature distomes. The other kitten died during the night of July 3rd; on examination the gall bladder and bile duct were found to be filled again with the same immature distome. Further, some flesh of *Leucogobio güntheri* and *Pseudorasbora parva* was given to six other kittens and two adult cats, which were killed respectively after

(a) three hours.
(b) fifteen hours.
(c) nine days.
(d) sixteen days.
(e) twenty-two days.
(f) twenty-six days.
(g) thirty-five days. (Adult cat).
(h) forty days. (Adult cat).

The results of all these experiments were positive, and in the last four cases the distomes obtained already contained mature eggs. Additional experiments were also performed on several rabbits and

Guinea pigs by forcing some flesh of infested *Pseudorasbora parva* into their gullet. After several days their liver was found to be infested by many distomes of the identical kind.

The encysted fish distome in question is found in the whole muscular parts and subcutaneous tissues of the host. The worm, when freed from its cyst (fig. 2), measures 0,5 mm. in length and 0,1 mm. in breadth; the body tapers posteriorly; the skin ("*cuticula*") is armed with very fine spines, which are conspicuous in the younger stages (fig. 3) but later disappear; the whole body is dotted with yellowish pigment. The oral and ventral suckers are distinct, the latter being situated in the anterior part of the posterior half of the body. The muscular pharynx and the bifurcation of the intestine can be recognized. Posteriorly to the ventral sucker there lies the terminal vesicle of the excretory organ containing highly refracting granules and opening externally at the posterior end of the body. The lateral vessels arise from the antero-lateral corners of the terminal vesicle and running along the lateral margin of the body, reach to the height of the pharynx. The freed distome executes a leech-like movement. The cyst (fig. 1) is ovoidal or elliptical in shape, measuring 0,13 mm. by 0,1 mm. The distome constantly rotates in the cyst, in which it lies with the body folded on itself. Three hours after being fed to the cat, the parasite is free from its cyst and creeps about actively, some already reaching the duodenum in this way. Fifteen hours after infection the parasite is found in the gall bladder. Six days after, the distome is considerably elongated and measures 1 mm. in length and 0,1 mm. in breadth; the terminal vessel of the excretory organ is also elongated; the sexual organs are not yet apparent. Twelve days after, the parasite measures 3 mm. in length and 0,5 mm. in breadth, and the sexual organs (testes, ovary and uterus, etc.) can now be clearly traced. From twenty-two to thirty days after infection the uterus of the parasite is filled with eggs.

Mature specimens of the distome measure 5–12 mm in length and 1–2,5 mm. in breadth, the size apparently depending upon the

space and nourishment available for the parasite. The oral sucker averages 0,3-0,34 mm. and the posterior sucker 0,24–0,26 mm. in transverse diameter. The ratio of the diameter of the suckers is 15 : 12–13.

There is no pigmentation in the body. In the fresh state the body is translucent with a slight reddish tint. The skin is smooth and without spines. Close behind the oral sucker lies the muscular pharynx, measuring 0,18 mm. in length and 0,15 mm. in breadth. The œsophagus is very short, about 0,2–0,25 mm. in length. The blind ends of the intestinal tubes lie near the posterior end of the body.

The terminal vessel of the excetory organ extends from the posterior end of the body to the posterior wall of the seminal receptacle, taking a sinuous course in the median line, and is slightly expanded at the anterior end. The lateral vessels arise, not from the anterior end of the terminal vessel, but laterally and somewhat behind its anterior end, and can be traced anteriorly as far as the posterior end of the œsophagus on the outer side of the intestine.

The lobes of the testes are variable. Broadly speaking, four of them can be counted in the anterior (left) testis, while the posterior (right) testis has generally five branches, with secondary branchlets, all lying in a horizontal plane. The two vasa deferentia unite in the middle part of the body and form a thick median vessel, the seminal vesicle, which is filled with semen and which after some windings reaches the common genital pore, situated just in front of the ventral sucker.

The ovary has three lobes and lies in the posterior third of the body. The vitellaria are composed of numerous small follicles and present a closely crowded acinous appearance. They reach ordinarily from the level of the ovary to the ventral sucker, but sometimes it lies more forward or backward. The follicles are all continuous and uniformly developed. The Laurer's canal and the shell gland can be seen clearly. The uterus forms about 20 or more loops. The eggs

contained are brownish in colour in the anterior and pale yellow in the posterior parts of it. They measure 0,022–0,027 mm. in length and 0,014–0,015 mm. in breadth.

This species may be distinguished from other distomes which are known to occur in the liver of the cat by the following characteristics:

1) The absence of spines on the surface of body in the fully grown state. *Metorchis truncatus* and *Opisthorchis noverca* have fine spines on the surface of body, while the distome obtained from my experiments has no spines when fully grown.

2) The ramification of testes. *Opisthorchis felineus* and *Metorchis albidus* have simply lobate testes, while in the present species they are distinctly branched.

3) The continuous vitellaria. *Opisthorchis felineus* and *Metorchis truncatus* have discontinuous vitellaria composed of several groups of follicles, while the present species has continuous vitellaria.

In spite of the small size of the specimens obtained from my experiments, I believe, on the basis of above grounds, that they all belong to *Clonorchis endemicus*, and that the fishes mentioned are intermediate hosts of the parasite.

It is very probable that the fishes which contain the encysted distomes are secondary intermediate hosts of the parasite. The first intermediate host and the way in which the fishes are infected require further investigation.

Recently I made some observations in Yanaidzu, Miyagi Prefecture, and in Kinohama and Iso, Shiga Prefecture, where hepatic distomiasis are also known to occur, and I found that various fishes contain the above described cyst distome in their muscle.

According to my observations the following species of fishes contain the cyst distome in question:

(1) *Leucogobio güntheri.*

(2) *Pseudorasbora parva.*

(3) *Acheilognathus lanceolata.*
(4) *Ach. limbata.*
(5) *Paracheilognathus rhombea.*
(6) *Pseudoperilampus typus.*
(7) *Abbottina psegma.*
(8) *Biwia zezera.*
(9) *Sarcocheilichthys variegatus.*

The first two species are most heavily infested, while the others are less so. It is very probable that this list of infested fishes will be increased on further investigation.

In the foregoing, I have used the name of one of the two species of Japanese human liver distome distinguished by Looss; but I hope to show in my full paper that these two species are really one.

It is my pleasant duty to express here my sincere thanks to Prof. Ijima, Prof. Goto and Dr. Miyajima for valuable suggestions on the subject. I wish also to express my obligation to Dr. Owatari, Professor in the Sixth High School, for the favours given me during my investigation.

Explanation of plate X.

Reference letters:

a. T.—Anterior testis (left testicle).
C. lat.—Lateral canal of excretory organ.
C. M.—Circular muscle.
Int.—Intestine.
L. C.—Laurer's canal.
L. M.—Longitudinal muscle.
Oes.—Œsophagus.
o. S.—Oral sucker.
Ov.—Ovary.
P. Gen.—Genital aperture.
Phar.—Pharynx.
R. sem.—Seminal receptacle.
p. T.—Posterior testis (right testicle).
Sp.—Spine.
Ut.—Uterus.
V. ex.—Terminal vessel of excretory organ.
Vit.—Vitellarium.
V. sem.—Seminal vesicle.
v. S.—Ventral sucker.

Fig. 1. Photograph of the encysted distome from the muscle of Pseudorasbora parva, fixed with heat; somewhat flattened by pressure. Enlargement ca. 400.

Fig. 2. Encysted distome: ventral aspect of a specimen freed from the cyst; half diagrammatic. Enlargement ca. 200.

Fig. 3. A part of the skin of *Clonorchis endemicus*, at the level of the pharynx. Specimen obtained from a cat 22 days after infection. Enlargement ca. 600.

Fig. 4. Ventral aspect of a mature *Clonorchis endemicus*. Specimen obtained from a cat 26 days after infection. Enlargement ca. 30.

On the Intracellular Stage of

Gregarina polymorpha.

By

Shigemi Ishii, *Rigakushi.*

The meal-worms[1] of Japan, as those of Europe, lodge three polycystid gregarines in the intestine, *viz.*, *Gregarina polymorpha*, *G. cuneata* and *Steinia ovalis* (var.?). In the intestinal epithelium are frequently found various intracellular developmental stages of a gregarine, which may be identified as those of *Gregarina polymorpha* on the following data: (*a*) Of the three species found in the intestine of the meal-worm, *Gregarina polymorpha* is the commonest; (*b*) whenever the epithelium contains intracellular gregarines, free *Gregarina polymorpha* is almost always found in the intestinal lumen also, the two other species being often entirely absent; (*c*) striking similarity in morphological characters between the full-grown intracellular gregarines and the smallest free examples of *G. polymorpha*, while the other species are each distinguishable from that species by characteristic features of their own.

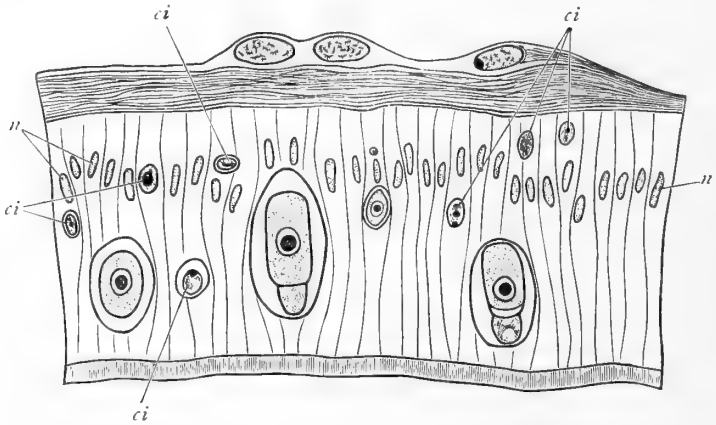
The observation of the intracellular stages is, I think, of some interest, since their occurrence in polycystid gregarines has been generally believed to be a very rare or exceptional circumstance. LÉGER and DUBOSCQ[2], as the result of their recent studies, have come even to the conclusion that no such stage exists in *Gregarina polymorpha*, and

---

1) Our meal-worm is closely related to *Tenebrio moritor*, only differing from this in having one posterior process in the last segment instead of two, in being less hairy over the body, etc.

2) Léger et Duboscq, '04.—Nouvelles recherches sur les grégarines et l'épithélium intestinal des trachéates: Arch. f. Protistenk., 4.

that the structures that there formerly taken for intracellular gregarines are merely certain cell-inclusions.



A portion of a cross-section through the intestinal epithelium of meal-worm, showing cell-inclusions (*ci*) and stages of intracellular *Gregarina polymorpha*. *n*, cell nucleus. (×500).

As to the method employed by me, meal-worms were cut at both ends; then, the whole digestive tract was pulled out and fixed with SCHAUDINN'S sublimate-alcohol or with acetic-sublimate. Sections were stained with iron-haematoxylin and counterstained with orange-G.

The epithelial cells of the intestine commonly contain numerous round or ovoid bodies besides the nucleus. It is certain that some of them are metaplasmic products due to secretion or some other cause, but many others are undoubtedly young gregarines.

The metaplasmic cell-inclusions are ovoid or elliptical in shape, and are very small, their major axis measuring only 2–10 μ. They may occur at any position in the epithelial cells. Usually a single inclusion is found within an epithelial cell; and in most cases it contains one or more nucleus-like granules, deeply stainable with iron-haematoxylin. The remaining part of the inclusion takes an orange color. The small bodies with one or more "Kerne," which BERNDT[1] has found in the intestinal epithelium of the larva of *Tenebrio moritor*

1) Berndt, A., '02.—Beitrag zur Kenntniss der im Darme der Larve von *Tenebrio moritor* lebenden Gregarinen: Arch. f. Protistenk., 1.

and has taken for an early developmental stage of *Gregarina polymorpha*, may be nothing else than cell-inclusions of the kind above referred to.

One the other hand, the intracellular gregarines are mostly larger than cell-inclusions. They may readily be classified into two kinds: (*a*) those in which the protomerite and deutomerite are already formed and (*b*) those in which this differentiation has not yet taken place. Smaller individuals of the latter kind nearly equal the larger metaplasmic cell-inclusion in size, and are usually plainly confined each within a single epithelial cell, while larger individuals frequently appear to extend through a space of two or more cells.

The non-differentiated intracellular gregarines are as a rule of an ovoid shape. Rarely the smaller forms show one end of the body more or less pointed. These are probably to be considered to be old sporozoites, the pointed end representing the remnant of the rostrum.

In the full grown and well differentiated intracellular gregarines the protomerite is nearly hemispherical, while the deutomerite presents the form of a short cylinder. Between the two segments of the body there always exists a distinct constriction. The width is nearly the same throughout the whole length of body, or the protomerite is a little narrower than the deutomerite. In length the latter is 2–4 times longer than the former. But the size of the protomerite in relation to that of the deutomerite is considerably larger in the intracellular gregarines than in the adult free sporonts or in associated individuals. Measurements taken from a medium-sized intracellular individual with protometite and deutomerite, are as follows :—

Length of body	18 μ
Length of protomerite	5 μ
Length of deutomerite	13 μ
Width of body (measured at the widest part of deutomerite)	8 μ
Diameter of karyosome	3 μ

The larger intracellular individuals lie nearer to the intestinal lumen than to epithelial base, with their longitudinal axis disposed vertically to the surface. In length they are about equal to one-third or even one-half of the whole epithelial thickness, while their lateral expansion, including the clear space round their body, covers an extent of from four to eight host cells.

The clear space just mentioned is ovoid or subspherical in shape. In the fresh state, that space is found to be filled with some fluid apparently secreted by the surrounding cell substance; the fluid may possibly serve as nutriment to the gregarine contained in it. The space is generally widest along the sides of the gregarine and narrows towards both ends. The posterior end of the gregarine is often in direct contact with the cytoplasm, all other parts lying free in the clear space.

The intracellular gregarines are yet very poor in entocytic granules, and, further, the granules present are still very fine. The entocyte is generally less dense in the protomerite than in the deutomerite. Sometimes there exists a clear region devoid of any granule in the anterior parts of the protomerite and behind the septum. The nucleus is comparatively large, its diameter being equal to about half the breadth of the body at the region, and is lodged in the centre of the deutomerite. The karyosome is always single and is very large. It stains most intensely with iron-haematoxylin, while the nuclear sap remains feebly colored. It is so strongly retentive of nuclear stains that it remains colored even when the chromatin of host cells is made to lose the stain,—a fact which affords great help in discovering the gregarines in the epithelium.

In most cases the protomerite is directed towards the lumen of the intestine,—a remarkable fact clearly demonstrable in our gregarines. One might think of three different ways to account for this phenomenon: (*a*) the sporozoite may have entered the epithelium with its posterior end foremost and developed the protomerite at the anterior end; (*b*) contrarily, the sporozoite may have entered the epithelium with its

anterior end foremost as in ordinary cases, and produced the protomerite at the posterior end; and (*c*) the sporozoite may have entered the epithelium with its anterior end foremost and developed the protomerite at that end but has made a turn so as to reverse the direction of the body-ends. The first assumption is scarcely admissible, since it stands against our previous knowledge regarding the sporozoites or merozoites of gregarines, coccidians, malarial plasmodia, etc., in all which cases the entrance into host cell is effected by the rostral end directed foremost. The second assumption is improbable, since it stands totally opposed to what experience we have on the matter. The third, it seems to me, affords a most satisfactory explanation. From my observations there seems to exist no difficulty on the way in assuming that a sporozoite, still very small and contained well within the body of a single cell, is capable of making a turn-round in the course of its movement. I presume the sporozoite, on its entrance into an epithelial cell, continue moving on a greater or less distance towards the cell-nucleus; then it turns round, whereby the anterior end, with which it first penetrated into the cell, is now directed towards the free border of the epithelium. With growth of the animal, the body elongates and eventually produces the protomerite at the anterior end. At the same time it gradually encroaches upon the neighbouring cells. A similar case was observed and reported by LÉGER and DUBOSCQ[1] in *Stenophora aculeata*, in which species, however, the turning-round seems to occur but very rarely and consequently was regarded by them as an abnormal phenomenon.

Later the intracellular gregarines escape into the intestinal lumen. In the intestinal canal, I have often noticed free gregarines with their posterior end close to the surface of the epithelium and surrounded by some mucilagenous debris of what seemed to be disorganized host-cells. It has generally been believed that intracellular gregarines become free by breaking through the wall of the host, first projecting the rapidly

1) *Loc cit.*

growing posterior part of the body into the intestinal lumen and finally remaining attached to the intestinal wall by the anterior end or the epimerite. Contrarily, in the present case, the fully grown intracellular gregarines seem to fall out anterior end first into the intestinal canal, retaining after their complete exit no connection whatever with the epithelium.

The intracellular gregarine lodged in the clear space already mentioned, is, according to my view, not totally motionless as has generally been belived to be in other cases. The movements probably become more and more active as the development progresses, and to this cause is probably to be ascribed in a large measure the breaking up of the host-cell. As is well known, free gregarines are mobile, and there exists no ground to deny the same power to the parasite while confined in the epithelial cell. Movements of intracellular parasitic protozoans have been observed in several cases, *f.i.*, in malarial *Plasmodia* (especially active in *Plasmodium immaculatum* of febris aestivo-autumnalis); also in the interesting *Euglena*-like flagekate parasitic in a mesostomid rhabdocoel recently reported by HASWELL.[1]

I have found, as CRAWLEY[2] and LÉGER and DUBOSCQ[3] did in various *Stenophora*, many intracellular young individuals of *Stenophora julipusilli* in the intestinal epithelium of *Julus*. I believe that many more instances of intracellular gregarines will in the future be brought to light.

In conclusion, I should take this opportunity of performing my pleasant duty of thanking Professor IJIMA for his advices and instructions given me during the course of this study.

Tokyo, May 1910.

1) Haswell, W.A., '07.—Parasitic Euglenae: Zool. Anz., 31.
2) Crawley, H., '03.—List of polycystid gregarines of the United States: Proc. Acad Nat. Sci. Philad., 55.
3) *Loc cit.*

Further Report on Japanese Stomatopoda with Descriptions of Two New Species.

By

T. Fukuda.

(*With Plate XI.*)

Among the specimens of Stomatopoda from our seas, which I have examined since the publication of my report in this 'Annotationes,'[1] I happened to find three species that were not mentioned in it. One of them is the well-known *Odontodactylus scyllarus*, which Rathbun[2] has already reported from Wakanoura, Prov. Kii., while the other two, one belonging to *Protosquilla* and the other to *Squilla*, seem to be new to science. The species described in both the previous and present papers taken together number seventeen. In addition to these some four or five species, *viz*, *Lysiosquilla latifrons*, *Squilla raphidia*, *S. scorpio*, *Pseudosquilla dofleini* have been reported by foreign investigators, such as de Haan, Rathbun, Balss as from Japanese waters. They unfortunately have not as yet come under my examination. Consequently it may safely be said that the number of known species of the order from our seas amounts to at present a little more than twenty.

1. *Protosquilla tanensis* n. sp.

Pl. XI, figs. 1, 2.

The rostrum bears a long acute median spine, its antero-lateral angles also provided with acute terminations. The carapace is nearly rectangular, the length of which measures a little less than $\frac{1}{5}$ the total

1) Annot. Zool. Japon. Vol. VII, Part 3, p. 140, 1909.
2) Proc. U. S. Nat. Mus. Vol. XXVII, p. 54, 1903.

length, the width of the anterior as well as the posterior margins being about $\frac{2}{3}$ the length. The antero-lateral angles are slightly produced, while the postero-lateral are obtuse and rounded. Gastric sutures run a little divergent posteriorly. Exposed thoracic segments increase in length gradually backward, of which the fifth segment is completely exposed dorsally, the next two having laterally produced and truncated margins. The lateral margins of all the abdominal segments are provided with carinae, which do not end in spines. There are some three or four pairs of longitudinally-marked depressions on the fifth segment; while the sixth is completely covered with irregularly-marked depressions, and bears four prominences besides the carinae near the margins.

The telson is nearly as long as wide, being about $\frac{1}{7}$ the total length; it is provided with three conspicuous prominences arranged in the same way as in, *e.g.*, *P. cerebralis*, the median one being triangular and the lateral nearly elliptical. The whole dorsal surface of the telson, except the summits of the prominences, is covered with irregularly-marked depressions as in the sixth abdominal segment. The posterior margin is divided on each side into three lobes, all nearly equal in size, and each with a carina upon the surface. A narrow median fissure, beginning on the posterior margin, reaches almost the middle of the telson; the space adjoining it being markedly lower and more depressed than the rest. The inner margins of the submedian lobes are beset each with a row of eight spinules, of which the outermost one is mobile and much larger than the rest. The intermediate and the lateral lobes are also provided each with a spinule on the inner margin. All these lobes and spinules point obliquely upward. The lateral margins of the telson have a longitudinal carina, upon which some depressions are present.

The surface of the basal segment of the uropoda bears also some irregularly-marked depressions: of two prolongations, the outer one is much longer and broader than the inner one. The proximal segment

of the exopodite has a round process at the base of the inner margin, and the mobile spines on the outer margin in either uropoda are seven in number.

The corneal region of the eye is somewhat widened. The dactylus of the raptorial limb is strongly dilated at the base, where a slight dentation occurs on the outer margin.

This species undoubtedly resembles *P. glabra* Lenz, but may be readily distinguished by the presence of the depressions upon the last two somites, etc.

Colour.—In the alcoholic specimen the ground colour is reddish brown, on which some dark purple markings are present upon the dorsal surfaces of the longest segment of the raptorial limb as well as of the exposed thoracic and the abdominal segments.

Size.—The single male specimen measures 30.5 mm in length.

Locality.—Tanegashima, Prov. Osumi.

2. *Odontodactylus scyllarus* (Linné).

Cancer scyllarus, Linné, Syst. Nat. (ed. X) p. 633 (1758).

Gonodactylus scyllarus, Milne-Edwards, Hist. Nat. Crust., II, p. 529 (1837); Miers, Ann. and Mag. Nat. Hist. (5) V, p. 115 (1880); de Man, Archiv f. Naturgesch. 53 Jhrg. 1, p. 572 (1887).

Odontodactylus scyllarus, Bigelow, Proc. U. S. Nat. Mus., XVII, p. 496 (1894); Borradaile, Proc. Zool. Soc. London, p. 36, Pl. V, fig. 6 (1898).

One male from Bōnotsu, Prov. Satsuma.

3. *Squilla quadraticauda* n. sp.

Pl. XI, figs. 3–5.

The rostrum is nearly equilateral triangular, with a median longitudinal carina. The length as well as the width on the posterior margin of the carapace is about equal to $\frac{1}{5}$ the total length; while the width on the anterior margin measures nearly $\frac{5}{8}$ the length or the width on

the posterior margin. The median carina is very faintly marked. The antero-lateral corners are angular and have a minute denticle directed antero-lateral, the postero-lateral being evenly rounded and produced. No projection is present on the median line of the posterior margin.

The submedian carinae upon the exposed thoracic segments are divergent posteriorly. The fifth segment bears two processes on the lateral margins; the anterior one being acute and straight directed antero-laterally downward, while the posterior is much shorter and blunt. The lateral margins of the next two segments are bilobed, the posterior lobes being much larger and triangular in shape.

The first five abdominal segments bear four pairs of carinae but no median tubercles. The submedian carinae are divergent posteriorly on all these segments and end in spines on the fifth. All the other pairs of carinae, except the first two of the intermediate and the first of the lateral, terminate in spines. There are three pairs of carinae upon the sixth segment all ending in spines and the submedian being parallel.

The telson is nearly square in shape and its length occupies about $\frac{1}{5}$ the total length. The dorsal surface is marked on each side with rows of shallow pits running outward and backward. Three pairs of spines are present on the margin besides the anterior lateral carinae which terminate in a short spiniform process. The submedian and the lateral spines are divergent, while the intermediate convergent posteriorly. All the carinae upon the marginal spines as well as the median crest are narrow and without traces of dilation. The secondary denticles are 3–4, 9, 1 in number. A shallow fissure is present on the posterior median line, the denticle adjoining which bears a row of minute spinules or denticles of the third order on the margin.

The basal prolongations of uropoda have a large tooth on the outer margin of the inner spine. The ophthalmic segment is exposed dorsally. The eyes are extraordinary large with the corneal axis almost half as long as the carapace. There is a process on the inner

margin of the carpus of the raptorial limb, the dactylus having five spines including the terminal one. The walking limbs are slender.

This species seems to resemble *S. quinquedentata* Brooks, but may be distinguished from it by the shape of the rostrum, the size of the eyes, etc.

Colour.—In the alcoholic specimen the ground colour is light brown besprinkled with minute dark dots. Some dark purple spots are present on the area near the lateral margins of the last two abdominal segments as well as at the end of the median crest of the telson.

Size.—The single female specimen measures 40 mm. in length.

