First report of the freshwater mussel *Mytilopsis leucophaeata* (Family Dreissenidae) in Trinidad W.I. and a new locality record of the native *Anodontites crispata* (Family Unionidae)

Freshwater mussels have been documented within Trinidad since the 1800s (Guppy 1866) with two species of the Unionidae family; *Anadontitis crispata* (Bruguiere 1792) and *Mycetopoda* sp. identified. In this note we record a new location for *A. crispata* and a new species record *Mytilopsis leucophaeata* (Conrad 1831) for Trinidad.

During a survey of freshwater biota in water courses in northeast Trinidad in August 2015, a population of the mussel *Mytilopsis leucophaeata* (Conrad 1831) was discovered in the small river immediately north east of the Rio Seco/Salybia River bridge on the Toco Main Road (UTM 20N 716200, 1184191). The density of mussels was estimated at between 20 to 100 individuals per square metre. They were clustered on both rock and driftwood substrate. No individuals were observed in the Rio Seco River or any other watercourse that was surveyed.

Specimens were collected and sent to Miramar Zeemuseum, Netherlands for confirmation of the identification. Live specimens were also housed in a freshwater aquarium at The University of the West Indies, St. Augustine for up to 24 months after collection.

Mytilopsis leucophaeata (Conrad 1831), (Dark false mussel or Conrad's false mussel) is a member of the Dreissenidae family native to North America. *M. leucophaeata* has a thick, usually dark periostracum covering the shell and a maximum length of 2cm. (Fig.1). Juveniles may also be striped. The ventral margin of the shell is fairly straight. Internally, there is a septum near the umbo, and partly covered by this is a small triangular apophysis. This characteristic septum is absent in the Mytilidae or true mussels.

This species has also been reported within suitable habitats in Martinique (Delannoye *et al.* 2015), Guadeloupe in 1980 and 2012 (GBIF 2018), Margarita, Nueva Esparta, and Boca Chavez, Anzoategui in Venezuela (GBIF 2018), and as far south as French Guiana (Massemin *et al.* 2011). Its range is suspected to be underestimated (Pointier 2015).

There have been several instances of the species being responsible for bio-fouling in European and temperate regions (Dziubińska 2015, Holeck *et al.* 2004, Therriault *et al.* 2004), and the initial expansion to these more southerly locations are thought to be the result of transport by watercraft and not necessarily natural dispersal (Holeck *et al.* 2004).

It is possible that subsequent natural spread to Trinidad may have occurred through planktonic drift influenced by the Orinoco discharge plume, or transport via birds or possibly a direct introduction from its natural range via ballast water discharge.

Whilst there is no documentation of this species forming dense colonies that out compete native bivalves in the other Caribbean countries, monitoring of the spread of this species and any negative impact on other species in Trinidad, is important. *Mytilopsis leucophaeata* could potentially compete with native mollusc species such as the *Neritina* sp., which was also found in low densities at the site. No predation of *M. leucophaeata* was observed at the collection site. In captivity however, the native freshwater prawn, *Macrobrachium crenulatum* did actively attack and feed on it. We suspect this prawn could be a natural predator as they also occur at the collection site.

Our second new finding refers to the native species *Anodontites crispata.* This species was first recorded by Guppy from the Caroni flood plains (Guppy 1866). Bacon recorded the species at Cuche River and Nariva Swamp in 1978 (Bacon 1979) and since then shells of *A. crispata* (=A. cf. *irisans*) were collected from Poole and Caparo drainages in 2007 (Mohammed *et al.* 2008) (Table 1). In addition mussels (> 2cm in length) were observed by Dr Mary Alkins-Koo in freshwater areas of the Carlisle River, south Chatham in the early 1980s. Although these were not identified, it is suspected they could be members of the Unionidae family. Here we document a new location for *A. crispata* in southern Trinidad within the South Oropuche drainage where a tributary crosses Mulchan Road (UTM 20N 672341, 1119862). The site has a muddy substrate, with slow moving turbid water and riparian vegetation, a habitat known to be favoured by the species (Huehner 1987, Gagnon *et al.* 2006) and similar to that where Mohammed *et al.* (2008) documented shells in 2007. The species is also known to be sensitive to low dissolved oxygen concentrations and the family does not tolerate any salinity (Huehner 1987, Gagnon *et al.* 2006).

The unionids fulfil important ecosystem functions and are one of the most threatened freshwater taxa globally (Zieritz *et al.* 2016). Unlike *M. leucophaeata*, which has planktonic free swimming stage in their life cycle, the Unionids planktonic stage relies on fish gills as primary host for both support and nutrition (Williams *et al.* 1993). Juveniles move upstream via their fish host. Subtle changes in habitat and /or extraction of their fish host can lead to loss of this taxon. This species may be a candidate as an indicator species indicating well aerated slow moving nutrient poor streams with intact fish populations.

