

OCCASIONAL PAPERS OF THE MUSEUM OF
ZOOLOGY

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

UNIVERSITY OF MICHIGAN PRESS

A FRESH-WATER TRICLAD FROM PUERTO RICO,
DUGESIA ANTILLANA, NEW SPECIES

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No fresh-water triclads or planarians have so far been reported from the West Indies, except from Trinidad, the southernmost island of the Lesser Antilles, lying close to the coast of Venezuela. This is probably due, not to a scarcity of planarians in the islands of the West Indies, but rather to the fact that the lower invertebrates in this region have been very little studied. Planarians are fairly common in the cooler mountain streams of Puerto Rico, although only one species appears to occur in this island.

Dugesia antillana, new species

EXTERNAL FEATURES.—The body, when extended, is of exceedingly slender shape (Fig. 1), attaining a length up to 19 mm. and a width of about 0.7 mm. Only the head is somewhat broader, approximately 1 mm. The anterior end (Fig. 2) is roughly triangular, with a rather pointed tip and two slightly convex sides. At the lateral corners of the triangle are a pair of long, slender, and sharply pointed auricles. Behind the head, the body is somewhat narrower, and it has the same width posteriorly to a level behind the pharynx, where it tapers gradually to the more or less rounded posterior end.

The animal is grayish-brown, darker on the dorsal than on the ventral side. The pigmentation appears to be uniform to the naked eye, but under a hand-lens shows an irregular distribution with lighter and darker patches. Sometimes an indistinct darker streak may be seen along the midline of the prepharyngeal region. The surface of the auricles and an area lateral to each eye lack pigment.

The eyes lie close to each other at a level slightly anterior to a line connecting the bases of the two auricles, each at the medial margin of the unpigmented area. Their distance from each other amounts to about one-fifth of the width of the head at the level of the eyes. The pharynx is clearly visible in the living animal because of its pigmentation. Its base is situated, in mature animals, at about the middle of the body, and its length amounts to approximately one-seventh of the entire length of the animal.

In young animals, the body exhibits somewhat different proportions. The head is comparatively larger, and the post-pharyngeal region, much shorter. Very young animals have a light-gray pigmentation and are almost transparent.

Genital organs are not easily discernible in living specimens, except for a small, round, unpigmented spot on the ventral side, at the site of the genital pore. The comparatively small copulatory complex occupies the anterior one-fourth of the postpharyngeal region.

The intestine is not distinctly visible. Its anterior ramus reaches up to the level of the eyes and bears on each side from eight to twelve lateral branches which themselves are much ramified.

When the animal is gliding undisturbed, the lateral margins of the body appear smooth and straight, and the auricles, as well as the anterior tip of the head, are raised above the substratum. In its searching movements, it often bends and twists the anterior end in all directions, giving the slender body a peculiar threadlike appearance. If disturbed, the animal is capable of a creeping motion, attaching itself to the substratum with the anterior end and contracting the body,

then extending the head and anterior portion of the body while the point of attachment moves posteriorly with a contraction wave.

The general anatomy of the digestive system is typical. The pharynx has a gray pigmentation that can be clearly seen if this organ is removed from a living specimen with a pair of needles. Under the compound microscope, the pigment resolves itself into a netlike pattern. The pigment granules are enclosed in parenchymatic cells below and close to the external muscular zone of the pharynx. The arrangement of the muscle fibers in the pharynx is of the type characteristic for the family Planariidae, i.e., the longitudinal and circular fibers of the inner muscular zone form distinct layers. The external muscular zone consists of a layer of longitudinal muscles underlying the surface epithelium of the pharynx, and beneath these a layer of circular fibers. A second (deeper) longitudinal layer, found in some other species of *Dugesia*, is lacking in our planarian.

The dorsal surface of the auricles is covered by a ciliated epithelium with depressed nuclei, and lacks rhabdites. This modified epithelium represents the auricular sense organs and apparently corresponds to the unpigmented areas of the auricles.

