



Title	A Freshwater Planarian from South Chile Collected by the Members of Two Japanese Limnobiological Expeditions into Chile : <i>Cura patagonica</i> (BORELLI, 1901)(Turbellaria, Tricladida, Paludicola)
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Citation	Journal of the Faculty of Agriculture, Hokkaido University, 61(4), 377-398
Issue Date	1984-03
Doc URL	http://hdl.handle.net/2115/12999
Type	bulletin (article)
File Information	61(4)_p377-398.pdf



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**A FRESHWATER PLANARIAN FROM SOUTH
CHILE COLLECTED BY THE MEMBERS OF
TWO JAPANESE LIMNOBIOLOGICAL
EXPEDITIONS INTO CHILE :
CURA PATAGONICA (BORELLI, 1901)
(TURBELLARIA, TRICLADIDA, PALUDICOLA)**

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Received August 19, 1983

1. Introduction

Several years ago, Dr. Masaru HAGA, Biological Laboratory of Iwamizawa School of Hokkaido University of Education, who was a member of "La I^a Expedición Científica en la Región Patagónica, la Universidad de Hokkaido, 1965-66", kindly sent to KAWAKATSU a preserved collection of planarian that he collected in the southern areas of Chile, including Tierra del Fuego. KAWAKATSU also graciously received a preserved collection from the Paine mountainous area, Magallanes, in the southern area of Chile, from INOUE, who was a member of "The 2nd Survey on the Salmonid Fishes in Chile, 1971". Since the freshwater planarian fauna in the Southern Chile and Argentina is known only by the studies of BORELLI (1895, 1897, 1901) and BÖHMIG (1902), KAWAKATSU and MITCHELL welcomed these collections.

Examination of the sexually mature specimens in the collections indicated that the species is *Cura patagonica* (BORELLI, 1901), reported from the vicinity of the Rio Santa-Cruz (Patagonia), Santa Cruz, South Argentina. The species is hitherto not studied taxonomically except for the old, original description. The purpose of the present paper is to present a redescription

of this little known species together with some remarks about the taxonomic relationship and distribution of the *Cura* species of the world. The data in the section 2 ("List of Localities, etc.") and 6 ("Distributional and Ecological Notes, etc.") including the sketch-map of Fig. 8 are principally written according to the field survey of INOUE. In addition, through the courtesy of Dr. HAGA, we can give detailed limnobiological data of the localities where *C. patagonica* was collected in South Chile in the "Section 2" of the present cooperative paper.

2. List of Localities, Physico-Chemical Data and the Species Obtained

In the following list the Specimen Lot Number given to each sample is the number registered in KAWAKATSU's fixing notebook according to his permanent recording system.

No. 1. Specimen Lot No. 652. *Cura patagonica*? A narrow stream of the Estero Daly, near Estancia Río Chico, the southeastern part of the Sierra de Carmen Silva, Tierra del Fuego (Isla Grande Tierra del Fuego, Chile; ca. lat. 53°55' S. and long. 61°05' W.). According to the collector (pers. comm.), the stream is located at the boundary line between a grazing land and the forest zone in this area; approximately 1-2 m in width and 20-60 cm in depth (less than 1 m). Its bottom is muddy with many pebbles. Several species of aquatic plants (*Ranunculus* sp., etc.), green algae (*Stigeoclonium*, *Chaetophora*, etc.) are found here; diatoms are also common. The stream's current is rapid (w. t., 6°C; pH 5.8). Altitude is approximately 300 m. About 20 non-sexual specimens of planarian were collected from the shore of the stream on February 9, 1966 (cf. HAGA, 1974, p. 293). The animals were fixed with 70% ethanol. Coll. Dr. M. HAGA. Cf. Fig. 7.

No. 2. Specimen Lot No. 653. *Cura patagonica*? A narrow stream running through along gentle slopes of the forest zone of Río de las Minas, approximately 5 km northeast of Punta Arenas, Magallanes, Chile (ca. lat. 53°08' S. and long. 70°51' W.). The stream is 1.5-2 m in width and 30-50 cm in depth and is current slow. Its bottom is covered with pebbles (w. t., 7°C; pH 5.6). Altitude is approximately 300 m. About 20 non-sexual specimens of planarian were collected from this brooklet on February 23, 1966. The animals were fixed with 70% ethanol. Coll. Dr. M. HAGA. Cf. Fig. 7.

No. 3. Specimen Lot No. 1032. *Cura patagonica*? A narrow stream located on the eastern side of Lago Pehoe, one of the typical glacial lakes located at the southern foot of the Paine mountainous range, Magallanes, Chile (ca. lat. 51°04' S. and long. 73°14' W.). Physicochemical data of the

locality were not obtained. Altitude is approximately 405 m. About 15 (and several fragments) non-sexual specimens of planarian were collected from the stream at the station near the shore of the lake on March 6, 1966. The animals were fixed with 70% ethanol. Coll. Dr. M. HAGA. Cf. Fig. 8.

No. 4. Specimen Lot No. 1090. *Cura patagonica*? A station near the entrance of the canal that links Lago del Toro with Lago Porteño, near Ea. la Peninsula (the southwestern side of Lago del Toro), Magallanes, Chile (ca. lat., 51°19' S. and long. 72°59' W.). According to SANO (1970) and SANO, INOUE and AOKI (1971, pp. 4-7), the stream is approximately 30 m in width and 20-50 cm in depth. Its bottom is sandy with pebbles (w. t., 11.6°C; pH 7.2; Ca-contents, 6.8068 ppm; transparency, over 30; the speed of a running fluid, 81.6 cm/sec). Altitude is approximately 300 m. A single, non-sexual specimen of planarian was collected from this stream on February 6, 1971. The animal was fixed with 3% formalin solution. Coll. S. INOUE. Cf. Fig. 8.

No. 5. Specimen Lot No. 1091. *Cura patagonica*? A station near the northwestern outlet of Lago del Toro (i. e., the beginning of the Río Serrano), the vicinity of Ea. El Paine, Magallanes, Chile (ca. lat. 51°11' S. and long. 73°12' W.). The stream near the outlet is approximately 150 m in width and is current slow; the bottom is sandy and pebbles covered with mud. The physico-chemical data of the water in this stream are as follows (on Feb. 4, 1971): w. t., 5.6°C; pH 7.2; Ca-contents, 8.008 ppm; transparency, 12.2; speed, 64.5 cm/sec (cf. SANO, INOUE and AOKI, 1971, pp. 8-9). Altitude is approximately 300 m. A single, non-sexual specimen of planarian was collected from the shore of this stream on February 6, 1971. The animal was fixed with 3% formalin solution. Coll. S. INOUE. Cf. Fig. 8.

No. 6. Specimen Lot No. 1092. *Cura patagonica*. An upper part of the Río Serrano, near its confluence with the Río de Grey, Magallanes, Chile (ca. lat. 51°14' S. and long. 73°13' W.). The physico-chemical data of the water in this stream are as follows: w. t., 9.7°C; pH 7.3; Ca-contents, 4.2868 ppm; transparency, over 30 (cf. SANO, INOUE and AOKI, 1971, pp. 7-9). Altitude is approximately 300 m. Two sexual and 4 non-sexual specimens of planarian were collected on February 7, 1971. The animals were fixed with 3% formalin solution. Coll. S. INOUE. Cf. Fig. 8.

