

Die Beinzeichnung stimmt ziemlich genau mit der von *Mansonia maior* Theob. überein, doch fehlen auf den Flügellängsadern gänzlich die für diese Art charakteristischen langgestreckten Schuppen. Die unteren Schuppen der 3. und 5. Längsader sind zwar lang elliptisch, besonders am unteren Ast der 5. Längsader, aber doch wesentlich breiter als die von Theobald abgebildeten entsprechenden Schuppen von *Mansonia maior*.

Die weiße Beschuppung an den Vorderecken des Thorax setzt sich nach hinten in zwei seitliche weiße Striemen fort, die seitlich wieder durch goldbraune Schuppen begrenzt sind.

Körperlänge (ohne Rüssel) 4,5—5 mm.

Die genannten Abweichungen scheinen mir zu gering, um die Aufstellung einer besonderen Art zu rechtfertigen.

Kamerun, Juli und September.

Togo, Kete Kratje, Juni—November.

Gehört offenbar zu den häufigeren Arten.

Aus der vorstehenden Aufzählung ergeben sich einige allgemeine Schlüsse über die Häufigkeit verschiedener Arten. Die häufigsten Anophelinen-Arten sind *Myomyia funesta* (Giles) var. *subumbrosa* Theob. und *Pyrethophorus costalis* (Lw.); sie machen den weitaus größten Teil des gesamten Anophelinen-Materials aus. Es scheint, daß in Kamerun *P. costalis*, in Togo *M. funesta* am häufigsten ist, dagegen in Togo die erstere, in Kamerun die letztere Art mehr zurücktritt. Die übrigen Anophelinen-Arten sind offenbar wesentlich seltener.

Stegomyia fasciata (F.) und *Culex fatigans* Wiedem., beide bekanntlich über die ganze heiße Zone verbreitet, sind auch in Kamerun und Togo außerordentlich gemein, wahrscheinlich die gemeinsten Culiciden-Arten überhaupt. Zu den häufigsten Culicinen-Arten gehören noch *Culex pseudocinerens* Theob., *C. tigripes* Grandpré und *C. condylodesmus* n. sp., vielleicht auch *C. masculus* Theob., ferner *Eretmapodites quinquerittatus* Theob., *Mansonia uniformis* Theob., die übrigen Arten liegen nur in einem oder wenigen Exemplaren vor.

Berlin, den 15. Juli 1905.

2. The Breeding Habits of Chitons of the Californian coast.

Harold Heath,

Leland Stanford Jr. University, California.

eingeg. 22. Juli 1905.

The first recorded observation on the breeding habits of chitons was made by Clark (1855)¹ who reported that *Chiton cinereus* lays

¹ Clark, W., On the phenomena of the reproduction of the chitons. Ann. of nat. hist. 2 Ser. XVI. 1855.

1300—1500 eggs within the space of 15 minutes. However this claim is somewhat in doubt since Lovén² the following year maintained that this same species deposits its eggs in groups of 7—16 on stones. Many years later Metcalf (1892)³ made observations on *Chiton squamosus* and *Ch. marmoratus* which were confined in an aquarium where first the males, like *Mopalia lignosa* (cf. Heath⁴ 1899. p. 572), shed the sperm after which the eggs are laid. In the case of the last named species the females shed the sex products only after the sperms had diffused to them, at times over a distance of ten or even twenty feet, and the fact that *Ch. squamosus* and *Ch. marmoratus* deposited their eggs from 1—1½ minutes after the spermatozoa were liberated leads to the conclusion that here likewise the sex products or some additional substance are essential to produce the necessary stimulus. By way of experiment I have kept solitary individuals of *Mopalia lignosa* and *Ischnochiton magdalenensis* in small elevated tide pools, which during the summer are usually aerated by algae and not by the dash of the surf as in the winter months, and of the twenty-three individuals the males invariably shed their products while the females, with one exception, retained theirs beyond their usual breeding time for six or eight weeks when the experiments were terminated. In control experiments where males and females were associated the sex products were liberated in the usual way.

During the past few years I have seen the egg laying process of *Ischnochiton mertensii*, *Isch. cooperi*, *Mopalia muscosa* and *Katharina tunicata* which were inhabiting some of the larger pools isolated during low tide from the open ocean in the vicinity of Monterey Bay, California. During this period of tranquility the males, always perfectly quiet, liberate spermatozoa steadily or with short intervals until disturbed by the dash of the returning surf. In some cases the process may consume two hours but usually not over half of this time. Almost immediately after the spermatozoa have diffused into the vicinity of the females, and in one case (*M. muscosa*) before the eye was able to detect its presence in the immediate neighborhood of the female, the eggs commenced to escape freely from the oviducts. In the case of *Katharina* a mucous secretion unites the eggs slightly but the development of albumen glands is far inferior to that of *Ischnochiton magdalenensis* and within a short time the ova are widely scattered in tidal currents.

On some of the rocky headlands and in the previously mentioned tide pools *Trachydermon raymondi* and *Nuttallina thomasi* are comparatively abundant and as in the case of *Chiton polii* according to Kowa-

² Lovén, S., Über die Entwicklung von *Chiton*. Arch. Naturgesch. Bd. 1. 1856.

³ Metcalf, M. M., Preliminary notes on the development of the *Chitons*, Johns Hopkins Univ. Circ. XI. 1892.

