Macrobrachium crenulatum (Stream Crayfish or Shrimp)

Order: Decapoda (Shrimps, Lobsters and Crabs)
Class: Malacostraca (Crustaceans: Shrimps, Sand-hoppers and Woodlice)
Phylum: Arthropoda (Arthropods)

Fig. 1. Stream crayfish, *Macrobrachium crenulatum.*

[http://ti.racoon.free.fr/galleries/Poissons/Eau_douce/macrobrachium_crenulatum-IMG_8035M.jpg, downloaded 25 January 2015]

TRAITS. One of the largest species of shrimp with a defined segmented body structure and several pairs of appendages (Fig. 1). The body has three segments, the head and thorax that both fuse to form the cephalothorax and the abdominal region. They are commonly identified as having a chitinous exoskeleton that forms a hard protective layer called the carapace over the cephalothorax (Dodds and Whiles, 2010). The head region contains two compound eyes and a straight rostrum (beak) with a receptive antenna along with two other pairs of antennae, the second pair appearing longer. There are usually three pairs of appendages on the thoracic region around the mouthparts called mandibles, maxillae and maxillipeds that aid in feeding. The forth pair is more prominent in males and are known as chelipeds that can be used for defence and capturing food (Fig 2.). The last three appendages on the thorax are the walking legs. The abdomen is usually made up of 6 segments each with smaller pairs of appendages called pleopods or swimmerets. The posterior region is made up of appendages known as uropods that assist in locomotion. The colour ranges from grey-dark brown or non-pigmented (Kaplan, 1999).

DISTRIBUTION. Native in Panama, Venezuela and several Caribbean islands including Trinidad & Tobago, Dominica, Grenada, Haiti, Jamaica Puerto Rico Guadeloupe and Virgin Islands (De Grave, 2013). The species ranges in the tropical waters of Caribbean Sea and Pacific Ocean. The different stages of the shrimp's life cycle, geographically distributes the species between freshwater and marine environments. There a small proportion of adult species that are able to migrate long distance in saltwater, however the chances are low (Snyder et al., 2011).

HABITAT AND ACTIVITY. Inhabits tropical freshwaters of lowland rivers and streams that drain downstream into the ocean. Some species occupy ponds and estuaries near the river mouths. The tropical climate provides a wet season with heavy rainfall and flooding that increases sedimentation and disrupts habitats leading to mortality. The dry season causes the water to have high salinity which is favourable for breeding and a reduced stream flow for the *Macrobrachium crenulatum* to swim upstream (Bauer, 2011). The habitats or resting places are generally near water edges of rocky or sandy areas in either deep or shallow waters. The water should have little or no currents for easy movement and accumulation of food particles. They are considered diurnal since juveniles may be feeding or moulting during the day but activity is significantly increased during the night (nocturnal) in order to avoid confrontation with predators such as birds and larger fishes (Bauer, 2011).

FOOD AND FEEDING. The spawned eggs in Stage 1 obtain nutrition from the yolk in the egg. Subsequently, it is moulted into the zoeal stage (Stage 2) (Fig. 3), to be able to feed and grow (Bauer, 2011). The juvenile and adult stages serve as important primary and secondary consumers in the freshwater ecosystem. *M. crenulatum* diet consists of algae, detritus, plant and other organic matter (Lefrancois and Coat, 2011). They usually prey on organisms such as smaller fishes and shrimps, worms and insect larvae. Adults have a developed pair of clawed chelipeds and other appendages around the mouth that aid in capturing food. Other prey like snails are held with the maxillipeds and the mandibles or jaw which breaks the shell and consumes the soft body inside (Jordan, 1985). In northern Trinidad, *M. crenulatum* was found to be a main predator to guppies which was evident in fin damages and the presence of guppy scales in the gut (Magurran, 2005). At night, shrimps can forage on flying insects such as small dragonflies that come near the water surface. However, post larval and juvenile shrimp can be food sources for larger organisms such as eels, mullet fishes and birds (Reagan and Waide, 1996). They are commercially harvested for local consumption and export as a result of expanding demands for sea foods in the tourist and cuisine industries (Lefrancois and Coat, 2011).

POPULATION ECOLOGY. *M. crenulatum* are generally solitary and territorial organisms however, in areas of high densities they can occur as large groups of the same species. Large numbers are found in clear freshwaters with high dissolved oxygen content to supply oxygenated water to their gills located on either side of the thorax (Zapalac and Liou, 2006). Water that is brackish and turbid has little or no species because of the low levels of dissolved oxygen and inability to move. There is the chance of homogenizing the population of shrimps from the interaction between marine and freshwater environments (Page et al., 2013). Some juveniles may inhabit estuary areas in close proximity to their freshwater territories to mature into adult. The life cycles of the shrimps usually proceed over a number of months having being developed into an adult after 3-4 weeks.

REPRODUCTION. Mating is seasonal and may occur rapidly or involve intricate courtship for the intermoult male to latch onto the post-moult female. The sperm of the males are non-motile and thus must be directly placed into the ovipore of the female via the spermatophore (Kaplan, 1999). *M. crenulatum* are amphidromous shrimps since dozens of small fertilized eggs are laid by females and held with its pleopods until they are released in freshwater (Fig. 4). The eggs are typically released in early evening prior to dusk. The spawned eggs are then carried with stream currents into the salt water where it develops into larval stage which then returns to the freshwaters as juveniles (Page et al., 2013). They no longer obtain parental care and must forage independently. The transition of larvae to adult shrimp occurs in a series of hormone-controlled moulting processes in which the exoskeleton is shed followed by the formation of a new cuticle layer (Fig. 5).