No. 7. Specimen Lot No. 1093. *Cura patagonica*? A station at the eastern shore of Lago Pehoe, approximately 200 m northeast from the outlet of the lake (i. e., the beginning of the Río Paine), Magallanes, Chile. This station is near Station 3. The physico-chemical data of the water in this station are as follows: w. t., 10.8°C; pH 7.2; Ca-contents, 8.008 ppm; trans-

parency, over 30 (cf. SANO, INOUE and AOKI, 1971, p. 7). Altitude is approximately 400 m. Two non-sexual specimens of planarian were collected from the surface of pebbles at the shore on February 7, 1971. The animals were fixed with 3% formalin solution. Coll. S. INOUE. Cf. Fig. 8.

3. Methods

The sexually mature specimens (Lot No. 1092 a, b) and several other non-sexual specimens were cut in serial sagittal sections at 7-8 micrometers and then stained with Delafield's hematoxylin and erythrosin. Photographs of the preserved specimens and several whole mounts of the non-sexual specimens were also prepared.

4. Presentation of the Results

Order TRICLADIDA

Suborder PALUDICOLA or PROBURSALIA

Family Dugesiidae BALL, 1974

Genus *Cura* STRAND, 1942

Cura patagonica (BORELLI, 1901)

Principal literature: BORELLI, 1901; BÖHMIG, 1902; KENK, 1930, 1974; BALL, 1974 a, b.

The following redescription is based primarily upon study of the sexually mature specimens (Lot No. 1092 a, b).

External features: This is a small, darkly pigmented, epigeal species. The preserved, sexually mature specimens measure 6 mm in length (the tail of one of 2 specimens is slightly broken); width measures between 2.5 mm and 3 mm. The preserved, sexually immature specimens from the same locality measure 3 mm long and 1 mm wide. In one sexual specimen, the head is a subtruncate with a bluntly pointed tip and also bears a pair of very short, bluntly pointed auricles (Fig. 1 E). In other sexual and non-sexual specimens, these characters of the head shapes are lost upon fixation (Fig. 1 A, C, G, I, J and K). There is no "neck" or narrowing of the body behind the auricles; the posterior end of the body is rounded (Fig. 1 A-K).

The paired eyes, each surrounded by a clear, narrow, non-pigmented, ocular area of a shortened lanceolate form, are rather small. The distance between them is wider than one-third of the width of the head at the level of eyes. Usually, they seem to have the slanted eyes of a fox (Fig. 1 C and G).

The non-pigmented pharynx is inserted at about midway and is about

one-fifth as long as the body. The genital pore opens at about the middle of the postpharyngeal region (Fig. 1 H and I).

The species has a uniform, blackish brown to nearly black dorsum with

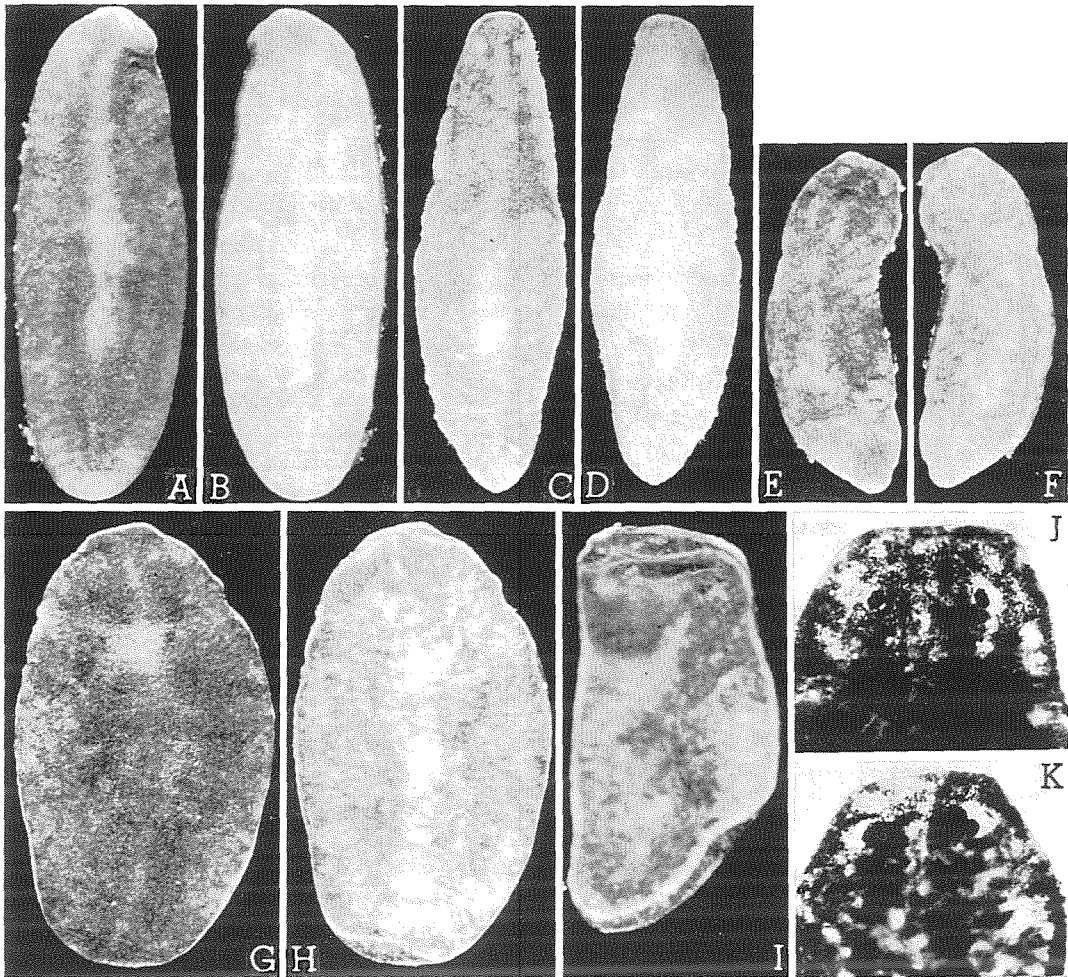


Fig. 1. *Cura patagonica* (BORELLI, 1901), photographs of preserved specimens. A and B: Dorsal and ventral views of a non-sexual specimen (Specimen Lot No. 652). C and D: Dorsal and ventral views of a non-sexual specimen (Specimen Lot No. 1032). E and F: Dorsal and ventral views of a non-sexual specimen (Specimen Lot No. 1090). G and H: Dorsal and ventral views of a sexual specimen (Specimen No. 1092 b). I: Ventral view of a sexual specimen (Specimen No. 1092 a). J (Specimen No. 1090 a) and K (Specimen No. 1091 a): Head of preserved, non-sexual specimens (photomicrographs taken from the whole mounts).

numerous blackish pigments. An indistinct, pale colored, middorsal longitudinal line (from the tip of the head to a level slightly anterior to the mouth opening) can be seen. The body margin has no pigments. A pair of white, short falcate auricular sense organs is clear on both lateral sides of the head. The ventral side of the body is a uniform dark brown to blackish brown with numerous dark colored spots. A short, narrow, whitish, midventral line is visible at the ventral side of the head; this character is very similar to that of *Phagocata vivida* (IJIMA et KABURAKI, 1916) from Japan (cf. KAWAKATSU, TESHIROGI and ISHIDA, 1982, p. 35, footnote 2). The areas around the mouth opening and the genital pore are without pigments (Fig. 1 B, D, H and I).