Locality.—Matsuwa, Prov. Sagami.

December 1910.
Kawanabé, Kagoshima-ken.

Explanation of the Plate.

Fig. 1. Cephalic region of *Protosquilla tanensis* n. sp. × 6.

„ 2. Last two abdominal segments and telson of the same specimen. × 6.

„ 3. *Squilla quadraticauda* n. sp. × 2.

„ 4. Marginal processes of the thoracic segments of the same specimen. × 2½.

„ 5. Telson and uropod of the same specimen. × 4.

Phasmiden und Mantiden Japans.

Von

T. Shiraki.

Entomolog an der Landwirtschaftlichen Versuchsstation,
Taihoku, Formosa.

Hierzu Tafel XII.

Phasmiden und Mantiden Japans mit Ausnahme des Formosas wurden von verschiedenen Entomologen wie DE HAAN, J. WESTWOOD, A. SERVILLE und J. A. G. REHN behandelt und beschrieben, und zwar scheinen mir die grosseren Arten fast alles ausgearbeitet zu sein. Durch die genauere Untersuchung der Sammlung an der Kaiserl. Universität zu Tohoku und der Sammlung an der landwirtschaftlichen Versuchsstation zu Formosa habe ich sechs für die Wissenschaft neue Arten (4 Phasmiden- und 2 Mantiden-Arten), und drei bis jetzt bei uns noch nicht bekannte Arten nachgewiesen, namentlich *Lonchodes nematodes* DE HAAN, *Lonchodes confucius* WEST. und *Sipyloidea samsoo* WEST., welche sämtlich aus China beschrieben wurden.

Die folgenden 11 Phasmiden-Arten und 7 Mantiden-Arten sind mir aus Japan bekannt:

Phasmidae.

Lonchodes nematodes DE HAAN.
Lonchodes confucius WEST.
Phraortes elongatus THUNB.
Phraortes mikado REHN.
Marmessoidea phluctainoides REHN.
Necroscia 6-punctata, n. sp.
Sipyloidea samsoo WEST.

Acanthoderus japonicus DE HAAN.
Entoria formosana, n. sp.
Entoria magna, n. sp.
Entoria japonica, n. sp.

Mantidae.

Micromantis formosanus, n. sp.
Gonypeta maculata SHIRAKI.
Statilia maculata THUNB. & LUND.
Paratenodera aridifolia var. *sinensis* STÅL.
Hierodula bipapilla var. *patillifera* SERV.
Mantis religiosa L.
Acromantis japonica WEST.

Die Phasmiden halten sich im Gebüsch auf; sie leben meistens auf Pflanzenblättern, wodurch sie öfters als schädliche Insekten betrachtet werden. Thatsächlich aber sind sie unschädlich, ja sogar nützlich. Die Mantiden, besonders *Paratenodera aridifolia* var. *sinensis* STÅL und *Hierodula bipapilla* var. *patillifera* SERV., sind sehr nützliche Thiere, indem sie schädliche Insekten vernichten, welche für Obst- und Forstbau in Formosa sehr schädlich sind.

Die untersuchten Materialen wurden meistens von Herrn Prof. Dr. S. MATSUMURA der kaiserl. Universität zu Tohoku, einige davon von Herren Y. NAWA, I. NITOBE und von mir gesammelt wurden. Da ich mit seiner Erlaubniss sie studieren konnte, und unter seiner freundlichsten Leitung diese Arbeit fertig gemacht habe, gestatte ich mir hier dem erst genannten Herrn meinen herzlichen Dank auszusprechen.

FAM. PHASMIDAE.

Tabelle zur Bestimmung der Subfamilien.

1. Fühler über 30-gliedrig.
   1'. Ohne Flügel ..... 1. *Lonchodinae.*
   2'. Mit Flügel ..... 2. *Necroscinae.*
2. Fühler nicht über 30-gliedrig. ..... 3. *Clitumninae.*

I. Subfam. **Lonchodinae** BRUNNER.

BRUNNER, VON W., 1893: Rev. Syst. Orth., p. 80.

In Japan kommen 2 Gattungen vor.

Tabelle zur Bestimmung der Gattungen.

1. Hinterkopf körnig ..... 1. *Lonchodes* GRAY.
2. Hinterkopf nicht körnig ..... 2. *Phraortes* STÅL.

Gatt. ***Lonchodes*** GRAY.

WESTWOOD, J. O., 1859: Cat. Orth. Phasm., p. 36.
DE SAUSSURE, H., 1864: Mél. Orth., XVII, IIme, Phasm., p. 299.
STÅL, C., 1875: Rec. Orth., III, p. 8.
BRUNNER, VON W., 1893: Rev. Syst. Orth., p. 81.

In Japan kommen 2 Arten vor.

Uebersicht der Arten.

1. ♂. Die Lappen des 9. Dorsalgliedes des Hinterleibs am Ende und Innen mit Dornen. .....
   ..... 1. *Lonchodes nematodes* DE HAAN.
2. ♂. Die Lappen des 9. Dorsalgliedes des Hinterleibs ohne Dornen ..... 2. *Lonchodes confucius* WESTWOOD.

1. ***Lonchodes nematodes*** DE HAAN.

DE HAAN, Orth. Orient., p. 133, pl. 11, fig. 6 u. pl. 13, fig. 1.
WESTWOOD, J. O., 1859: Cat. Orth. Phasm., p. 42, pl. V, fig. 7.

♀. Körper sehr lang und schmal, cylindrisch, gelbbraun oder grünlichbraun, glänzend. Kopf convex, länger als breit, nach hinten zu verschmälert, zwischen den Netzaugen ohne Dornen, an der Seite je mit 2 gelben Längsstreifen (bei einigen Exemplaren fehlen diese Streifen). Netzaugen kreisförmig, mittelgross, hervorstehend. Fühler schmal und lang, doch kürzer als der Vorderschenkel, das 1. Glied gross, walzenförmig, die übrigen borstenförmig. Pronotum kürzer als der kopf, fast quadratisch, schmutziggelb oder rotbraun, in der Mitte mit einer kreuzförmigen Furche, am Vorderrande etwas eingebogen und ausgerandet, am Hinterrande quer ausgeschnitten. Mesonotum sehr schmal und lang, etwa 6-mal so lang wie das Pronotum, nach hinten zu ziemlich verschmälert, dunkelgelb, an der Seite je mit einem hellgelben schmalen Längsstreifen, in der Mitte mit undeutlicher, schmaler Längskante, am Vordertheile etwas gekörnt Metanotum (mit dem Mittelglied) schmal und lang, kürzer als das Mesonotum, fast gleich gefärbt wie das Mesonotum, nach hinten zu ziemlich verschmälert. Beine sehr schmal und lang, hellbraun. Vorderschenkel länger als die übrigen Schenkel, seitlich zusammengedrückt, ohne Dornen und Lamellen, am Ende schwärzlichbraun; Vorderschienen viel länger als der Schenkel, Querschnitt fast dreieckig, am Ende schwärzlichbraun; Mittelschenkel kürzer als die übrigen Schenkel, fast so lang wie der Kopf, das Pronotum und das Mesonotum zusammen, ohne Dornen, gleich gefärbt wie die Vorder- und Hinterschenkel; Hinterschenkel das Hinterleibsend nicht erreichend, etwas seitlich zusammengedrückt, unten mit 2 Längskante, am Ende mit 5 bis 7 schwärzlichbraunen Zähnchen; Hinterschienen viel länger als der Schenkel, oben an der Aussenkante und unten an der Seitenkante mit kurzen und schmalen schwärzlich braunen Dörnchen. Das 1. Tasalglied länger als die übrigen. Hinterleib schmal und lang, so lang wie der Kopf und das Notum zusammen: das 9. Dorsalglied tief gespaltet, 2 Lappen am Ende eingebogen und an der Innenseite mit zahlreichen, schwarzen, zugespitzten Dörnchen. Cerci schmal, etwas seitlich zusam-

mengedrückt, am Ende rundlich, den Dorsaltheil ausgenommen mit feinsten Härchen, 3 Endglieder des Bauches das 9. Dorsalglied des Hinterleibs nicht erreichend.

	♂
Körperlänge:	84.—95. mm.
Kopflänge:	3,5—3,8 mm.
Pronotumlänge:	3.—3,2 mm.
Mesonotumlänge:	17,5—20,5 mm.
Metanotumlänge (mit dem Mittelglied):	15 —17. mm.
Fühlerlänge:	30.—40. mm.
Vorderschenkellänge:	43.—44. mm.
Vorderschienenlänge:	48.—48,5 mm.
Mittelschenkellänge:	26.—29. mm.
Hinterschenkellänge:	31.—36. mm.
Hinterleibslänge:	45.—49,8 mm.
Cerculslänge	0,8 mm.

3 Exemplare aus Formosa (Taihoku in December ♂ 2, und Nanto in Mai ♂ 1) in meiner Sammlung. Sonstige Verbreitung: China, Singapore.

Trivialname: Kaya-Nanafushi.

2. *Lonchodes confucius* WEST.

WESTWOOD, J. O., 1859: Cat. Orth. Phasm., p. 46, pl. VII, fig. 2 & 3.

♀. Körper mittellang, etwas flach, hellgrün oder hellbraun. Kopf länger als breit, ziemlich flach, fast quadratisch, ohne Dornen, Vordertheil gekörnt, in der Mitte mit einer undeutlicher Längskante, gelbbraun oder gelbgrün. Netzaugen klein, kreisförmig, braun. Fühler schmal und lang, länger als das Vorderbein. Pronotum fast quadratisch, in der Mitte mit einer undeutlichen Längskante und einer Querfurche, nahe dem Vorderrande mit einer Querfurche, ein wenig gekörnt, am Vorder- und Hinterrande fast quer ausgeschnitten, viel kürzer als der Kopf. Mesonotum fast 6-mal so lang wie das Pronotum,

nach hinten zu ziemlich verbreitert, deutlich gekörnt, in der Mitte mit einer undeutlichen Längskante. Metanotum (mit dem Mittelglied) fast $\frac{4}{5}$-mal so lang wie das Mesonotum, in der Mitte mit einer undeutlicher Längskante, an der Seite fast parallelseitig, ein wenig gekörnt. Beine kurz, mitteldick: die Schenkel unten mit 2 reichlich gezähnelten Lamellen; Vorderschenkel ein wenig länger als das Mesonotum. Hinterleib ein wenig länger als der Kopf und das Notum zusammen, nach hinten zu verschmälert, in der Mitte mit einer undeutlichen Längskante; das 8. Dorsalglied des Hinterleibs kürzer als die übrigen Glieder; das 9. Dorsalglied ein wenig länger als das 8., am Ende dreieckig gespaltet, in der Mitte das 10. Glied verbergend. Operculum kahnförmig, in der Mitte geschwollen, das 9. Dorsalglied erreichend. Cerci schmal und klein, am Ende verschmälert.

♂. Körper schmal, mittellang, glänzend, kaum gekörnt, hellgelblichbraun. Hinterleib etwas cylindrisch, am Ende ein wenig verschmälert, 8. Glied hinten plötzlich verdickend. 9. Dorsalglied des Hinterleibs länger als das 8., am Ende tief gespaltet und nach innen gebogen. 3 Endglieder des Bauches sehr kurz, das Endglied an der Basis plötzlich geschwollen, die Basis des 9. Dorsalgliedes fast erreichend. Cerci kurz und breit, seitlich zusammengedrückt, am Ende rundlich, behaart.

	♂	♀
Körperlänge:	69.—73. mm.	88.—99. mm.
Kopflänge:	3.—3,2 mm.	5.—5,1 mm.
Fühlerlänge:	51.—57. mm.	42.—44. mm.
Pronotumlänge:	2,6—2,7 mm.	3,2—3,6 mm.
Mesonotumlänge:	16,—18,5 mm.	19.—22. mm.
Metanotumlänge (mit dem Mittelglied):	11,5—13. mm.	13,5—15,8 mm.
Vorderschenkellänge:	17.—21. mm.	19,5—22. mm.
Vorderschienenlänge:	18.—20. mm.	17,8—20. mm.
Mittelschenkellänge:	15,5—16. mm.	15.—18. mm.

	♂	♀
Hinterschenkellänge :	16,5—18,5 mm.	17.—19. mm.
Hinterleibslänge :	35,9—35,6 mm.	46,7—51,8 mm.
Supraanalplattenlänge :	——	0,6—0,7 mm.
Operculumlänge :	2. mm.	9.—10. mm.
Cerculslänge :	2. mm.	0,8—1. mm.

Zahlreiche Exemplare aus Formosa (Taihoku in Juni, Shōkei in Mai und Taipin in September) in meiner Sammlung. Sonstige Verbreitung : China.

Trivialname : Miyama-Nanatushi.

Gatt. ***Phraortes*** STÅL.

STÅL, C., 1876 : Rec. Orth., III, pp. 8, 64.

In Japan kommen 2 Arten vor.

Uebersicht der Arten.

1. Das 6. Bauchglied des Hinterleibs gewölbt.....
.....1. *Phraortes elongatus* THUNBERG.
2. Das 6. Bauchglied des Hinterleibs nicht gewölbt..
.....2. *Phraortes mikado* REHN.

1. ***Phraortes elongatus*** THUNB.

THUNBERG, 1815 : *Phasma elongata*, Mém. Ac. Pét., V, p. 299.

STÅL, C., 1875 : Rec. Orth., III, p. 64.

DE HAAN ; *Phasma* (*Bacteria*) *Niponense*, Orth. Orient., p. 134.

WESTWOOD, J. O., 1859 : *Lonchodes Niponense*, Cat. Orth. Phasm., pp. 46, 25.

♀. Körper gelblichgrün, lang. Kopf eiförmig, länger als breit, nach hinten etwas verschmälert, zwischen den Netzaugen mit 2 kleinen, zugespitzten Dornen. Netzaugen klein, kreisförmig, hervorragend, schwarzbraun. Fühler schmal und lang, fast halb so lang wie die Körperlänge, braun ; das Basalglied walzenförmig, gross, gelbbraun ; das 2. Glied fast

kreisförmig, $\frac{1}{3}$-mal so lang wie das 1.; die übrigen Glieder zusammen borstenförmig. Pronotum fast viereckig, fast $\frac{1}{6}$-mal so lang wie das Mesonotum, ein wenig länger als der Kopf, in der Mitte mit einer unsichtbaren Längsfurche und einer deutlichen Querfurche, am Vorderrande ausgerandet. Mesonotum schmal und lang, nach hinten zu etwas verbreitert, in der Mitte mit einer undeutlichen Längskante, fein gekörnt. Metanotum (mit dem Mittelglied) breiter als das Mesonotum, fast $\frac{5}{7}$-mal so lang wie das Mesonotum, in der Mitte mit einer unsichtbaren Längskante, fein gekörnt; Mittelglied fast $\frac{3}{5}$-mal so lang wie das Metanotum. Beine mittellang, grünlichgelb: Vorderschenkel länger als das Mesonotum, an der Basis gebogen, Querschnitt fast dreieckig, unten am Ende mit 2 schwarzen Dornen; Vorderschienen ein wenig kürzer als der Vorderschenkel, mit behaarten Längskanten; Mittelschenkel kürzer als der Vorderschenkel und fast so lang wie das Metanotum (mit dem Mittelglied), unten am Ende mit 2 Lamellen, welche mit 2 schwarzen Dörnchen versehen sind; Hinterschenkel länger als der Mittelschenkel, fast gleich gebildet wie der Mittelschenkel. Hinterleib länger als der Kopf und das Notum zusammen, am Ende verschmälert, oben in der Mitte mit einer deutlichen, feinen Längskante: das 6. Bauchglied am Ende stark gewölbt; das 9. Dorsalglied ein wenig länger als das 8., am Ende breit gespaltet. Supraanalplatte fast rund, in der Mitte mit einer feinen Längskante, am Ende ausgerandet und fein behaart. Operculum dick und gross, fast so lang wie die 3 Dorsalendglieder, fast kahnförmig. Cerci klein, conical, schmutziggelb, fein und braun behaart.

♀. "Viridis; capite convexo, inter oculus bispinuloso; femoribus mediis et posticis bilamellaribus, lamellis bidenticulatis. Tarsorum anteriorum et posticorum articulo 1 mo caeteris longiore; mediorum articulo 1 mo caeteris aequali; femoribus et tibiis tetragonis; abdominis apice dilatato; vagina apice emarginata. Long. corp. 3″ 2‴; mesoth. 9½‴; metath. 7‴; ped. ant. 2″ 1‴; ped. med. 1″ 7‴; ped. post. 2″." —Nach WESTWOOD.

	♀
Körperlänge :	97. mm.
Kopflänge :	4,8 mm.
Fühlerlänge :	49. mm.
Pronotumlänge :	3,2 mm.
Mesonotumlänge :	21. mm.
Metanotumlänge (mit dem Mittelglied)	16. mm.
Hinterleibslänge :	52,1 mm.
Vorderschenkellänge :	23. mm.
Mittelschenkellänge :	17,5 mm.
Hinterschenkellänge :	19. mm.
Operculumlänge :	8,1 mm.
Supraanalplattenlänge :	0,8 mm.
Cercuslänge :	1. mm.

Nur 1 Exemplar (♀) aus Tokyo in meiner Sammlung. Ich kenne das ♂ nur aus der WESTWOOD'schen Beschreibung.

Trivialname: Nanafushi.

2. *Phraortes mikado* REHN.

REHN, J. A. G., 1904: Proc. Acad. Nat. Sci. Phil. (Stud. Phasm.), p. 40.

♀. Körper schlank, grünlichbraun. Kopf mittellang, vorn breiter als hinten, am Occiput mit 2 zugespitzten, conicalen Dornen von fast derselben Länge wie die Höhe des Netzauges. Netzaugen kreisförmig. Pronotum quadratisch, länger als breit, an der Oberfläche mit undeutlichen Längs- und Querfurchen. Mesonotum über 4-mal so lang wie das Pronotum, fast so breit wie das Pronotnm, in der Mitte mit einer deutlichen Längsfurche. Metanotum (mit dem Mittelglied) fast $\frac{1}{6}$-mal so lang wie das Mesonotum, nach hinten zu verbreitert; Mittelglied fast $\frac{1}{4}$-mal so lang wie das Metanotum. Beine sehr schlank; Vorderschenkel länger als der Kopf, das Pro- und Mesonotum zusammen, von fast dreieckigem Querschnitt, am oberen Aussen- und Unterrande ziemlich stark gesägt, unten mit einer Längskante, welche nahe dem Innen-

rande in einer Entfernung von der Mitte verläuft; Vorderschienen länger als der Vorderschenkel, von fünfeckigem Querschnitt; Mittelschenkel verhältnissmässig kurz, nicht so lang wie das Mesonotum, von fast dreieckigem Querschnitt; oben schmal abplattet, an den Unterrändern der Basis ziemlich stark verbreitert, mit Dornen versehen; unten mit einer Mittelkante, welche am Ende deutlich erhoben und mit fein bedornten Lamellen versehen ist; Genicularlappen zugespitzt; Hinterschenkel viel länger als das Pro- und Mesonotum zusammen, fast gleich gebildet wie der Mittelschenkel, nur der äussere Unterrand etwas verbreitert, mit einer bedornten Lamella versehen; Hinterschienen ein wenig länger als der Hinterschenkel, von fünfeckigem Querschnitt, unten mit einer Mittelkante. Hinterleib viel länger als der Kopf und das Thorax zusammen; das 9. Dorsalglied dachförmig, in der Mitte mit einer Längskante, an den Seitenrändern gebogen, am Ende dreieckig gespaltet. Supraanalplatte dachförmig, am Ende ausgeschnitten, in der Mitte mit einer Längskante. Operculum seitlich zusammengedrückt, mit einer Dängskante, schöpferförmig.

	♀
Körperlänge:	104,5 mm.
Pronotumlänge:	3,5 mm.
Mesonotumlänge:	21. mm.
Metanotumlänge (mit dem Mittelglied):	17. mm.
Hinterleibslänge:	57. mm.
Vorderschenkellänge:	32. mm.
Vorderschienenlänge:	38. mm.
Mittelschenkellänge:	20. mm.
Hinterschenkellänge:	25,5 mm.

Fundort: Yokohama (LOOMIS) [A. N. CANDELL.]

Ich kenne nur die Beschreibung REHN's, welche ich fast wörtlich wiedergegeben habe.

Trivialname: Mikado-Nanafushi.

II. Subfam. **Necroscinae** Brunn.

Brunner, von W., 1893: Rev. Syst. Orth., p. 80.

In Japan kommen 3 Gattungen vor.

Tabelle zur Bestimmung der Gattungen.

1. Kopf rund, Hinterkopf ohne Längsfurche.
   2. Vorderschenkel seitlich zusammengedrückt, mit Längskante ..... 1. *Marmessoidea* Brunner.
   2′. Vorderschenkel cylindrisch, an der Basis gefurcht ..... 2. *Necroscia* Serv.

1′. Kopf lang, zusammengedrückt. Hinterkopf mit einer Längsfurche ..... 3. *Sipyloidea* Brunner.

Gatt. ***Marmessoidea*** Brunn.

Brunner, von W., 1893: Rev. Syst. Orth., pp. 84, 85.

Rehn, J. A. G., 1904: Proc. Acad. Nat. Sci. Phil. (Stud. Phasm.), p. 73.

Westwood, J. O., 1859: *Necroscia marmessus*, Cat. Orth. Phasm., p. 149, pl. XIX, fig. 7, pl. XIX, fig. 1, and pl. XXIX, fig. 4.

de Saussure, H., 1864: *Necroscia rubescens*, Mél. Orth., IIme, p. 317, fig. 12; 1868, Revue de Zool., p. 68.

In Japan kommt nur ein Art vor.

1. ***Marmessoidea phluctainoides*** Rehn.

Rehn, J. A. G., 1904: Proc. Acad. Nat. Sci. Phil. (Stud. Phasm.), p. 73.

♀. Körper klein, mittelmässig schlank, purpurbraun. Kopf gross, oben nach unten ziemlich stark zusammengedrückt, nach hinten zu ein wenig verbreitert, am Seitenrande mit einem gelben Streifen; Hinterkopf convex, mit einer unsichtbaren Längsfurche. Netzaugen oval, hervorragend, gelbbraun. Fühler so lang wie das Hinterleib; das

Basalglied deutlich länger als breit, ziemlich stark zusammengedrückt; das 2. Glied länger als breit und kürzer als das Basalglied. Pronotum quadratisch, in der Mitte mit einer feinen Längsfurche und vorn von der Mitte mit einer deutlichen Querfurche. Mesonotum 3-mal so lang wie das Pronotum, nach hinten zu schwach verbreitert, mit deutlichen Mittel- und Seitenkanten, welche sich nach hinten zu erlöschen, körnig. Tegmina (Vorderflügel) kurz, am Ende etwas ausgeschnitten, am Vorderrande blassrötlichweiss, welche Färbung an die Netzaugen übergeht, mit runder und schwarzer Erhöhung. Hinterflügel gross, blassrötlichpurpur. Vorderschenkel länger als das Pro- und Mesonotum zusammen, an der Basis stark gebogen; Vorderschienen ein wenig kürzer als der Vorderschenkel; Hinterschenkel ein wenig länger als die Hinterschienen. Hinterleib schlank, mittellang: das 7. Dorsalglied ein wenig kürzer als das 8. Dorsalglied, nach hinten zu etwas verbreitert; das 8. Dorsalglied etwas seitlich zusammengedrückt; das 9. Dorsalglied fast so lang als das 7., seitlich zusammengedrückt, etwas dachförmig. Operculum erreicht das Ende des 8. Dorsalgliedes, am Ende rundlich eingeschnitten. Cerci erreicht fast das Ende des 9. Dorsalglied, fast so lang wie das 9. Dorsalglied, am Ende nach innen zu gebogen.

