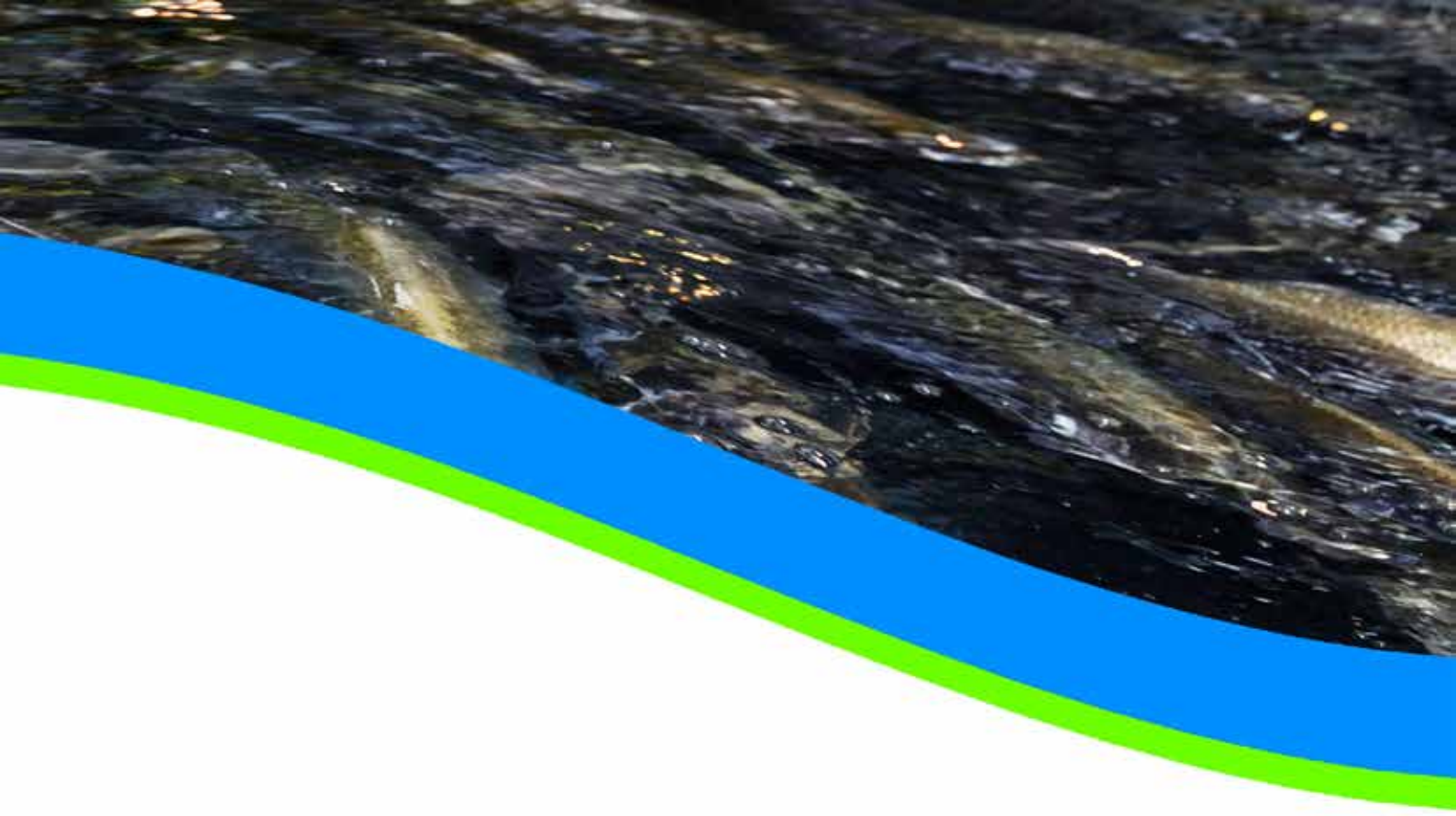




HYDROCENTRE
— hydroponics —

Aquaponics System and Species Guide

Aquaponics Species Guide

Freshwater Invertebrates



Murray Crayfish

Euastacus armatus

Murray Crayfish are slow-growing animals and may take up to nine years until they reach their legal length of 10 cm.

