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ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

A NEW SPECIES OF BRANCHIURA (CRUSTACEA: MAXILLOPODA) FISH PARASITE FROM THE BRAZILIAN AMAZON

UNA NUEVA ESPECIE DE BRANCHIURA (CRUSTACEA: MAXILLOPODA) PARÁSITA DE PECES DE LA AMAZONIA BRASILEÑA

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ABSTRACT

Argulus ybatecobe n. sp. was collected parasitizing the body surface of *Potamorhina altamazonica* (Cope, 1878) (Curimatidae) from Lake Poción, in the complex of lakes of Catalán, municipality of Iranduba, Amazonas, Brazil. The new species is characterized by ovigerous ducts, extended to the lobes of the carapace, visible in the female; a pair of spines in the anterior portion of the buccal cone near the jaws; accessory sexual structures in the form of a flag in the 2nd and 4th pair of legs of the male; second leg with three structures similar to a flag and the third leg with a rounded structure and caudal branches with long arrows.

Key words: Argulidae – fish parasites – River Solimões

RESUMO

Argulus ybatecobe n. sp. foi coletado parasitando a superfície corporal de *Potamorhyna altamazonica* (Cope, 1878) do lago Poção, no complexo de lagos do Catalão, município de Iranduba, Amazonas, Brasil. A nova espécie é caracterizada por dutos ovígeros, estendidos aos lóbulos da carapaça, visíveis na fêmea; um par de espinhos na porção anterior do cone bucal próximo às mandíbulas; estruturas sexuais acessórias em forma de bandeira no 2º e 4º par de pernas do macho; segunda perna com três estruturas parecidas com uma bandeira e a terceira perna com uma estrutura em forma arredondada e ramos caudais com setas longas.

Palavras-chave: Argulidae – parasitas de peixes – Rio Solimões

RESUMEN

Argulus ybatecobe n. sp. fue colectado parasitando la superficie corporal de *Potamorhyna altamazonica* (Cope, 1878) del lago Poción, en el complejo de lagos del Catalán, municipio de Iranduba, Amazonas, Brasil. La nueva especie se caracteriza por ductos ovígeros, extendidos a los lóbulos del caparazón, visibles en la hembra; un par de espinas en la porción anterior del cono bucal cerca de las mandíbulas; estructuras sexuales accesorias en forma de bandera en el 2º y 4º par de patas del macho; segunda pata con tres estructuras parecidas a una bandera y la tercera pata con una estructura en forma redondeada y ramas caudales con flechas largas.

Palabras clave: Argulidae – parásitos de peces – Río Solimões

INTRODUCTION

Branchiura are ectoparasites both able to attach to the freshwater fish species slippery bodies and swim freely to find themselves another host. Nearly 210 species are known and they belong to four genera: *Argulus* Muller, 1785; *Dolops* Audouin, 1837; *Chonopeltis* Thiele 1900 and *Dipteropeltis* Calman, 1912 (Martin & Davis, 2001). Branchiura are ectoparasites mainly found on freshwater fish and yet some species of *Argulus* have been described on marine fishes. There are scattered reports on Branchiura species being found on tadpoles, salamanders and even alligators (Ringuelet, 1943; Piasecki & Avenant-Oldewage, 2008).

Thirteen *Argulus* species occur in Brazil (Malta, 1998; Luque *et al.,* 2013). Five of them, namely: *A. multicolor* Stekhoven, 1937; *A. pestifer* Ringuelet, 1948; *A. juparanaensis* Lemos de Castro, 1950; *A. amazonicus* Malta & Silva, 1986*; A. chicomendesi* Malta & Varella, 2000 (Malta, 1982; 1983;1984; 1998; Malta & Silva 1986; Malta & Varella, 2000), have been reported in the Amazon. The present study includes a description of one new species from the Amazon, Brazil.

MATERIAL AND METHODS

One female and one male of *Argulus ybatecobe* n. sp. collected in Lake Poção, in the Catalão complex, Iranduba municipality, Amazonas, Brazil, located between the Negro and Solimões rivers (03 º 010'04"S; 59 º 054`45" W). Samples were collected in November 2016, license SISBIO-6531958 and CEUA – 036/2016. Fishes were harvested with gill netting. Argulids were removed, fixed in 70 % ethanol and studied by light and stereo microscopy.

