

# New Records of Cladocera (Crustacea) for Trinidad, West Indies

Azad Mohammed

Department of Life Sciences, The University of the West Indies  
St Augustine, Trinidad and Tobago  
E-mail: Mohc0134@trini.com

## ABSTRACT

Four cladoceran species, *Latonopsis occidentalis*, *Diaphanosoma brachyurum*, *Ceriodaphnia rigaudii* and *Moinodaphnia macleayi*, are recorded from Trinidad for the first time. All four are known from other areas of the Caribbean and South America. However, some show modest morphological differences when compared to those described elsewhere. These new records increase the known geographic distribution of the order, Cladocera.

**Key Words:** Cladocera, Water-fleas, Trinidad and Tobago.

## INTRODUCTION

Cladocerans (water-fleas) are a group of small crustaceans, with a wide geographic distribution. The majority of species are eurythermal, but the distribution of some is limited by temperature. Among these latter, at least three species are cold stenothermal (*Latona*, *Holopedium gibberum* and *Daphnia longiremis*), while *Pseudosida bidentata*, *Ceriodaphnia rigaudii* and *Euryalona occidentalis* are restricted to warm waters (Pennak 1998).

The morphology and distribution of these organisms have been well documented (Goulden 1968; Delome 1991; Pennak 1998). The majority of species live in freshwater, but a few marine species belonging to the family Polyphemidae have been reported (Delorme 1991). Because of their wide distribution and variation within species, the systematics of this group remains problematic. With the exception of Cuba, Puerto Rico and Haiti, faunistic knowledge of Caribbean cladocerans is very limited. To date, no species is recorded from Trinidad. Extensive studies have been done in some mainland Latin American countries, such as Mexico, Panama, Brazil and Venezuela, which lie west of Trinidad (Frey 1982).

Zoppi de Roa and Vasquez (1991) were able to identify 24 species in Mantecal (Apure state, Venezuela) in Venezuela. Of these, 18 belonging to 6 families (Sididae, Daphniidae, Moinidae, Macrothricidae, Chydroidae and Aloninae) were new records for Mantecal and nine were new records for Venezuela. In a review of cladoceran records for the wider Caribbean region by Frey (1981) species belonging to several families, including Sididae, Daphniidae, Moinidae, Bosminidae, Macrothricidae and Chydoridae were identified. Four species of the genus *Daphnia* (*D. laevis*, *D. pulicaria*, *D. parvula* and *D. ambigua*), and three *Ceriodaphnia* (*C. cornuta*, *C. dubia* and *C. rigaudii*) were reported for the Greater Antilles. Four members of the family Sididae (*Diaphanosoma brachyurum*, *D. brevireme*, *Latonopsis occidentalis* and *L. fasciculate*) have also been identified, and *Moina micrura*, *M. affinis* and *Moinodaphnia macleayi* from the family Moinidae appeared to be most widely distributed (Frey 1981).

Trinidad and Tobago sits on the continental shelf of South America and is only 12 kilometers from Venezuela. Geological evidence suggests that Trinidad had a dry-land connection to the mainland as recent as about 11,000-15,000 years ago (EMA 2001). The flora and fauna of Trinidad is therefore a natural extension of South American populations. This paper identifies four new cladocera records for Trinidad, but species, which were identified in Venezuela.

## METHODS

Water samples (40 l) were collected from ten isolated pools in

an isolated forest stand at Valencia in northern Trinidad. A 500 ml beaker was used to collect water from the pools and was then transferred to a large 20 l bucket. Organisms were also collected using a 50 mm mesh plankton net. These samples were aerated and maintained as cultures at the Department of Life Sciences, University of the West Indies at St. Augustine. The invertebrate fauna was then sampled and examined using a compound light microscope. Species identification was done using different taxonomic keys (Goulden 1968; Pennak 1898; Delorme 1991). A minimum of 50 organisms was examined for each of the taxonomic groups and measurements made of standard body length and lengths of the antennae.