BEHAVIOUR. Immediately after moulting, the shell is removed exposing the soft and vulnerable animal before a new shell is formed. During this time, juveniles have developed swimmerets and are most cautious staying hidden. This stage is mostly important in seeking food and migrating upstream to establish a freshwater habitat. The juveniles are capable of moving around small obstacles and low waterfalls on their way (Bauer, 2011). Antipredator responses of *M. crenulatum* involve use of rostrum and chelae as defence mechanisms. They appear mostly drab colours which can facilitate camouflage from predators. The species can swiftly escape since they have a high sensitivity to vibrations in the water that is detected by the sensory antennae on the head. It was found that the shrimps are responsive to white light which is a method that has been used during harvesting (Zapalac and Liou, 2006).

APPLIED ECOLOGY. *M. crenulatum* is listed by the IUCN Red list of Threatened Species (2014) as an organism that is of least concern since there are no known threats. The species are vastly abundant and thus do not demonstrate any risk of extinction and currently there are no conservation practices being used (De Grave, 2013).

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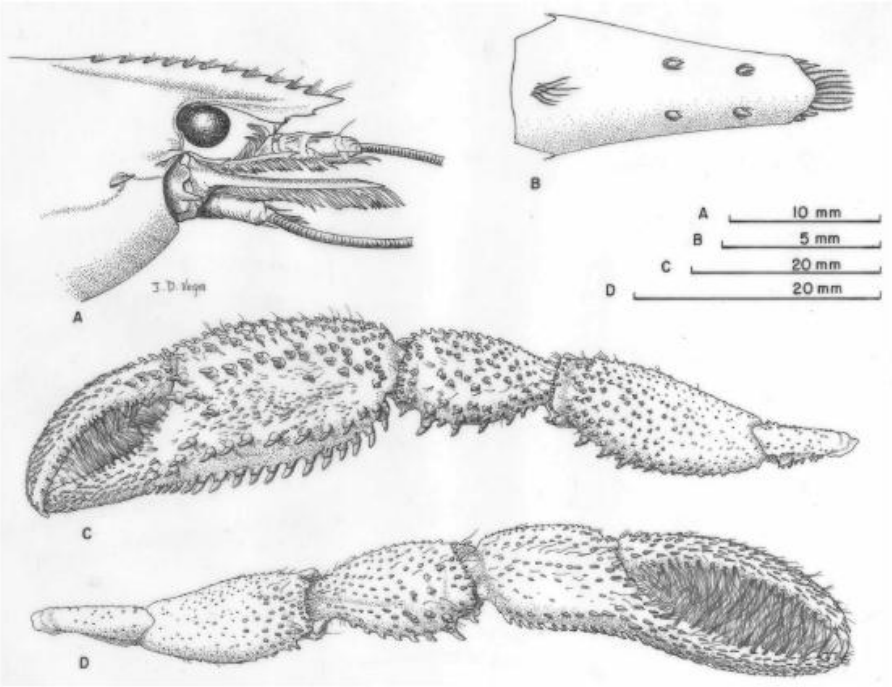

Fig. 2. Anterior, posterior body parts and chelipeds of *M. crenulatum.*

[Fig.7. of Valencia (2007)]

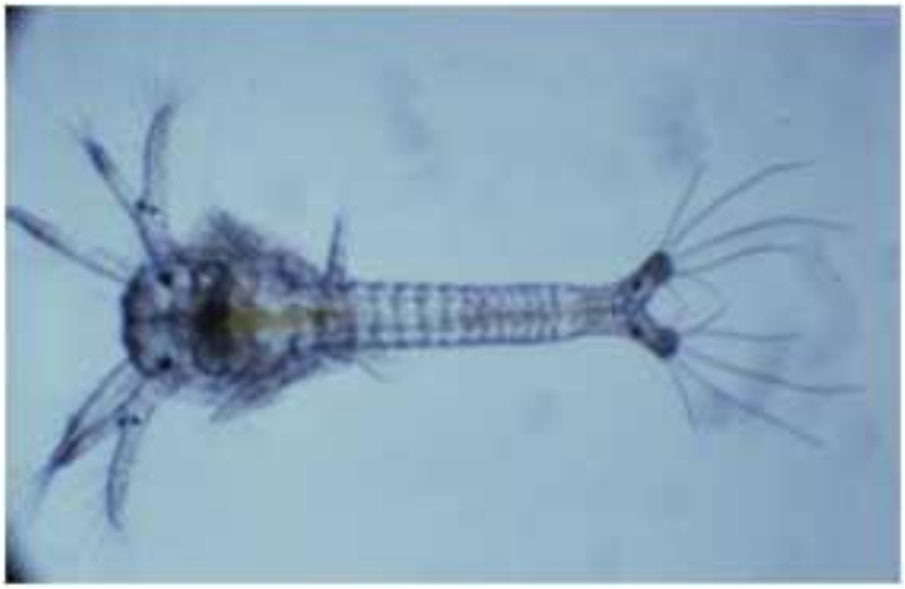

Fig. 3. Zoeal stage (Stage 2) of life cycle of *Macrobrachium.*

[http://www.kauaishrimp.com/images/farm/lifecycle_zoea.jpg,
downloaded 28 March 2015]

Fig. 4. Female shrimp carrying the fertilized eggs before releasing them.

[http://www.zoologischemededelingen.nl/z/zoomed/images/vol85/nr02/8502a01fig12.jpg, downloaded 28 March 2015]

Fig. 5. Outer shell of a shrimp that is shed after moulting.

[http://i952.photobucket.com/albums/ae9/ashtar9/FishFAQs/2013/amanoshrimp3_zps863e79d0.jpg, downloaded 28 March 2015]