Temporary glycerin slides were prepared. All measurements are in millimeters. Drawings were made in light microscope Olympus BH-2 with camera lucid. Types, fixed in 70% ethanol, were deposited in the non-insect Invertebrate Collection of the National Research Institute of Amazonia (Female - INPA CR 2291 and Male – INPA CR 2292) Manaus, Amazonas, Brazil.

RESULTS

Argulus ybatecobe n. sp.
Material examined – Holotype adult female (INPA - CR 2291 and male INPA - CR 2292) from the body surface of *Potamorhyna altamazonica* Cope, 1878, from Catalão floodplain lakes complex, located between the Negro and Solimões rivers $03^{0}10`04”$ S $59^{0}54`45”$ W, State of Amazonas, Brazil.

Female (Figs. 1 – 11)
Total length 2.8 (Figs. 1 and 2). Elongated body. Carapace's translucent beige surface with ovigerous ducts of dense, irregular and brown

color, the structure of which resembles a tree (Figs. 1 and 2)**.** Carapace more long than wide. Carapace length 1.7, total length / carapace length (tl / cl) 1.6 ratio. Absent side grooves. Edge of suction cups visible in dorsal view (Figures 1 and 2). Well defined interocular ribs. Large paired compound eyes in anterior third of the body (Figure 1). Nauplius eye located on dorsal surface near the center of carapace. Ventral surface of anterior frontal region armed with numerous, similar-sized sharply pointed regularly arranged spines beyond anterior margin of larger respiratory area (Figure 7).

Lateral lobes broadly rounded, extending posteriorly to cover base of 2nd pair of legs (Figures 1 and 2) separated by large V-shaped sinus less than 1/2 the length of the carapace. Carapace length / width (cl/w) ratio of 0.9. Respiratory areas consist of a smaller, anterior ovoid “area ” and a larger, posterior "J-shaped" “area” (Figure 7) gently defined on the ventral surface of the lobes, little visible in dorsal view.

Thorax (Figs. 1 and 2) distended with large eggs and smooth indistinctly 4-segmented ventral surface. Dorsal surface displaying three longitudinal bands, the two lateral ones being formed by irregular patches and the central one with no patches.

Abdomen more long than wide, length (Figs. 1 and 2) 0.73 and width 0.39. Posterior lobes taper into sharp tips, separated by sinus, encompassing nearly 55% of total abdomen length. Spinules in the dorsal and ventral portions located below the spermathecae. Caudal rami long, slender, basal in anal sinus. Paired spermathecae small and orbicular (Figs. 1 and 2).

First antenna (Figure 10) comprising 2 sections; the first section is 2-segmented, the broad proximal and, the slender distal one with a large spine; and the second section is 4-segmented with setae. First segment bearing a large rounded posterior spine and two rounded elevations; second segment possessing anterior spine with small hook; slender hook-like terminal spine; two rounded medial spines. Distal section of antenna comprising 4 segments; terminal section with group of apical spines. Second antenna (Figure 10) 4-segmented; first segment with inconspicuous posterior spine; all segments bearing short setae; fourth segment terminating in group of apical spines. Pair of post-antennal spines rounded on ventral surface of cephalothorax on either side of midline.