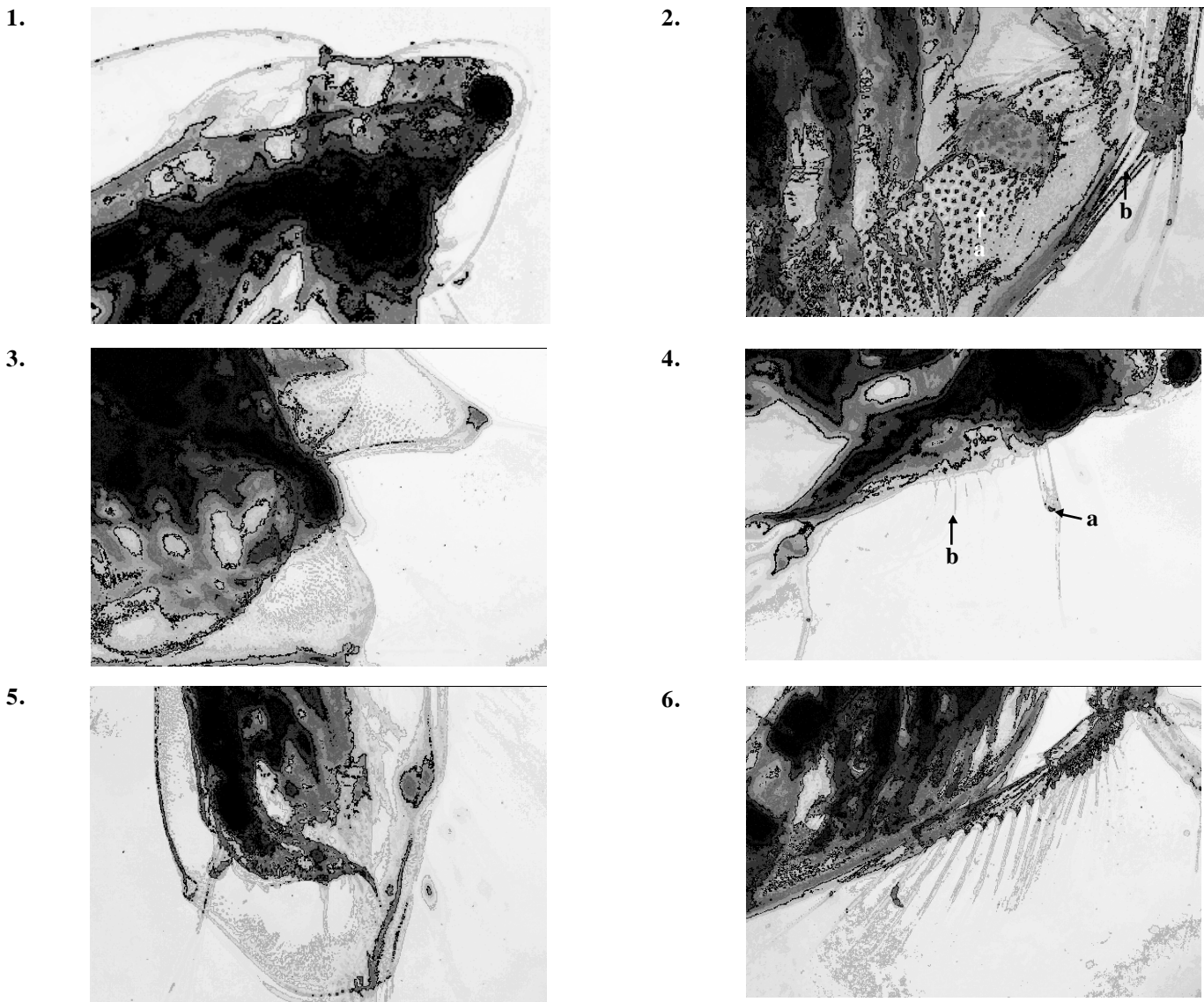
## RESULTS

In most of the pools sampled, natural populations of cladocerans were present. Ambient temperatures of the pools ranged between 26-28°C and the relative humidity of the area was above 90%. From the samples collected, four cladoceran species belonging to three families (Sididae, Daphniidae and Moinidae) were identified.

