Aquaculture Notes

Biology of Yabbies *(Cherax destructor)*

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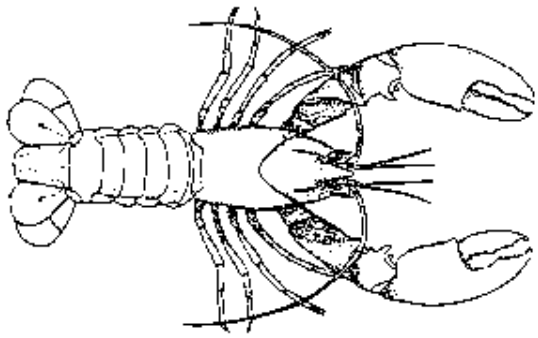
Compiled by Fiona Withnall, Melbourne



Common Name: Yabby

Family: Parastacidea

Scientific Name: Cherax destructor (Illustrated)

Status: Native, Freshwater

Introduction

The freshwater crayfish commonly termed the yabby, Cherax destructor, is often referred to as an ideal species for aquaculture in Victoria. While production estimates are varied, the 120 licensed farmers in Victoria produced 10 and 25 tonne of yabbies during 1995-1996. Prices for yabbies are influenced by demand, quality and size of product, with live yabbies falling into the mid to upper price range for shellfish.

Yabby farming is often carried out at the lowest and easiest level, known as “extensive” aquaculture. The production system is simple and initial cost of farming is low as most farmers utilise existing dams that have been built for the watering of agricultural livestock. Once established in dams, yabby populations often become self-sustaining and very little needs to be done by the farmer to enhance production.

Although the initial cost of farming is low and establishment of yabbies in dams is relatively simple, issues such as uncontrolled breeding, post harvest handling and maintainence of a high quality product for market, need to be considered. Live yabbies that are quality assured attract the highest prices on the domestic and international markets.

Attempts to improve the farming of yabbies using purpose built ponds will increase productivity however, a cost benefit analysis is necessary and shall be based on realistic production return estimates.

A basic but sound understanding of the animal’s anatomy, physiology and behaviour is an essential pre-requisite to successful yabby farming.

Information presented in this Aquaculture Note represents only the most basic aspects of biology specific to C. destructor and it is recommended that further literature, including the references listed at the end of this Series Note be read to obtain a more complete understanding of the subject if you are contemplating a successful aquaculture venture.

Habitat

The yabby, *Cherax destructor*, is a semi-aquatic freshwater crayfish commonly found in a wide range of habitats throughout most of Victoria and New South Wales, including low-lying swamp ground, streams, rivers and dams. The most wide spread species of freshwater crayfish, the yabby may also be found in southern Queensland, South Australia, and parts of the Northern Territory. Yabbies are generally found in areas where oxygen levels are high and where there is plenty of vegetation.

Adapted to a wide range of temperatures, the yabby is able to survive in water temperatures between 1°C and 35°C however, when water temperatures drop below 16°C the yabby falls into a state of partial hybernation where metabolism, feeding and growth virtually cease. Temperatures higher than 35°C will result in cessation of growth and eventually mortality. The ideal temperature range for optimum growth is between 20°C and 25°C.

Yabbies are able to tolerate a wide range of dissolved oxygen levels and elevated salinities. Research has shown that they are capable of surviving in sea water for approximately 48 hours however, high salinity levels will result in increased stress on the individual. Growth will often cease in salinities over 8 parts per thousand (ppt), which is equal to approximately one quarter that of seawater, and mortalities will occur as salinity levels increase. Dissolved oxygen levels are also important. As

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dissolved oxygen decreases, feeding and therefore growth, also decreases.

Hence, good feeding activity and optimal growth are achieved when salinity levels are lower than 8 ppt and are dependent on healthy, well oxygenated waters.