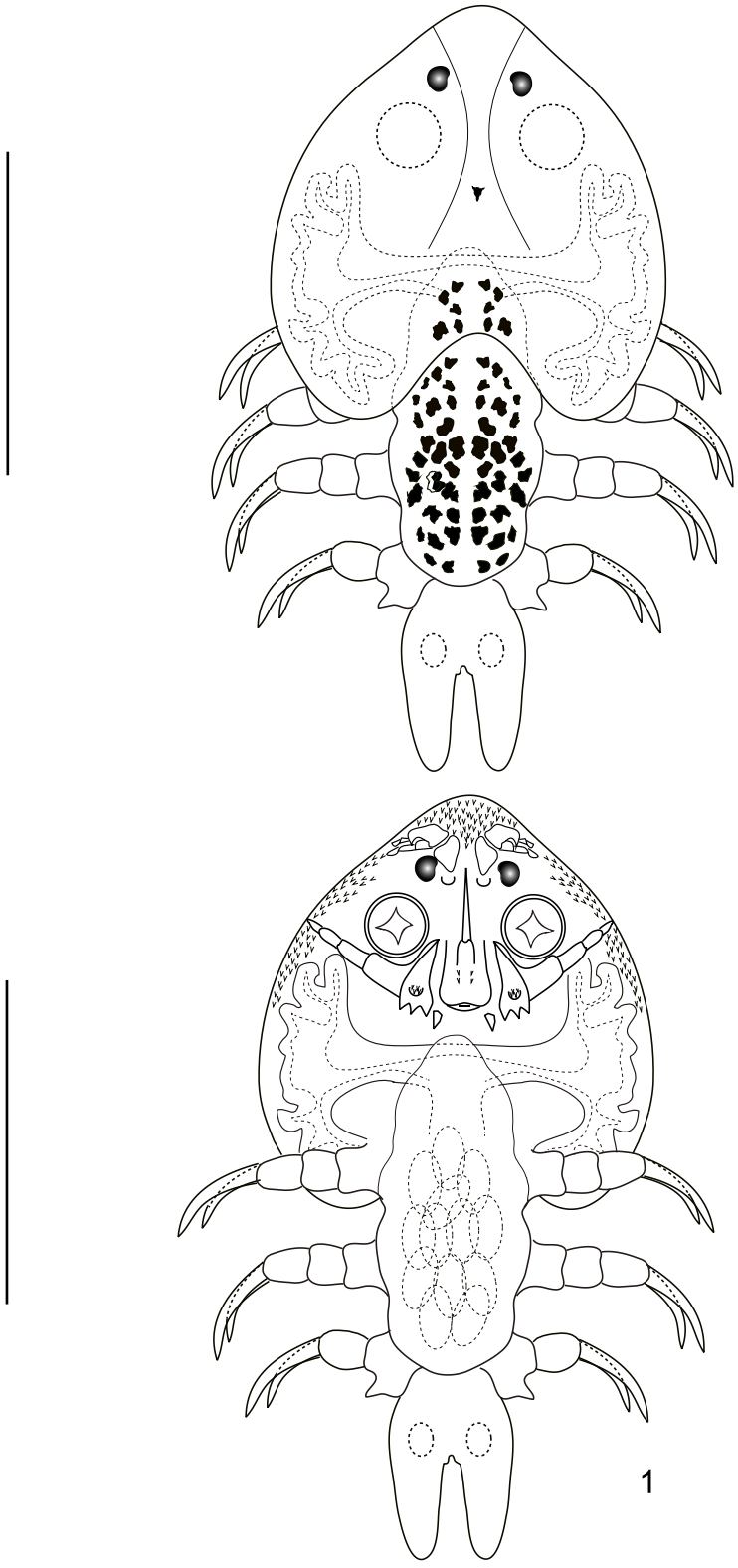
First maxilla forming large suction cups; supporting rods with 4 - 7 sclerites (Figure 12), rod elements similar in form; rim of suction cups with a fringe of setae from anterolateral portion. Second maxillae (Figure 11) with of 5 segments; basal plate ornamented with 3 posteriorly directed sharp teeth and long antero-lateral process, 4 - 5 conical spines in basal segment nodule; 2nd segment with pectinated scales in the mid-distal portion; 3rd and 4th segments very short, with pectinated scales; 5th segment with a spine and two conical structures with rounded edges (Figs. 8 and 9).

Retractile pre-oral spine, without scales, located midway between maxillary suckers. Mouth tube of moderate length, usually not reaching thoracic accessory spines, bearing a pair of simple spines on its anterior margin. Denticulate mandibles visible within mouth-tube (Figure 2).