The above-mentioned external characters can be seen in the non-sexual specimens from the other localities. It seems to us that all of our samples represent only one species, *Cura patagonica*. A few indistinct, whitish spots at the anterior end of the head (probably sensory spots) can be seen only in the specimens of the Lot No. 653.

Internal features: The anterior intestinal trunk has 12 to 15 branches; each posterior trunk has about 15 short lateral branches. The inner pharyngeal musculature of the pharynx consists of two distinct layers, a thick circular layer adjacent to the pharynx lumen and a thinner longitudinal layer (the characteristic arrangement of the family Dugesidae). The external musculature of the pharynx consists of two layers, a thin outer one of longitudinal fibers and a thick inner one of circular fibers (Fig. 2 A).

The marginal adhesive glands are well developed in this species. In histological sections, the epithelial cells of the midventral stripe of the head are slightly more flat-

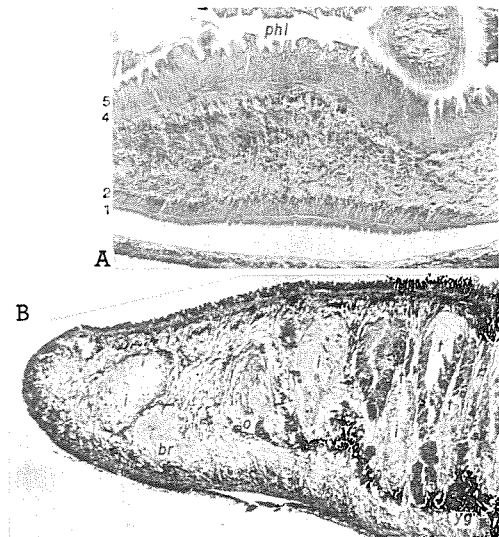


Fig. 2. *Cura patagonica*. A: Photomicrograph of sagittal section of pharynx (No. 652 a). B: Photomicrograph of sagittal section of the anterior portion (No. 1092 b). br, brain; i, intestine; o, ovary; t, testis; yg, yolk gland; 1, longitudinal fibers of outer muscle zone; 2, circular fibers of outer muscle zone; 4, longitudinal fibers of inner muscle zone; 5, circular fibers of inner muscle zone.

tened than other epithelial cells, and without rhabdites and cilia. The subepithelial muscle fibers in this part are not conspicuous. Histologically, the cells here are pierced by two kinds of the glandular ducts, of which one provided a coarsely glandular, erythrophilic secretion; the other well-developed glands provided cyanophilic secretion.

A pair of small and rounded ovaries is situated in the ventral position between the second and third intestinal diverticula (Fig. 2 B). Numerous yolk

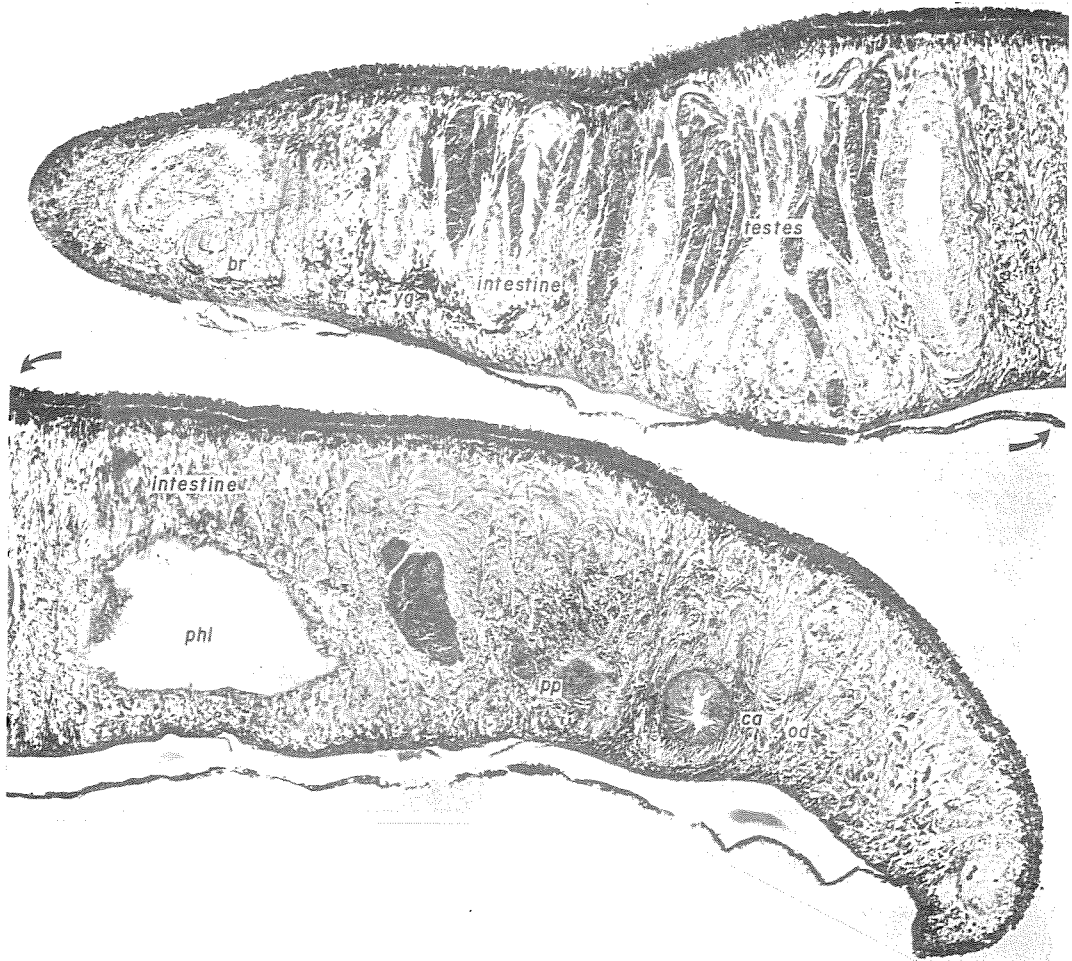


Fig. 3. *Cura patagonica*, photomicrograph of near midsagittal section (No. 1092 b). br, brain; ca, common genital antrum (blind, oblong cavity); od, ovovitelline duct; phl, pharynx lumen; pp, penis papilla; yg, yolk gland.

glands (or vitellaria) are distributed throughout the body in the surrounding parenchyma (Fig. 2 B).