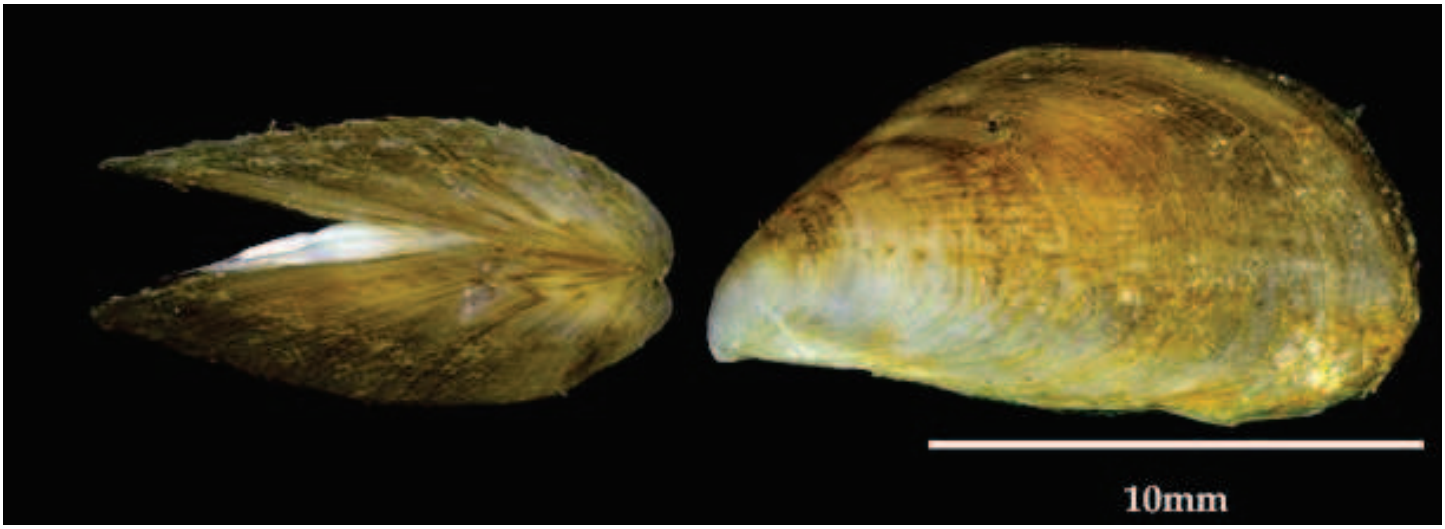

Figure 1. *Mytilopsis leucophaeata* collected in North East near Rio Seco River, Trinidad. Photo credits- Robert Vink, The Netherlands.

Table 1 Occurrences of freshwater mussels in Trinidad. *See location description in text

Species	Location	Sighting Date	Publication
Anodontites crispata	Caroni flood plains	na	Guppy, 1866
	Cuche River	May 1978	Bacon *et al.* 1979
	Nariva	August 1978	Bacon *et al.*1979
	Nariva	August 1988	Smithsonian via I.W. Ramnarine, 1988
	Poole River	May 2007	Mohammed *et al.* 2008
	Caparo River	November 2007	Mohammed *et al.* 2008
	Mulchan Trace, Penal Rock Road	September 2014	current paper
Mycetopoda sp.	Nariva	August 1988	Bacon *et al.* 1979
	Ortoire	May 2007	Mohammed *et al.* 2008
Mytilopsis leucophaeata	NE of Rio Seco River*	August 2015	current paper

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Field observations of potential cannibalism among tadpoles of the Trinidad stream frog *Mannophryne trinitatis* (Anura: Aromobatidae)

Cannibalistic behaviour has been reported among tadpoles and is potentially influenced by food availability and conspecific density (Jefferson *et al*. 2014). Cannibalism involves killing and feeding on an individual of the same species (Fox 1975), not to be confused with scavenging, which involves feeding on already dead individuals. Cannibalism offers direct benefits to tadpoles in the form of a meal, and also provides other direct and indirect benefits such as shortened development time (Crump 1990) and reduced competition in some populations (Jefferson *et al*. 2014). Conversely cannibalism may pose selective disadvantages. For example, it may increase the risk of contracting chytridomycosis (Altig *et al.* 2007), or there may be inclusive fitness costs of killing close relatives. Observation and investigation across more species is required to further understand how common cannibalism is among tadpoles (Fox 1975, Altig *et al.* 2007).

Mannophryne trinitatis (Garman 1887) of the family Aromobatidae (formerly Dendrobatidae) are small frogs (males 29mm, females 30mm snout to vent length) which are distributed across the Northern Range and Central Range of Trinidad (Murphy *et al*. 2018). Cannibalism among large *M. trinitatis* tadpoles has been reported by Downie *et al*. (2001) mainly under laboratory conditions and briefly in the field. We report on a field observation of potential cannibalistic behaviour in tadpoles of *M. trinitatis* in Trinidad and suggest further research.

On 6 August 2018 at 1810h, RJA and NFA observed seven to eight tadpoles of *M. trinitatis* consuming a single conspecific individual. We were unable to determine if the individuals were scavenging on an already dead conspecific, or whether this was a case of intraspecific predation, or cannibilism as defined by Fox (1975). Most tadpoles detached from the dead tadpole when we moved leaves and shone our LED torches to gain a better view. But one of the larger tadpoles appeared more aggressive than the others and stayed feeding, finally moving the dead tadpole into an overhanging rock crevice apart from the others (Figure 1). The site was along the Lopinot Rd., Trinidad just south of Lopinot Village (UTM 20N 682925, 1181345). The microhabitat consisted of an isolated pool of water, within a rock gully, less than 10m from the roadside. The ephemeral pool was on a slightly inclined rock surface surrounded by dense canopy cover with an almost dried up stream flowing nearby. The pool had leaves in it covering more than 50% of the surface of the water, and macrofauna consisted solely of *M. trinitatis* tadpoles. The tadpoles were visually identified using the