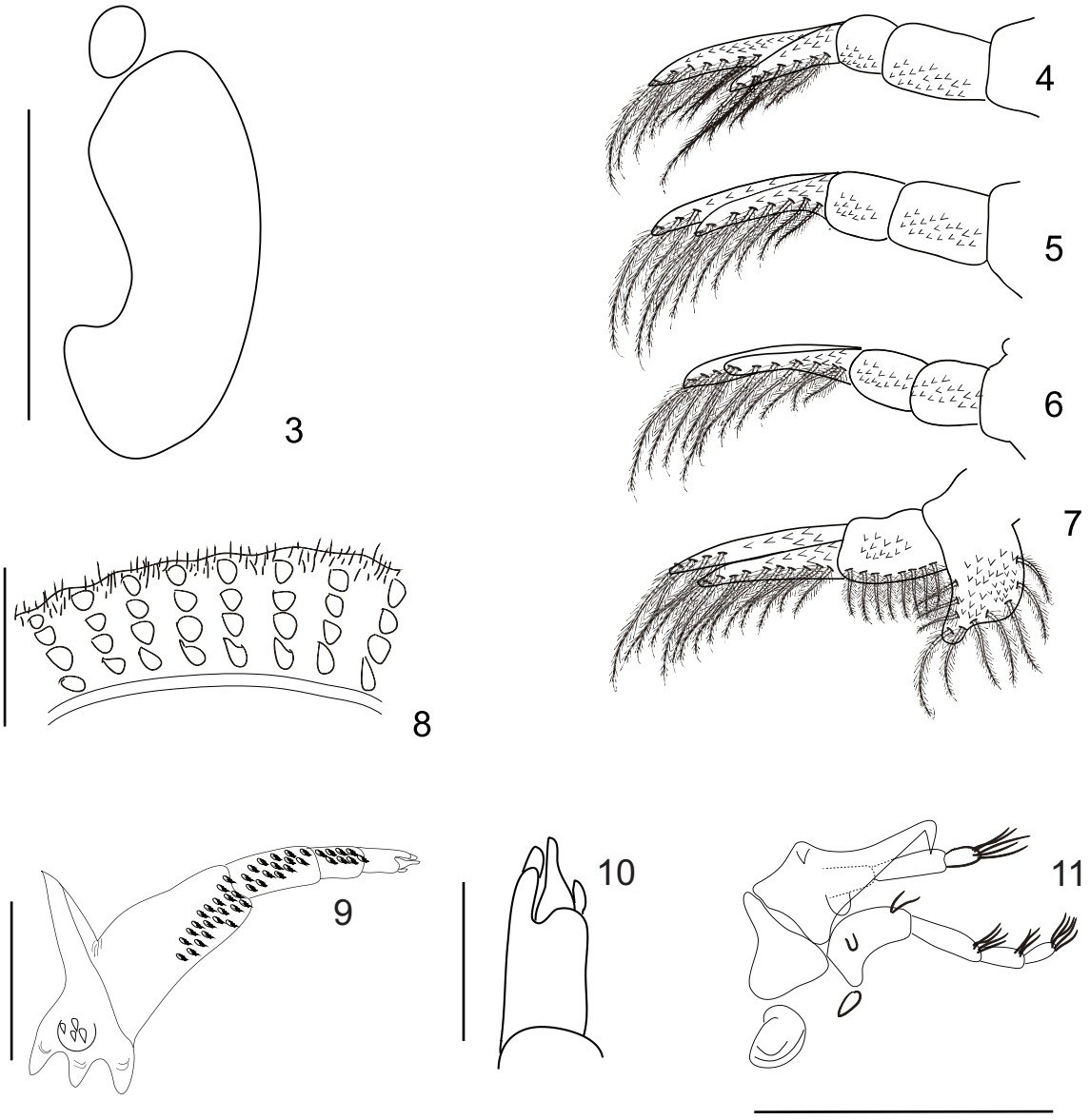
Pair of accessory spines located between maxillae (Figure 2) and pair of thoracic spines posterior to the maxillae (Figure 2). First to 4th pair of legs are biramous (Figure 6) and nearly equal-sized; sympods 2-segmented (precoxa, coxa, basis, exopod, and endopod) exopods and endopods with plumose setae; no flagellum; legs with simple scales in the middle ventral portion, rami bearing long plumose setae. Natatory lobe on 4th leg (coxopodite expansion) with five plumose setae.

Male (Figures 12 - 16)
Total length 2.92 mm. Surface of translucent beige carapace, but with a softer and dense coloration than that in females. Carapace heart-shaped, slightly more wide than long. Carapace length 1.42 mm (Table 1). Frontal region (Figure 12) more defined than in females. Lateral lobes broadly rounded (Figure 12) separated by large V-shaped sinus less than 1/2 the length of the carapace similar to females'. Similar duct structure smaller and less dense than female's. Respiratory areas (Figure 7) visible only in the ventral region of the carapace.

Thorax (Figure 12) smaller, narrower and less prominent than the females' with four well defined somites. Dorsal surface with two irregular



Figures 1 – 2. *Argulus ybatecobe* sp. n.; 1 – Dorsal female; 2 – Ventral female (Bar=1.0mm).



