fication of some of his material will be undertaken at the museum and some division of the collections will ultimately be made between the Field Museum and the British Museum.

DISCUSSION

NATIVE AND INTRODUCED LAND PLANARIANS IN THE UNITED STATES

THE land planarians characteristically inhabit humid forests in the tropical and subtropical zones of the earth where hundreds of species exist. In his classical monograph[1] von Graff listed 348 species (some, however, probably synonyms) and probably two hundred additional species have been described since that time. As great areas of the tropics remain unexplored with regard to this group of flatworms, it seems reasonable to suppose that the undescribed species at least equal the described ones in number.

The introduction of tropical land planarians into the north temperate zone with tropical plants appears inevitable, yet until recently only one species was known to have succeeded in establishing itself. This is the familiar *Bipalium kewense* Moseley, discovered in 1878 in the greenhouses of the Kew Gardens, near London. This animal is common in greenhouses and conservatories throughout Europe and the United States and also occurs in nature in a variety of tropical habitats, as Brazil, New Zealand, Australia, Samoa, Fiji, Madeira, Hawaii, China and Japan. Its original home is unknown, but may be inferred to have been somewhere in the Indo-Malay region, since the family Bipaliidae centers there. Specimens received for identification from the U. S. National Museum show that *Bipalium kewense* has become established out-of-doors in the West Indies and southern Florida.

Occasionally other exotic land planarians appear in greenhouses, but none is known to have persisted for any length of time. Thus several specimens of a species of *Desmorhynchus* (possibly from Madagascar) were taken in 1914–1916 in greenhouses of the U. S. Department of Agriculture in Washington, D. C.

In view of the general failure of exotic land planarians to maintain themselves in the north temperate zone, even in greenhouses, it is rather surprising to find that these animals have in recent years established themselves in Californian gardens and appear to be flourishing. Specimens of three different species have been received to date.[2] These comprise two species of *Geoplana* and one *Bipalium*. One of the *Geoplanas*, a small black species, turns out to be *G. mexicana* Hyman, 1939,[3] twice found at the Texas border on shipments of flowers from Mexico. Hence this species has been introduced into California from Mexico. The other *Geoplana*, a larger bluish-black form, and the *Bipalium*, light brown with a dark brown mid-dorsal stripe, do not appear to coincide with any described species. All three species are fully mature and are undoubtedly reproducing sexually in their adopted home. This point is of especial interest, since in general tropical land planarians when introduced into cooler climates fail to mature sexually and hence can not persist unless they are capable of some mode of asexual reproduction. The latter appears to explain the persistence of *Bipalium kewense*, since this species also has never been found with sex organs in temperate regions. The fact that the California forms are able to mature leads one to suspect that they are native to some adjacent, not fully tropical region, as Mexico or Central America.

Genuinely endemic land planarians do, however, occur in the north temperate zone; curiously enough, all these belong to the family Rhynchodemidae, and nearly all to the genus *Rhynchodemus*.[4] About 15 species have been described in Europe,[5] but the endemicity of some of these may be questioned, especially those known only from the Riviera, where there are many introduced plants. In the United States, two endemic rhynchodemids have been reported to the present time. These are *Rhynchodemus sylvaticus* (Leidy), 1851[6] and *R. atrocyaneus* Walton, 1912.[7] The former, small, slender, grayish with two dark stripes and with pointed head bearing a pair of large eyes, has been reported from Rhode Island, Pennsylvania, and Ohio, under pots and boards in gardens and meadows, and under logs and bark in woods. Apparently not uncommon in former years, this species seems not to have been collected in the last twenty years, and attempts to obtain specimens from Philadelphia, the type locality, have so far proved futile.[8] Of *R. atrocyaneus* nothing was known but the original description, which states that two specimens were found at Gambier, Ohio, 20 cm long and of a uni-

[1] "Monographie der Turbellarien. II. Tricladida Terricola." 1899.

[2] Kindly sent by Dr. M. W. de Laubenfels, Pasadena, and John L. Mohr, Berkeley.

[3] *Proc. U. S. Nat. Mus.*, 86: 425.

[4] *Microplana* has recently been shown to be a synonym of *Rhynchodemus* (Schneider, *Zool. Jahrb. Abt. System.*, 67: 179).

[5] Recently listed by Arndt, *Zoogeographica*, 2: 375.

[6] *Proc. Acad. Nat. Sci. Phila.*, 5: 239, 289; 10: 171.

[7] SCIENCE, 25: 732.

[8] Dr. J. Percy Moore kindly tried to find some specimens for me.

formly dark blue color. I have come into possession of a set of serial sections of this species found among the effects of Dr. Walton,[9] and these yield some additional information but unfortunately the specimen is sexually immature.