⁴ Heath, H., The development of *Ischnochiton*. Zool. Jahrb. Bd. XII. 1899.

levski⁵ (1883) and *Ischnochiton imitator* as testified by Plate⁶ (1897) both species carry their young until they are in an advanced trochophore stage. These to the number of about 200 in the case of *Trachydermon* are held in the mantle cavity on each side of the foot. Plate speaks of their extending over neighboring regions of the mantle and to some extent upon the foot but in the present case this removal of the eggs from the mantle cavity never occurs unless the animal has been disturbed. It is interesting to note that while the gills are thus covered and respiration impeded the proboscis (Mundscheibe) is highly distended with blood and the lateral protuberances (Laterallappen) become much enlarged and both may temporarily assume increased powers of respiration. *Nuttallina thomasi* which breeds during the mid summer carries its eggs in two rod shaped masses, each with approximately 80 eggs, held in the mantle cavity on each side of the foot.

On several occasions I have removed some of the adults of *T. raymondi* and *N. thomasi* to isolated tide pools and in these situations they have bred and the young have lived until they became sexually mature. Additional observations were made upon the growth of the last named species in its native habitat and the results show that the conditions just described are normal. As Mead⁷ (1900) has shown for the starfish (*Asterias forbesii*) and the soft-shell clam (*Mya arenaria*) the growth of the young may be surprisingly rapid if supplied with abundant nourishment. If these conditions prevail both species of chitons attain sexual maturity within one year. In the case of *Tr. raymondi* the adult may be of maximum size (8—10 mm) but with *Nut. thomasi* there is usually an increase of 3 mm during the early part of the second year, the largest adults measuring on an average of 12 mm.

The young of *Kath. tunicata* placed in tide pools nearer the mean tide mark and therefore in conditions closely approaching those of their native habitat may reach a total length of 25 mm in one year. The second year they may become sexually mature after having grown an additional 8—11 mm. During the third year they reach their average size, 55 mm. This rate of growth appears also to be characteristic of *Mopalia muscosa*, *M. lignosa*, *Ischnochiton regularis*, *Isch. magdalenensis* and *Isch. cooperi*. In the case of *Cryptochiton stelleri*, which breeds some time in February or March, the young in the early part of the following summer

⁵ Kowalevski, A., Embryogénie du *Chiton polii* (Philippi) avec quelques remarques sur le développement des autres Chitons. Ann. Mus. nat. Marseille. T. I.

⁶ Plate, L. H., Die Anatomie und Phylogenie der Chitonen. Zool. Jahrb. Suppl. 4—5 (Fauna Chilensis).

⁷ Mead, A. D., On the correlation between growth and food supply in starfish. Amer. Nat., Vol. XXXIV. Observations on the soft-shell clam. Rept. of Commissioners of Inland Fisheries, No. XIII.

range from 12 to 25 mm in length and during the year may attain a length of 75 mm and in some cases as much as 95 mm. By the close of the following year, judging from measurements of large numbers of specimens, they usually become sexually mature and are then from 120 to 175 mm in length. Not uncommonly this species reaches a length of 27 cm (11 in.) and one specimen in my possession was in life and in a resting condition 33 cm (13 in.) long and weighed slightly less than two kilograms (4,4 lbs.) and there is a strong presumption that it was not less than than four years of age.

3. Zur Anatomie des Genus *Paramermis*.

Von Dr. v. Linstow in Göttingen.

(Mit 1 Figur.)

eingeg. 3. August 1905.

Kohn beschrieb eine von mir entdeckte *Mermis contorta*, die er in das Genus *Paramermis* stellt, und benutzt diese Gelegenheit, meine Arbeiten einer Kritik zu unterziehen, die mich veranlaßt, ein Wort zu erwidern. Ich habe seinerzeit, da mir ein ungenügendes Material vorlag, nur eine systematische Beschreibung, keine histologische von *Mermis contorta* gegeben, habe aber *Paramermis crassa* und *M. nigrescens* auf ihren Bau untersucht, was Kohn offenbar nicht getan hat; trotzdem findet er in meinen Arbeiten eine Menge Irrtümer.

Kohn findet bei *Mermis contorta* ein Spiculum und zwischen den Muskeln 8 Längswülste, die er seltsamerweise Linien nennt, gelegentlich auch nur 6 (S. 37); eine Linie hat keine Breitenausdehnung, und da kann man einen Körper, welcher den vierten Teil eines Cylinders der Länge nach durchzieht, nicht Linie nennen; die Art *contorta* setzt Kohn in das Genus *Paramermis*, bei dem ich ein Spiculum und 6 Längswülste fand, von denen die breiteren nicht in den Seitenlinien, sondern dorsal von ihnen verlaufen; um diese Ansicht zu motivieren, meint Kohn, ich habe bei meiner Art *Paramermis crassa* vermutlich einen 7. und 8. Längswulst übersehen, was bei ihrer geringen Ausbildung sehr leicht möglich sei. Wer meine Abbildungen der Querschnitte von *P. crassa* vom vorderen und hinteren Körperende, wo die Längswülste mächtig verdickt und einander nahe gerückt sind, vergleicht (1889, Tab. XXII Fig. 3 u. 6), wird finden, daß solche Auffassung unmöglich ist; hier bestehen 6 Längswülste und nicht 8. Die Art *contorta* würde, wenn Kohn richtig beobachtet hätte, in das von Corti 1902 aufgestellte Genus *Hydromermis* gehören, bei dem sich 8 Längswülste finden; auch hier besitzt das Männchen nur 1 Spiculum. Einzelne *Mermis*-Larven führen am Hinterleibsende ein gekrümmtes Horn, das ich mit dem einer Sphin-

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