Figures 3-11. *Argulus ybatecobe* sp. n., 3 – respiratory area (Bar=1.0mm); 4 – 7 legs female (Bar=1.0mm); 8 – maxilla 1(Bar=0.1mm); 9 maxilla 2 (Bar=1.0mm); 10 – distal portion maxilla 2 (Bar=0.1mm); and 11 - Antennas.

longitudinal bands, the lateral ones being formed by small circular patches less evident than the female's.

Abdomen (Figure 12) rectangular slightly more long than wide. Abdomen width 0.39. Abdomen length 0.91. Pair of well-defined testicles in the same format as the abdomen, occupying nearly 90% of the abdominal area. Lobes with the anal sinus lanceolate on posterior extremities. Well defined posterior sinus, with about 42% of the total length of the abdomen. Large caudal. On each side of the midline of the abdomen there are pigments forming small dark spots.

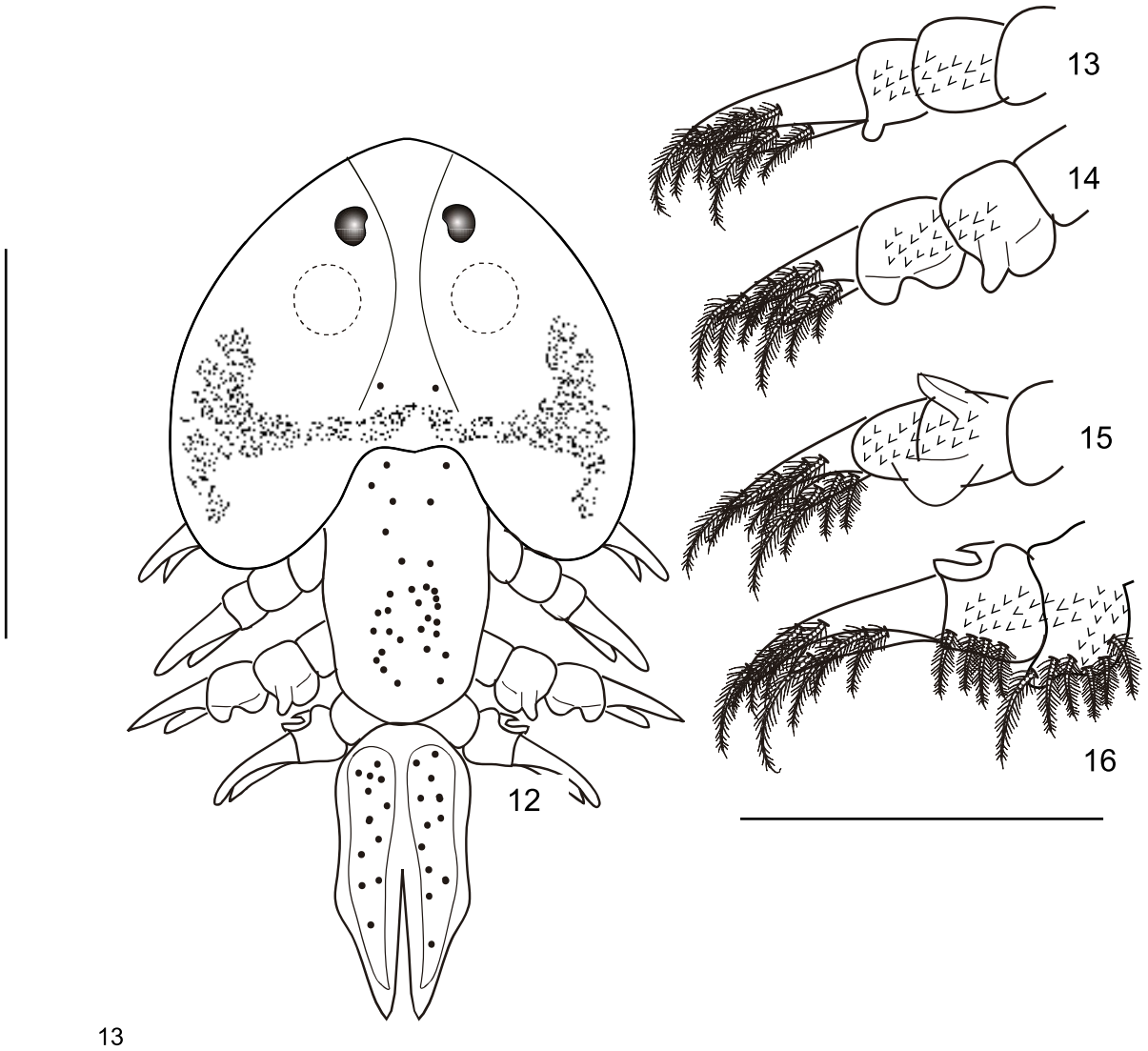
First to fourth pair of biramous legs (swimming legs, thoracic legs, thoracopods, pereopods) are nearly equal-sized; sympods 2-segmented