### Description of Species

#### Sididae: *Latonopsis occidentalis* Birge

An ocellus is markedly absent, as was described for species from Mantecal, Venezuela (Zoppi de Roa and Vasquez 1991). The head appears triangular, with the eye in the apex of the triangle (Fig. 1). Body length was about 1.7 – 2.0 mm, body width about 0.6 - 0.8 mm. The carapace has numerous pyramidal surface reticulations (Fig. 2). The posterior end of the carapace appears indented on the dorsal rim (Fig. 3). At the point of indentation, there are six long setae and eight shorter marginal spines. Along the ventral rim, just posterior to the head, there are 14 setae (Fig. 4). The abdominal claw has three basal spines, instead of two as reported species from Mantecal. There are also about 4-6 denticles present, the last two of which are very prominent (Fig. 5). The first antennae measures about  $0.26 \pm 0.003$  mm and has one long spine and 4-6 short filamentous setae. The basal segment of the second antennae is about  $0.53 \pm 0.03$  mm long and  $0.2 \pm 0.03$  mm wide. The distal end has two short spines and a long seta. The dorsal ramus is approximately twice as long as the ventral one. The first segment of the dorsal ramus is about  $0.21 \pm 0.02$  mm long and  $0.1 \pm 0.009$  mm wide with eight feathery setae and two spines on the distal end. The second segment is approximately twice as long as the first ( $0.43 \pm 0.03$  mm) but only about half as wide ( $0.05 \pm 0.004$  mm), and has eleven setae and two spines on the distal end (Fig. 6). The ventral ramus has three segments, the first ( $0.03 \pm 0.001$  mm) and



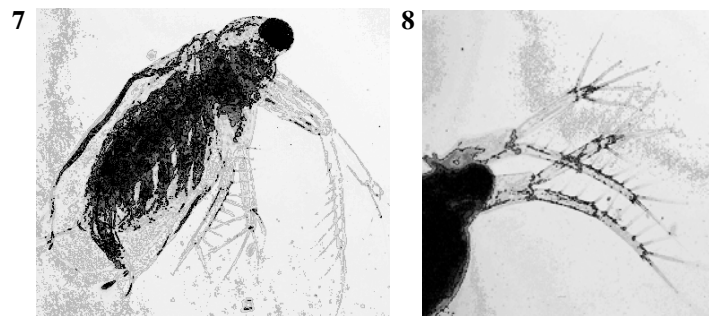
**Plate I: Figs. 1- 6.**

*Latonopsis occidentalis*: **1.** Head with eye, ocellus absent (x63); **2.** (a) Surface reticulations, (b) Second ramus of the first antenna (x63); **3.** Posterior end of the carapace (x63); **4.** (a) First antenna (x63), (b) Setae along the ventral margin of the carapace (x63); **5.** Abdominal claw with three basal spines (x63); **6.** Dorsal ramus of the second antenna with setation (x63).

third ( $0.05 \pm 0.001$  mm) are much smaller than the second ( $0.21 \pm 0.01$  mm). There is one seta on the second segment, and four on the third segment. Three of the setae are apical and one about half way along its length (Fig. 2). The setation formula for this species is 8-11/0-1-4.

**Sididae: *Diaphanosoma brachyurum* (Liéven)**

An ocellus is conspicuously absent in this species. The head appears rounded, with the eye almost completely filling the anterior region (Fig. 7). The body appears elongated with the length ranging from 0.8 to 1 mm. The surface of the carapace is covered by small, raised hexagonal reticulations. The abdominal claw has three basal spines. The first antennae measures about  $0.09 \pm 0.02$  mm and has one long spine and three short filamentous setae. The basal segment of the second antennae has one small seta close to the point of attachment of the two rami and one on the third formix. The two rami are almost of equal length. The first segment of the dorsal rami