The testes are essentially dorsally located, but large ones occupy the almost all of the dorsoventral space. They are a club-shaped or lenticular (some of anterior ones are an obovoid in shape), and occupy the mesenchyme almost in one longitudinal zone on either side of the prepharyngeal region from the posterior level of the ovaries to the slightly anterior level of the pharyngeal base (Fig. 3). Their total number is estimated at about 15 to 18 (less than 20). Our observations on the arrangement and number of the testes is consistent with the description and figure of "*Planaria*" *patagonica* by BORELLI (1901, pp. 2-3).

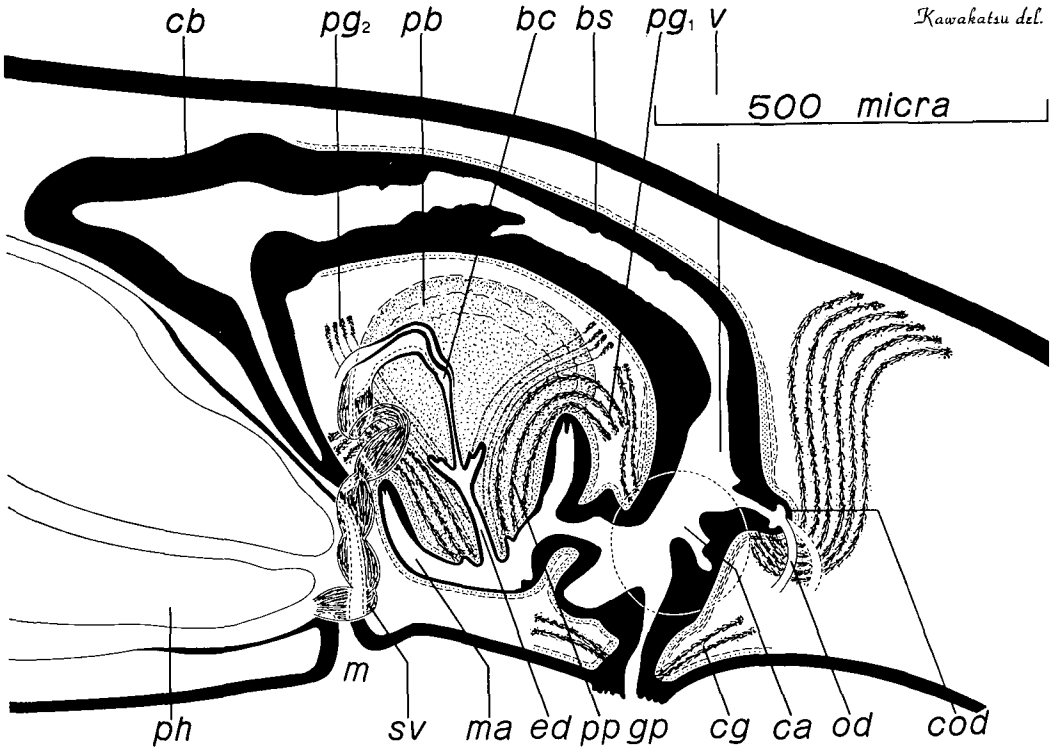


Fig. 4. *Cura patagonica*, semidiagrammatic sagittal view of the copulatory apparatus (No. 1092 b). cb, bulbar cavity; bs, bursal stalk; ca, common genital antrum; cod, common ovovitelline duct; cb, copulatory bursa; cg, cement gland; ed, ejaculatory duct; gp, genital pore; ma, male genital antrum; od, ovovitelline duct; pb, penis bulb; pg₁, erythrophilic penis gland; pg₂, cyanophilic penis gland; ph, pharynx; pp, penis papilla; sv, spermiducal vesicle; v, vagina.

The sagittal view of the copulatory apparatus, reconstructed mainly from the sections of Specimen No. 1092-b (parts of the penis papilla in the figure made up by sections of No. 1092 a), is shown in Fig. 4. Photomicrographs of the parts of the copulatory apparatus of these two specimens are also shown in Fig. 6 (A-C). The penis has a moderately large, hemiglobose bulb embedded in the parenchyma and a moderately large, short conical papilla of a symmetrical form (the papilla is preserved in a rather contracted condition in both the specimens examined). The bulb is moderately muscular in nature, but this is somewhat difficult to analyze because the most of it is full of numerous, faintly erythrophilic gland ducts and their granular secretions (Figs. 4; 6 B). The sperm ducts from well-developed spermiducal vesicles from the level of the mouth to the anterior level of the penis bulb. Each spermiducal vesicle ascends through the bulb and forms a slightly thick-walled tube finally to curve posteriorly. Then, they converge in the posterior part of the penis bulb and open separately into the posterior part of the narrow bulbar cavity (Fig. 4).

The tubular bulbar cavity, of which the proximal part forms a slightly bifid lumen, continues into the penis papilla as a slightly widened ejaculatory duct that opens into the male genital antrum (Figs. 4; 6 B). A well-developed diaphragm of the penis lumen is found at the basal part of the penis papilla (Figs. 4; 6 B). The lining epithelium of the anterior part of the bulbar cavity has nuclei; that of the posterior part and the ejaculatory duct is difficult to analyze histologically. Both the bulbar cavity and the ejaculatory duct are surrounded by a thin muscle coat of circular fibers. Numerous, heavily cyanophilic gland ducts opens into the terminal part of the bulbar cavity (or the region of the diaphragm

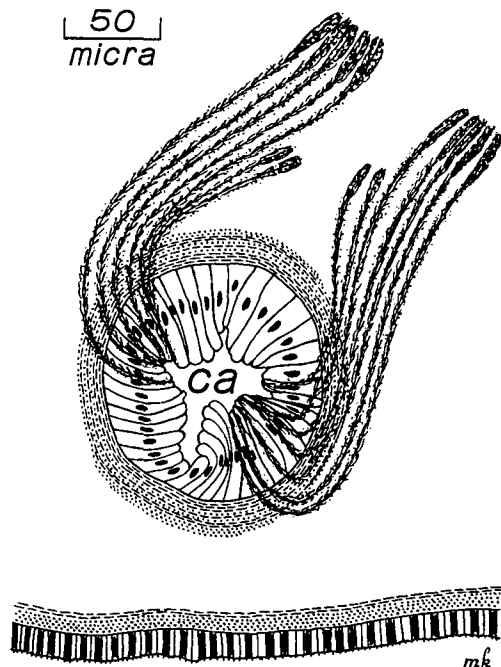


Fig. 5. *Cura patagonica*, drawing of the common genital antrum (blind, oblong cavity) from serial sagittal sections (No. 1092 b). See Fig. 6(D). ca, common genital antrum.