♀. Körper mittelgross und dick, grasgrün. Kopf etwas lang, ziemlich stark zusammengedrückt, nach hinten zu schwach verschmälert, an den Seiten je mit einem gelblichen Längsstreif. Netzaugen oval, schwach hervorragend, hellbraun. Fühler ein wenig länger als die halbe Körperlänge, purpurlich hellbraun: das Basalglied länger als breit, stark zusammengedrückt; das 2. Glied cylindrisch, viel kleiner als das Basalglied. Pronotum quadratisch, nach hinten zu etwas verschmälert, am Vorderrande nach hinten zu gebogen und ausgerandet, in der Mitte mit einer Längsfurche, welche sich nach hinten zu erlöscht, am Vorderdrittel mit einer deutlichen Querfurche, am Hinterrande fast rundlich, nahe diesem mit einer feinen Querfurche. Mesonotum fast 3-mal so lang wie das Pronotum, nach

hinten zu verbreitert, mit deutlicher Mittel- und Seitenkante, körnig. Tegmina kurz, fast quadratisch, runzelig, am Ende etwas quer geschnitten, am Vorderrande mit einem breiten chromgelben Längsstreif welcher das Vorderrande des Mesonotums erreicht, am Unterrande dieser Färbung unten mit einem schwärzlich gerandeten gelben Streif, am Innenwinkel schwärzlichbraun, Erhöhung niedrig und rundlich. Hinterflügel kurz, das Ende des 3. Dorsalgliedes des Hinterleibs erreichend, fast $\frac{3}{4}$-mal so breit wie lang, am Costalfelde mit netzartigen Adern, am Humeralfelde grün, am Analfelde rosafarbig. Beine kurz, hellgrün: Vorderschenkel ein wenig länger als das Mesonotum, an der Basis stark gebogen; Vorderschienen ein wenig kürzer als der Vorderschenkel; Mittelschenkel sehr kurz, fast so lang wie die 2 Basalglieder, ein wenig länger als die Mittelschienen; Hinterschenkel ein wenig kürzer als das Pronotum und Mesonotum zusammen, ein wenig länger als die Hinterschienen. Hinterleib schwach geplattet: das 7. und das 8. Dorsalglied dachförmig; das 9. Dorsalglied ein wenig länger als das 8., nach hinten zu verschmälert, am Ende quer ausgeschnitten. Supraanalplatte undeutlich. Operculum dachförmig, zugespitzt, das Ende des 8. Dorsalgliedes erreichend. Cerci gerade, das Ende des 9. Dorsalgliedes des Hinterleibs erreichend.

	♂	♀
Körperlänge:	41. mm.	50. mm.
Kopflänge:	4. mm.	4,5 mm.
Pronotumlänge:	1,7 mm.	2,51 mm.
Mesonotumlänge:	6,9 mm.	10. mm.
Tegminalänge:	2,5 mm.	3. mm.
Hinterflügellänge:	22,8 mm.	16,3 mm.
Vorderschenkellänge:	11. mm.	11,6 mm.
Vorderschienenlänge:	9,5 mm.	9,7 mm.
Mittelschenkellänge:	?	7,5 mm.
Hinterschenkellänge:	11,5 mm.	11,7 mm.

	♂	♀
Hinterleibslänge:	22,5 mm.	32. mm.
Operculumlänge:	3,5 mm.	4,2 mm.

2 Exemplare (♂ u. ♀) aus Tokyo in meiner Sammlung.

Trivialname: Tobi-Nanafushi.

Gatt. ***Necrescia*** SERV.

SERVILLE, A., 1839: Hist. Nat. Orth., p. 250.
DE HAAN, Orth. Orient., p. 117.
WESTWOOD, J. O., 1859: Cat. Orth. Phasm., p. 128.
DE SAUSSURE, H., 1864: Mél. Orth., XVII, 2me, p. 313.
STÅL, C., 1875: Rec. Orth., III, pp. 41, 86.
BRUNNER, VON W., 1893: Syst. Orth., p. 84.
GRAY, G. R., *Platycrana* p., Syn. Phasm., p. 36.
BURMEISTER, *Phasma* Sect. II, p., Hand. Ent., p. 585.

In Japan kommt nur eine Art vor.

1. *Necroscia 6-punctata*, n. sp.

♂. Körper schmal und klein, schmutziggelb. Kopf rund und convex, breiter als das Pronotum, hellbraun, behaart, ohne Dornen zwischen den Netzaugen. Netzaugen gross, braun, hervorragend. Fühler länger als die Körperlänge, oben dunkelbraun, unten schmutziggelb, fein behaart. Pronotum länger als breit, $\frac{1}{3}$–mal so lang wie das Mesonotum, am Vorderrande ein wenig gebogen und ausgerandet, am Vorderdrittel mit einer Querfurche, in der Mitte mit einer sehr schmalen Längsfurche, am Hinterrande abgerundet, gelb, mit 6 schwarzen Punkte, weiss behaart. Mesonotum schmäler als das Pronotum, hellgelb, weiss behaart, nahe dem Vorderrande mit 2 Quererhöhungen, am Hinterrande eingebogen, in der Mitte mit einer schmalen Längsfurche, welche am Hinterende als Kante erhoben ist, am Vorderrande mit 3 schwarzen Pünktchen, am Seitenrande mit schmalen Längsfurche und mit 2 schwarzbraunen Längsstreifen, am

Hinterrande an der Seite mit 2 grossen schwarzen Punkte. Tegmina sehr kurz, fast so lang wie das Pronotum, sehr breit, hellbraun, mit braunen Ädern, Erhöhung niedrig. Hinterflügel lang und gross, am Humeralfelde hellbraun, am Analfelde angeraucht, mit schwarzbraunen Ädern. Beine sehr schmal, hellgelblichbraun, weiss behaart, ohne Dornen. Hinterleib sehr schmal, den Hinterflügel überragend, schmutziggelb, weiss behaart, oben mit 7 braunen Längsstreifen: das 9. Dorsalglied des Hinterleibs breit und gross, am Hinterrande in der Mitte etwas gebuchtet, das Operculum überragend. Cerci lang und gross, zusammengedrückt; am Ende abgerundet und nach innen zu gebogen, weiss behaart. Operculum fast dreieckig, in der Mitte mit einer kurzen Längsfurche, am Ende abgerundet.

	♂
Körperlänge:	44. mm.
Kopflänge:	3,1 mm.
Pronotumlänge:	2,6 mm.
Mesonotumlänge:	6,0 mm.
Tegminalänge:	3,5 mm.
Hinterflügellänge:	29,8 mm.
Mittelschenkellänge:	8,3 mm.
Hinterschenkellänge:	12. mm.
Hinterleibslänge:	29,5 mm.
Cercuslänge:	1,6 mm.

Nur 1 Exemplar (♂) aus Formosa (Kōshun in Mai) in meiner Sammlung.

Trivialname: Hoshi-Tobi-Nanafushi.

Gatt. ***Sipyloidea*** BRUNN.

BRUNNER, VON W., 1893: Rev. Syst. Orth., pp. 84, 86.
SERVILLE, A., 1839: *Necroscia chlorotica*, Hist. Nat. Orth., p. 252
DE HAAN, *Phasma chlorotica*, Orth. Orient., pp. 118, 121.

WESTWOOD, J. O., 1859: *Necroscia chlorotica*, Cat. Orth. Phasm., p. 150; *Necroscia sipylus*, idem., p. 138; u. s. w.
In Japan kommt nur eine Art vor.

1. *Sipyloidea samsoo* WESTWOOD.

WESTWOOD, J. O. 1859: *Necroscia Samsoo*, Cat. Orth. Phasm., p. 132; pl. X, fig. 6, ♀.

♂. Körper schmal und lang, dunkelbraun. Kopf schmal und lang, fast oval, niedrig; ohne Dornen, am Scheitel mit einer dreieckigen Furche, schwarzbraun, an der Seite mit einem breiten, gelben Streif. Stirn gelb. Netzaugen gross, kreisrund, schwarz. Fühler sehr lang, schwarz, nach der Spitze zu heller, mit 5 breiten rotgelben Ringen. Pronotum schmal und lang, ein wenig länger als der Kopf, schwarzbraun, mit 6 gelben undeutlichen Längsstreifen, etwas körnig, in der Mitte mit einer undeutlichen Längskante, vorn von der Mitte mit einer schmalen Querfurche, am Vorderrande ausgerandet, am Hinterrande fast quer ausgeschnitten. Mesonotum 5-mal so lang wie das Pronotum, sehr schmal, etwas körnig, mit 3 Längskanten, schwarzbraun. Tegmina sehr kurz, oval, schwarzbraun, am Vorderdrittel mit einem gelben Längsstreifen, die Erhöhung fast zugespitzt, schwarz. Hinterflügel sehr lang, am Humeralfelde dunkelbraun, mit gelblichen Längsädern, am Analfelde durchsichtig. Vorderschenkel sehr schmal und lang, hellbraun, an der Basis schwach gebogen, mit behaarten Längskanten; Vorderschienen ein wenig kürzer als der Vorderschenkel, mit behaarten Längskante. Mittel- und Hinterbein sowie auch Hinterleib fehlen.

♀. Körper schmal und lang, hellbraun oder schwarzbraun. Kopf schmal und lang, fast oval, niedrig, oben mit 4 gelben Längsstreifen, an der Seite mit 2 gelben Längsstreifen, ohne Dornen, etwas runzelig, hinter den Netzaugen je mit einer kleinen Furche. Netzaugen mittelgross, elliptisch, schwärzlich braun. Fühler sehr schmal und lang, fast so lang wie die Körperlänge, hellbraun, am Ende jedes

Gliedes schwarz, weiss behaart. Pronotum schmäler als der Kopf, klein, etwas runzelig, in der Mitte mit einer schmalen Längskante und mit einer deutlichen Querfurche, am Vorderrande ausgerandet. Mesonotum sehr schmal und lang, cylindrisch, stark runzelig, fast 3-mal so lang wie das Pronotum. Tegmina klein, oval, braun; Erhöhung rund und schwarz. Hinterflügel mittelgross, viel kürzer als der Hinterleib, am Humeralfelde hellbraun oder schwarzbraun, am Analfelde durchsichtig und farblos. Beine schmal und lang, gelbbraun oder hellgelbbraun, ohne Dornen, mit behaarten Längskanten: Vorderschenkel ein wenig kürzer als der Hinterschenkel, an der Basis ziemlich stark gebogen; Vorderschienen ein wenig kürzer als der Vorderschenkel; Mittelschenkel kürzer als der Vorderschenkel. Hinterleib sehr lang, breiter als das Mesonotum, in der Mitte verbreitert, depress. Operculum lang, kahnförmig, am Ende rund, ein wenig kürzer als die 3 Endglieder des Hinterleibs. Das 9. Dorsalglied ein wenig länger als das 8., am Ende zugespitzt. Cerci schmal und lang, compress, am Ende abgerundet, weiss behaart.

	♂	♀
Körperlänge:	über 37. mm.	73,3—80. mm.
Kopflänge:	3,5 mm.	4,1 mm.
Pronotumlänge:	2. mm.	3,1 mm.
Mesonotumlänge:	11. mm.	11.—12. mm.
Tegminalänge:	3. mm.	4,7—5. mm.
Hinterflügellänge:	34,8 mm.	35.—42. mm.
Vorderschenkellänge:	21. mm.	16.—22,5 mm.
Vorderschienenlänge:	20,7 mm.	15.—22. mm.
Mittelschenkellänge:	?	13.—15. mm.
Hinterschenkellänge:	?	19.—23. mm.
Hinterleibslänge:	?	41.—47. mm.
Operculumlänge:	?	7,5—8. mm.
Cerculslänge:	?	2. mm.

3 Exemplare (♂ 1 u. ♀ 2) aus Formosa (Nanto in Mai) in meiner Sammlung.

Sonstige Verbreitung: China.

Trivialname: Taiwan-Tobi-Nanafushi.

III. Subfam. **Clitumnidae** BRUNN.

BRUNNER VON W., 1893: Rev. Syst. Orth., p. 80.

In Japan kommen 2 Gattungen vor.

Tabelle zur Bestimmung der Gattungen.

1. Thorax mit Dornen ..... 1. *Acanthoderus* GRAY.
2. Thorax ohne Dornen ..... 2. *Entoria* STÅL.

Gatt. ***Acanthoderus*** GRAY.

WESTWOOD, J. O., 1859: Cat. Orth. Phasm., p. 48.
DE SAUSSURE, H. 1865: Mél. Orth., IIme, p. 295.
SERVILLE, A., 1839: *Rhaphiderus*, Hist. Nat. Ins. Orth., p. 245.
BRULLÉ — *Cyphocrana*, p.; DUMERIL — *Phasma*, p.;
PERCHERON — *Bacteria*, p.

In Japan kommt nur eine Art vor.

1. ***Acanthoderus japonicus*** DE HAAN.

DE HAAN, H., *Phasma japonicum*, Orth. Orient., p. 135, pl. 12. fig. 4.
WESTWOOD, J. O,, 1859: Cat. Orth. Phasm., p. 50.

♀. Körper dick, hellbraun, runzelig. Kopf verhältnissmässig klein, fast eiförmig, am Hinterkopfe mit einem Kröpfchen. Fühler mittellang, viel kürzer als die Körperlänge, borstenförmig: das Basalglied gross; 2. Glied viel kürzer als das 3. Pronotum cylindrisch, am Vorderrande mit 2 Dornen, am Hinterrande mit zahlreichen Kröpfchen, Mesonotum 4-mal so lang wie das Pronotum, in der

Mitte der Seiten je mit einem Dorn, mit 2 Reihen 8 Dornen, auch mit kleinen Dörnchen und Kröpfchen. Metanotum mit Mittelglied viel kürzer als das Mesonotum, mit 2 Dornen. Beine mehr oder weniger bedornt: Vorderschenkel am Vorderhälfte mit dunkelem Markel; Mittel und Hinterschenkel viereckig; 1. Tasalglied kürzer als das 2. und das 3. zusammen. Hinterleib länger als das Thorax, cylindrisch, mit zahlreichen Dörnchen: das 9. Dorsalglied des Hinterleibs ein wenig länger als das 8., am Ende etwas gespaltet. Operculum in der Mitte mit einer Längskante, gerade, das End des 9. Dorsalgliedes nicht erreichend.

Körperlänge:	62. mm.
Kopflänge:	3,2 mm.
Pronotumlänge:	4,5 mm.
Mesonotumlänge:	18. mm.
Metanotumlänge (mit dem Mittelglied)	9,5 mm.

Nur 1 Exemplar (♀) aus Okinawa in meiner Sammlung.

Trivialname: Toge-Nanafushi.

Gatt. ***Entoria*** STÅL.

STÅL, C., 1875: Rec. Orth., III, p. 15.

BRUNNER, VON W., 1893: Rev. Syst. Orth., pp. 88, 90.

In Japan kommen 3 Arten vor.

Uebersicht der Arten.

1. Kopf zwischen den Netzaugen mit 2 Dornen.
   2. Vorderschenkel gesägt ..... 1. *Entoria formosana*, n. sp.
   2'. Vorderschenkel nicht gesägt.... 2. *Entoria magna*, n. sp.

1'. Kopf zwischen den Netzaugen ohne Dornen
..... 3. *Entoria japonica*, n. sp.

1. ***Entoria formosana***, n. sp. pl. XII, fig. 1.

♀. Körper schmal und lang, schmutziggelbgrün, cylindrisch. Kopf länger als breit, nach hinten zu schwach verschmälert, zwischen

den Netzaugen mit 2 zugespitzten Dornen, am Hinterkopf mit 3 schmalen Längsfurchen. Netzaugen gross, kreisförmig, etwas hervorragend. Fühler sehr kurz, depress, 25-gliedrig: 1. Glied sehr gross, platt, in der Mitte mit einer Längskante; das 2. fast kreisförmig, sehr kurz; die übrigen nach dem Ende zu verlängert. Pronotum langquadratisch, kürzer als der Kopf, in der Mitte mit kreuzförmiger Furche, am Vorderrande ausgerandet. Mesonotum schmal, fast 5-mal so lang wie das Metanotum, nach hinten zu schwach verbreitert, in der Mitte mit einer schmalen Längskante, ziemlich stark körnig. Metanotum (mit dem Mittelglied) $\frac{4}{5}$-mal so lang wie das Mesonotum, kaum gekörnt, in der Mitte mit einer sehr schmalen Längskante, nach der Mitte zu schwach verschmälert; Mittelglied fast ein Drittel so lang wie das Metanotum. Beine mässig lang und dick: Vorderschenkel länger als der Hinterschenkel, länger als der Kopf, das Pronotum und das Mesonotum zusammen, schwach deprimirt, Querschnitt fast dreieckig, unten sehr breit und mit 2 Längskanten, dazwischen eine schmale Längsfurche, an dem Untenaussen- und dem Unteninnenrande je mit 5–6, dreieckigen, platten Zähnen; Vorderschienen länger als der Vorderschenkel, oben mit 2 Längskanten, unten mit einer Längskante, Querschnitte fast fünfeckig, ohne Dornen und Zähnen; Mittelschenkel kürzer als der Hinterschenkel oben mit zwei Längskanten, welche am Basaldrittel je mit einem zugespitzten Zähnchen versehen sind, unten mit einer Längsfurche und zwei Längskanten, welche sich am Ende erheben und gezähnelt sind, unten an der Basis verbreitert, an den Seitenrändern je mit einem grossen, platten Zähnchen; Mittelschienen fast so lang wie der Mittelschenkel, oben an der Aussenkante mit einem comprimirten und zugespitzten Zähnchen, unten in der Mitte mit einer Längskante, welche sich an der Basis erhebt und nahe dem Ende ein Dörnchen besitzt, unten am Aussenrande am Endhälfte bedornt; Hinterschenkel fast so wie der Mittelschenkel; Hinterschienen ein wenig länger als der Hinterschenkel, oben an der Innenkante gezähnelt, unten mit

einer Längskante, am Seitenrande nach Ende zu bedornt. Hinterleib viel länger als der Kopf und das Thorax zusammen, am Ende verschmälert, cylindrisch: 8. Dorsalglied des Hinterleibs sehr klein; 9. Dorsalglied länger als das 8., am Ende ein wenig gespaltet, in der Mitte mit einer Längs ante, dachförmig. Operculum sehr schmal und lang, comprimirt, fast schneideförmig, das 9. Dorsalglied überragend. Supraanalplatte sehr schmal und lang, in der Mitte mit einer Längskante, stark seitlichzusammengedrückt, das Operculum überragend. Cerci klein, gerade, zugespitzt.

	♀	
Körperlänge:	120.	mm.
Kopflänge:	5,5	mm.
Fühlerlänge:	11.	mm.
Pronotumlänge:	4.	mm.
Mesonotumlänge:	20.	mm.
Metanotumlänge (mit dem Mittelglied)	16.	mm.
Hinterleibslänge:	74,5	mm.
Vorderschenkellänge:	35.	mm.
Vorderschienenlänge:	39.	mm.
Mittelschenkellänge:	22.	mm.
Hinterschenkellänge:	28.	mm.
Supraanalplattenlänge:	5.	mm.
Operculumlänge:	17.	mm.
Cercuslänge:	0,7	mm.

Nur zwei Exemplare (♀) aus Formosa (Nanto in Mai und Koshun [Larvae]) in meiner Sammlung.

Trivialname: Taiwan-Nanafushi.

2. *Entoria magna*, n. sp. pl. XII, fig. 3.

♀. Körper dunkelbraun, lang und dick. Kopf eiförmig, nach hinten zu verschmälert, convex, zwischen den Netzaugen mit 2

langen zugespitzten Dornen. Netzaugen klein. kreisförmig, hervorragend, gelbbraun. Fühler kurz, 26-gliedrig, halb so lang wie der Vorderschenkel: das Basalglied elliptisch, depress, fein behaart, gross; das 2. Glied klein, kreisförmig, ein wenig kürzer als das 3., ziemlich stark behaart; die übrigen fadenförmig, fein behaart. Pronotum langquadratisch, fast $\frac{1}{4}$-mal so lang wie das Mesonotum, am Vorderrande nach hinten gebogen, ausgerandet, in der Mitte mit einer undeutlichen kreuzförmigen Furche, am Seitenrande ziemlich stark nach innen gebogen, ausgerandet, runzelig. Mesonotum länger als das Metanotnm, vorn fast so breit wie hinten, in der Mitte mit einer unbedeutenden Längskante, Oberfläche mit feinen Körnchen zerstreut. Metanotum (mit dem Mittelglied) $\frac{3}{4}$-mal so lang wie das Mesonotum, fast so breit wie das Mesonotum, in der Mitte ohne Längskante; Mittelglied fast $\frac{1}{4}$-mal so lang wie das Metanotum. Vorderschenkel so lang wie das Pronotum und das Mesonotum zusammen, ohne Dornen oder Lamellen, ein wenig länger als die Vorderschienen, an der Basis stark gebogen, an den Längskanten fein behaart; Vorderschienen sehr schmal; ohne Dornen oder Lamellen; Mittelschenkel dick und kurz, Querschnitte fast dreieckig, unten in der Mitte mit einer feinen Längskante, am Ende mit 2 Lamellen, welche mit schwarzen, zugespitzten Dornen versehen sind, am unteren Aussenrande nahe der Basis mit einem grossen dreieckigen Zähne; Hinterschenkel fast so lang wie der Vorderschenkel, ohne Dornen oder Lamellen; Mittel- und Hinterschienen respective ein wenig länger als Mittel- und Hinterschenkel, Querschnitte fast fünfeckig, oben an der Aussenkante nahe der Basis mit einem grossen, comprimirten Zahn, an den Längskanten nach dem Ende zu gesägt. Hinterleib länger als der Kopf und das Thorax zusammen, nach dem Ende zu verschmälert; 9. Dorsalglied ein wenig länger als das 8., am Ende ein wenig gespaltet, in der Mitte mit einer feinen Längskante. Supraanalplatte schmal und lang, so lang wie das 8. und 9. Dorsalglied zusammen, glänzend, dachförmig, zugespitzt. Operculum

sehr lang, die Supraanalplatte überragend, comprimirt, in der Mitte mit einer Längskante, zugespitzt.

	♀
Körperlänge:	135. mm.
Kopflänge:	6. mm.
Fühlerlänge:	16. mm.
Pronotumlänge:	5,3 mm.
Mesonotumlänge:	21,7 mm.
Metanotumlänge (mit dem Mittelglied):	17,5 mm.
Vorderschenkellänge:	29,5 mm.
Vorderschienenlänge:	29. mm.
Mittelschenkellänge:	27. mm.
Hinterschenkellänge:	31,5 mm.
Supraanalplattenlänge:	8,5 mm.
Operculumlänge:	23,5 mm.

Nur 2 Exemplare (♀ und Larv. ♀) aus Yoshihama (August) in meiner Sammlung.

Trivialname: O-Nanafushi.

3. *Entoria japonica*, n. sp. pl. XII, fig. 2.

♀. Körper mittellang, kastanienbraun, schwach depress. Kopf eiförmig, am Vordertheile breiter als das Hintertheil, zwischen den Netzaugen ohne Dornen, oben platt, braun, schwarzbraun gefleckt. Netzaugen kreisförmig, in der Mitte hervorragend, klein, glänzend kastanienbraun. Fühler sehr kurz, 22-gliedrig, $\frac{1}{3}$-mal so lang wie das Thorax, ziemlich stark deprimiert, dunkelbraun: das Basalglied sehr gross, fast $\frac{1}{6}$ der Fühlerlänge, stark geplattet, oval, am Vorderrande quer ausgeschnitten, weiss behaart; das 2. Glied fast rundlich, fast halbesmal so lang wie das 3.; die übrigen fadenförmig. Pronotum quadratisch, ein wenig länger als breit, in der Mitte mit einer schmalen Längsfurche, mit einer sehr kurzen Querfurche, am Vorder- und Seitenrande ausgerandet, am Hinterrande quer ausgeschnitten,

ziemlich stark runzelig, schwarzbraun gefleckt. Mesonotum fast 4-mal so lang wie das Pronotum, nach hinten zu verbreitert, in der Mitte mit einer feinen Längskante, an der Oberfläche mit feinen gelbbraunen Körnchen gesprenkelt. Metanotum (mit dem Mittelglied) kürzer als das Mesonotum, parallelseitig, in der Mitte mit einer feinen Längsfurche, ein wenig breiter als das Mesonotum; Mittelglied fast $\frac{1}{3}$ so lang wie das Metanotum. Beine mittellang, gelbbraun, bräunlich gefleckt: Vorderschenkel länger als der Kopf, das Pronotum und das Mesonotum zusammen, Querschnitte fast dreieckig, an der Basis stark gebogen, oben an der Aussenkante gesägt, unten mit einer Längskante, welche nahe am Innenrande entstehend, sich von der Mitte entfernt; Vorderschienen fast so lang wie der Vorderschenkel, Querschnitt fünfeckig; Mittelschenkel kürzer als der Vorderschenkel, ein wenig länger als das Mesonotum, unten mit 2 feinen Längskanten, welche je am Ende mit einer bedornten Lamelle versehen sind, am unteren Innenrande mit einem kleinen Zahn; Mittelschienen kürzer als der Mittelschenkel, oben am Aussenrande nahe der Basis mit einem dreieckigen Zahn, an den Längskanten am Ende gesägt; Hinterschenkel länger als der Mittelschenkel, kürzer als der Vorderschenkel, fast so wie beim Mittelschenkel gebildet am Innenrande ohne Zahn; Hinterschienen wie beim Mittelschienen, nur am Oberrande ohne dreieckigem Zahn. Hinterleib viel länger als der Kopf und das Thorax zusammen, das 3. Glied breiter als die anderen Glieder, das 7. am Ende schmälst; das 9. Dorsalglied länger als das 8., dachförmig, am Ende ein wenig ausgebuchtet. seitlich zusammengedrückt. Supraanalplatte länger nnd schmäler als das 9. Dorsalglied, stark seitlich zusammengedrückt, in der Mitte mit einer Längskante, zugespitzt. Operculum länger als die 3 Endglieder und die Supraanalplatte zusammen, schmal, schneideförmig, zugespitzt.