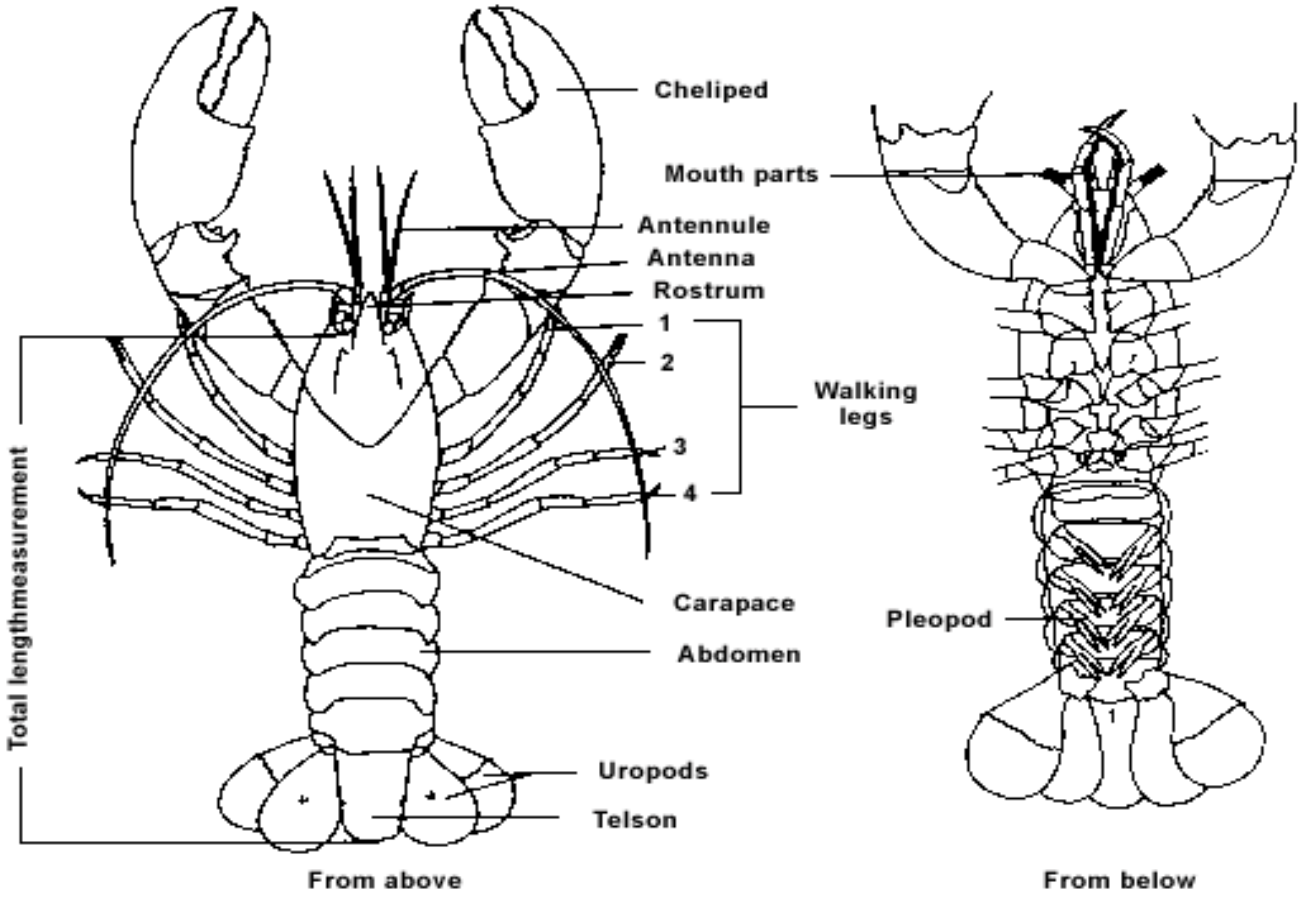
Yabbies are commonly found on muddy or silted bottoms and are rarely found in clear water habitats, preferring water with moderate levels of turbidity. Muddy waters afford some protection from predators such as fish and birds giving the yabby a better chance at survival.

Description:

All freshwater crayfish belong to one of three taxonomic families. Two of these, Astacidae and Cambaridae, occur only in the northern hemisphere of Australia. The remaining family, Parastacidae, is restricted to the southern hemisphere and contains 13 different genera (or groups) including *Cherax*. There are 30 species of *Cherax* throughout Australia, of which marron (*C. tenuimanus*), redclaw (*C. quadricarinatus*) and yabbies (*C. destructor*) are the most well known and the most popular aquaculture species'

As for all crustaceans, yabbies do not have a skeleton (internal bone structure), but have an exterior hard shell, known as an **exoskeleton**. Easily distinguished from the true spiny freshwater crayfish which is characterised by the presence of spines on the exoskeleton, the yabby has a smooth shell. The colour of the shell varies greatly depending on the location, season and water conditions in which the yabby is found. Colour will also vary from individual to individual in one location. They are usually a drab olive, dun or light brown colour, but have also been found to range from black, ochre-yellow and brown to red and blue.