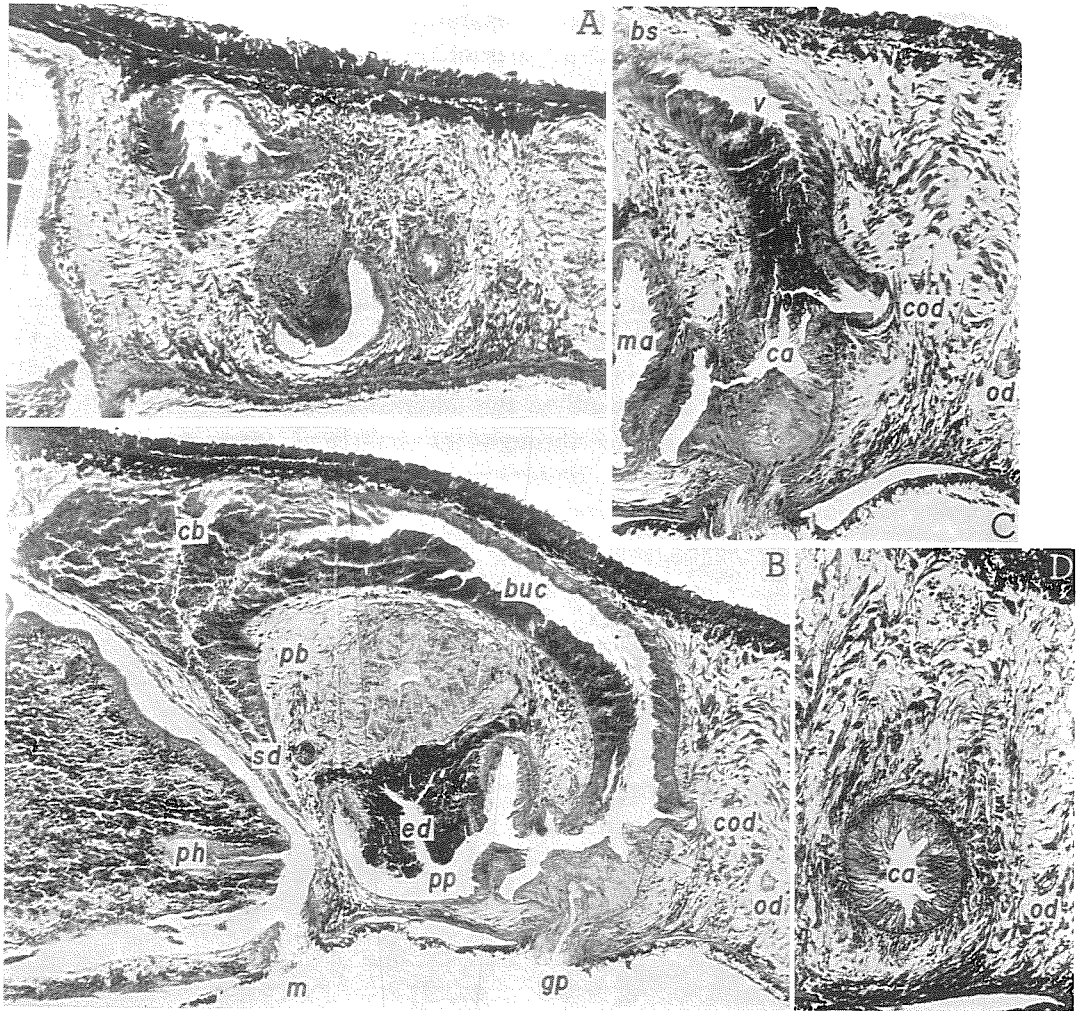


Fig. 6. *Cura patagonica*, photomicrographs of sagittal sections of the copulatory apparatus. A: Penis (No. 1092 a). B: Penis (No. 1092 b). C: Detailed view of the posterior part of the copulatory apparatus (No. 1092 b). D: Detailed view of the common genital antrum (blind, oblong cavity; No. 1092 b). bs, bursal stalk; buc, bursal canal; ca, common genital antrum; cb, copulatory bursa; cod, common ovovitelline duct; ed, ejaculatory duct; gp, genital pore; m, mouth; ma, male genital antrum; od, ovovitelline duct; pb, penis bulb; ph, pharynx; pp, penis papilla; sd, sperm duct; v, vagina.

in the penis lumen) and the entire course of the ejaculatory duct (Figs. 4; 6 B).

The penis papilla is probably weakly muscular in nature. Except for the inner portion that is occupied by cyanophilic glands, most of the remaining tissue of the papilla is completely full of numerous, heavily erythrophilic gland ducts (penis gland) and their granular secretions (Figs. 4; 6 B). The papilla has a weak constriction near its tip (Figs. 4; 6 B). Histologically, the inner side of the constriction is accompanied by cyanophilic glands; the outer side of it is accompanied by erythrophilic glands. The posterior section of the papilla is covered with a flat, nucleate epithelium, below which there are two muscle layers consisting of outer, thin, circular fibers and inner, thin, longitudinal ones. In the anterior section of the papilla, the nucleate epithelial lining and its subepithelial circular muscle fibers become thicker than those of the anterior section (Figs. 4; 6 B).

The male genital antrum is a cup-shaped cavity and is separated from the wide common genital antrum by the posterior constriction of the former (Figs. 4; 6 A-C). The roof and the posteroventral portion of the male antrum are covered with a thick, glandular, nucleate epithelium, below which there are two muscle layers, one of inner, thick, circular fibers and another of outer, thin, longitudinal ones. The floor of the male antrum has a thin nucleate epithelium accompanying a thin muscular coat of circular and longitudinal fibers (Figs. 4; 6 A and B).

The copulatory bursa is a large organ and is irregularly lobed. It seems in our slides that the copulatory bursa is strongly contracted (especially its underside) by the pressure of the pharynx when the animals were killed (Figs. 4; 6 B). The bursal stalk, a wide and long duct of almost uniform diameter, opens into the common genital antrum. The lumen of both the bursa and the stalk (*i. e.*, bursal canal) is lined with a tall, highly glandular epithelium of a nucleate type (it is thinner at the dorsal side of the canal than the other part of it). The anterior three-fourth's of the bursal stalk is surrounded by a thin muscular coat consisting of an inner layer of circular fibers and an outer layer of longitudinal ones. The posterior one-fourth of the stalk forms a little-developed vagina accompanying a rather thick muscular coat. Apparently the longitudinal fibers are outermost but slightly intermingle with the circular fiber (Figs. 4; 6 B and C).

The posterior, terminal portion of the vagina, or the roof of the posterior portion of the common genital antrum, forms a rather wide but short tube or a diverticulum; the two ovovitelline ducts open into the terminal portion of this tube separately as shown in Figs. 4 and 6(C). This structure in

"*Planaria patagonica*" is described by BORELLI (1901, p. 4) as follows: "... un canale comune, nell'estremità allargata del canale uterino, vicino al punto dove quest'ultimo si apre nella cloaca (ovd.)". In "*Planaria Michaelsoni*", BÖHMIG (1902, pl. II, fig. 37) used the term "Drüsen". Is this structure the common ovovitelline duct or a diverticulum of the terminal portion of the bursal canal? At the present, we are inclined to think that it is the common ovovitelline duct because it receives in its terminal portion numerous erythrophilic gland ducts that apparently seem to be the shell glands. The surrounding musculature is thinner than that of the vagina and the posterior wall of the common genital antrum.