I have now to report the finding in woods of the Appalachian Mountains of a new endemic rhynchodemid. To date three specimens have come to hand,[10] collected in Maryland, Virginia, and West Virginia, respectively. All three are at or near sexual maturity, and study of the copulatory apparatus in serial section has shown that the animal belongs to the genus *Diporodemus* Hyman, 1938.[11] This genus differs from *Rhynchodemus* in that in addition to the usual common genital pore opening in the midventral line there is a female or vaginal pore to one side of the median line by which the copulatory bursa opens to the exterior. I established this genus for a species from Yucatan, Mexico. Since then a second species of the genus has been found on Barro Colorado Island, Canal Zone,[12] and now the Appalachian form is the third member. All three species are practically identical in external appearance. They are black or brownish black, plump, cylindroid and about 15 mm in length; the Panamanian and Appalachian species are further alike in that the eyes are degenerate, detectable only in sections, and the creeping sole continues onto the ventral surface of the head as a glandular cleft, probably acting as an adhesive organ in food capture. The Yucatan and Appalachian species have also in common a pair of longitudinal sensory tracts on the cephalic ventral surface.

A complete account of these endemic and introduced land planarians will be published elsewhere.

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CONCERNING PURE CULTURES OF SPIRILLUM

ALTHOUGH bacteriologists have long been interested in spiral bacteria, very few workers have reported success in the isolation of pure cultures. Esmarch,[1] Beijerinck,[2] Kutscher,[3] Bonhoff,[4] Dimitroff[5] and Giesberger[6] have described methods by which they were able to isolate several species from water and feces.

Several months ago, the writer wished to procure some species of this genus for cytological study, but after considerable correspondence, found that such cultures are not available. It now seems probable that all or most of the pure cultures isolated by earlier investigators have been lost. *Rhodospirillum rubrum* (Esmarch) Molich and *Spirillum virginianum* Dimitroff were obtained from the American Type Culture Collection. The cells of these species are rather small, however, and not well suited for cytological study. Since pure cultures could not be obtained from culture collections, isolation of the desired species from original sources was accomplished.

This note is written to correct a general impression that the isolation of pure cultures of Spirillum is a difficult matter. My experience has been that several species are readily isolated from raw cultures by simple routine methods employed for other groups of bacteria. Suitable raw cultures must be obtained by enrichment methods, but this is not difficult since most surface waters appear to contain a variety of species of this genus.

Several culture media were tested for enrichment, but none was found more satisfactory than hay or other plant infusions. Decaying cultures of fresh water algae usually contain many spiral bacteria. Spiral cells are rarely seen in the early stages of decomposition, but as the culture ages they become more and more abundant until, at times, the surface pellicle becomes a swarming mass in which they predominate. This peak period may be reached within a few days but generally requires from one to three weeks. Raw cultures are generally rather short lived.

During the swarming period, pure cultures are readily isolated by streaking out on the surface of beef extract peptone agar. The colonies appear promptly and are readily recognized by microscopic examination *in situ*. By this method the following species were isolated from creek and pond waters in the vicinity of Austin, Texas: *Sp. serpens* (Müller) Winter, *Sp. undula* (Müller) Ehrenberg, *Sp. tenue* (Müller) Ehrenberg, *Sp. itersonii* Giesberger. The most common species in this vicinity proved to be *Sp. serpens*.

Although rich raw cultures of *Sp. volutans* Ehbg. became available on two occasions, it was not possible to obtain pure cultures since no colonies developed on the streaked plates or in poured plates with semi-solid agar as the plating medium. The giant spiral cells of this species could be seen lying on the agar surface,

[9] Dr. H. I. Strohecker, of Kenyon College, Gambier, Ohio, kindly forwarded to me a box of slides of land planarians made by Dr. Walton.

[10] Sent for identification by the U. S. National Museum and collected by Dr. J. P. E. Morrison of that institution.

[11] "Fauna of the Caves of Yucatan," Carnegie Inst. Wash., Publ. No. 491.

[12] A collection of land planarians from Barro Colorado Island was kindly sent to me for identification by E. C. Williams, Jr., of Northwestern University; description in press.

[1] E. von Esmarch, *Centr. f. Bakt.*, 1: 225, 1887.

[2] M. W. Beijerinck, *Centr. f. Bakt.*, 14: 827, 1893.

[3] Kutscher, *Zeitschr. f. Hygiene*, 20: 46, 1895.

[4] Bonhoff, *Archiv f. Hygiene*, 26: 162, 1896.

[5] V. T. Dimitroff, *Jour. Bact.*, 12: 19, 1926.

[6] G. Giesberger, Delft thesis, W. D. Meinema, pp. 1–136, 1936.