	♀
Körperlänge:	98. mm.
Kopflänge:	4,8 mm.

Fühlerlänge:	10. mm.
Pronotumlänge:	3,7 mm.
Mesonotumlänge:	15. mm.
Metanotumlänge (mit dem Mittelglied):	12,5 mm.
Vorderschenkellänge:	26. mm.
Mittelschenkellänge:	19. mm.
Hinterschenkellänge:	22,1 mm.
Supraanalplattenlänge:	7,3 mm.
Operculumlänge:	20,7 mm.

Nur 1 Exemplar (♀) aus Yoshihama (August) in meiner Sammlung.

Trivialname: Yamato-Nanafushi.

FAM. MANTIDAE.

Tabelle zur Bestimmung der Subfamilien.

1. Beine und Körper ohne Anhängen (Fühler bei den beiden Geschlechtern einfach). ..... **1. *Mantinae.***
2. Beine und Körper mit Anhängen (Hinterschenkel und Hinterleibsglied lappig, oder Vertex mit conicalen Anhängen). ..... **2. *Harpaginae.***

I. Subfam. **Mantinae** BRUNN.

BRUNNER, VON W., 1893: Rev. Syst. Orth., p. 58.

In Japan kommen 6 Gattungen vor.

Uebersicht der Gattungen.

1. Pronotum kurz, nicht länger als die Vorderhüfte.
   1′. Flügel vollständig entwickelt ..... 1. *Micromantis* SAUSS.
   2′. Flügel beim Weibchen meistens rudimentär ..... 2. *Gonypeta* SAUSS.

2. Pronotum lang, nicht kürzer als die Vorderhüfte.
   1'. Vorderulnarader des Hinterflügels einfach .....
   ..... 3. *Statilia* STÅL.
   2'. Vorderulnarader des Hinterflügels zweiästig.
      1''. Hinterflügel mehr oder weniger gefleckt .....
      ..... 4. *Paratenodera* REHN.
      2''. Hinterflügel durchsichtig.
         1'''. Mittel- und Hinterschenkel mit Enddorn .....
         ..... 5. *Hierodula* BURM.
         2'''. Mittel- und Hinterschenkel ohne Enddorn.....
         ..... 6. *Mantis* L.

Gatt. ***Micromantis*** SAUSS.

SAUSSURE, H. DE, 1870: Bulletin entom. Suisse, III, pp. 225, 228.
SAUSSURE, H. DE, 1870: Mélan. Orth., III, p. 178.
STÅL, C., 1877: Syst. Mant., p. 24.

In Japan kommt nur eine Art vor:

1. ***Micromantis formosana,*** n. sp. pl. XII, fig. 5.

Körper schmal und klein, grün. Kopf mässig gross, kürzer als breit, dunkelgrün; Netzaugen beim Männchen gross, beim Weibchen ziemlich klein, schwärzlich, hervorquellend, sodass Scheitel und Stirn vertieft aussehen, aber nicht kegelförmig und überhaupt nicht hervorragend, über den Nebenaugen mit 2 kleinen Höckerchen. Mundtheile sehr kurz und klein, schwärzlichgrün, mit sehr kleinen, schmalen, hellgrünen, am Ende geschwärzten Taster. Pronotum kaum kürzer als der Vorderschenkel, halb so breit wie die Länge, in der Mitte mit einer schmalen Längskante, am Vorderdrittel mit einer sehr schmalen Querfurche, am Seitenrande ziemlich stark gekerbt, von der Mitte nach aussen gebogen, am Vorder- und Hinterrande abgerundet. Meso- und Metanotum $\frac{1}{3}$ so lang wie das Pronotum, in der Mitte mit einer Längskante, hellbraun. Metanotum fast

dreieckig. Vorderflügel das Hinterleibsende erreichend, mässig breit, bräunlichgrün, am Castalfelde grün, mit grünen Adern; beim Weibchen grün. Hinterflügel hellpurpur, am Vorderrande rotgelb, mit rötlichbraunen Adern. Geäderung der beiden Flügel wie bei *M. glauca* SAUSS. Beine einfärbig hellgrün: Vorderhüfte ohne Stacheln, viel schmäler und kürzer als der Vorderschenkel; Vorderschenkel dick, etwas seitlich zusammengedrückt, oben mit einer Kante, unten mit 2 Reihe schwarzer Stacheln; Mittel- und Hinterschenkel sehr schmal, cylindrisch, ohne Stacheln und Anhängen, innen und oben je mit einer sehr feinen Enddorn, der letztere ein wenig länger als der erstere. Hinterleib lang, oben braun, unten weisslichgrün, beim Weibchen breiter als beim Männchen. Supraanalplatte kurz, dreieckig, beim Weibchen abgerundet, braun. Cerci schmal und klein, fadenförmig, braun. Letztes Bauchglied des Hinterleibs sehr lang; beim Männchen am Ende abgerundet, die Subgenitalplatte überragend; beim Weibchen schief abgeschnitten. Subgenitalplatte beim Männchen sehr lang, am Ende tief gespaltet; beim Weibchen sehr breit, am Ende plötzlich verschmälert, tief gespaltet und fast das Legescheide bedeckend. Legescheide kurz, fast dreikantig, seitlich zusammengedrückt.

	♂	♀
Körperlänge:	24.—25. mm.	30.—34. mm.
Pronotumlänge:	7,5—8,3 mm.	10.—11,1 mm.
Vorderflügellänge:	20.- 21. mm.	21,5—24. mm.
Vorderschenkellänge:	8.—7,8 mm.	9.—11. mm.
Hinterschenkellänge:	6,8—7. mm.	8,4—10. mm.
Cercuslänge:	1,3 mm.	2. mm.
Subgenitalplattenlänge:	1,4—1,6 mm.	2.—2,3 mm.
Legescheidelänge:	——	2. mm

Zahlreiche Exemplare aus Formosa (Shinsha und Koshun, in Juli) in der Sammlung von Herrn Prof. Dr. S. MATSUMURA und in meiner Sammlung.

Trivialname: Taiwan-Hime-Kamakiri.

Gatt. ***Gonypeta*** SAUSS.

SAUSSURE, H. DE, 1870: Mélan. Orth., III, p. 198.
STÅL, C., 1877: Syst. Mant, p. 24.
Iridopteryx SAUSS; *Oxypilus* DE HAAN.

In Japan kommt nur eine Art vor.

1. *Gonypeta maculata* SHIRAKI. pl. XII, fig. 6.

Gonipeta maculata SHIRAKI, Matsumura, 1907, Ekichiu-Mokuroku.
Gonipeta nawai SHIRAKI, 1908, Konchiusekai.

♀. Körper klein und dick, schmutziggelb, schwarz gefleckt. Kopf mittelgross, ein wenig kürzer als breit, dreieckig; Netzaugen mittelgross, rundlich, etwas hervorquellend. Stirn platt; Kopfscheitel abgerundet. Punktaugen sehr klein, gelb. Mundtheil sehr kurz, klein, mit sehr kurzen und schmalen hellgelben Tastern, welche mit schwarze Endgliedern besiltzen. Pronotum kurz und klein, länglich-rhombisch, in der Mitte mit einer Längskante, am Vorderzweifünftel mit einer schmalen Querfurche, am Seitenrande kaum gekerbt, am Vorder- und Hinterrande abgerundet. Meso- und Metanotum $\frac{1}{3}$ so lang wie das Pronotum, in der Mitte mit einer Längskante. Vorderflügel sehr kurz, lappenförmig, das Mesonotum überragend; Hinterflügel viel kürzer als der Vorderflügel, das Metanotum etwas überragend. Beine lang und schmal, hellgelb, schwarz punktiert: Vorderhüfte ohne Stacheln, so lang wie das Pronotum, grau, schwärzlich punktiert; Vorderschenkel dick, schwärzlich, ziemlich stark seitlich zusammengedrückt, länger als die Vorderhüfte, oben mit einer Kante, unten mit 2 Reihen kürzer Stacheln, von seiten gesehen länglich dreieckig; Vorderschienen ziemlich stark verdickt, unten mit 2 Reihen sehr schmaler Stacheln, ein wenig kürzer als der Vorderschenkel; Mittel- und Hinterschenkel sehr schmal, cylindrisch, ohne Stacheln und

Anhängen; Mittelschenkel oben und aussen je mit einem schmalen Enddorn; Hinterschenkel ein wenig länger als der erstere; Mittel- und Hinterschienen sehr schmal, cylindrisch, am Ende schwarz, mit einem feinen Enddorn. Hinterleib breit und flach, oben und unten schmutziggelb, schwarz gefleckt. Supraanalplatte kurz und breit, fast dreieckig, am Ende abgerundet, oben in der Mitte mit einer abgerundeten Längskante. Cerci schmal, fadenförmig, länger als das Legescheide, hellbraun, am Endgliede grün. Letztes Bauchglied kurz, etwa dreieckig, convex, am Ende kurz gespaltet. Subgenitalplatte kurz, am Ende abgerundet, die Legescheide bedeckend. Legescheide schwach, sehr schmal, braun, nur am Ende sichtbar.

♂. Körper schmäler als das Weibchen. Vorderflügel sehr lang, fast 3-mal so lang wie beim Weibchen, durchsichtig, schwärzlichbraun geädert, am Ende abgerundet; Hinterflügel breit, durchsichtig, schwärzlichbraun geädert. Hinterleib sehr klein und kurz: Subgenitalplatte ein wenig länger als die Breite, fast dreieckig, am Ende abgerundet, mit zugespitzten, kleinen und behaarten Stylen, etwas behaart; Cerci mittellang, die Subgenitalplatte überragend, zugespitzt, behaart.

	♂	♀
Körperlänge:	15,5 mm.	15,2 mm.
Pronotumlänge:	3,5 mm.	3,9 mm.
Vorderflügellänge:	16,2 mm.	3,1 mm.
Hinterflügellänge:	15,5 mm.	2,9 mm.
Vorderschenkellänge:	4,5 mm.	4,5 mm.
Hinterschenkellänge:	5. mm.	6,1 mm.
Subgenitalplattenlänge:	1,3 mm.	2. mm.
Cerculslänge:	1,1 mm.	1,5 mm.

Nur 3 Exemplare aus Shizuoka (♀ 1) und Formosa (Taihoku in November ♂ 1, und Taipin in Juli ♀ 1) in der Sammlung von Herrn Prof. Dr. S. MATSUMURA und in meiner Sammlung.

Trivialname: Hina-Kamakiri.

Gatt. ***Statilia*** STÅL.

STÅL, C., 1877: Syst. Mant. (Bihang. till k. Svenska Vet.-Akad. Handlingar, IV. 10) pp. 36, 55.

In Japan kommt nur eine Art vor:

1. ***Statilia maculata*** THUNB. et LUND.

THUNBERG und LUNDAHL, 1784: *Mantis maculata*, Dissert Entomolog., pt. III, p. 61.

THUNBERG, 1815: *Mantis maculata*, Mém. Ac. St. Pétersb., V, p. 291.

DE HAAN, 1815: *Mantis maculata*, Bijdrag., 77, tb. 18, f. 5. ♀.

SAUSSURE, H., DE, 1870: *Deroplatis maculata*, Mél. Orth., I. III^e. fasc., p. 316.

BOLIVAR, I., 1897: *Statilia maculata*, Ann. Soc. Ent. France, LXVI, pp. 309, 310.

REHN, J. A. G., 1903: *Statilia maculata*, Proc. Acad. Nat. Sc. Phil. (Stud. Old World Mant.), p. 704.

SAUSSURE, H., DE, 1870: *Pseudomantis Haani*, Mél. Orth., I. III^e. fasc., p. 185.

BOLIVAR, I., 1897: *Pseudomantis Haani*, Ann. Soc. Ent. France, LXVI, pp. 309, 310.

REHN, J. A. G., 1903: *Pseudomantis Haani*, Proc. Acad. Nat. Sc. Phil., p. 704.

Körper schlank, dunkelbraun, bei einigen Exemplaren schwärzlich punktiert. Kopf kürzer als breit, oben mit einer schwarzen Querkante. Netzaugen gross, braun. Stirn platt, in der Mitte mit 2 rotbraunen Querlinien. Punktaugen wenig gross, elliptisch, schwarzbraun oder hellbraun. Fühler bei den beiden Geschlechtern sehr schmal und lang, fadenförmig, braun. Mundtheile klein, braun, mit schmalen am Ende geschwärzten Taster. Pronotum schmal, über 3-mal so lang wie breit, in der Mitte mit schmaler Längskante und

etwa am Vorderviertel mit einer schmalen Querfurche, an der Seite gekerbt, am Vorderrande schmal, abgerundet, am Hinterrande ziemlich stark abgerundet. Scutellum vom Vorderflügel nicht bedeckend, in der Mitte mit einer Längskante. Vorderflügel schmal, kürzer als der Hinterflügel, hellbraun oder braun, bei einigen Exemplaren schwärzlich gefleckt, am Anal- und Costalfelde dunkel; beim Männchen das Hinterleibsend ein wenig überragend, beim Weibchen etwas kürzer, am Hinterrande heller. Hinterflügel das Hinterleibsend überragend, am Costalfelde rotbraun, am Ende schwarzbraun, nach dem Hinterrande zu dunkler, mit hellgelben Queradern. Beine sehr schmal und lang, schmutziggelbbraun: Voderhüfte $\frac{2}{3}$ so lang wie der Vorderschenkel, vierkantig, an der Zwischenfurche der 2 Unterkanten mit 7 kurzen weissgelben Stacheln, an der Innenseite der Basis mit einem glänzenden, schwarzen, grossen Flecke; Vorderschenkel schmal und stark seitlich zusammengedrückt, so lang wie das Pronotum, mit kurzen Stacheln, an der Innenseite in der Mitte mit einem grossen, glänzenden schwarzen Flecke, nahe dem Vorderrande dieses Fleckes mit einem fast quadratischen Fleckchen; Vorderschienen sehr schmal, fast $\frac{1}{2}$ so lang wie der Vorderschenkel; 2 Hinterschenkel sehr schmal und lang, ziemlich stark gefurcht, ohne Stacheln und Anhängen, dunkelbraun; Mittel- und Hinterschienen je mit einem feinen Enddorn. Hinterleib lang, schmutziggelbbraun. Supraanalplatte bei den beiden Geschlechtern sehr kurz, am Ende ziemlich stark abgerundet, braun. Cerci senr kurz, fadenförmig, braun. Subgenitalplatte beim Weibchen breit, abgerundet, etwas das Legescheide bedeckend, am Ende tief gespaltet; beim Männchen sehr lang, am Ende schmal und quer ausgeschnitten, mit 2 sehr feinen Stylen. Letztes Bauchglied beim Weibchen lang und breit, am Ende abgerundet, dreieckig gespaltet; beim Männchen kurz, am Ende ziemlich stark abgerundet. Legescheide schmal und kurz, nach unten stark gebogen, am Ende quer ausgeschnitten.

	♂	♀
Körperlänge:	55.—63. mm.	41.—43. mm.
Pronotumlänge:	17.—20. mm.	13,5—14. mm.
Vorderflügellänge:	30.—34. mm.	30.—33. mm.
Hinterflügellänge:	28.—34. mm.	28.—30. mm.
Vorderschenkellänge:	17.—20. mm.	12,6—13. mm.
Hinterschenkellänge:	16,9—19. mm.	14,1—15. mm.
Cerculslänge:	4,3—4,4 mm.	4.—4,1 mm.
Subgenitalplattenlänge:	4,7—4,8 mm.	2.5—3 mm.

Zahlreiche Exemplare aus Tokyo (August), Gifu, Kumamoto (September), Totomi (August), Yoshihama (August) und Formosa (Juli) in der Sammlung von Herrn Prof. Dr. S. MATSUMURA und in meiner Sammlung.

Sonstige Verbreitung: Sumatra und Siam.

Trivialname: Ko-Kamakiri.

Gatt. ***Paratenodera*** REHN.

REHN, J. A. G., 1903: Proc. Acad. Nat. Sc. Phil., p. 705.

In Japan kommt nur eine Art vor:

1. ***Paratenodera aridifolia*** STÅL var. ***sinensis*** SAUSS.

SAUSSURE, H., DE, 1871: *Tenodera aridifolia* var. *sinensis*. Mél. Orth., III^e^ fasc. Suppl., p. 419.

REHN, J. A. G., 1903: *Paratenodera sinensis*, Proc. Nat. Sc. Phil., p. 705.

SAUSSURE, H., DE, 1869: *Mantis japonica*, Bull. ent. Suisse., III, p. 69. ♂; 1870, Mél. Orth., p. 238. ♂.

Körper gross und schlank, rotbraun oder grün. Kopf mittelgross, fast 2-mal so breit wie lang, gelbgrün oder braun. Gesichtsschild hoch und platt, schwarzbraun, mit 4 rotbraunen Längslinien. Mundtheile kurz, von vorn nach hinten ziemlich stark zusammengedrückt,

mit feinen Taster. Stirn ziemlich tief ausgehöhlt; Kopfscheitel gebogen. Netzaugen gross, elliptisch, ziemlich hervorgequollen, schwarzbraun; Punktaugen beim Männchen sehr gross, kreisrund, rotbraun bis gelbbraun, beim Weibchen sehr klein, fast undeutlich. Pronotum länger als der Vorderschenkel, am Vorderviertel mit kleinen Höckerchen und mit einer ziemlich breiten Längsfurche, am Dreiviertelntheile glatt, in der Mitte stark gekielt (beim Männchen ohne Längskante, mit einer sehr feinen seichten Längsfurche), an dem Seitenrande ziemlich stark gekerbt. Meso- und Metanotum fast gleich lang, in der Mitte ziemlich stark gekielt. Vorderflügel bei den beiden Geschlechtern das Hinterleibsende überragend, hellbraun oder hellgrün, selten ein wenig braun-gefleckt; Costalfeld breit, gewöhnlich gelblichgrün oder weisslichgrün. Hinterflügel bei den beiden Geschlechtern ein wenig länger als der Vorderflügel; Humeralfeld ziemlich breit, mit braunen oder schwarzbraunen Flecken (2 Exemplare aus Takasago mit nur schwarzbraunen Queradern); Vorderrand ziemlich hellrosafarbig; Axillarfeld hellbraun oder braun, mit durchsichtigen Flecken (2 Exemplare aus Takasago hellgelb, ohne Flecken); Innen- und Unterrand durchscheinend. Beine mittellang, gelbgrün oder braun: Vorderhüfte fast $\frac{1}{2}$ so lang wie das Pronotum, an der Unterseite mit Stacheln; Vorderschenkel ziemlich dick, mit kurzen schwarz gespitzten Stacheln; Vorderschienen über etwa halb so lang wie der Vorderschenkel; Mittel- und Hinterschenkel schmal, ohne Furche oder Stachel, am Ende je mit einem sehr feinen Stachel; Mittel- und Hinterschienen kürzer als der Hinterschenkel, sehr schmal, am Ende je mit 2 schwarzbraunen kurzen Stacheln. Hinterleib schmal und lang, oben gelbgrün oder rotbraun, unten grün oder braun. Supraanalplatte kurz; beim Weibchen sehr klein, ziemlich stark abgerundet, oben am Ende mit einer kurzen Längskante; beim Männchen fast dreieckig, oben mit einer langen Längskante. Cerci schmal und lang, fadenförmig. Subgenitalplatte beim Männchen gross und lang, am Ende schmal und quer ausgeschnitten, mit kurzen Stylen;

beim Weibchen grösser als beim Männchen, am Ende die Legescheide fast bedeckend, und seitlich zusammengedrückt. Legescheide kurz nach unten schwach gebogen, am Ende cylindrisch und zugespitzt.

	♂	♀
Körperlänge:	78.—80. mm.	82.—86. mm.
Pronotumlänge:	22,8—27,5 mm.	27.—28. mm.
Vorderflügellänge:	53.—63. mm.	51.—51,5 mm.
Hinterflügellänge:	50.—62. mm.	49,8—50. mm.
Vorderschenkellänge:	16.—19. mm.	18,7—20. mm.
Hinterschenkellänge:	21.—23,1 mm.	26.—27,1 mm.
Cerculslänge:	7,8—8. mm.	7.—7,5 mm.
Subgenitalplattenlänge:	5,5—6. mm.	6.—7. mm.

Zahlreiche Exemplare aus Insel Ogasawara (August), Takasago (October), Aomori (September), Kumamoto (September), Totomi (August), Yoshihama (August), Atami (August), Hakone (August) und Formosa (November), in der Sammlung von Herrn Prof. Dr. S. MATSUMURA und in meiner Sammlung.

Sonstige Verbreitung: China, Hainan und Annan.

Trivialname: Kamakiri oder O-Kamakiri.

Gatt. ***Hierodula*** BURM.

BURMEISTER, 1838: Handb. Ent., II, p. 536.
DE SAUSSURE, H., 1870: Mél. Orth., III^e fasc., p. 213.
STÅL, C., 1877: Syst. Mant., p. 38.
BRUNNER, VON W., 1893: Rév. Syst. Orth., p. 62.

In Japan kommt nur eine Art vor:

1. ***Hierodula bipapilla*** SERV. var. ***patillifera*** SERV.

SERVILLE, A., 1839: *Mantis patillifera*, Orth., p. 185.
DE HAAN, *Mantis patillifera*, Bijdrag., 70.9.

DE SAUSSURE, H., 1870: *Hierodula bipapilla* SERV. syn. *patillifera*, Mél. Orth., III^e fasc., p. 227.

REHN, J. A. G., 1903: *Hierodula patellifera*, Proc. Ac. Nat. Sci. Phil., p. 709.

Körper dick und gross, grün oder braun. Kopf dreieckig, gross; Facialschild gross, fünfeckig, so lang wie breit, ohne Zeichnung; Stirn viel kürzer als breit, mit drei grossen, glänzenden, gelben Punktaugen; Kopfscheitel fast gerade; Netzaugen gross, eiförmig. Fühler sehr schmal, fast so lang wie das Pronotum, fadenförmig, rotbraun oder grünlichbraun. Pronotum breit, länglichrhombisch, $1\frac{1}{3}$-mal so lang wie das Meso- und das Metanotum zusammen, am Seitenrande fein gekerbt, am Vorderdrittel in der Mitte mit einer Längsfurche, am $\frac{2}{3}$ in der Mitte mit einer schmalen Längskante, welche beim Männchen kaum sichtbar ist. Prosternum platt, rotbraun oder gelbgrün, an der Basis mit 2 braunen Querbänder, das erstere breit. Meso- und Metanotum lang und gross, fast gleich lang, in der Mitte je mit einer niedrigen Längskante. Beine mittelgross, braun oder grün: Vorderhüfte dick, mit drei Kielen, an der unteren Aussenkante mit sehr kurzen Dornen, nach innen von dieser Kante mit 3 gelben oder rotgelben höckerigen Zähnchen; Vorderschenkel dick, ein wenig kürzer als das Pronotum, seitlich zusammengedrückt, mit drei Kielen, Unterkanten mit ziemlich langen, braunen Stachein; Vorderschienen dick, $\frac{3}{4}$-mal so lang wie der Vorderschenkel; Mittel- und Hinterschenkel kaum gekielt, je mit einem sehr kurzen und feinen Enddorn; Mittel- und Hinterschienen ohne Stacheln oder Anhängen, je mit einem feinen Enddorn. Vorderflügel breit, meistens das Hinterleibsende überragend, nur bei einigen Weibchen nicht überragend, durchscheinend, weisslichgrün oder hellbraun, selten hellgelblich gefleckt, mit langen weissgelben Stigmen; Costalfeld breit. Hinterflügel so lang wie der Vorderflügel, durchsichtig, am Ende grünlich, mit hellgelben Adern. Hinterleib dick und gross, oben grünlichbraun oder gelbgrün, unten kastanienbraun oder grün. Supraanalplatte beim Weibehen sehr kurz,

transversal, am Ende ziemlich abgerundet, in der Mitte ziemlich tief ausgebuchtet; beim Männchen viel länger als beim Weibchen, oben in der Mitte mit einer Längskante. Subgenitalplatte, Legescheide und Cerci wie bei *Paratenodera aridifolia*.

	♂	♀
Körperlänge:	58.—59. mm.	63.—66. mm.
Pronotumlänge:	16,5—17. mm.	17,5—19. mm.
Vorderflügellänge:	48.—49. mm.	44.—49. mm.
Hinterflügellänge:	46.—47,5 mm.	40.—45. mm.
Vorderscbenkellänge:	17.—17,3 mm.	16.—18. mm.
Hinterschenkellänge:	16.—17. mm.	16,1—17,9 mm.
Cercuslänge:	7.—7,2 mm.	9.—9,1 mm.
Subgenitalplattenlänge:	8—8,1 mm.	6.—6,1 mm.