The most peculiar feature in the genital anatomy of this species is the presence of a wide, blind, oblong cavity or a pocket in the common genital antrum. This apparatus was called a "diverticoli" (cf. BORELLI, 1901, pp. 2-3, fig.) or a "Taschen des Atrium genitale" (cf. BÖHMIG, 1902, pl. II, fig. 37). In our slides, it measures to approximately 120 micrometers in diameter at the widest portion; the width measures up to 500 to 550 micrometers (equal to a distance of the inter-eye width). It was observed in the sagittal sections of the Specimen Lot No. 1092-b that the lumen of the two lateral pouches of this apparatus is lined with a thick, highly glandular, nucleate epithelium. The thick muscular coat surrounding this apparatus consists of the three principal layers, *i. e.*, an inner thick one of longitudinal fibers, a very thick one of circular fibers with intermingled longitudinal fibers, and an outermost one of circular fibers. This muscular coat is thicker in the dorsal and ventral sides of the apparatus than in the anterior and posterior sides of it (Figs. 5; 6 D). The lumen of both the lateral pouches of the apparatus receives numerous erythrophilic gland ducts from the two sides as shown in Figs. 5 and 6(D).

The middle part of the common genital antrum is a wide cavity, which continues to the male genital antrum anteriorly and to the vagina dorsally, and opens to the genital pore ventrally by a narrow, tubular portion of the antrum (Figs. 4; 6 B and C). The antrum is lined with a tall, glandular, nucleate epithelium, below which there are two muscle layers, a slightly thickened one of circular fibers and a rather thick outer one of longitudinal fibers. Weakly erythrophilous cement glands open into the terminal portion of the tubular cavity of the antrum near the genital pore.

The cocoon of this species is not known.

Material: Two sets of sagittal serial sections (Specimen Lot. No. 1092 a, b) of the sexually mature specimens, several sets of sections of non-sexual specimens (Nos. 652 a-d, 653 a-c, 1032 a-h, 1092 c, d), whole mounts (Nos.

1090 a, 1091 a), and preserved non-sexual specimens in 70% ethanol are retained by the senior author (KAWAKATSU's laboratory, Fuji Women's College, Sapporo).

Locality: See the "Section 2" in the present paper.

5. Taxonomic Remarks and Differential Diagnosis of *Cura patagonica*

The taxonomic position of the genera in the family Dugesiidae was discussed by Dr. BALL in his serial papers published during the past ten years (BALL, 1974 a, b, c, 1975, 1977 a, b, c, 1980, 1981; BALL and TRAN, 1979; HAY and BALL, 1979). It must be said that the opinion is divided among taxonomists as to the taxonomic status of the subgenera and/or species of the genera *Dugesia s.l.* (cf. *Euplanaria* in KENK, 1930, p. 291; *Dugesia* in MARCUS, 1946, pp. 145-146; *Dugesia* in HYMAN, 1951, p. 158) and *Cura s.l.* (cf. *Curtisia* in KENK, 1930, p. 290; *Curtisia* in MARCUS, 1946, p. 142; *Curtisia* in HYMAN, 1951, p. 160; see also MARCUS, 1955, pp. 111-112, including the key of 10 species of the genus *Cura*).

KENK (1974, pp. 11-12) has listed up 7 species of the genus *Cura* STRAND, 1942, in his "Index of the Genera and Species of the Freshwater Triclad (Turbellaria) of the World". They are as follows:

Cura azteca BENAZZI et GIANNINI, 1971, from México; *Cura evelinae* MARCUS, 1955, from South Africa; *Cura falklandica* (WESTBLAD, 1952) from Falkland Islands; *Cura foremanii* (GIRARD, 1852) from Eastern and Central North America; *Cura michaelsoni* (BÖHMIG, 1902) from South Chile; *Cura patagonica* (BORELLI, 1901) from Argentina; *Cura pinguis* (WEISS, 1909) from Australia and South Pacific islands.

BALL (1974 c, pp. 11-18), who gave a new diagnosis of the genus *Cura s.s.*, listed 5 species: *C. azteca*, *C. foremanii*, *C. michaelsoni*, *C. patagonica*, and *C. pinguis*. He also transferred 2 species including KENK's (*op. cit.*) list into the genus *Neppia* BALL, 1974 (it was described as a subgenus of the genus *Dugesia s.l.* in his paper of 1974 a, and then a new generic diagnosis was given in his later paper of 1974 c, p. 18): *C. evelinae* and *C. falklandica*. In addition to them, BALL (1974 c, pp. 18-27) also placed the other 6 species from South America, East and South Africa, and New Zealand in his genus *Neppia*. Those species are placed in the genus *Dugesia s.l.* GIRARD, 1850, in the KENK's (1974) list. They are: *Dugesia jeanneli* (DE BEAUCHAMP, 1913) from East Africa; *Dugesia montana* NURSE, 1950, from New Zealand (3 subspecies including a nominate one are there according to the original author); *Dugesia paeta* (MARCUS, 1955) from South Africa;

Dugesia schubarti (MARCUS, 1946) from Brazil; *Dugesia tinga* (MARCUS, 1955) from South Africa; *Dugesia wimbimba* (MARCUS, 1970) from South Africa.

Among those 13 species in the *Dugesia-Cura-Neppia* group, BALL (1974 c) has examined slides of the type-series and/or newly prepared slides of his own of the following 9 species. They are: *Cura foremanii*, *Cura pinguis*, *Neppia evelinae*, *Neppia falklandica*, *Neppia jeanneli*, *Neppia montana*, *Neppia paeta*, *Neppia schubarti*, and *Neppia tinga*. We examined our own slides of 5 species. They are: *Cura azteca* (cf. KAWAKATSU and MITCHELL, 1984), *Cura foremanii* (cf. KAWAKATSU and MITCHELL, 1982), *Cura patagonica* (redescribed in the present paper), *Cura pinguis* (cf. KAWAKATSU, 1969 a, b), and *Dugesia schubarti* (cf. KAWAKATSU, HAUSER and FRIEDRICH, 1976; KAWAKATSU, HAUSER, FRIEDRICH and SOUZA LIMA, 1982). Based upon the samples collected from the type-locality of *Cura azteca*, this Mexican species was redescribed by us as *Dugesia azteca* (BENAZZI et GIANNINI, 1971) (cf. KAWAKATSU and MITCHELL, 1984). Our opinion is different from that of Dr. BALL as to the position of *Dugesia schubarti* (MARCUS, 1946), a species widely distributed in the southeastern area of Brazil.

Planaria ambigua BÖHMIG, 1902, from the vicinity of Punta Arenas, South Chile, seems to be a *Cura* species (cf. MARCUS, 1946, 1954), but is a species inquirenda (cf. KENK, 1974, p. 45; BALL, 1974 c, p. 28). BERGENDAL's (1899, pp. 523-524) record of a freshwater planarian (*Planaria* sp.) from the same district is uncertain.