**Plate II: Figs. 7- 8.**

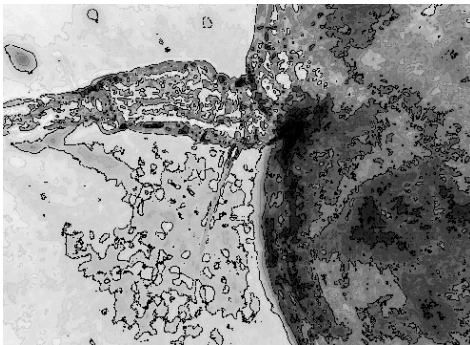
*Diaphanosoma brachyurum*. **7.** Whole body showing head and large eye, with no ocellus, second antennae, abdominal claw and post anal setae (x100); **8.** Dorsal and ventral ramus of the second antenna (x100).

is about  $0.14 \pm 0.03$  mm long with four feathery setae and one spine on the distal end. The second segment is about  $0.15 \pm 0.02$  mm and has seven setae, two apical and five along the length and one small distal spine. In some organisms, there may be six setae along the length of the second segment. The ventral rami has three segments, the first ( $0.02 \pm 0.001$  mm) and third ( $0.04 \pm 0.001$  mm) are much smaller than the second ( $0.15 \pm 0.03$  mm). There is one seta on the second segment, one midway on the third segment and three apical setae (Fig. 8). One short spine is present on the distal end of the second segment. The setation formula for this organism is 4-7/0-1-4.

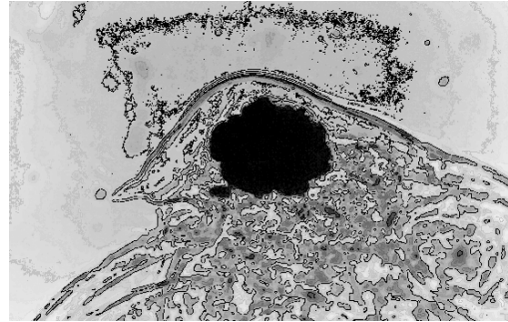
9



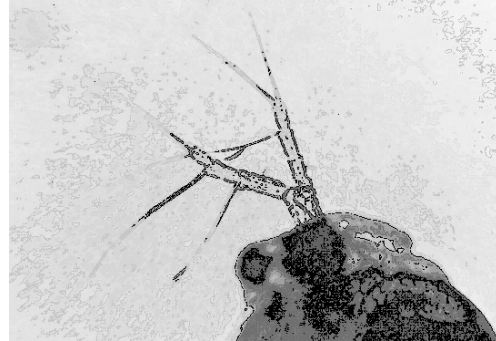
11



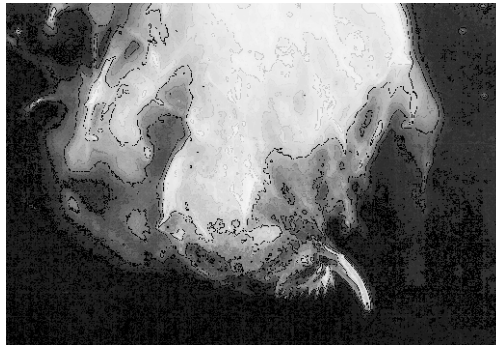
10



12



13



**Plate III: Figs. 9-13.**

*Ceriodaphnia rigaudii*. **9.** Body with surface reticulations (x200); **10.** Head with (a) large eye and (b) ocellus (x400); **11.** Spine on the basal segment of the second antennae (x400);