Zahlreiche Exemplare aus Kyoto (August), Takasago (October), Totomi (August), Okinawa (August), Odawara (August) und Formosa (Juli), in der Sammlung von Herrn Prof. Dr. S. MATSUMURA und in meiner Sammlung.

Sonstige Verbreitung: Phillipinen, Java und China.

Trivialname: Harabiro-Kamakiri.

Gatt. ***Mantis*** L

LINNAEUS, 1758: Syst. Nat., X ed., p. 425.
BURMEISTER, 1839: Handb. Ent., II, p. 530.
FISCHER, H., 1880: Orth. europe., p. 123.
STÅL, C., 1877: Syst. Mant., p. 38.
DE SAUSSURE, H., 1870: Mél. Orth., III[e] fasc., p. 236.
FINOT, A., 1890: Faune Fr. Orth., p. 87.
BRUNNER, VON W., 1882: Prodr., p. 58.
BRUNNER, VON W., 1893: Rev. Syst. Orth., p. 62.
REDTENBACHER, J., 1900: Derm. Orth. Öst.-Ung. Deutsch., p. 33.
TÜMPFEL, R., 1901: Geradf. europe., p. 235.

In Japan kommt nur eine Art vor:

1. *Mantis religiosa* L.

LINNEAUS, 1767: *Mantis religiosa*, Syst. Nat., II, p. 690.
SULZER, 1776: *Mantis religiosa*, Gesch. Ins., tb. VIII, fig. 4.
PANZER, 1823: *Mantis religiosa*, Faun. ins. Germ., fasc. 50, tb. 8.
LATREILLE, 1804: *Mantis religiosa*, Hist. Nat., T. XII, p. 109. tb. 94, fig. 3.
CHARPENTIER, 1825: *Mantis religiosa*, Hor. ent., p. 88.
ROESEL, 1750: *Mantis religiosa*, Insekt., Vol. II, Vorbericht etc., p. 8, t. 1; 1761, deinde Vol. IV, p. 89, t. XII.
BURMEISTER, 1839: *Mantis religiosa*, Handb., II, p. 535.
SERVILLE, A., 1839: *Mantis religiosa*, Hist. Nat., p. 193.
CUVIER, 1846: *Mantis religiosa*, Regn. anim., 3^e^ édit. t. 78. fig. 1.
FISCHER, H., 1853: *Mantis religiosa*, Orth. europe., p. 129.
FINOT, A., 1890: *Mantis religiosa*, Faun. Fr. Orth., p. 87.
BRUNNER, VON W., 1882: *Mantis religiosa*, Prodr., p. 59, fig. 14.
DE SAUSSURE, H., 1870: *Mantis religiosa*, Mél. Orth., III^e^ fasc. p. 239.
REDTENBACHER, J., 1900: *Mantis religiosa*, Derm. Orth. Ost.-Ung. Deutsch., p. 33.
TÜMPFEL, R., 1901: *Mantis religiosa*, Geradf. europ., p. 235.
REHN, J. A. G., 1903: *Mantis religiosa*, Proc. Ac. Nat. Sci. Phil., p. 712.
DE HAAN, W., *Mantis religiosa*, Bijdr., 71.13.
FABRICIUS, 1792: *Mantis sancta*, Ent. Syst., II, 21, 33.
OLIVIER, 1825: *Mantis sancta*, Enc., VII, 628, 14.
FABRICIUS, 1792: *Mantis striata*, Ent. Syst., II, 21, 33.
LICHTENSTEIN, 1802: *Mantis striata*, Monogr. Mant., No. 27.
LATREILLE, 1804: *Mantis striata*, Hist. Nat. Ins., XII, p. 110.
FISHER, W., 1833: *Mantis striata*, Orth. Ross., 101, pl. II, fig. 3.
THUNBERG, 1815: *Mantis macroura*, Mém. Acad. Pétersb., V, p. 287.
FABRICIUS, 1793: *Mantis oratoria*, Syst. Ent., 277, 14; 1792, Ent. Syst., II, 20, 31.

OLIVIER, 1825: *Mantis oratoria*, Enc. VII, p. 628, 11.
FISCHER, W., 1833: *Mantis radiata* MOTSCHULSKY, Orth. Ross., 101, tb. II, fig. 3.

Körper schwach, grün oder hellbraun. Kopfscheitel ein wenig convex; Gesichtschild kürzer als breit, oben stumpfig; Stirn fast platt, mit 3 glänzenden, gelben, kleinen Punktaugen; Hinterkopf kantig, nicht gerade. Fühler beim Weibchen fast so lang wie das Pronotum, sehr schmal, fadenförmig; beim Männchen viel länger als das Pronotum, borstenförmig. Netzaugen mittelgross, etwa eiförmig, schwarzbraun oder grünlichbraun. Pronotum kurz, grün oder hellbraun, mit rötlichen Ränder, $1\frac{1}{2}$-mal so lang wie das Meso- und Metanotum zusammen, am Vorderdrittel mit einer seichten Längsfurche, am $\frac{2}{3}$ mit schmaler Längskante: beim Weibchen am Seitenrande ein wenig gekerbt; beim Männchen nicht gekerbt. Meso- und Metanotum gelblichgrün oder hellbraun, in der Mitte je mit einer schmalen Längskante. Prosternum ziemlich stark concav, in der Mitte mit einer schmalen Längskante. Beine schwach und sehr schmal, grün oder hellbraun: Vorderhüfte oben und unten gezähnelt, innen mit weisslichgelben kleinen Körnchen; an der Basis mit einer glänzend schwarzen, selten in der Mitte mit einem weissen, Makel; Vorderschenkel schmal, so lang wie das Pronotum, mit drei feinen hellgrünen oder hellbraunen Discoidalstacheln, welche an der Innenseite einen kreisförmigen gelben Makel zeigt; Vorderschienen fast halb so lang wie der Vorderschenkel, rotbraun, fein stachelig; Mittel- und Hinterschenkel sehr schmal, weder gekielt noch gestachelt; Mittel- und Hinterschienen mit 2 feinen Enddornen; Tarsen braun. Vorderflügel grün oder braun, selten mit braunem Costalfelde, am Vorderrande hell gesäumt, nach dem Hinterrande zu durchsichtig (beim Männchen fast ganz durchsichtig), am Costalfelde braun oder bräunlichgrün. Hinterflügel glashell, an der Spitze und am Vorderrande grün oder braun. Hinterleib schmal, lang gestreckt, grün oder hellbraun. Supraanalplatte sehr kurz, am Ende abgerundet, beim

Männchen oben in der Mitte mit einer sehr schmalen Längskante. Subgenitalplatte beim Weibchen wie bei *Paratenodera sinensis*: beim Männchen sehr lang, am Ende sehr schmal und ein wenig gespaltet, mit feinen und langen Stylen. Cerci und Legescheide wie be *Paratenodera sinensis*.

	♂	♀
Körperlänge:	50.—54. mm.	55.—58. mm.
Pronotumlänge:	12,5—14. mm.	15.—16,1 mm.
Vorderflügellänge:	32,5—39. mm.	38.—39,4 mm.
Hinterflügellänge:	31,5—38. mm.	35.—37. mm.
Vorderschenkellänge:	11.—13. mm.	14.—15,8 mm.
Hinterschenkellänge:	18.—14. mm.	16,5—17. mm.
Cerculslänge:	5.—7,1 mm.	7.—8. mm.
Subgenitallänge:	4.—3,5 mm.	5.—5,3 mm.

Zahlreiche Exemplare aus Aomori, Kyoto, Takasago und Formosa (September) in der Sammlung von Herrn Prof. Dr. S. MATSUMURA und in meiner Sammlung.

Sonstige Verbreitung: Korea, China, Africa und Europa.

Trivialname: Usuba-Kamakiri oder
Hime-Usuba-Kamakiri.

II. Subfam. **Harpaginae** BRUNN.

BRUNNER, VON W., 1893: Rev. Syst. Orth., p. 58.

In Japan kommt nur eine Gattung vor:

Gatt. ***Acromantis*** SAUSS.

DE SAUSSURE, H., 1870: Bull. ent. suiss., III, 226, 229.
DE SAUSSURE, H., 1870: Mél. Orth., III^e fasc. p. 209.
DE SAUSSURE, H., 1870: Mél. Orth., III^e suppl., p. 448.

In Japan kommt nur eine Art vor:

1. *Acromantis japonica* WEST.

WESTWOOD, 1889: *Acromantis japonica*, Rev. Ins. Fam. Mant. p. 43.

"Pallide fusca, facie supra in angulum latum brevem producto, vertice inter oculos 4 impresso; prothorace lateribus subserratis; tegminibus brevioribus apice rotundatis, area costali viridi opaca, area discoidali densissime reticulata, venis 4 oblique curvatis et robustioribus; alis pallide flavidofulvis, costa brunnea apiceque obscuriori et truncata; pedibus anticis robustis, femoribus margine supero interno, in medio pallidius subnotatis, femoribus posticis infra vix lobatis; angulo nigricanti." (WESTWOOD).

Long. corp. lin. 12; proth. lin. 4; expans. tegm. lin. 17.

Hab. Japan. In Mus. Hope.

Diese Art ist mir unbekannt.

Erklärung zur Tafel XII.

1. *Entoria formosana*, n. sp. (♀)
   a. Analtheil des Hinterleibs.
2. *Entoria japonica*, n. sp. (♀)
   a. Analtheil des Hinterleibs.
3. *Entoria magna*, n. sp. (♀)
   a. Analtheil des Hinterleibs.
4. *Necroscia 6-punctata*, n. sp. (♂)
5. *Micromantis formosana*, n. sp. (♀)
6. *Gonypeta maculata* SHIRAKI (♀)
   a. (♂).

Observations and Experiments on the Ctenophore Egg:

II. Notes on Early Cleavage Stages and Experiments on Cleavage.

BY

Naohide Yatsu.

The early history of the egg cleavage of *Beroë ovata* has been studied up to the 120-cell stage by ZIEGLER ('98). And this is the only work, in which the ctenophore cytogeny has been studied up to so far advanced a stage. In connection with my experimental work on cleavage, early developmental stages of three common species of ctenophores at Naples, *Beroë ovata*, *B. forskålii* and *Callianira bialata*, were studied.

I. Early Cleavage of Beroë.

As is seen from Table I, appended to the end of this paper, the cleavage of the egg of *Beroë ovata* was followed up to the 136-cell stage.

The type of cleavage, as is well known, is biradial or disymmetrical conforming to the architectonic of the adult. I would call, for the sake of brevity, the submedian or subventral cell middle-cell (M) and the subtentacular cell end-cell (E). The former is larger than the latter and is situated a little towards the macromere pole.[1] The subsequent history of these two kinds of cells is different; each of the middle-cells gives off two micromeres (m_1 and m_2), while the end-cells three (e_1, e_2 and e_3). After the micromeres are budded off each macromere is divided in two equal daughter cells, thus producing sixteen entoderm cells.

1) Macromere pole = vegetative pole of Hatschek (Korschelt und Heider '09 p. 24), the pole from which the polocytes are expelled.

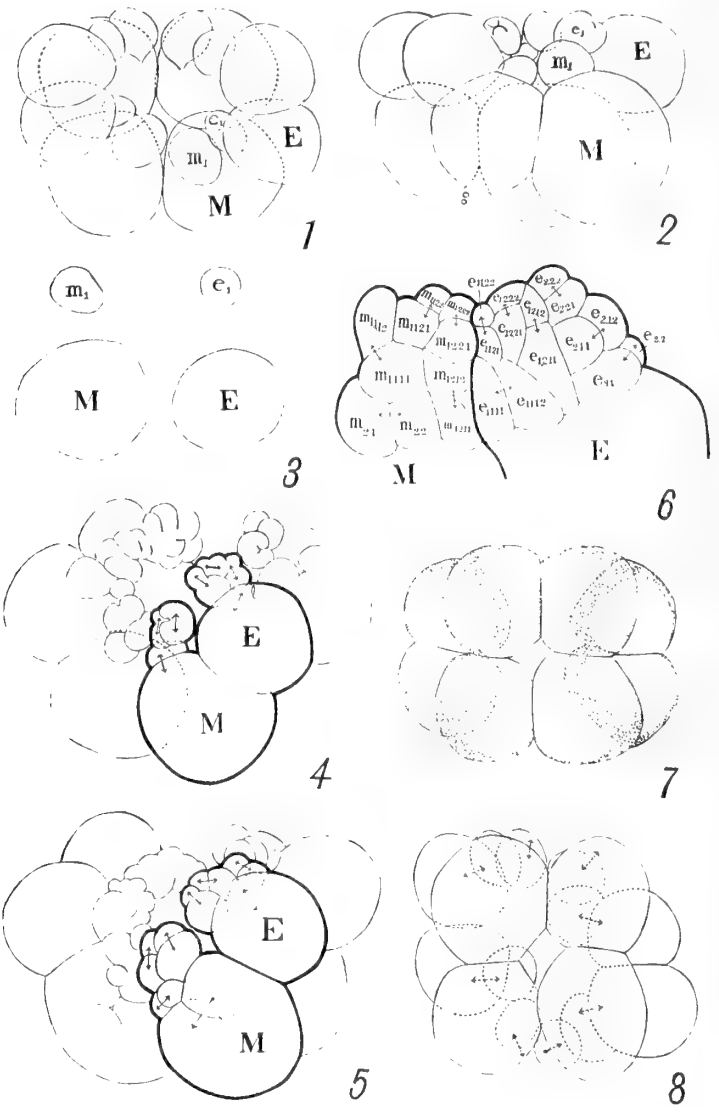


Fig. 1 (all the figures, except 7 and 8, are from the egg of *Beroë ovata*) 1, 8-cell stage seen from the micromere pole, × 40; 2, the same side view, × 40; 3, middle- and end-cells and their micromeres, × 40; 4, 32-cell stage, about to be 48-cell stage × 40; 5, 60-cell stage, × 40; 6, micromere groups of middle- and end-cells at 108-cell stage × 73; 7 and 8, two stages of the egg of *Callianira bialata*, × 180.

The first micromere (e_1) of the end-cell is smaller than that of the middle-cell (m_1) (Fig. I, 1, 2 and 3). To a certain extent the size of the micromere depends upon that of the macromere, it is true, but that is not always the case as will be seen later on.

Some points of interest regarding the cleavage may be mentioned. As ZIEGLER pointed out $m_{1.1}=m_{1.2}$, while $e_{1.1} > e_{1.2}$. $e_{1.1.1}$, the largest of the E micromeres, is divided vertically a little later than its fellows. $e_{2.1}$, e_3 and m_2 are also divided vertically (Fig. I. 6). M (basal cells) cleaves into two at no constant period, sometimes quite early as in Fig. I. 5, sometimes much later.

At about the 140-150-cell stage some cells go into the interior and hand in hand with this process a great cytolisthesis suddenly takes place—a kaleidoscopic change I might say. This converts the embryo into a typical epibolic gastrula. On account of this change the tracing of individual cells beyond this stage is extremely difficult. Then several small "mesoderm cells" are budded off from the entoderm cells (M). They show a fine spinning activity like the polocytes, all of them being connected by a bridge of fine protoplasmic threads.

The early cleavage stages of *Beroë forskalii* was followed up to the 96-cell stage (Table II). The egg of this species is much smaller than *B. ovata*, which makes the study a good deal easier. In the main the mode of cleavage of *B. forskalii* agrees with that of *B. ovata*. The only difference is in the rythm of cleavage. e_2 divides and e_3 is formed, later than in *B. ovata*.

II. Early Cleavage of Callianira.

The mode of cleavage of *Callianira bialata* is somewhat different from that of the preceding two (Table III). In some cases the third cleavage is horizontal instead of vertical, the end-cells taking the position of the first quartet of the ordinary type of cleavage.

METSCHNIKOFF figures this case (Taf. 24 Fig. 2) though he does not mention anything in the text ('85). In such eggs m_1 is given off horizontally and e_1 towards the macromere pole. There are all gradations between this mode of cleavage and that of ordinary ctenophore type. Fig. I 7 and 8 represent two intermediate stages.

As is seen from Table III the cleavage of *Callianira* differs from that of *Beroë* in the following points. m_2 is formed earlier and e_4 is given off from the end-cells in *Callianira*. $m_{1.1}$ and $m_{1.2}$ remain undivided much longer than those of *Beroë*. A long pause is found in the 72-cell stage of *Callianira*.

III. Experiments on Cleavage.

Experiments on cleavage have previously been made by ZIEGLER ('98) and incidentally by FISCHEL ('03). In order to supplement their results removal experiments were performed on the eggs of *Beroë ovata* (eighty-four cases) in various ways and at various periods. As to the method of operation the reader is referred to Part I [1] of this study. Most of the egg fragments were examined at the 16-cell stage so as to compare the sizes of the middle-cells, end-cells and their micromeres.

In the following series isolation experiments are entirely omitted, because they are not so interesting as those to be described in this section: isolated blastomeres cleave as though they were in the whole egg, as I have incidentally attested while experimenting on the problem of germinal localization (*cf.* DRIESCH u. MORGAN '95).

a. *Experiment 1* (2 cases).

The egg was cut soon after it was discharged, *i.e.*, before fertilization. In two cases the mode of cleavage was studied. Both of them were found to be normal in spite of the operation. Section

1) Journal of Science College XXXII, Art. 3.

plane was not determined, and the cases were too few to draw any conclusion from. Further experiments with exact determination of the section plane by means of the polocytes are very desirable.

b. *Experiment II* (10 cases).

The egg with the first and second polocytes was cut along various planes before the beginning of the first cleavage. ZIEGLER ('98) mentions two such cases, figuring the 2-cell stages alone.

Three eggs were cut vertically (Fig. II. 9, 10[1]). One notices at once abnormal proportion of the end-cells and the middle-cells (*cf.* Fig. I 1–3). Nevertheless it is a whole cleavage, the micromeres being formed normally.

Six eggs were cut obliquely. The result was the same as that of vertical sectioning. In one case, however, the end-cells divided in two equally, instead of sending out a micromere (e_1) as is shown in Fig. II 11.

One egg was cut horizontally[2]. The end-cells were very small, but the micromeres (e_1) are almost as large as in the normal egg.

This series of experiments clearly show that at whatever angle the section may strike (if the operation be done before the beginning of the first division) the fragments perform a whole cleavage. Moreover it should be noticed that the end-cells are more affected in size by the cutting than the middle-cells.

c. *Experiment III* (seven cases).

At the beginning of the first cleavage the egg was split into two nucleated fragments. No matter how section plane may pass, the result was in all cases half-cleavage (Fig. II. 13 and 14).

1) All the figures are drawn in the same magnification (× 40). The micromere pole is directed upward in the figures. The end-cells and their micromeres are represented in heavier lines.

2) Both the halves of this egg developed into larvae, owing probably to the fact either that it was a dispermic egg or that the germ-nuclei in it did not unite.

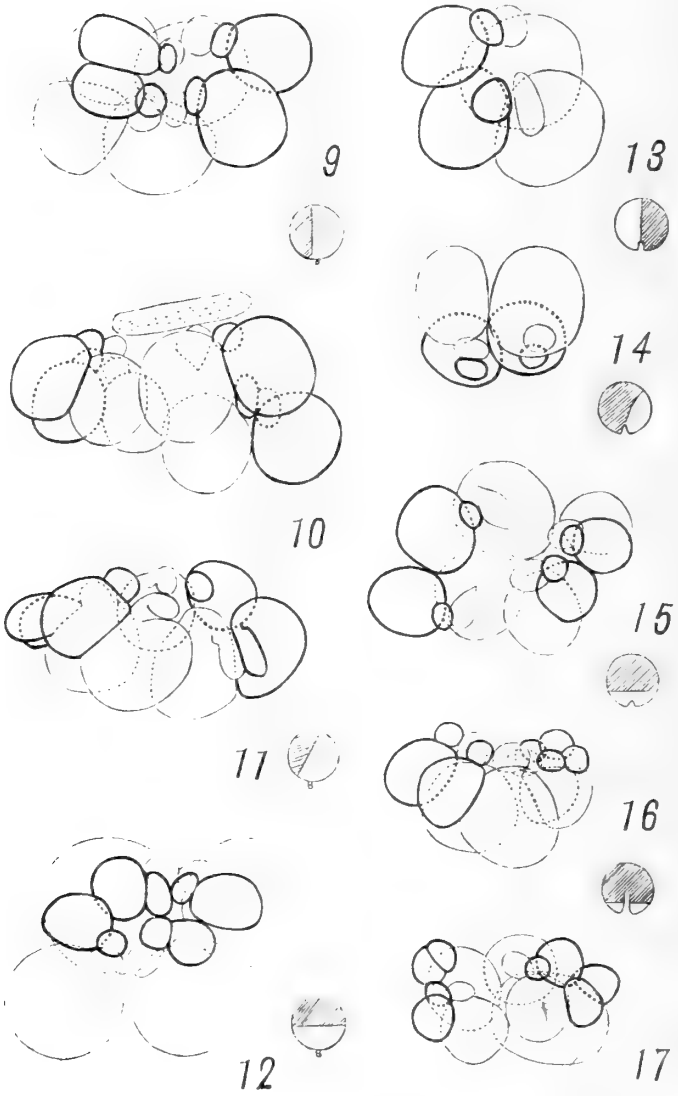


Fig. 11 (all the figures × 40). 9 and 10, 16-cell stages resulting from an egg operated upon as in the accompanying diagram; 11, 12, 16 cell stage resulting from two different cuts; 13, 14, half-cleavage of an egg cut vertically; 15, 16-cell stage of an egg cut horizontally; 16, 17, the same of an egg cut as in the diagram which is between these two figures.

d. *Experiment IV* (thirty-eight cases).

During the first cleavage various amount of cytoplasm was cut off to see how cleavage goes on in nucleated fragments. Since ZIEGLER ('98 p. 58) has already discovered that the micromeres are formed after such an operation, this series of experiments was especially directed to ascertain the size relation between the micromeres. Of the thirty-eight eggs, thirty were cut horizontally at different levels and the rest obliquely.

In the case of horizontal cutting (Fig. II, 15–17; Fig. III, 18–20), we notice that in small fragments the size of blastomeres and especially that of the end-cells is more variable. In Fig. II 17, one of the middle-cells has budded out a large micromere, and two of the end-cells have divided equally. In larger pieces the size relation between the end-and middle-cells is almost normal (Fig. III. 18–20).

Now as to the size of the micromeres. As we have already seen in the foregoing experiments the micromeres vary somewhat in size even in one and the same egg. In general, however, it may be stated that they are proportional in size with the fragments (*cf.* Fig. II. 15 or 16 and Fig. III. 19 and 20). To a certain extent the micromeres are also proportional in size to the macromeres, it is true; those of the middle-cells are usually larger than those of the end-cells. But that is not always the case, since the small end-cells may sometimes produce relatively large micromeres (Fig. II, 16 and 17).

Turning our attention to the relation between the size of micromeres and the quantity of the ectoplasm contained in the piece we find that, contrary to our expectation, there is no such relation at all. At the stage of Fig. II 15, a large quantity of the ectoplasm has gonedown towards the macromere pole, while at the stage of Fig. II 16 (or still better Fig. III 18 19, 20) its greater part has ascended towards the micromere pole, yet, as these figures show, the sizes of the micromeres are almost the same.

Oblique sections yield, as we should expect, asymmetry in regards to the size of blastomeres. Here again it should be remarked that the size of the micromeres of the end-cells is about the same irrespective of the sizes of their macromeres.

Inferring from this series of experiments, there seems to be a certain constancy of size in the micromeres, or at least a tendency towards it.

e. *Experiment V* (eleven cases).

During various periods of the second cleavage the egg was cut horizontally. The result was the same as that of the foregoing experiments.

Fig III 22 represents a case in which, at the time of operation, the ectoplasmic accumulations were found at the macromere pole in preparation for the second cleavage. It is certain that more ectoplasm was in the nucleated fragment than in any other stage. Yet the micromeres produced from this piece were not larger than those of Fig. II 16.

Fig. III 23 shows a case in which a middle-cell has divided equally instead of giving off a micromere.

f. *Experiment VI* (five cases).

The region near the micromere pole was cut off at the 4-cell stage. Exactly as in the forgoing experiments, micromeres of the usual size were formed.

g. *Experiment VII* (seven cases).

At the 2-cell stage one of the blastomeres was cut vertically (Fig. IV 24). This operation caused very little effect upon the mode of cleavage.

h. *Experiment VIII* (four cases).