In the temperate zone of Chile and Argentina, 8 species of the genus *Dugesia* s. l. are known, of which 2 are species inquirenda. They are as follows:

Dugesia anceps (KENK, 1930) (*olim Planaria dubia* BORELLI, 1895) from Paraguay and Argentina; *Dugesia andina* (BORELLI, 1895) (*olim Planaria andina*) from Argentina; *Dugesia chillia* MARCUS, 1954, from Chile; *Dugesia dimorpha* (BÖHMIG, 1902) (*olim Planaria dimorpha*) from Chile; *Dugesia rincona* MARCUS, 1954, from Chile; *Dugesia sanchaezi* HYMAN, 1959, from Chile; *Planaria laurentina* BORELLI, 1897, from Argentina (cf. MARCUS, 1946; KENK, 1974, pp. 48-49); *Planaria similis* BÖHMIG, 1902, from Chile (cf. MARCUS, 1946; KENK, 1974, p. 51). Only *D. chillia* is recorded from the vicinity of Punta Arenas in the subfrigid zone of Chile, too (cf. MARCUS, 1954).

The above-mentioned 6 *Dugesia* species have a triangular head with a pair of well- (or moderately) developed auricles, ventral or dorsal testes extending to nearly the posterior end of the body, and without a diaphragm

in the penis lumen (*i. e.*, members of the subgenus *Girardia* BALL, 1974). The remaining 2 uncertain species have a triangular head with well- (or moderately) developed auricles (see BORELLI, 1897, p. 1, fig.; BÖHMIG, 1902, pl. I, figs. 25-26). Externally and/or anatomically, all these species are quite different from *Cura patagonica*. According to our data, *Dugesia rincona* occurs in the vicinity of Lima, Peru (cf. KAWAKATSU, MITCHELL and KISHIDA, 1983).

We return to the taxonomic discussion of the *Cura* species. According to BALL's (1974 c, p. 12; see also BALL, 1974 a, p. 377) classification, only 4 species are counted in the genus *Cura s. s.* (*foremanii*, *michaelseni*, *patagonica*, and *pinguis*) except for *Dugesia azteca* mentioned in the foregoing paragraph. *C. patagonica* can easily be separated from *C. foremanii* and *C. pinguis* by the difference of the external appearance and the details of the genital anatomy (see KAWAKATSU, 1969 a, b; KAWAKATSU and MITCHELL, 1982).

KAWAKATSU's (1969 a, b) description of *Cura pinguis* from New Caledonia and the vicinity of Canberra, Australia, includes some errors (cf. BALL, 1970, p. 285, 1974 a, p. 368). Due to the faint stain of the sections, the trace of the musculature is rather difficult to interpret in KAWAKATSU's samples of *C. pinguis* (Specimen Lot Nos. 547, 567, 568, 569). But, the following corrections and additional notes should be necessary: 1) musculature of the bursa stalk consists of inner circular fibers and outer, discontinuous longitudinal ones; 2) the two sperm ducts enter separately into the penis bulb and form a slight expansion, which continues to a narrow, tubular ejaculatory duct (the use of a term "common sperm duct" for this expansion may not be justified; 3) a very short common ovovitelline duct may be present, but careful reexamination of the new material is necessary.

Cura foremanii has a rather long common ovovitelline duct. The muscular coat of almost all parts of the bursa stalk consists of a single, thin layer of circular fibers (or at least we cannot trace the outer thin longitudinal muscle fibers in our specimens examined; cf. KAWAKATSU and MITCHELL, 1982, p. 99 and fig. 5 A-C on pp. 96-97).

The difference between *Cura patagonica* and *Cura michelseni*, a little known species, is very little. The schematic figures of the copulatory apparatus of these two species (Fig. 4; see BÖHMIG, 1902, pl. II, fig. 37) are similar. *C. michelseni* has a rather wide bulbar cavity with many folds, three layers of muscle fibers surrounding the bursa stalk, and the shell glands (eosinophile Drüsen) which open ectally and entally to the "Drüsengang". BALL (1974 c, p. 14) emphasized that the last mentioned character is an

unusual arrangement, and it served to distinguish *C. michaelsoni* from *C. patagonica*. It is, however, highly probable that *C. michaelsoni* is identical with *C. patagonica* as already proposed by DE BEAUCHAMP (1939), or is a subspecies of the latter. We defer the final conclusion about this until future samples from South Chile are available.

KENK (1974, p. 11) recognized MARCUS' (1955) *Cura evelinae* from Cape Province, South Africa, and WESTBLAD's (1952) *Cura falklandica* from Port Stanley, Falkland Islands. BALL (1974 a, c), who studied the type-series of these two species, placed them in his genus *Neppia* (BALL, 1974 c, pp. 22-24, p. 48, fig. 6 C). The former has a spatulate head, 8 to 15 pairs of dorsal testes extending the prepharyngeal region, an elongate and muscular penis bulb with a wide bulbar cavity, a narrow ejaculatory duct with an enlargement of its proximal part, a rather muscular penis papilla of a slender knobbed cone form, and a short common ovovitelline duct which enters the posterior part of the bursa stalk (cf. MARCUS, 1955, pp. 105-107, p. 112, pp. 142-143, pl. 3, figs. 15-20, pl. 4, figs. 21-22). The latter has a subtruncate head, about 15 pairs of dorsal testes extending the prepharyngeal region, an elongated penis bulb with a wide bulbar cavity, an ejaculatory duct with a large glandular chamber of its proximal part, and a moderately muscular, conical penis papilla (cf. WESTBLAD, 1952, pp. 49-51, fig. 24 A-C; BALL, 1974 c, pp. 22-23, 48, fig. 6 C). The course of the sperm ducts and the separate opening of the ovovitelline ducts into the posterior part of the bursa stalk in this species are different from the former. More detailed description and discussion of the genital anatomy of these two species are given by BALL (1974 c).

The presence of a diaphragm in the penis lumen of *Cura patagonica* is contrary to the diagnosis of the genus *Cura s. s.* (cf. BALL, 1974 c, pp. 11-12). However, we examined only 2 sexual specimens and we cannot trace this structure in the sections of the Specimen No. 1092-a. Further examination of well-preserved, additional specimens are necessary for correction of the generic diagnosis.

Cura patagonica is defined as follows: animal small in size (living animal probably less than 12 mm in length) and blackish brown to nearly black-colored with numerous blackish pigments on the dorsal surface (an indistinct, pale colored middorsal line can be seen at the prepharyngeal and pharyngeal regions), dark brown to blackish brown with numerous dark colored spots on the ventral surface; head subtruncate with a bluntly pointed tip and bears a pair of very short, bluntly pointed auricles (sometimes several sensory spots can be seen at the frontal margin of the head); two eyes, each ac-

companying a non-pigmented, ocular area of a shortend lanceolate form; external musculature of the non-pigmented pharynx consisting of outer longitudinal and inner circular layers; dorsal testes (some of them occupy the dorsoventral space) in one longitudinal row on either side extending near to the pharyngeal base (less than 20 in total number); penis bulb moderately large, hemiglobose in shape, containing numerous erythrophilic gland ducts; bulbar cavity narrow and tubular, with a slightly bifid, narrow lumen at its proximal part into which sperm ducts open separately; symmetrical penis papilla moderately large, short and conical (it is occupied by inner cyanophilic and outer erythrophilic gland ducts), with a slightly wide ejaculatory duct; probably a diaphragm present in the penis lumen; copulatory bursa large in size, with a rather wide bursal canal opening to the wide common genital antrum; the posterior one-fourth of the brusa stalk forms a little-developed vagina, which receives a rather wide but short common ovovitelline duct at its posterior terminal portion; common genital antrum (it is sharply