Figure 2: Anatomical Characteristics of the Yabby, C. destructor



Anatomy

The basic anatomical characteristics of the yabby are illustrated in Figure 2. The body of the yabby may be broadly divided into two sections; the abdomen (tail) and the cephalothorax (head). In yabbies, the tail meat, which is important to the farmer, makes up 15-20% of the total body weight when they have been headed and shelled. The head, and other internal organs, is protected by the carapace and armoured at the front with a strong, pointed rostrum. The major sensory organs for crayfish are the large feelers or antennae and the finer, more central feelers known as antennules. The eyes, although quite prominent in the head, are of little use in the murky environment in which the yabby lives. Thus, the antennae and antennules act in place of the poor eyesight as touch and taste sensors, locating potential food as well as sensing changes in water quality parameters such as temperature and salinity.

The abdomen is divided up into six segments that are individually encased in hard shell. A flexible membrane joining each segment allows the yabby to move relatively unhindered. Appendages located on the underside of abdominal segments two to five are known as **pleopods** (or **swimmerets**). These are very important for female crayfish as the edge of each pleopod is lined with fine hairs, or **setae,** to which they attach their eggs.

The appendages found on the sixth segment are larger than the pleopods and are referred to as **uropods**. These, along with two central flaps and the terminal abdominal segment (the **telson**), form the tail flap that is used to create the thrust that moves the yabby quickly through the water. Females also utilise the tail flap as a device to protect the eggs during incubation, forming a temporary "brood chamber" by folding the tail under her body.

The sex of yabbies can be determined externally by the position of the reproductive or genital openings. The male **gonopores**, or sexual organs, are located at the base of the fifth pair, or rearmost pair, of walking legs (**pereiopods**) while the female gonopores are found at the base of the third , or middle, pair of legs (see Figure 3). Breeding maturity is reached when the yabby is approximately 6-10 cm in length.

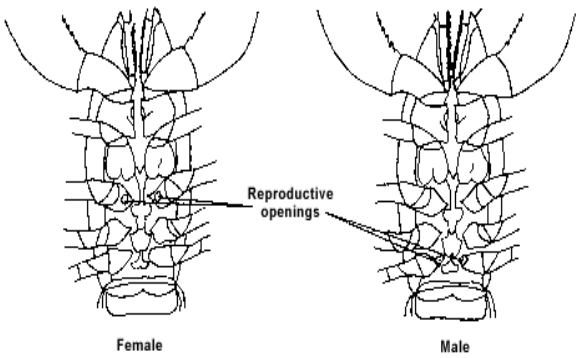


Figure 3: Location of Reproductive Organs for Crustaceans

Reproduction

Reproduction in yabbies is primarily related to water temperature and day length. Research has shown that mating begins in the spring and early summer when water temperatures reach above 15°C and day length has increased. Spawning reaches its peak between October and January. Females often spawn two or more times in the one season.

During spawning, the male yabby places a **spermatophore** between the female's fourth and fifth pair of walking legs. The female breaks open the spermatophore and mixes the sperm with the eggs she expels. The fertilised eggs are placed within the "brood chamber" where they become firmly attached to the pleopods.

Fertilised eggs may be identified by their colour. Approximately 2 mm in length and oval in shape, the fertilised eggs are usually olive green in colour. The number of fertilised eggs carried by the female ranges from 100 to 300 for a young female, to more than 1000 for an older (larger) females.

A female carrying eggs beneath her tail is said to be in "berry". A berried female will actively work to keep eggs cleaned and well oxygenated, removing any mortalities or foreign particles with her fifth pereiopods. As the eggs develop they undergo a series of larval stages, taking approximately 19 to 40 days to hatch. The length of time taken for the eggs to hatch is entirely dependent on temperature. In water temperatures of 20°C, the eggs will hatch within 40 days. As temperature increases, the length of time taken to hatch will decrease until water temperatures reach 30°C. Temperatures above 30°C will adversely affected both the adult and the juvenile.

The young remain within the "brood chamber" after hatching from the eggs for a number of weeks, undergoing three distinct larval phases before emerging as juvenile yabbies. Once the young leave the female, she is immediately able to spawn again, if environmental conditions permit.