**12.** Setation on the second antennae (x200); **13.** Abdominal claw with denticles (x200).

**Daphniidae: *Ceriodaphnia rigaudii* Richard**

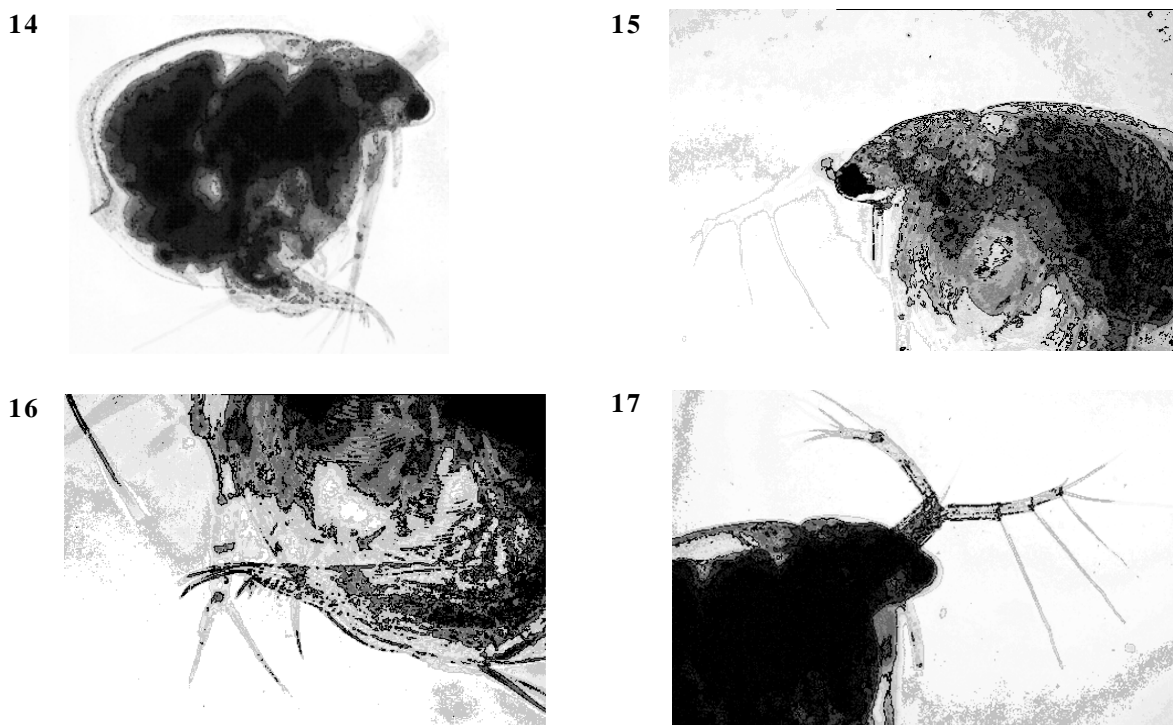
The body is typically oval in shape and is about  $0.45 \pm 0.03$  mm long. A single folded carapace covers the body and opens ventrally, giving the appearance of a bivalve (Fig. 9). The carapace tapers to the posterior and is covered with large hexagonal reticulations. A distinct cervical sinus separates the head from the thoracic region. The head appears very compact with a prominent beak but does not open ventrally. There is a large eye that occupies about two thirds of the headspace. A small ocellus is present ventral to the eye (Fig. 10). The abdominal claws have six pairs of spines associated with them. The stout basal segment is about  $0.2 \pm 0.003$  mm long and has a long spine at the base between the third and fourth formix (Fig 11). The first antenna is short ( $0.03 \pm 0.003$  mm) and relatively inconspicuous with many bristle-like spines on the

distal end. They are located ventrally on the head, close to the posterior margin. The second antenna is longer and positioned laterally close to the posterior margin. The dorsal ramus has four segments and is about  $0.1 \pm 0.007$  mm long. The first segment ( $0.01 \pm 0.002$  mm) is much smaller than the other three. The second ( $0.028 \pm 0.004$  mm), third ( $0.032 \pm 0.003$  mm) and fourth ( $0.031 \pm 0.003$  mm) are almost of the same length. There is one setae on the third segment and three apical ones on the fourth, with no spines on any of the segments (Fig. 12). The ventral ramus ( $0.12 \pm 0.01$  mm) has

three segments. The first segment ( $0.06 \pm 0.005$  mm) is almost twice as long as the second ( $0.035 \pm 0.005$  mm) and third ( $0.03 \pm 0.005$  mm). There is one setae on each of the first two segments and three setae on the third. The general setation formula for the species is 0-0-1-3/1-1-3 (Fig. 13).