(precoxa, coxa, basis, exopod, and endopod) exopods and endopods with plumose setae (Figure 13 - 16). First pair of legs like the females. Secondary sexual modifications on 2nd, 3rd and 4th pair of legs.

Accessory copulatory structures on second leg consist of three flag-like protrusions (Figure 14 and 15). Third leg with one rounded flag-like protrusion (Figure 16). Fourth leg with peg process on anterior side modified at the point of opposition of the cup-shaped elevation (accessory copulatory structure). Modifications of the male's fourth pair of legs include a strong anterior projection with a median aperture having the inner "U" shape covering the gonopore. Natatory lobes are short and rectangular bearing four plumose setae.

Area of attachment: body surface, fins base, gills and buccal cavities.

Etymology: The specific name *Argulus ybatecobe* refers to the structure that resembles a tree formed by ducts in the carapace lobes, where eggs are stored, the name derives from the Tupi-Guarani language (ybá = tree + tecobe = life), tree of life.



Figures 12 – 16: 12 – Dorsal male *Argulus ybatecobe* sp. n. (Bar=1.0mm); Legs Male, 13- leg 1; 14 – leg 2; 15 – leg 3; and 16 – leg 4(Bar=1.0mm).

DISCUSSION

Argulus ybatecobe n. sp. is the sixth species of the genus *Argulus* cited for the Amazon. *Argulus ybatecobe* is like *A. chicomendesi* Malta & Varella, 2000. But it differs because it is smaller, by the presence of spines in the ventral region of the carapace between the first and second maxilla, in the form of respiratory areas, in the accessory copulatory structure of the second, third and fourth legs of the male and in the tree-shaped ovigerous ducts,, evident in the lobes of the carapace.

Accessory sexual structures in flag-like form on 2nd 3rd, 4th legs also occurred in two other species, *A. ernsti* Weibezahn & Cobo, 1964 from Venezuela, two flag-like structures in flag-like form ion the second and two in the third pair of legs with different shapes (Weibezahn & Cobo, 1964). And *A. smalei* Avennant-Oldewage & Oldewage, 1995 from South Africa, on posterior face of 2nd leg flat disc covered by pectinate scales. Two bulbous and flag-like protrusions covered by scales on anterior face of 3rd leg (Avennant-Oldewage & Oldewage, 1995). On *Argulus ybatecobe* n. sp. the structures on second leg consist of three flag-like protusions and, on the third leg one rounded flag-like protrusion.

The mouth tube of *Argulus fryeri* Rushton-Mellor, 1994 from Lake Turkana, Kenya, Africa, bears a pair of accessory spines located posterior to mouth-tube. *Argulus gracilis* Rushton-Mellor, 1994 from Lake Tanganyika exhibits a pair of accessory spines located on either side of labium (Rushton-Mellor, 1994). *Argulus ybatecobe* n. sp. also displays a pair of simple spines on its anterior margin of mouth tube.

Carapace slightly more long than broad like *A. pestifer* Ringuelet, 1948. But partly covering the second pair of legs in *A. ybatecobe* being like *A. chicomendesi* (Malta & Varella, 2000). In *Argulus ybatecobe* n. sp. duct is seen to store eggs (observed for egg storage) in the carapace lobes, a unique characteristic not observed in other species already described.

Argulus ybatecobe n. sp. is characterized by ovigerous ducts, extending to the carapace lobes, visible in the female. By the presence of a pair of spines in the anterior portion near the mouth, accessory flag-like sexual structures on 2nd 3rd, 4th legs. Second leg has three flag-like structures and the third leg one rounded flag-like structure in the male. Caudal rami with long setae and a pair of spines in the anterior portion near the mouth.

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