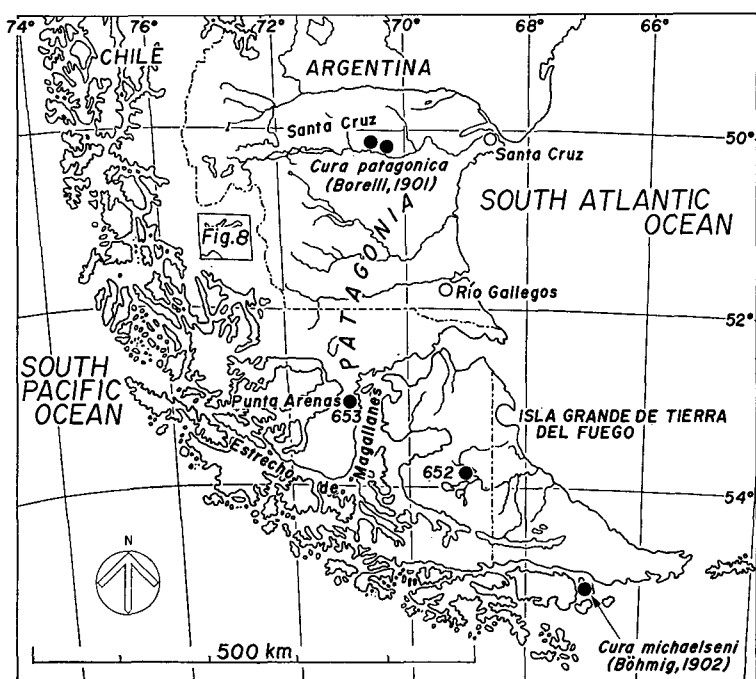


Fig. 7. Sketch-map of the Patagonia region, showing the known localities of *Cura patagonica* (BORELLI, 1901) and *Cura michaelseni* (BÖHMIG, 1902). For Specimen Lot Nos. see the section "List of Localities, etc."

separated from the male genital antrum) has a wide, blind, oblong cavity surrounded by a thick muscular coat and accompanying numerous erythrophilic gland ducts.

6. Distributional and Ecological Notes on *Cura patagonica*

Fig. 7 shows the localities of *Cura patagonica* (including localities of non-sexual specimens which seem to be this species) that we examined, together with the type-localities of "*Planaria patagonica*" and "*Planaria Michelseni*"; a detailed position of the collecting sites in the Paine mountainous area is also shown in the sketch map of Fig. 8.

The material of "*Planaria patagonica*" was collected from the "Dintorni del Río Santa-Cruz (Patagonia) fra 50 gradi 12' e 50 gradi 11' di latitudine

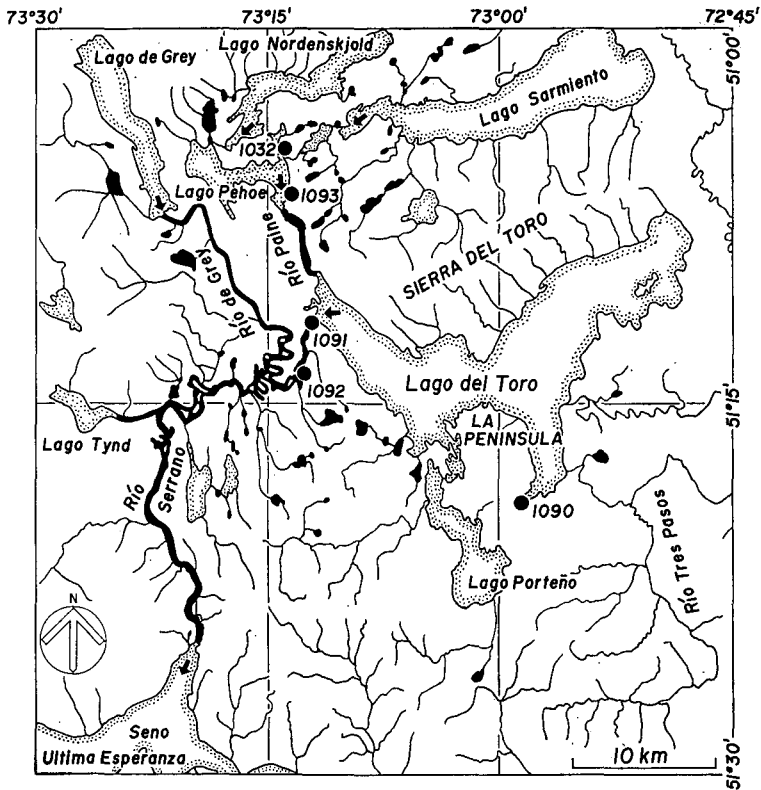


Fig. 8. Sketch-map of the Paine mountainous area, showing the collecting sites. Arrow indicates the direction of the watercourse. For Specimen Lot Nos. see the section "List of Localities, etc."

sud; 69 gradi 45' e 70 gradi 51' di longitudine ovest" (January 16-23, and February 3-12, 1900; w. t., ca. 10°C) (cf. BORELLI, 1901, p. 5). The type-locality of "*Planaria Michelseni*" is "Süd-Feuerländ. Archipel, Isl. Picton, Süßwasser-See, unter Steinen" (December 26, 1892) (cf. BÖHMIG, 1902, p. 22). BERGENDAL's (1899) uncertain species and BÖHMIG's (1902) "*Planaria ambigua*" were collected from the vicinities of Punta Arenas. Figures of the latter (cf. BÖHMIG, 1902, pl. I, figs. 29-30) are very similar to the external appearance of *Cura patagonica* which we examined.

Judging from our ecological data of the localities of *Cura patagonica* described in the "Section 2", the species is common in clean, cold-water streams and shores of lakes in the Paine mountainous area. The distance between BORELLI's localities and our localities is approximately 250 km. It is highly probable that *C. patagonica* is the predominant planarian in the southern area of Patagonia.

Summary

Redescription of *Cura patagonica* (BORELLI, 1901), a little known species of freshwater planarian (Turbellaria, Tricladida, Paludicola) reported originally from South Argentina as *Planaria patagonica*, is given in the present paper. The samples examined were collected from several localities in Patagonia in South Chile. Distributional and ecological data on this species are also given. *C. patagonica*, an inhabitant of clean, cold-waters, seems to be the predominant species of freshwater planarian in the southern area of Patagonia.

Acknowledgements

We wish to thank Dr. Masaru HAGA for supplying preserved specimens of this interesting planarian with their detailed collection data. We also thank Dr. Tatsuichi TSUJII, Botanic Garden, Faculty of Agriculture, Hokkaido University, who was a leader of the First Expedition to Patagonia, for some pertinent literature.

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