Gambusia affinis – the Mosquitofish, a recent introduction to the Groot Estuary?

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During a recent SANParks ichthyofaunal survey of the Groot Estuary a species of fish that has up to this point not been previously sampled from the system was encountered. Four individual fish identified as Mosquitofish, *Gambusia affinis*, were found whilst seine netting in the middle reaches of the estuary. Up till now you may not have heard of the Mosquitofish, but it is one of the most widely distributed fresh water species in the world and it is also one of the most studied.

Originating in central America, *Gambusia* are relatively small, non-descript fish generally ranging in size from 1 to 5cm, they have a single dorsal fin and a large rounded caudal (tail) fin and are generally silver with a greenish hue and scattered grey and black markings. At this point you would be forgiven for wondering why a fish so drab would attract so much attention and why they are so wide spread.
Interestingly the genus name *Gambusia* (Poey 1854) was modified from a provincial Cuban word Gambusino that meant nothing or a joke whilst in Latin *Gambusia* means nothing or frustration. Initially, due to their small size, fish of this genus were viewed as being worthless or of no importance. However, perceptions began to change around the beginning of the last centuary when species of the genus *Gambusia* including *Gambusia affinis* began to be introduced into water bodies as a control measure for mosquito larvae. Although the effectiveness of *Gambusia* as a mosquito control agent was largely based on perception and generalized observation, rather than robust studies with adequate sample sizes and random treatment assignments, by the 1920's *Gambusia* were widely accepted as an effective control method for both mosquitoes and the diseases they carry and was in fact already the principal fish species used in this manner. Hence, in the name of mosquito control *Gambusia* were rapidly translocated throughout the world. Interestingly, one of the drivers for mosquito control and the use of *Gambusia* was the onset of World War 2. Initially mosquito control was primarily through the drainage of wetlands (the mosquito breeding grounds) and the conversion of this land to amongst others agriculture. However, as the environmental costs of this practice became apparent in the late 1930's and with an increase in concern regarding the risks of mosquito-borne diseases faced by military personnel *Gambusia* came to the forefront and became the major mosquito control strategy. In essence government health agencies, military and private individuals all played a role in their increasing distribution.

However, during the 1960's there was growing concern around the potential impacts of *Gambusia* on native fauna including fish, frogs and aquatic invertebrates which ultimately lead to restrictions on the distribution and stocking of this genus. As more evidence has became available a new name began to be used, that of plaque minnow. Today views are still polarized with one group advocating these fish as effective mosquito control agents whilst others either doubt this ability or argue that indigenous fish are equally if not more effective and that the negative impacts outweigh any positives.

The success of Mosquitofish and their ability to colonise most parts of the world is due to a number of quite extraordinary abilities at a species, population and individual level. Mosquito fish are exceptionally hardy, flexible and adaptable. They can tolerate and use a wide range of natural and artificial conditions, their diet is broad and they have a high reproductive potential. In fact they can alter their life history to adapt to particular environments. For example as a species although generally occurring in shallow, still or slow-moving water with dense aquatic vegetation they now occur in environments that range from undisturbed swamps and streams to highly disturbed water bodies including urban drains with numerous water quality problems. They can tolerate wide temperature, salinity, pH, dissolved oxygen and turbidity regimes. Compared to other fish *Gambusia* is also highly resistant to the effects of toxins and the longer a population is exposed to such conditions the more robust they become. Furthermore biological and life-history flexibility enables individuals to adapt to changing conditions. Females can store sperm and depending on environmental conditions gestation period can be delayed or sped up as can the onset of maturity. One study found that *Gambusia* populations where predatory fish were present exhibited morphological differences associated with higher swimming speed and indeed were able to swim faster than fish from predator free populations. With a small dorsally oriented mouth, a dorso-ventrally flattened head and strong conical teeth Mosquitofish are typically predatory, predominantly feeding near the surface with a wide diet that may vary considerably from one time and from one place to another. Prey items include insects, spiders, crustaceans, worms, molluscs, larvae and pupae of aquatic invertebrates, algae and other plant material, smaller fish of its own and other species and diatoms. Individuals have also been observed attacking the tails of larger fish and removing pieces of their fins and other body parts.

Since the 1970's several studies have documented negative impacts of mosquitofish populations on invertebtrates, amphibians and other fish species. Mosquitofish have been implicated, through spatial and temporal comparisons as responsible for reduced densities of aquatic invertebrates, the decline and disappearance of a number of amphibian species and fish species of similar size. Overall the negative impacts of Mosquitofish on other species populations seems to result from a complex interplay of age/size and habitat dependent competition, predation, and agonistic interactions.

It was an upleasant surprise to sample Mosquitofish in the Groot estuary and although only four individuals were caught, the distribution and abundance of this alien species needs to be monitored. The current ichthyofaunal study will be run over the next year with sampling occurring every three months. I will in another article give more detail on this project and some of the results.