REPRODUCTIVE SYSTEM.—The testes are numerous and are situated in the parenchyma lateral to the main intestinal rami between the lateral branches of the intestine. In the post-pharyngeal region, behind the copulatory organs, they occupy also the space between the posterior rami. The most anterior testes lie a short distance behind the ovaries, the hindmost ones near the posterior end of the body. The testes are generally situated in the dorsal part of the parenchyma, close to the muscular layer of the dorsal integument. However, a few testes approach the ventral side, and, in fully mature specimens, some larger testes may occupy almost the entire dorso-ventral diameter of the body.

The thin vasa deferentia of the prepharyngeal region run along the upper side of the main nerve trunk of each side,

medial to the oviduct. At the level of the mouth opening they expand to form large, irregularly winding tubes, the false seminal vesicles. Near the penis they again become narrower, ascend towards the dorsal side, and enter the penis bulb separately.

The two ovaries, situated immediately behind the head, show no anatomical peculiarities.

Vitellaria, or yolk glands, are well differentiated in fully mature animals and occupy the ventral and lateral parts of the parenchyma.

The copulatory apparatus (Fig. 3) consists of the parts typical for the genus *Dugesia*. The genital pore (*gp*) leads to a moderately large common atrium (*ac*), into which the bursa stalk (*b*) opens from the dorsal side. The tubular connection between the genital pore and the common atrium receives the outlets of numerous cement glands (*cg*), the secretion of which is granular and is stained pale pink by treatment with erythrosin. The male atrium (*am*), containing the papilla of the penis, is separated from the common atrium by a projecting diaphragm. Both atria are equipped with a thin muscular layer containing circular and longitudinal fibers.

The penis is composed of a comparatively small bulb (*pb*), indistinctly marked off from the surrounding parenchyma, and a short, conical papilla (*pp*), projecting into the male atrium. The bulb is formed by rather weakly developed scattered muscle fibers running in various directions, but, in general, in concentric curves. Beneath the epithelium of the papilla are two muscular layers, one of circular and the other of longitudinal fibers.

The two vasa deferentia (*vd*) enter the penis bulb from the dorsolateral sides as comparatively narrow canals, then proceed obliquely in a ventral and posterior direction and expand into a pair of spindle-shaped cavities. Finally they unite to form a short canal, which opens into the male atrium at the tip of the papilla. Close to the place of the union of the two vasa deferentia, a pair of distally closed tubes extends from the common canal into the tissues of the penis bulb. The posi-

tion of these tubes varies in the different specimens; the tubes are often arranged asymmetrically, possibly because of the state of muscular contraction of the organ. It appears that these two tubes, together with the enlarged portions of the vasa deferentia, which all are lined with a cubical epithelium, represent physiologically a seminal vesicle, while the short common canal opening into the atrium plays the role of an ejaculatory duct. The latter, however, is not equipped with a distinct muscular layer.

The bursa duct (*bd*) first runs from the dorsal part of the common atrium dorsally, then bends anteriorly and leads into a voluminous cavity, the copulatory bursa (*b*). The latter often extends through the entire dorsoventral diameter of the parenchyma. The musculature of the bursa stalk is not strongly developed and is composed of a fine coat of circular and longitudinal fibers. The two oviducts (*od*) open separately into the bursa stalk at the place where it bends forward. Shell glands (*sg*) are not connected with the oviducts themselves, but open into the bursa stalk in an annular area situated below the openings of the oviducts.

REPRODUCTION.—No signs of asexual reproduction were observed. Sexually mature animals were collected in the season from June to December, which is the warmer part of the year in Puerto Rico. The egg capsules are spherical (diameter, 0.8–1.0 mm.) and are attached to the substratum by a stalk.

