

Recht häufig habe ich Formen in Knospung angetroffen.

Die Sporen (Fig. 4) sind länglich kugelförmig; ihre Länge beträgt 40—48 μ , ihr größter Breitendurchmesser 30—38 μ . Vier Polkapseln von etwa 12—15 μ Länge liegen in einiger Entfernung vom verschmälerten Kugelende.

Die Form und Größe der Sporen lassen keinen Zweifel zu, daß hier eine neue Art vorliegt; in Berücksichtigung der Größe ihrer Sporen



Fig. 4. *Chloromyxum magnum* nov. sp.

habe ich sie als *Chloromyxum magnum* bezeichnet. Die Zahl der Sporen im Amöboid ist gewöhnlich recht groß, nicht selten werden jedoch auch kleine Formen mit einer Spore angetroffen. Zeitweise nämlich schnüren sich durch Knospung kleine kugelförmige Protoplasmaabschnitte mit einer Sporenanlage ab, welche sich späterhin bloß weiter entwickelt.

Vorkommen: Gallenblase von *Acanthias blainvilei*. Port Elisabeth (Algoabai). East London. Lüderitzbucht (D. S.-W. A.).

3. Autotomy in *Linckia*.

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Altho it has long been known that many starfishes, and particularly *Linckia*, have unusual powers of regeneration so that a ray accidentally lost is readily replaced, it was for long doubted whether a ray detached from the disk could really replace the lost body and the other rays. Experiments have proven conclusively that an isolated ray of *Asterias* does not long survive and shows no power of rebuilding the disk. In recent years however observations by several zoologists and experiments by Miss Monks have demonstrated beyond doubt that *Linckia* has powers of regeneration far exceeding those of *Asterias* and

that an isolated ray, even tho it be severed from the starfish at some distance from the disk, does under normal conditions develop a complete, new individual from its proximal end. Unfortunately Miss Monk's papers (1903, 1904, Proc. Philadelphia Acad. Nat. Sci. vol. 55, p. 351 and vol. 56, pp. 596—600) are handicapped by the fact that her starfishes were wrongly identified (see Fisher, 1911, Bull. U.S. Nat. Mus., no. 76, pp. 242, 243) as is easily seen from her figures, and the title of her principal paper ("Variability and Autotomy of *Phataria*") is consequently quite misleading. *Phataria* is an entirely different starfish from the one with which she was concerned and so far as we have any evidence its powers of regeneration are quite limited, and there is no evidence at all that it is autotomous. But no doubt for years to come we shall find references in the literature to the remarkable regenerative powers of "*Phataria*"! As Fisher has pointed out, the starfish with which Miss Monks worked, was *Linckia columbiae* Gray. It is a typical member of the genus and closely related to the West-Indian species *L. guildingii* Gray.

Nowhere in her papers does Miss Monks discuss the possible use to the starfish of autotomy, but she demonstrates perfectly that it is a normal and not an abnormal phenomenon and that it takes place in response to internal stimuli which are not evidently associated with any changes in the environment. The only writer, so far as I can learn, who has referred to the use of autotomy in starfishes, is Ritter, who suggests that it may be an asexual method of reproduction in *Linckia* (1902, Science, N.S., vol. 15, p. 62), a conclusion which this brief paper is intended to support.

While enjoying the privileges of the Marine Laboratory of the Carnegie Institution of Washington, at Montego Bay, Jamaica, in February and March, 1912, thanks to the kindness of the Director, Dr. A. G. Mayer, I took occasion to collect and preserve all the specimens of *Linckia guildingii* Gray which could be found. In all, 93 specimens were secured. Of these only three are symmetrical; two have five rays, in one case about 15 mm long, in the other about 23, and one has six rays each 14 mm in length. In the six-rayed specimen and in the larger five-rayed, the rays are slender, the diameter of each ray being only about .14 of its length; in the smaller five-rayed specimen, the diameter of the rays is about .27 of their length.

Of the remaining 90 specimens, 13 (or 14 per cent) are isolated arms the proximal ends of which have healed, but no new rays are as yet visible. There are 16 (or 18 per cent) isolated rays, at the proximal ends of which new rays less than 5 mm in length have formed; in one case there are six new rays, in twelve cases there are five, and in three

cases there are four. There are 15 similar specimens in which the new rays are more than 5 mm long; ten of these have four new rays and five have five. In all these 44 specimens, the old or parent ray is from 18 to 41 mm in length, with the diameter ranging from 15 to 20 per cent of the length. An unusually large and fine specimen, in this "comet" stage of development, has the parent ray 93 mm long and the younger rays are 62, 62, 54, 60, 56 mm; the rays are each about 11 mm in diameter.