At the 4-cell stage nucleated portions of the two blastomeres were cut off by a vertical section. The small nucleated fragments per-

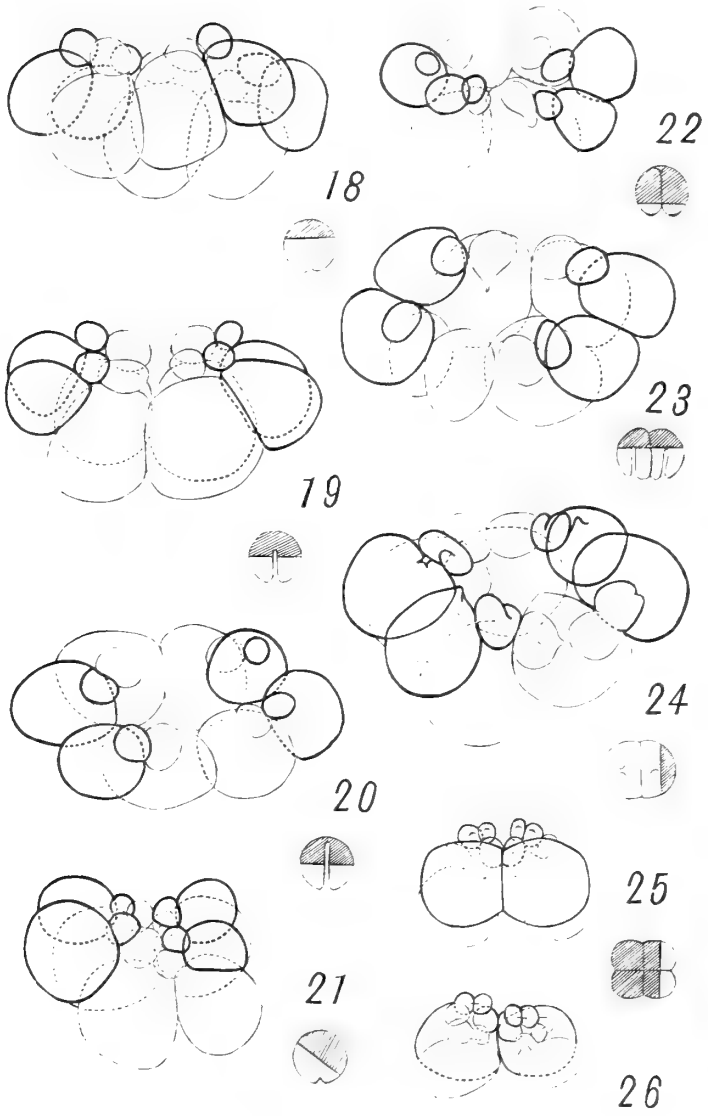


Fig III (all the figures × 40). 17–20, 16-cell stage of eggs cut horizontally at various periods of the first cleavage; 21, 16-cell stage of an egg cut obliquely; 22, 23, 16-cell stage of eggs cut horizontally at the 2-cell stage; 24, 16-cell stage of an egg cut vertically at the 2-cell stage; 25, 26, 14- and 16-cell stages (half-cleavage) of an egg fragment cut vertically at the 4-cell stage.

formed half-cleavage as in an isolated blastomere of the 2-cell stage (Fig. III. 25 and 26).

IV. Summary and Conclusions.

The egg cleavage of *Callianira bialata* differs from that of *Beroë* in the following points:

1. The third cleavage plane is sometimes horizontal; in other cases there is a tendency to be so.

2. The fourth micromeres are budded off from the end-cells.

The following are the results obtained from the experiments performed upon the egg of *Beroë ovata*.

1. If a portion of cytoplasm is removed from the egg before the commencement of the first cleavage, the nucleated fragments cleave like a whole egg.

2. If the egg be split into two during the first cleavage, each nucleated fragment divides as half-cleavage, as in isolated blastomeres of the 2-cell stage.

3. If the egg be cut along any plane into nucleated and non-nucleated fragments during the first cleavage, the former divides like a whole egg, forming micromeres in thenor mal way.

4. End-cells are more variable in size than middle-cells in operated eggs, especially when these are small.

5. Size of micromeres depends principally upon that of the fragments producing them and not upon the quantity of ectoplasm contained in these.

6. Size of the micromeres from the end-cell is not proportional to that of its macromere in operated eggs.

7. Micromeres seem to have a tendency to keep their proper size as various operations show.

8. Egg fragments, from which a large portion of the micromere pole has been removed before the fourth cleavage, are capable of producing micromeres.

9. Fragments, consisting of two nucleated portions of the 4-cell stage produced by a vertical cut, perform half-cleavage.

10. In operated eggs both the middle- and end-cells may each divide equally in two, instead of giving off micromeres.

Misaki Marine Biological Station
August 21, 1910.

Literature.

DRIESCH H. und MORGAN T. H., '95. — Zur Analysis der ersten Entwicklungsstadien des Ctenophoreneies: Arch. Entm. 2.

FISCHEL, A., '03.—Entwickelung und Organdifferenzierung: Arch. Entm. 15.

KORSCHELT E. und HEIDER K., '09.—Lehrbuch der vegleichenden Entwicklungsgeschichte der wirbellosen Thiere. Allg. Teil. 3 Lief.

METSCHNIKOFF, E., '85. — Vergleichend-embryologische Studien. 4. Über die Gastrulation und Mesodermbildung der Ctenophoren: Z. W. Z. 42.

YATSU, N., '11. — Observations and Experiments on the Ctenophore Egg. I. The Structure of the Egg and Experiments on Cell-division: Journ. Science Coll. 32 Art. 3.

ZIEGLER, H. E., '98. — Experimentelle Studien über die Zelltheilung. III. Die Furchungszellen von *Beroë ovata*: Arch. Entm. 7.

TABLE I.

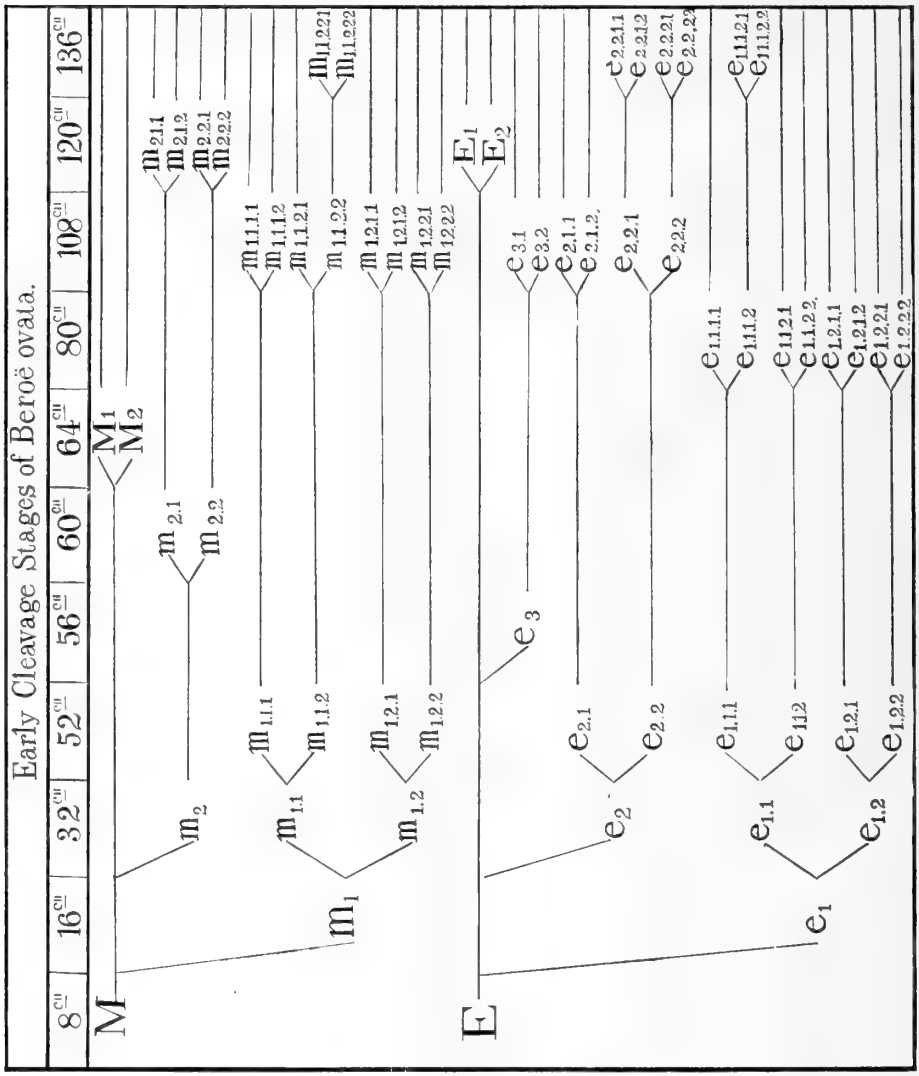

Early Cleavage Stages of Beroë ovata.
8 CH
16 CH
32 CH
52 CH
56 CH
60 CH
64 CH
80 CH
108 CH
120 CH
136 CH
M
M1
M2
m1
m2
m1.1
m1.2
m2.1
m2.2
m1.1.1
m1.1.2
m1.2.1
m1.2.2
m1.1.21
m1.1.22
m1.2.11
m1.2.12
m1.2.21
m1.2.22
m2.1.1
m2.1.2
m2.2.1
m2.2.2
m1.1.221
m1.1.222
E
E1
E2
e3
e2
e2.1
e2.2
e3.1
e3.2
e2.1.1
e2.1.2.
e2.2.1
e2.2.2
e2.1.1.1
e2.1.1.2
e2.2.1.1
e2.2.1.2
e2.2.2.1
e2.2.2.2
e1
e1.1
e1.2
e1.1.1
e1.1.2
e1.2.1
e1.2.2
e1.1.1.1
e1.1.1.2
e1.1.2.1
e1.1.2.2
e1.2.1.1
e1.2.1.2
e1.2.2.1
e1.2.2.2
e1.1.1.2.1
e1.1.1.2.2

TABLE II.

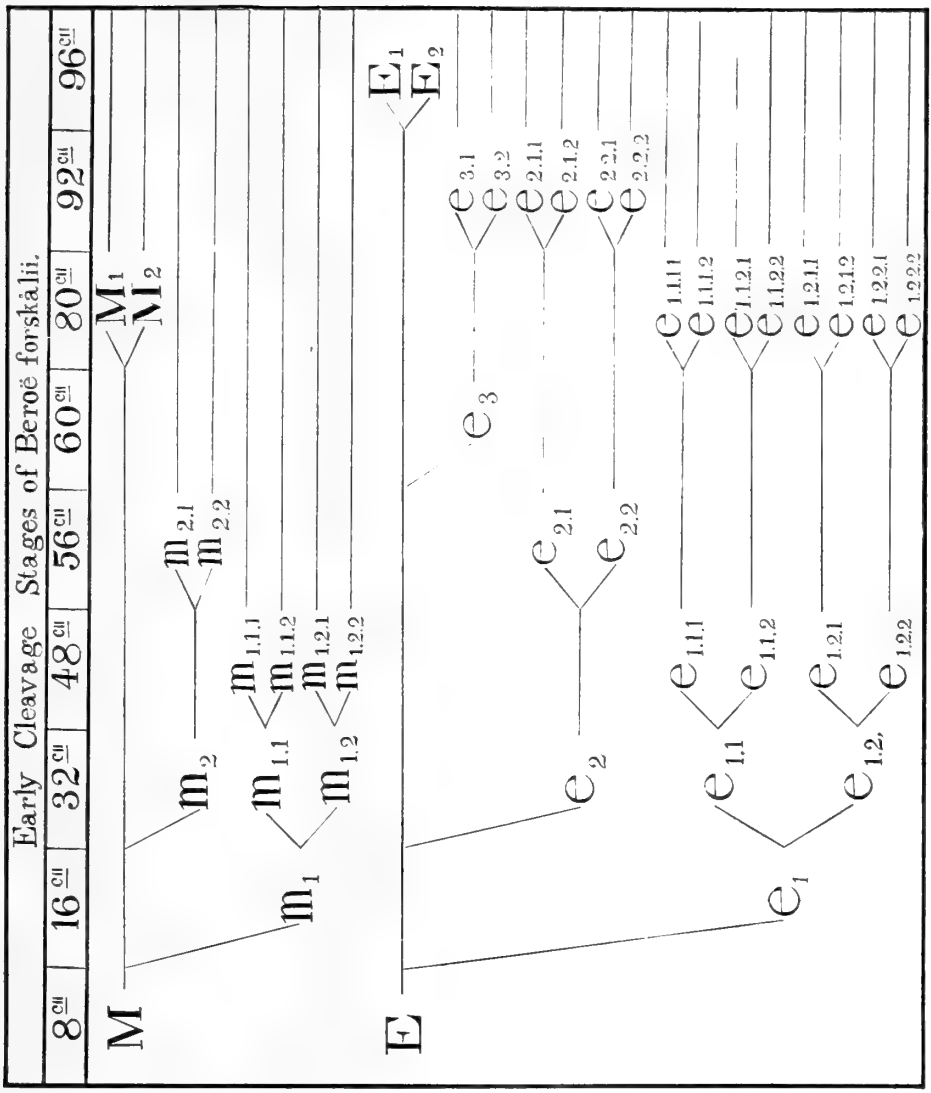
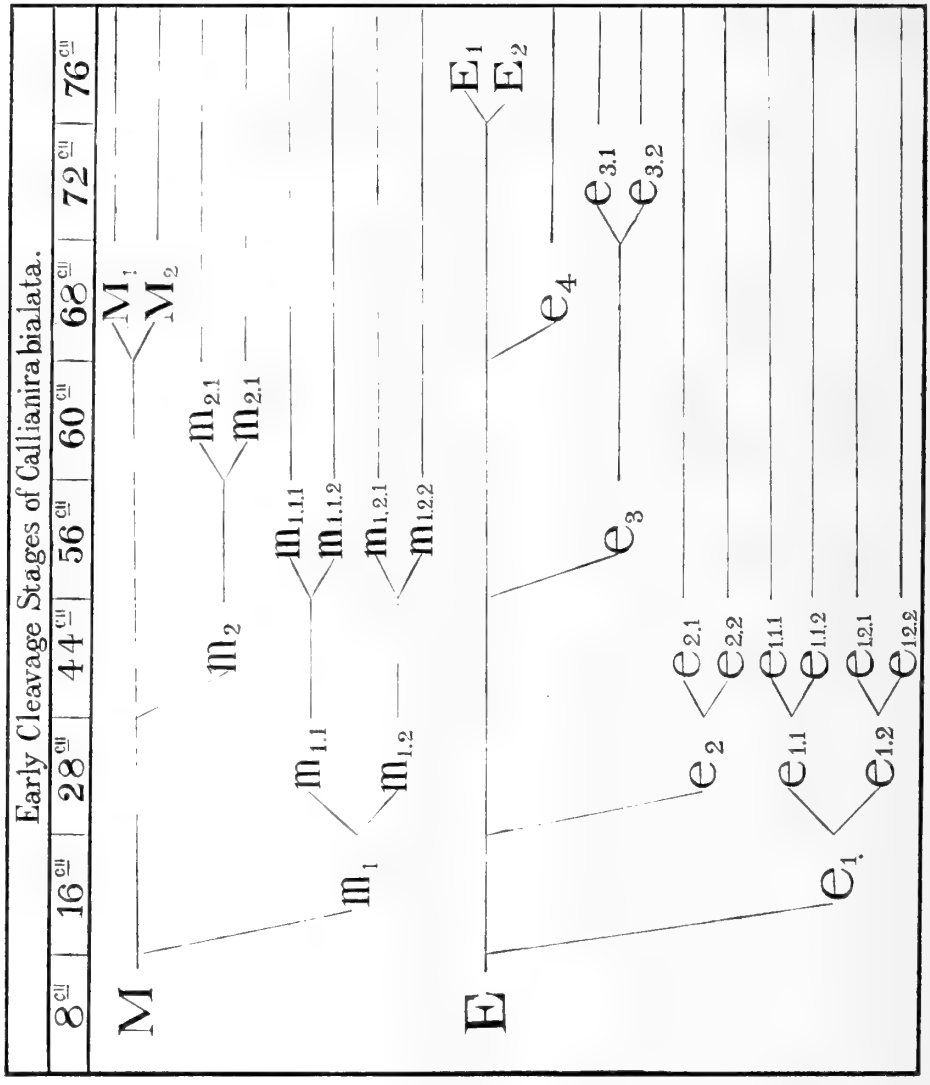

Early Cleavage Stages of Beroë forskålii.
8 Cll
16 Cll
32 Cll
48 Cll
56 Cll
60 Cll
80 Cll
92 Cll
96 Cll
M
m1
m2
m1.1
m1.2
m2.1
m2.2
m1.1.1
m1.1.2
m1.2.1
m1.2.2
E
e1
e2
e3
e1.1
e1.2
e2.1
e2.2
e3.1
e3.2
e1.1.1
e1.1.2
e1.2.1
e1.2.2
e2.1.1
e2.1.2
e2.2.1
e2.2.2
e1.1.1.1
e1.1.1.2
e1.1.2.1
e1.1.2.2
e1.2.1.1
e1.2.1.2
e1.2.2.1
e1.2.2.2
E1
E2
M1
M2

TABLE III.


Early Cleavage Stages of Callianira bialata.
8 cll
16 cll
28 cll
44 cll
56 cll
60 cll
68 cll
72 cll
76 cll
M
m1
m1.1
m1.2
m2
m1.1.1
m1.1.2
m1.2.1
m1.2.2
m2.1
m2.1
M1
M2
E
e1
e1.1
e1.2
e2
e1.1.1
e1.1.2
e1.2.1
e1.2.2
e2.1
e2.2
e3
e3.1
e3.2
e4
E1
E2

Note on a Gigantic Form of Auricularia Allied to *A. nudibranchiata* CHUN.

By

Hiroshi Ohshima, *Rigakushi.*

Zool. Inst., Tokyo Imp. Univ.

The remarkable Holothurian larva, *Auricularia nudibranchiata*, was first discovered at Orotava, Canary Islands, in 1887 and was carefully studied by CHUN.* No second record of the discovery of the same or a similar larva seems to have since been given from any part of the world. In the Misaki Marine Station, there came into observation from time to time since 1898, a gigantic form of *Auricularia* which is apparently very closely allied to, if not identical with, the Orotavan form described by CHUN. As recorded in the diary of the Station, the first specimen of the larva was obtained on December 29th. of that year, followed by two specimens on the following day; and on January 2nd., 1899, thirty six more individuals seem to have been collected. During the winter of 1910, I myself have had the good fortune of capturing a few specimens, besides coming into possession of some more which were taken by Messrs. K. AOKI and S. FUJITA of the Station and have been preserved in formalin. Now, here will be given a short account of my observations on the larva in both living and preserved states.

At the outset it may be mentioned that in all essential points of external and internal organization, the Misaki form shows close agreement with that of Orotava. As in the latter case, nothing whatever is known as to the metamorphosis or the adult condition of the larva.

* Atlantis. Biologische Studien über pelagische Organismen, II. *Auricularia nudibranchiata*. Bibl. Zool., Heft 19, 1895.

The largest of the Misaki specimens reaches 15 mm. in length as measured after preservation in formalin. This is a size which considerably exceeds that of the largest described by CHUN. The smallest of my specimens is of about the same size as the larger ones of CHUN's. The peculiar arabesque-like arrangement of ciliary bands is manifestly more complex in all my specimens than in the Orotavan. The large and small lateral lappets bearing ciliary band on the frilled edge, stretch out on each side in two rows, in one of which they are obliquely dorsally inclined and in the other ventrally; so that the larva in frontal aspect presents a shape which is somewhat like an oblique cross or a flattened X.

In life the body is quite transparent. It bears a light violet tinge along the ciliary bands; moreover, there are observable numerous small black spots scattered all over the body surface. The spots are most abundant near the margin of the grooves which correspond to the oral and lateral fields of ordinary *Auricularia*. The same spots are found also on the wall of the œsophagus. Examined under a high power of the microscope, the spots reveal themselves to be minute reddish brown pigment cells of a roundish or irregular shape, which change shape and creep about in an amœboid manner.

In the larger preserved specimens I find that the aboral ciliary bands are in the ventral parts discontinuous at several points. I think this is probably merely due to artificial cause, since there exists no symmetry or regularity in the manner of occurrence of the discontinuity. That it does not represent the breaking up of the band preliminary to pupation, is indicated by the unadvanced developmental state of such internal organs as the hydrocœl, the enterocœls, &c.

The wheel-shaped calcareous deposits (figs. 1 and 2), which I was able to observe only in the four fresh specimens captured by myself, are distributed exactly in the way shown by CHUN; only

they seem to be somewhat more numerously present than in his specimens, a fact which may be in relation with the larger size of the body. The diameter of the wheel varies within a range of 70–102½ μ. The nave is solid and cup-shaped, facing the body surface with the convex side; the spokes number 11–17. The ring seems to be somewhat thinner in my specimens than in CHUN's; it shows no transverse slits that should indicate its origin by fusion of lateral outgrowths from the outer end of the spokes. The inner contour-line of the ring is finely serrated, instead of being smooth as in CHUN's specimens; there exist 4–6 teeth in the interval between the outer ends of every two spokes.

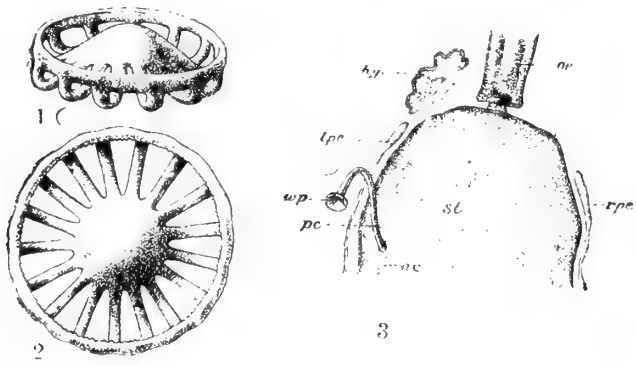


Fig. 1. Wheel-shaped calcareous deposit, viewed obliquely from side. × 300.

Fig. 2. Same seen from above. × 300.

Fig. 3. Anterior parts of mid-gut and adjacent organs seen from above; drawn from a preserved specimen. × 22. *ae* anterior enterocœl; *hy* hydrocœl; *lpe* left posterior enterocœl; *oe* œsophagus; *pc* pore-canal; *rpe* right posterior enterocœl; *st* mid-gut; *wp* water-pore.

As regards the alimentary canal, the œsophagus seems to be relatively longer than is represented in CHUN's figures. At its junction with the mid-gut there is a short strong constriction. The mid-gut is a large, elongate-cylindrical sac of a light brown colour; it usually contains no solid substance. As it lengthens with the growth of the larva, the posterior part becomes broader than the

anterior. Posteriorly it opens into the hind-gut with a narrow constriction at the end of the ventral side. The hind-gut bulges out anteriorly to form a cæcum, the flattened dorsal surface of which is in close contact with the mid-gut. The shape of the hind-gut, including the cæcum, is oval in ventral aspect, but somewhat triangular in side view. It is of a colour similar to, but slightly lighter than, that of the mid-gut. The anus opens on a low prominence of the anal field.

CHUN's statement that the ciliary bands along the oral field seem to execute a food-wafting motion, could be experimentally verified by adding some powdered carmine into the water containing the living larva. At the time when the mouth is opened, there arises a flow of water in the oral groove, which carries the powder gradually towards the mouth. The powder is allowed to enter the mouth, and is then driven into the mid-gut by quick swallowing action, which occurs immediately after the mouth is closed. At this moment the above mentioned constricted end of the œsophagus sinks slightly into the latter. The powder travels slowly through the mid-gut towards its posterior end, to pass into the hind-gut. In this last section of the alimentary canal, it is caught by the revolving current of the watery contents caused by the action of the cilia of the wall. Thus the powder continues for some time to circle round in the hind-gut, until it is finally emitted through the anus. I have never observed periodic contraction of the hind-gut; nor did there yet exist bud-like rudiments of the tree even in the largest specimen observed.

The posterior enterocœls of both sides (fig. 3, *lpe* and *rpe*) run along the whole length of the mid-gut, and are in the large specimens dorso-ventrally somewhat extended so as to embrace the latter to a degree.