**Moinidae: *Moinodaphnia macleayi* (King)**

Adults appear bright red in color. The body is typically oval and measures about 0.9 – 1.0 mm in length. The general species description coincides with the description of Goulden (1968). The carapace is rounded with plate-like surface reticulations, but no spines along its margins. There is a clearly defined cervical cleft that marks the separation of the head from the rest of the body (Fig. 14). The head appears triangular in shape with a large eye that



**Plate IV: Figs. 14–17.**

*Moinodaphnia macleayi*. **14.** Shape of body (x100); **15.** Head with large eye and ocellus (x100); **16.** Abdominal claw with denticles (x200); **17.** Setation on the second antennae (x100).

fills the anterior end. An ocellus is visible, posterior to the eye (Fig. 15). The first antenna is positioned ventrally to the eye and is about  $0.16 \pm 0.02$  mm long. It is not segmented and has numerous bristle-like setae on the distal end. The second antenna is positioned laterally on the head and has a stout basal segment and two long rami. A long sensory setae is located on the basal segment between the two ramus. The dorsal ramus has four segments, the first of which is very short. Only the two distal segments have setae. The second segment is relatively longer ( $0.13 \pm 0.01$  mm) than the others and has no setae or spines. The third segment ( $0.07 \pm 0.01$  mm) has one long seta and no spines. The last segment ( $0.06 \pm 0.01$  mm) has three setae and one elongated spine (Fig. 16). These setae appear shorter than those on the ventral ramus. The ventral ramus has only three segments with the first ( $0.11 \pm 0.01$  mm) and second ( $0.08 \pm 0.01$  mm) segments bearing a single seta. The distal segment ( $0.07 \pm 0.02$  mm) has three setae and one short spine. This gives a setation formula of 0-0-1-3/1-1-3. The abdominal claw has eight pairs of denticles (Fig. 17).

## DISCUSSION

Cladocerans have been reported from Brazil, Venezuela, Mexico, Costa Rica in South America, and Cuba, Haiti, and Puerto Rico in the wider Caribbean regions. Studies have thus far reported species belonging to six families: Bosminidae, Chydoridae, Daphniidae, Macrothricidae, Moinidae and Sididae. This study of cladocerans in Trinidad has identified four species, all of which are new records for the country. This extends the known distribution of these species, all of which has previously been recorded in Venezuela. Given the close proximity of Venezuela to Trinidad, with the direct land connection in the Pleistocene period, and the overall biotic similarity between them, this sharing of cladoceran species is not

surprising.

The species found in Trinidad are similar in gross morphology to those described in other areas. However, in some cases there are notable differences. *Latonopsis occidentalis* from Trinidad has a larger number of setae on the terminal end of the carapace than was identified for this species from Mantecal, Venezuela. Similarly, whereas those reported by Zoppi de Roa and Vasquez (1991) had only two spines associated with the claw, the ones from Trinidad had three prominent large spines and several smaller ones. Similarly, in *Ceriodaphnia rigaudii* the presence of the elongated spine on the basal segment appears not to have been noted before. While *Moinodaphnia macleayi* coincides with the description given by Goulden (1968), a few modifications were evident. There is no seta along the ventral margin of the carapace and the eight pairs of denticles associated with the abdominal claw. These minor anatomical modifications may have arisen as a result of geographical separation as organisms adapt to exploit new, changing niches.

## REFERENCES

- Delorme, D. L. 1991. Ostracods. p. 691-822. In James H. Thorp and Alan P. Covich, eds. Ecology and Classification of North American Invertebrates. San Diego: Academic Press.
- Environmental Management Authority. 2001. Biodiversity strategy and action plan for Trinidad and Tobago. Environmental Management Authority, Trinidad and Tobago. 139 p.
- Frey, D. G. 1982. Cladocera. p. 177-187. In Stuart H. Hulbert and Alejandro Villalobos-Figueroa, eds. Aquatic Biota of Mexico, Central America and the West Indies. Academic San Diego.
- Goulden, C. E. 1968. The systemics and evolution of the Moinidae. *Trans. of the Am. Philosophical Society*, 58(6): 5-101.
- Pennak, R. L. 1989. Freshwater Invertebrates of the United States. 2<sup>nd</sup> ed. New York: Wiley-Interscience. 900 p.
- Zoppi de Roa, E. and Vasquez, W. 1991. Additional cladoceran records for Mantecal and new for Venezuela. *Hydrobiologia*, 225: 45-62.