The remaining 45 specimens are strikingly irregular in form. The largest has five rays 130, 120, 68, 64 and 63 mm long respectively, and 13 mm in diameter. Eighteen others have five rays while twenty-four have six and one has seven. In all of these specimens, no two of the arms are of exactly the same length; often two or three rays will be approximately equal and the others very short, just beginning to regenerate. One of the interesting cases is a large specimen with two arms about 105 mm long, a third 80 mm, a fourth 58 mm, a fifth 39 mm, and a sixth which was severed 13 mm from the mouth but has a regenerating tip 4 mm long.

On the reefs of Jamaica, *Linckia guildingii* occurs on the under side of fragments of coral rock, which are well exposed to the surf. Here, protected from the surf but surrounded by the abundance of organisms which swarm in such well-aerated places, it leads a very sluggish life. In very shallow water only the smallest specimens are found; the larger specimens occur further out. The full-grown specimens seem to be confined to relatively deep water, for I have myself only once collected a full-grown adult. My other specimens have been brought to me by native fishermen.

Taking into consideration all the facts now known I think we are driven to the conclusions which I summarize below. Some of them are not capable of positive proof but the weight of evidence justifies our accepting them.

- 1) Autotomy in *Linckia* is not merely a normal process originated by internal stimuli but in *L. guildingii* at least, is an asexual method of reproduction of prime importance.

- 2) Young *Linckias* have five or six (sometimes possibly seven) rays of approximately equal length; the number is not subsequently either increased or decreased.

- 3) When the rays are about 15 mm long, autotomy begins to occur more or less irregularly; usually only one ray is severed but frequently two, rarely three or possibly four.

- 4) Growth continues after autotomy, uninterruptedly, but most rapidly in the regenerating rays.

5) As autotomy occurs at irregular intervals for a long period, if not thruout life, symmetrical adults are exceedingly rare, if they occur at all.

6) In the autotomously severed rays, growth continues, especially at the proximal end where new rays soon begin to appear, radiating out from a new mouth.

7) Growth of the new rays is much more rapid than that of the parent ray, and they may ultimately approximate it in size. The new rays are commonly of about an equal size.

8) The number of new rays may be four, five or six, but six is very rare and four is hardly as common as five.

9) Rays severed at some distance from the disk give rise to new disks and rays just as well as those which separate close to the disk.

10) Autotomy occurs in individuals derived from severed arms, in the same way and apparently as freely as in those sexually produced.

4. Über *Arrhenurus nobilis* Neuman.

Von O. Lundblad (Upsala).

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Diese seit langem bekannte, sehr eigentümlich gestaltete Hydracinen-Art war bislang nur aus Schweden bekannt. Da sie aber schon im Jahre 1879 aufgestellt worden ist, muß es als ganz merkwürdig angesehen werden, daß es seit dieser Zeit trotz der eifrigsten acarinologischen Untersuchungen niemandem gelungen ist, sie wieder aufzufinden. Man könnte ja annehmen, sie sei eine der selteneren Wassermilben. Und zweifelsohne ist es auch so.

Mir wenigstens schien diese Sache etwas merkwürdig. Die Art wurde von Neuman im mittleren Schweden gefunden (ein einziges Exemplar) und kann nicht als arktische gelten. Es war daher zu erwarten, daß sie auch in andern benachbarten und südlicheren Gegenden erbeutet werden solle, aber davon hörte man gar nichts.

Schon seit langem hegte ich den Verdacht, daß *nobilis* in einiger Beziehung zu *kanei* Halbert stehe, aber ich hatte keinen direkten Beleg für meine Ansicht. Schon durch Piersig¹ wissen wir, daß das *nobilis*-Männchen in der Gotenburger Typensammlung fehlt. Aus eigener Erfahrung kann ich diese Angabe bestätigen, und leider kann man wohl deshalb das Exemplar jetzt als definitiv verkommen ansehen. Da infolgedessen ein direkter Vergleich mit der Type ausgeschlossen ist, so ist natürlich auch keine absolute Sicherheit in bezug auf das genauere

¹ S. Zool. Anz. Bd. XX. Revision der Neumanschen Hydrachniden-Sammlung des Gotenburger Museums usw.

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