It is highly interesting to notice that in the large specimens there is already formed the primitive ring canal or the hydrocœl

(fig. 3, *hy*). As regards the formation of the ring canal, CHUN made a suggestion in the following terms: "Wollte man nun annehmen, dass der langgestreckte Kanal die Anlage des Ambulacralringes abgebe, indem er sich später derart hufeisenförmig krümmt, dass das Hinterende (Taf. III, Fig. 5, c^6) mit dem links neben dem Mitteldarm gelegenen Vorderende (*amb.*) verschmilzt, so könnte man in den rechts (schräg nach vorn) abgehenden Seitenästen die Anlagen der Fühlerkanäle und in den links (schräg nach hinten) gerichteten Seitenästen die jungen Radiärkanäle erblicken." This is not in agreement with the facts observed by me. It can be clearly made out in my specimens that the ring canal is formed by enlargement of only the anterior knob-shaped end (indicated *amb* in CHUN's figures), and not by the whole extent, of the thin-walled branching canal (*ac*) which CHUN took for the "Ambulacralsystem." The main branching part of the canal, I am strongly inclined to think, corresponds to the space discovered in the young of *Cucumaria planci*, *C. crocea* and some other Holothurids, which was called "anterior enterocœl" (BURY 1889), "Madreporenblase" (LUDWIG '91), or "axial sinus" (MACBRIDE and SIMPSON 1908). The wall of this canal is extremely thin and can not be perceived except in the living larvæ. The hydrocœl is a broad flat sac situated on the left side of, and obliquely inclined towards, the hind end of the œsophagus. On the antero-lateral side of the hydrocœl, where its wall is thickest, there are observed five or more outbulgings separated by parallel furrows running in dorso-ventral direction. The said outbulgings probably represent the rudiments of tentacular canals and also of some radial canals. In the middle of its dorsal edge the hydrocœl communicates with the anterior enterocœl. The pore-canal (*pc*) and the water-pore (*wp*) show no difference from those of the Orotavan form; they are well defined and very conspicuous together with the hydrocœl. That part of the anterior enterocœl which connects the hydrocœl with the proximal end of the pore-canal will probably develop into the stone-

canal, though it differs much from the early stage of that canal in other Echinoderm larvæ in having very thin epithelial wall.

In two large preserved specimens I have found in the mid-gut, and also imbedded in the gelatinous mesenchyme, a species of Trematode to a number of more than ten in each. The parasite possessed a pair of eyes and measured 0.17–0.23 mm. in length of body.

The larger size, the more complex arabesque-like arrangement of ciliary bands, and also the somewhat better developed internal organization of some of my specimens in comparison to the largest observed by CHUN, may be taken for an indication that the former represent an older developmental stage than the latter.

It is perhaps worth pointing out that while CHUN obtained his specimens in successively progressing stages from January to March, in Misaki the large specimens above referred to occurred together with smaller ones in the months of December and January.

Tokyo, Feb. 1, 1911.

NOTICE.

Terms of subscription, $\$ 2.50 = 10s = 12^1/_2 F = M10 = ¥ 5$ per volume. Postage prepaid.

Remittances from foreign countries should be made by postal money orders payable in Tokyo to M. NAMIYE, Zoological Institute, Science College, Imperial University, Tokyo.

All manuscripts should be sent to THE EDITOR ANNOTATIONES ZOOLOGICÆ JAPONENSES, College of Science, Imperial University, Tokyo.

All business communications should be sent to THE SECRETARY OF THE TOKYO ZOOLOGICAL SOCIETY, College of Science, Imperial University, Tokyo.

明治四十四年七月廿七日印刷
明治四十四年八月三十日發行

東京市神田區美土代町二丁目一番地
編輯兼發行人　島　連太郎

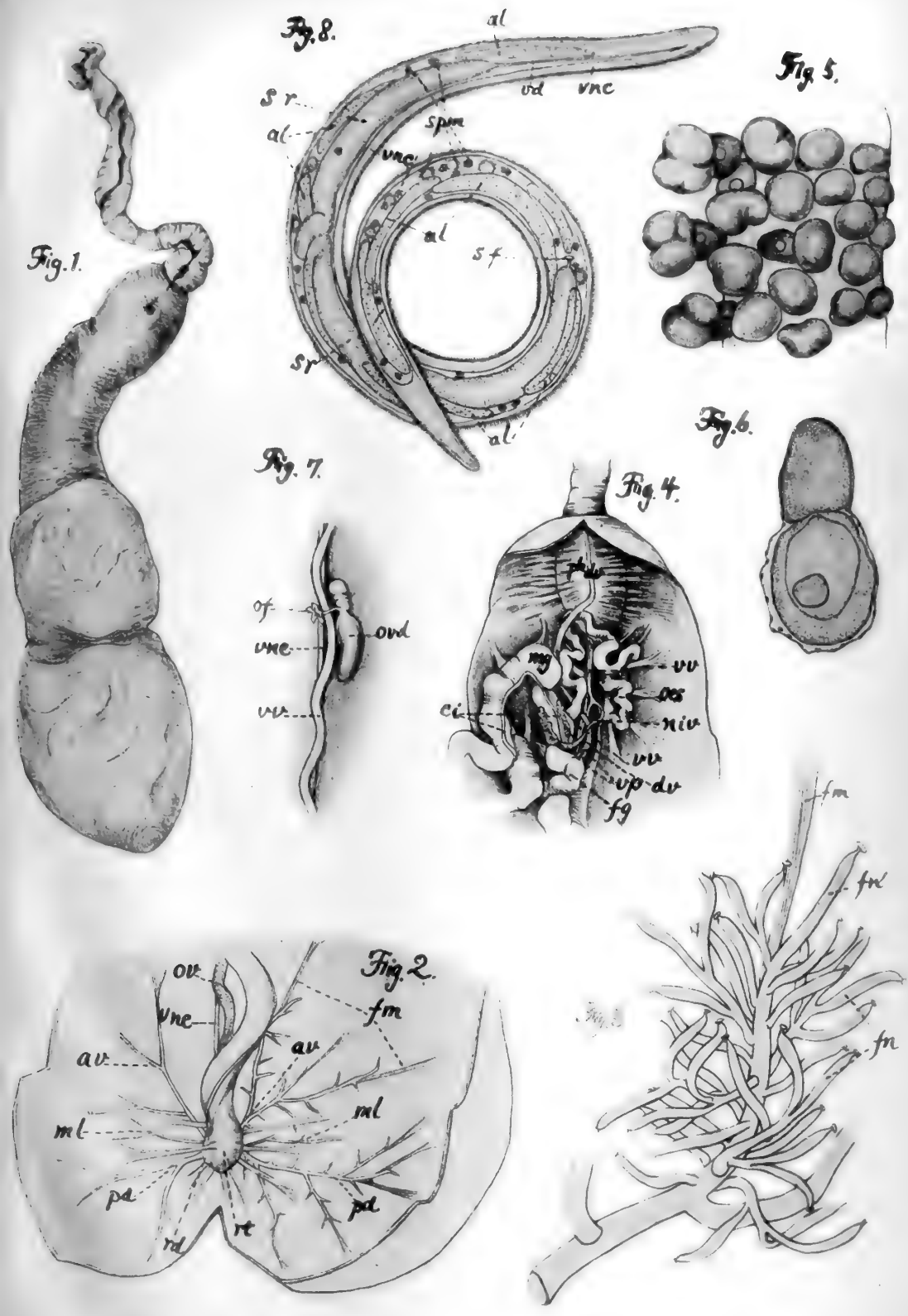
東京市神田區美土代町二丁目一番地
印刷人　前田宗松

東京市神田區美土代町二丁目一番地
印刷所　三秀舍

東京市日本橋區通リ三丁目十四番地
大賣捌所　丸善書籍株式會社

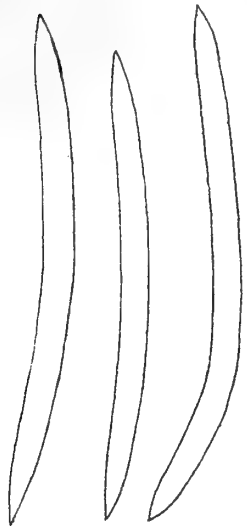
第七卷第五冊　定價　金壹圓

郵便爲替ハ東京市本鄉區理科大學動物學敎室波江元吉宛ニテ本鄉區森川町郵便爲替取扱所へ御拂込有之度候

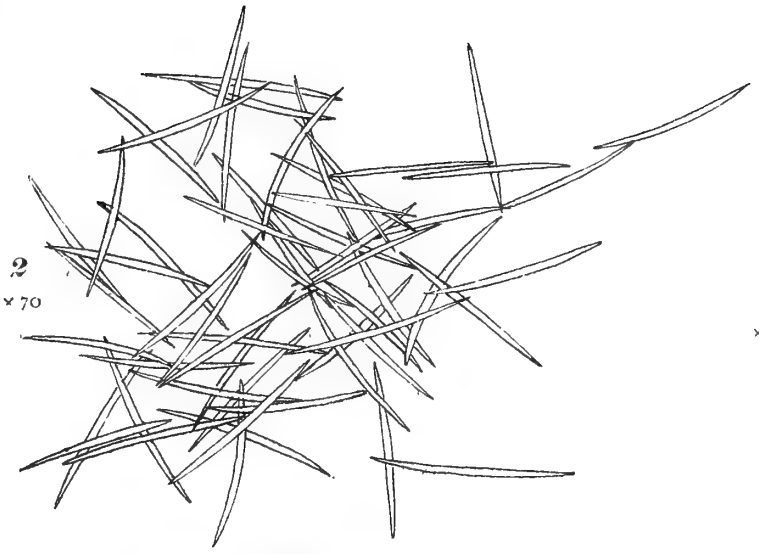


I. IKEDA: A New Echiuroid.

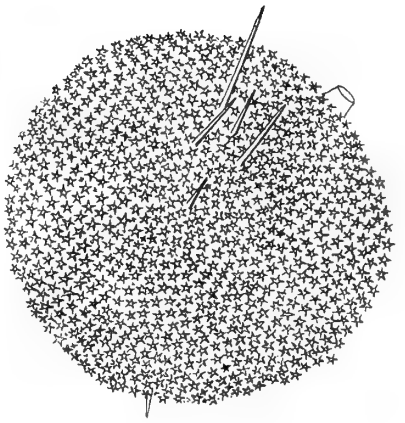
(*Hamingia ijimai*).



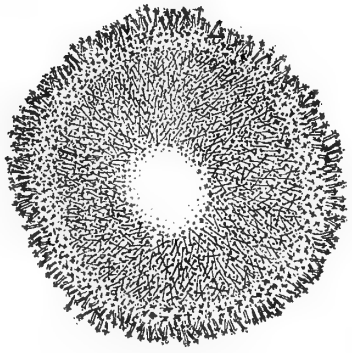
1
× 240



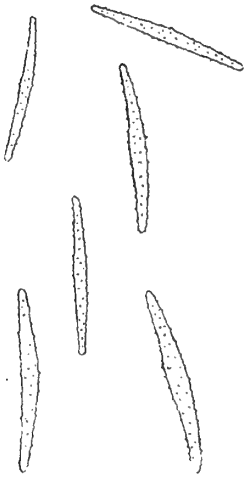
2
× 70



3
× 40

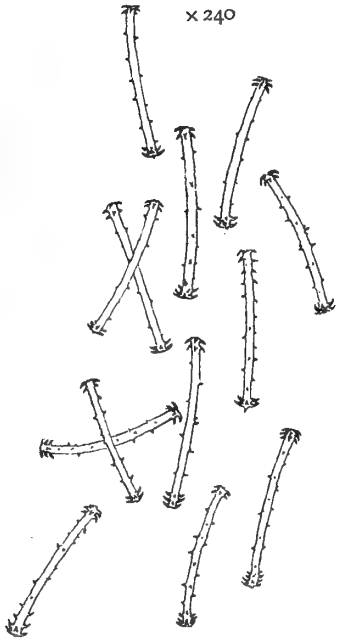


2a
× 70

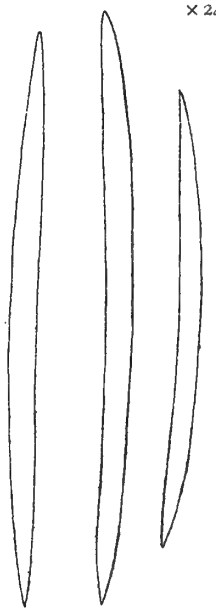


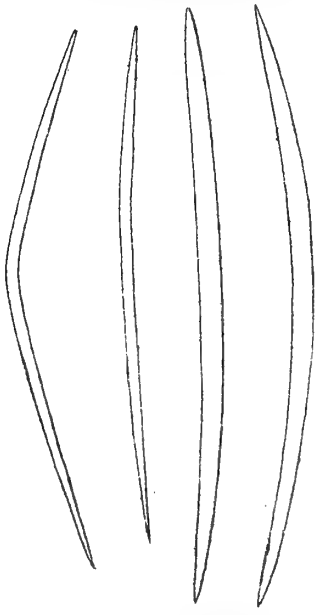
1a
× 240

2c
× 240

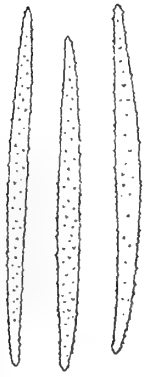


3a
× 240





2b
× 240



1b
× 240

3b
× 240

Annandale: Japanese Freshwater Sponges.

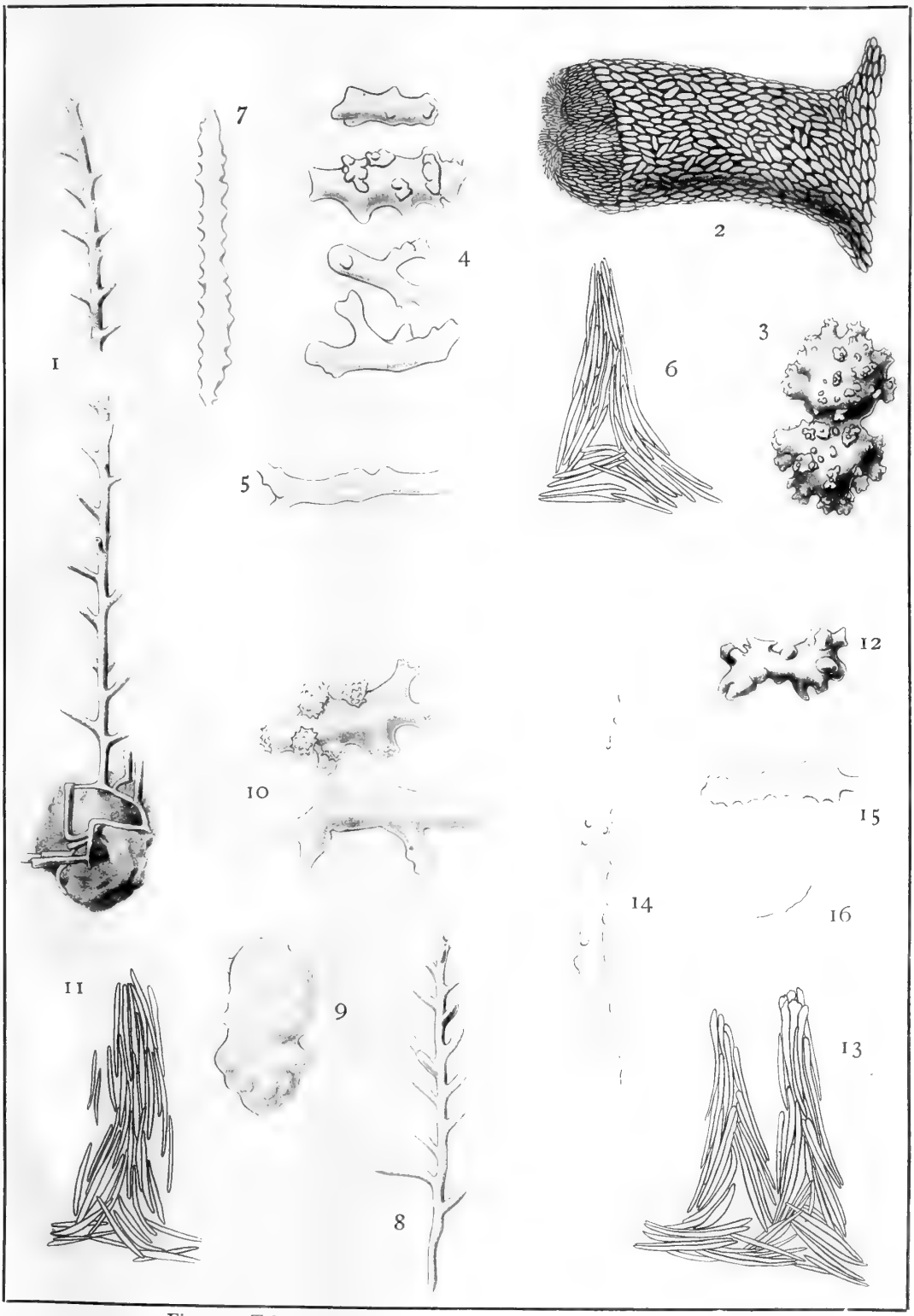


Fig. 1–7, *Telesto tubulosa* n. sp. Fig. 8–11, *Telesto sagamina* n. sp.
Fig. 12–16, *Pseudocladochonus hicksoni* Versluys.

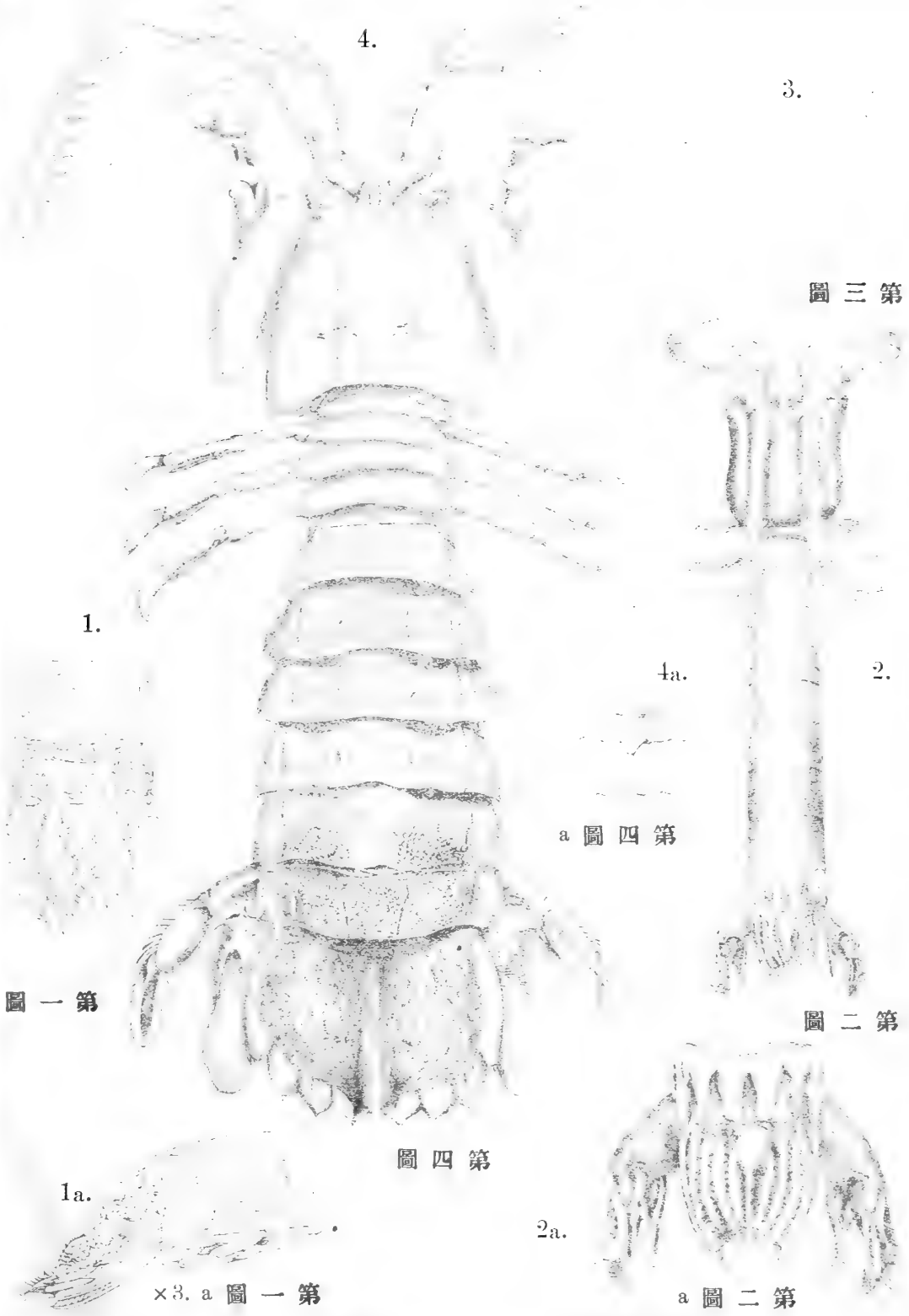


圖 三 第

a 圖 四 第

圖 二 第

圖 一 第

圖 四 第

×3. a 圖 一 第

a 圖 二 第

T. Fukuda : Stomatopoda of Japan.

Fig. 1.

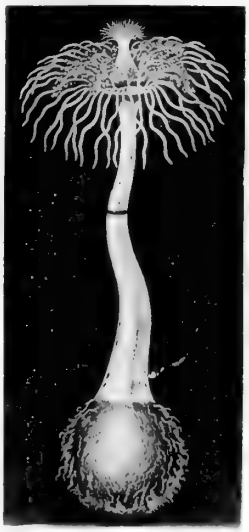


Fig. 2.

Fig. 3.

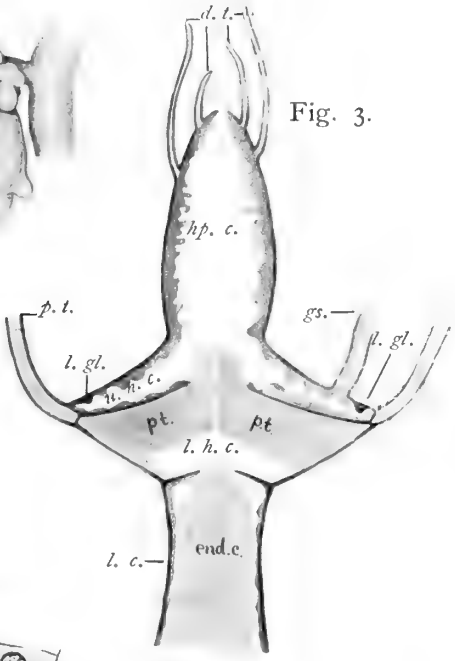


Fig. 8.

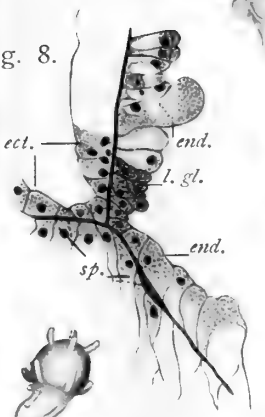


Fig. 5.

Fig. 4.

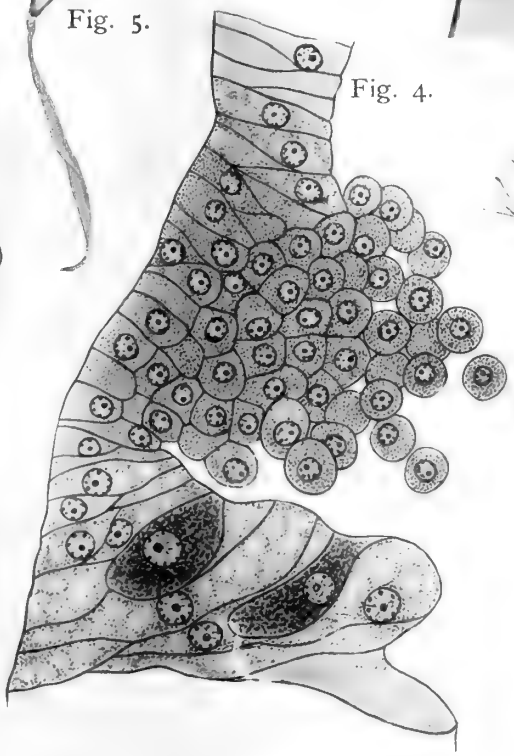


Fig. 6.

Fig. 7.

I. Ikeda : Corymorpha tomoensis.

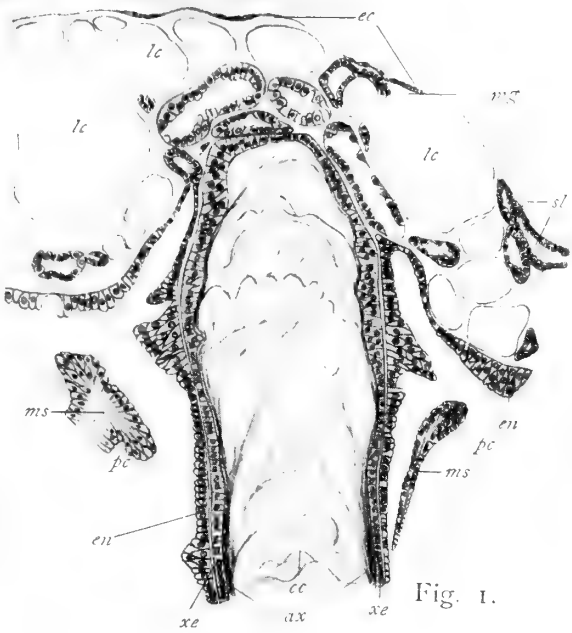


Fig. 1.