ECOLOGY AND DISTRIBUTION.—*Dugesia antillana* is found in cool, swiftly flowing mountain brooks and streams of Puerto Rico. It occurs even in very small seepage springs, sometimes in fairly large numbers. The animals and cocoons are found chiefly on the undersides of stones. If a crushed snail is placed in the stream and covered with a stone, the planarians will be attracted to the bait and many may be collected within a few hours. They were found in greatest abundance in a creek near Maricao, at the place where the overflow from a fish hatchery enters the creek. Apparently the remainders of food and other matter contained in the waste attracted the planarians.

The worms were collected in Puerto Rico at the following stations:

Caribbean National Forest (Luquillo Forest), in the smaller streams and springs of the Recreation Area (altitude, about 2500 ft.), under stones. November 19, 1938 (temperature of the water, 20.7° C.); August 18, August 24 (21.5° C.), September 11 (22.2° C.), October 28, 1939. In creeks on the slopes of El Yunque (altitude, about 2900 ft.), November 21, 1938 (19.0° C.).

Barranquitas, in a small spring with clean water, muddy bottom, with few stones. One immature specimen, June 18, 1939.

Maricao, in a small creek near the Government Fish Hatchery, bottom muddy, with stones. December 19, 1938, and June 26, 1939, numerous mature and immature specimens, under stones.

Creeks near San Germán, in Hocomuco River and in two creeks on the road north of San Germán (tributaries to Rosario River). June 27, 1939, several immature specimens.

Patillas, in a creek entering Lago Real de Patillas, in clear, swiftly running water, with bottom of pebbles and sand. December 23, 1938, under stones.

It is probable that *Dugesia antillana* is not confined to Puerto Rico. Unfortunately, no planarians have been reported as yet from other islands of the Greater Antilles. However, Dr. Julio Daréa-Díaz of the University of Puerto Rico informs me that he saw planarians in a stream in Santo Domingo (Hispaniola). The planarian fauna of the West Indies, according to the data available at present, may be summed up as follows:

Dugesia antillana, Puerto Rico.

Dugesia aurita (Kennel, 1888), Trinidad.

"*Planaria*" *fissipara* Kennel (1888), Trinidad.

Tricladida paludicola, species undetermined,
Santo Domingo.

TAXONOMIC POSITION.—The genus *Dugesia* Girard, 1850 (synonym *Euplanaria* Hesse, 1897; see Hyman, 1939:264–65)

comprises at present about thirty-five species, distributed over all continents of the world. It is apparently a very old and primitive genus. The American species of the genus resemble each other closely in their external features. They have a more or less triangular head and well-differentiated lateral auricles. The vasa deferentia enlarge inside the penis to form seminal vesicles—a character which is not found in the European, Asiatic, and Australian species of the genus. Another feature of many American representatives of *Dugesia* is the pigmentation of the pharynx, described so far in *D. longistriata*, *paramensis*, *polyorchis*, and *cameliae* (Fuhrmann, 1914), but also found in *D. tigrina* and in the new species from Puerto Rico. *D. antillana* differs from related forms mainly in its slender body and in the differentiation of the penis lumen, particularly the two short tubes extending from the ejaculatory duct into the penis bulb.

While this article was in press, the author received knowledge of de Beauchamp's paper (1939) which reviews the distribution of planarians in the Western Hemisphere and proposes a great number of changes in the current nomenclature of the American freshwater triclads. However, the paper does not affect the descriptive part of the present article.

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PLATE I

- FIG. 1. *Dugesia antillana*, outline of the extended animal, $\times 5$.
FIG. 2. *D. antillana*, anterior end, $\times 18$.
FIG. 3. *D. antillana*, diagram of the copulatory apparatus, $\times 120$:
 ac, common atrium.
 am, male atrium.
 b, copulatory bursa.
 bd, bursa stalk.
 cg, cement glands.
 gp, genital pore.
 m, mouth.
 od, oviduct.
 pb, penis bulb.
 ph, pharynx.
 pp, penis papilla.
 sg, shell glands.
 vd, vas deferens.