Moulting:

Yabbies grow by a process known as "moulting". Moulting is the process of shedding the old shell (exoskeleton) and growing a new one in its place. The new shell is soft and prior to it hardening, the yabby will take up and store water within it's body tissues thus effectively artificially expanding it's size and 'stretching' the new shell. The water is expelled from the body once the new shell has hardened. The overall effect is that the yabby now has a shell bigger than it's actual size into which it can then grow. In newly hatched yabbies, moulting may take place every couple of days. The frequency will decrease as the yabby gets older until it will only moult once or twice a year.

The hardening of the shell is achieved by drawing calcium from deposits in the body and from the surrounding water. Calcium is stored in the body by reabsorbing it from the old exoskeleton prior to moulting and depositing it in two

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calcareous deposits in the stomach wall known as **gastroliths**. Yabbies often eat their discarded exoskeleton after moulting in order to conserve calcium. The calcium is then redeposited into the new exoskeleton in order to harden it.

Juvenile crayfish are approximately 0.02g upon hatching. Under favourable conditions, a juvenile yabby will grow rapidly, gaining around 0.5 to 1.0 gram in the first 60 days. Moulting several times, the juvenile will continue to grow rapidly until it reaches sexual maturity within 12 months (50 to 100 grams). Individual growth is highly variable, and the maximum size of around 320 grams for adult yabbies will be reached within 2 to 3 years. Minimum marketable size for yabbies is 30 grams and may be reached in around 6 months.

Feeding:

Yabbies are **omnivorous**, but primarily vegetarian, favouring rotting leaves and plant detritus. They are opportunistic feeders, eating just about anything when they are hungry including vegetables, fish food, fish, manure of any type, plants, wood and meat.

It should be noted that yabbies are also cannibalistic, particularly if they are in overcrowded situations or if there is insufficient natural food available. Animals that have recently moulted are more susceptible to the cannibalistic nature of their neighbours as they are extremely vulnerable to attacks from others at this time. This is an important consideration when establishing an aquaculture venture in farm dams.

Yabbies are a nocturnal species. Feeding behaviour is mostly controlled by the amount of light filtering through the water and it is often found that the greatest periods of activity occur shortly before dawn and just after dusk. Water temperature also plays an important role in the level of activity. At the temperature extremes, feeding rate will decrease as will metabolic rate which will result in reduced growth.

Other facts:

The burrowing behaviour of *C. destructor* is a cause for concern for farmers. Yabbies are capable of digging very deep burrows which can be 50 cm to two meters deep depending on the species. Burrows are connected by access shafts to the water. In the event of the water drying up, the yabby is able to survive over summer in the burrows. Unfortunately, this behaviour may also destroy the integrity of dam walls causing problems for farmers.

The main predators of yabbies are aquatic birds and fish species. Farmers often find that bird species such as cormorants, herons and the ibis are common pests while Murray cod and Callop are the main fish predators. Carp often compete with yabbies for food sources and may act to displace yabbies from their habitat through their foraging activities. Invertebrates such as dragonfly larvae, chironomid larvae and some beetles often predate on juvenile crayfish.

Yabbies are a popular bait for fishermen and are becoming increasingly popular as a restaurant menu item both within Australia and overseas.

Definitions:

Exoskeleton - hard supporting external structure of arthropods and some sponges. The exoskeleton is formed from calcium.

Gastrolith - calcareous deposit located within the stomach of crustaceans. Calcium is stored in this way just prior to a moult in order to conserve calcium reserves.

Gonopore - Reproductive, or genital, opening.

Omnivore - animal that eats both plants and animals.

Pereiopod - walking limb of crustaceans. There are five pairs of walking limbs found on the cephalothorax.

Pleopods - Swimmerets found on the underside of each abdominal segment of crustaceans.

Setae - chitinous hair, or bristle, found along the edge of the pleopods of crustaceans.

Spermatophore - a number of sperms enclosed in a sheath of gelatinous material.

Swimmeret - small paired appendage present on the first five abdominal segments of crustaceans. Swimmerets are possibly used by females to attach fertilised eggs during incubation.

Telson - the unpaired terminal abdominal segment of crustaceans.

Uropod - Fan-shaped paired appendage found on the final abdominal segment of crustaceans. The uropod is used in swimming.

Recommended Reading:

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