Fig. 2.

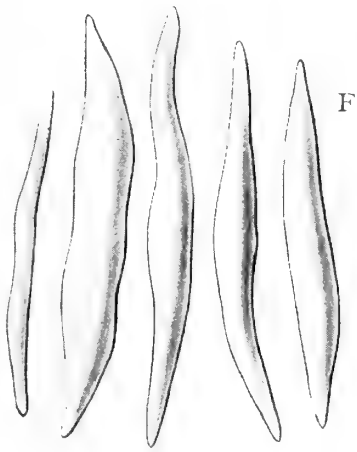


Fig. 3.

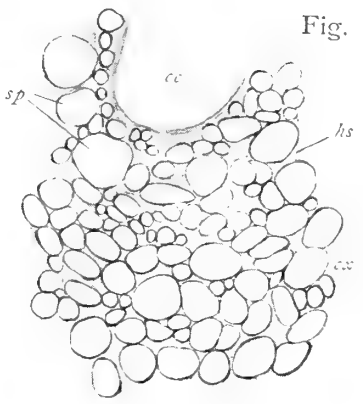
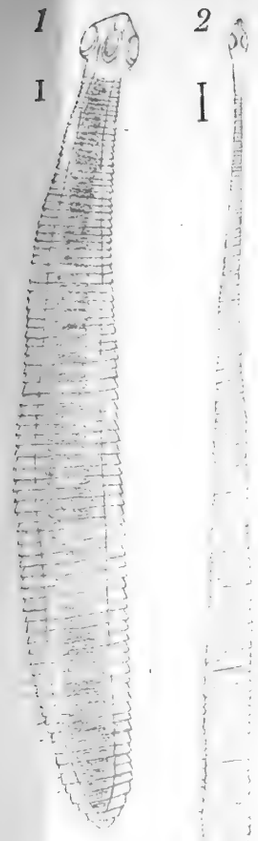


Fig. 4.

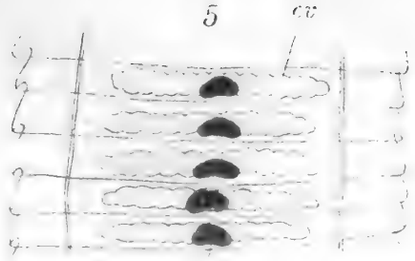
K. Kinoshita: *Kerocides koreni* Wr. & St.

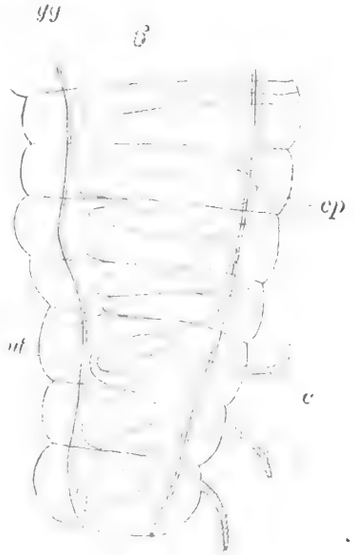

1

2

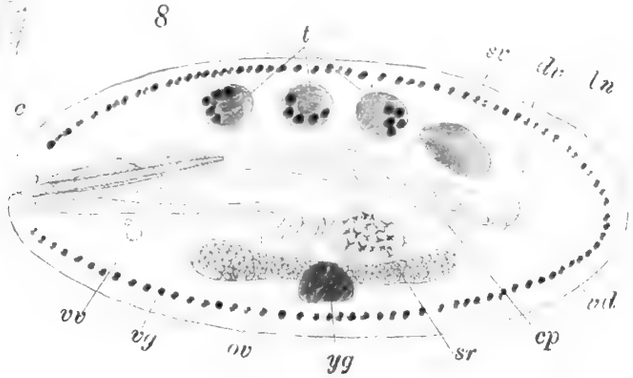

3

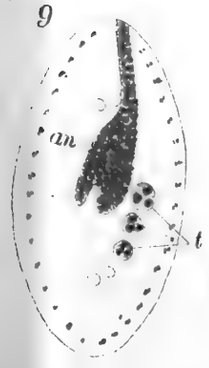

4
n

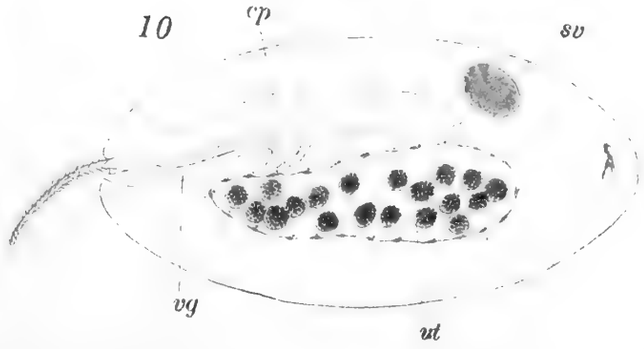

5
ov
yg


6
cp
ut
c


7


8
t
sr
ut
ln
c
vv
vg
ov
yg
sr
cp
ut

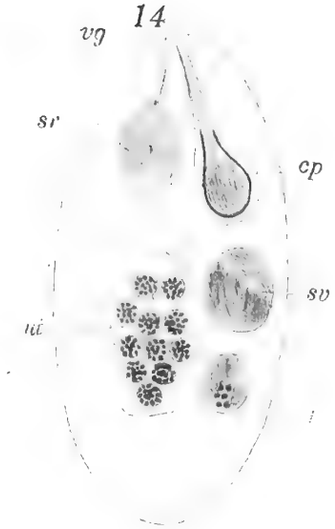

9
an
t


10
cp
sv
vg
ut

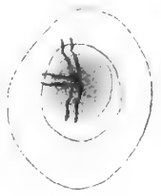

11
sr
C


12
A
an
B


13
cp
t
sv
t
vg
sr
eg


14
vg
sr
cp
sv
ut

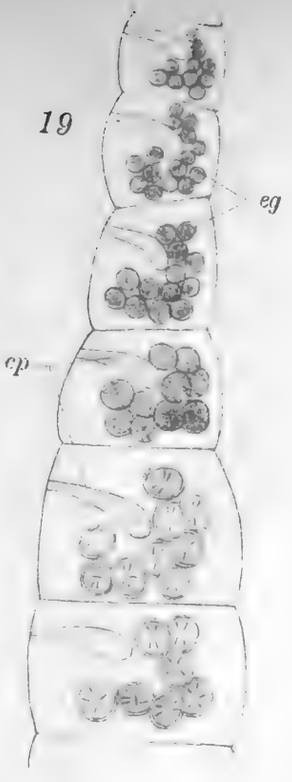

15
eg


16


17

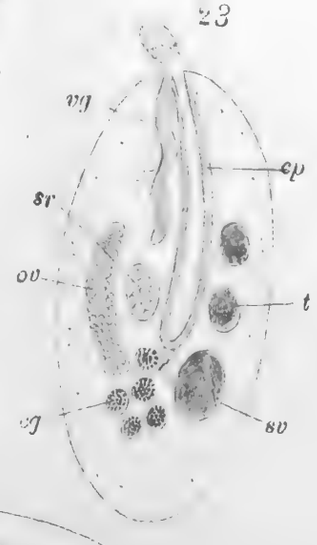

20


18
r
rs
m
21

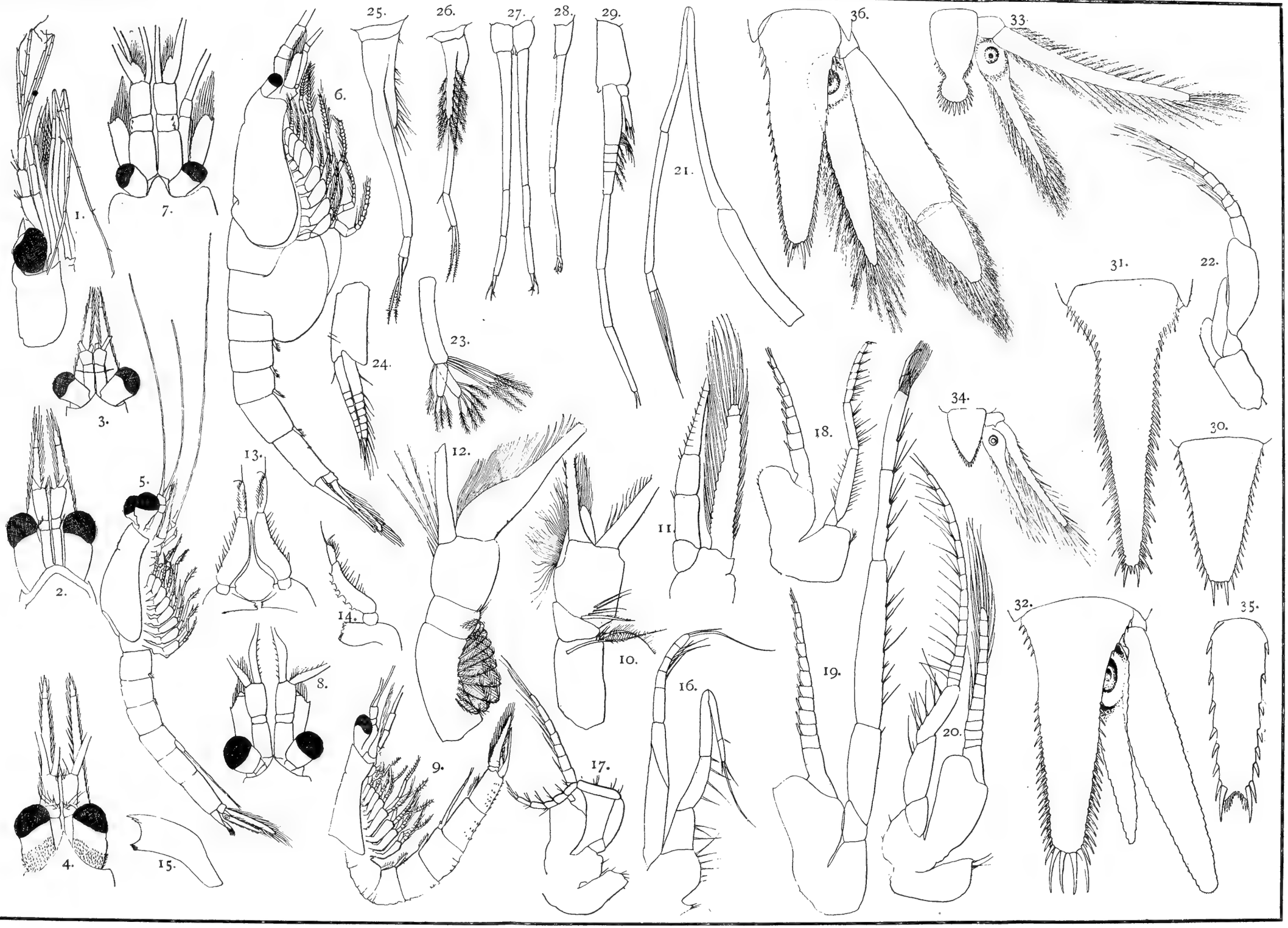

19
eg
cp


24
cp
ut
vg
ut

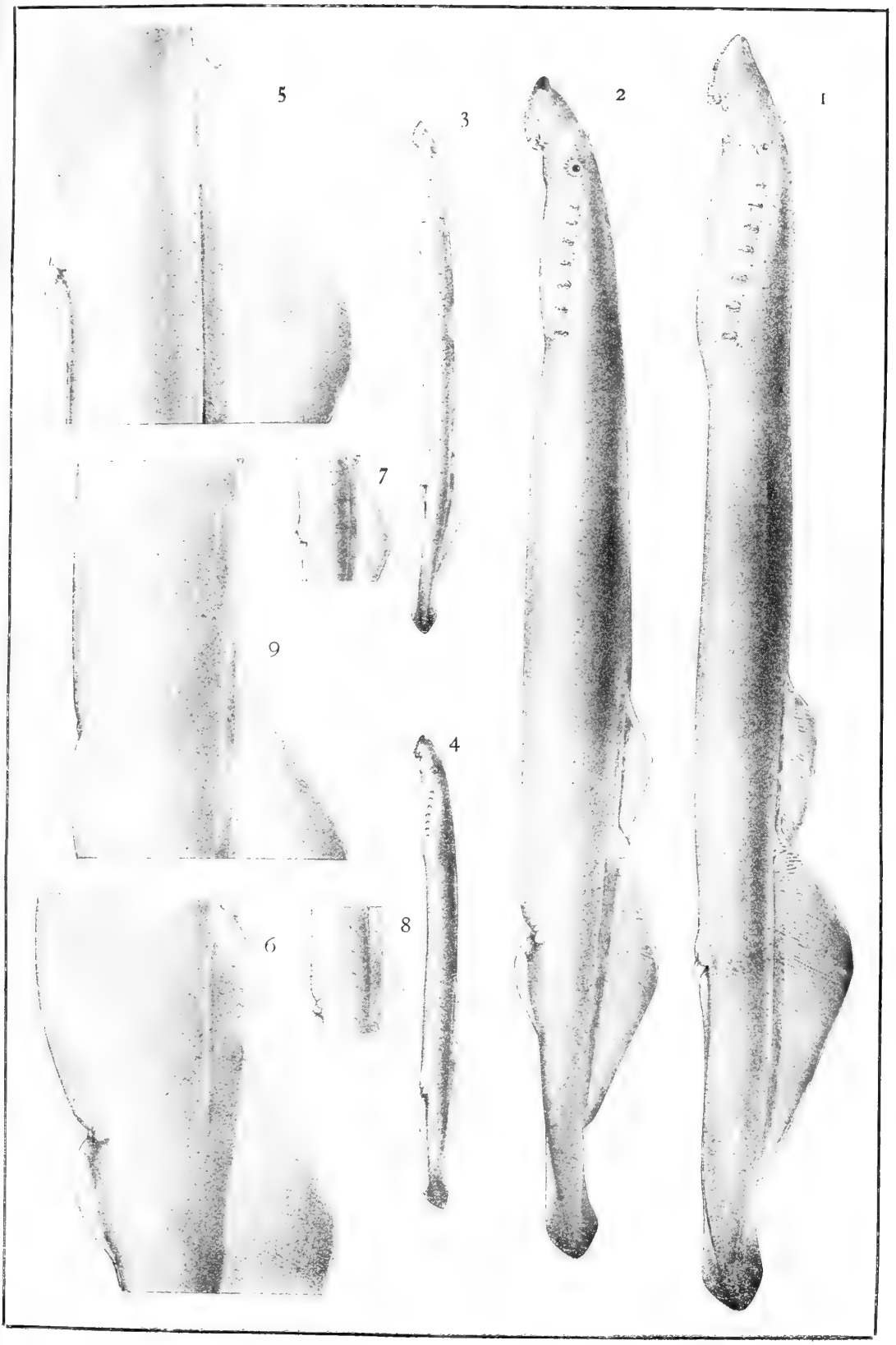

22


23
vg
cp
sr
ov
t
eg
sv


25

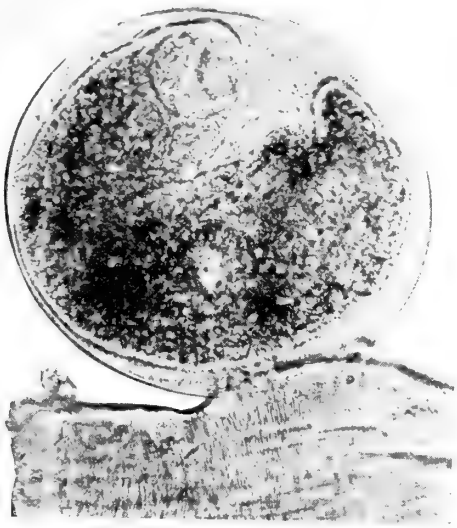


Nakazawa: Japanese Schizopoda.

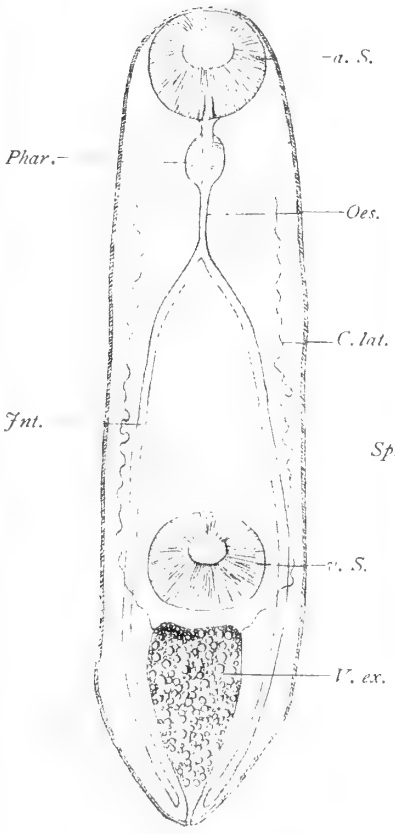


Hatta : Japanische Neunaugen.

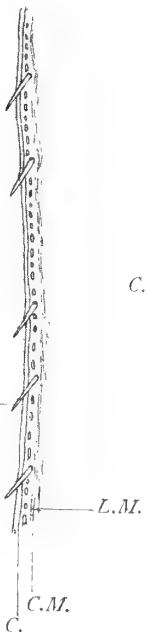
1



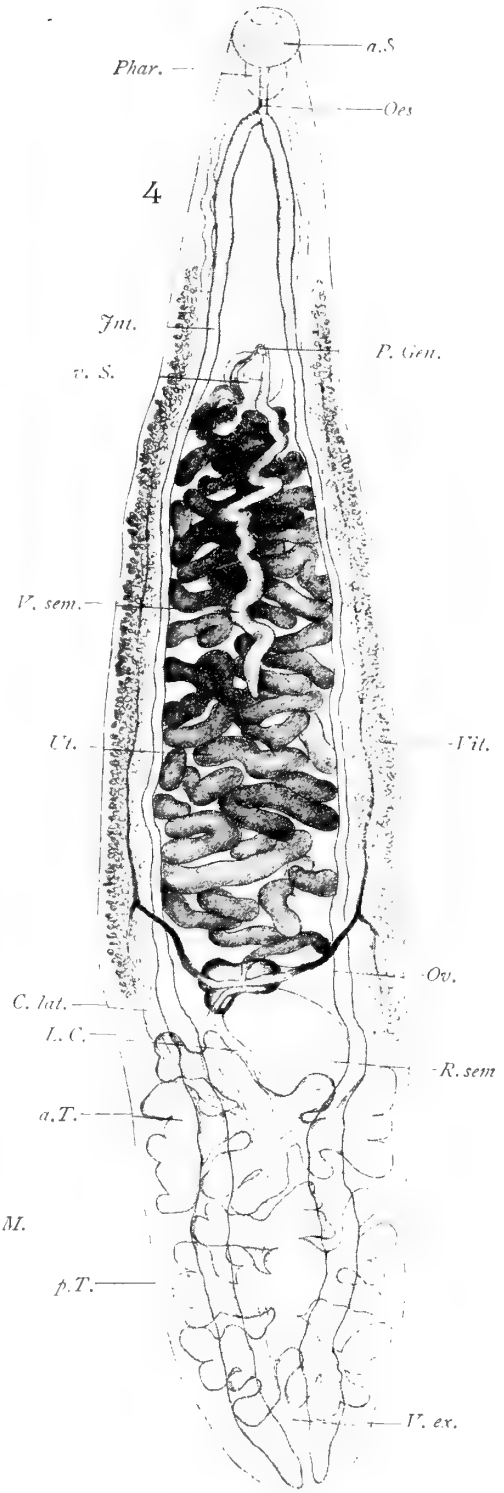
2


a. S.
Phar.
Oes.
C. Int.
Int.
v. S.
V. ex.

3


Sp.
L.M.
C.M.
C.

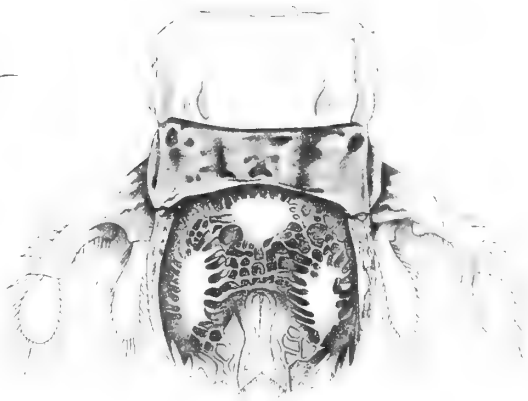
4


a.S.
Phar.
Oes
Int.
P. Gen.
v. S.
V. sem.
Ut.
Vit.
Ov.
C. lat.
L. C.
R. sem
a.T.
p.T.
V. ex.

1

4

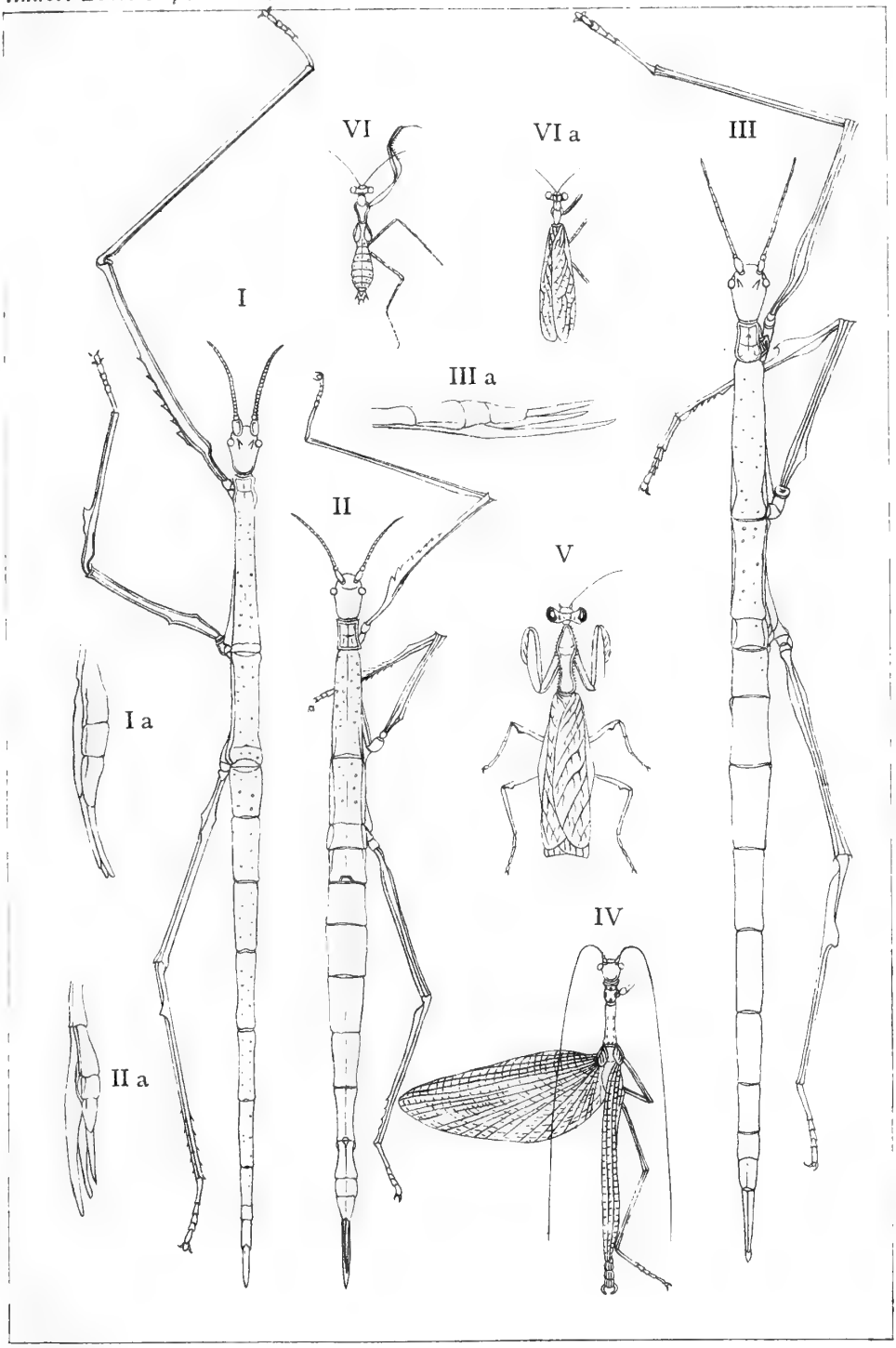
3



2

5

T. FUKUDA del.



Shiraki