They are opportunistic feeders, feeding on decaying animals and plants.

Mating activity usually occurs during May, most likely cued to a decline in water temperatures.

Females carry eggs under their tails. Eggs hatch during late spring, around 140 days after fertilisation.

Murray Crays grow up to 2.5kg, the second largest Freshwater crayfish after the Tasmanian Freshwater Crayfish.



Yabby

Cherax

Yabby as a name can refer to any number of different crayfish species but as a rule it generally refers to *Cherax destructor*.

This species is a native of the Murray Darling system.

Yabbies grow to a maximum size of 350 gram, however, the common large size is 120 – 150 gram. Yabbies have a life span of only 5 – 7 years.

They are also cannibalistic so will eat each other, they are most susceptible to cannibalism when they moult leaving them soft and vulnerable. Yabbies can be any colour blue, black, white, brown, red, green or any combination.



Redclaw Crayfish

Cherax quadricarinatus

Redclaw grow quickly, breed naturally in ponds and have a simple life cycle. Optimal growth occurs between 26C and 29oC. Lethal limits are around 9-10C and 34-35C. The ideal pH range for redclaw is 7-8.5. Levels below 7 may cause moulting and shell hardening problems. Low calcium levels - hardness less than 50 ppm - will have the same effect. The total growout time is about 6-9 months (plus the 3-4 months spent in the juvenile production pond). Several market size grades exist from 35g to over 100g.

Its texture and flavour compares very favourably with commonly eaten marine crustaceans and, having the appearance of a lobster, is positioned at the premium end of the crustacean market spectrum.

Its preferred temperature range is 23 °C to 31 °C and it will perish at 36 °C.

Reproduction will only occur while water temperature remains above 23 °C.

The food used will have an important bearing on production. Commercial crayfish pellets are available and have proven to be effective. A feeding frequency of once per day is adequate, preferably at dusk when crayfish are active.



Australian Marron

Cherax tenuimanus

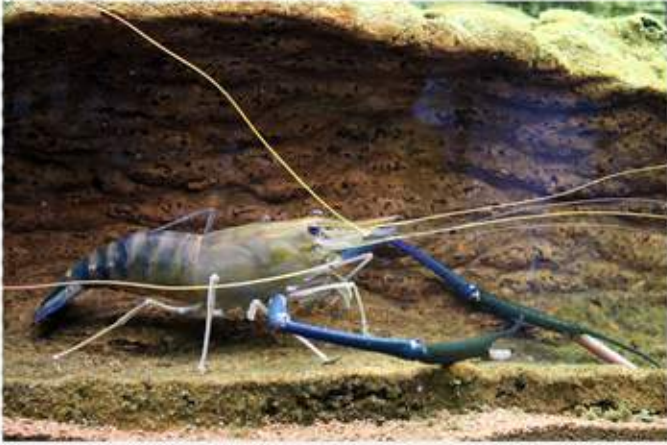
Australian marron is a species commonly grown both inside and outside of Australia. It is a spiny, non burrowing freshwater crayfish found naturally in Western Australia. It is the highest valued freshwater crayfish farmed in Australia.

Marron are the largest freshwater crayfish in Western Australia – and the third largest in the world.

Marron production ponds must be sited near a source of good quality water. A general temperature range of 8 30 °C is given for marron. The optimum temperature for growth is 17 20 °C. The optimal pH for crayfish is between 6.5 and 7.5.

Marron can grow to more than 380 mm in total length. They range in colour from jet-black to brown or even striped, red and cobalt-blue, a rare natural version now farmed for aquariums.

Marron play a critical role as recyclers, breaking down animal and plant matter. Marron eat living, dead and decaying plant and animal material found on the river or dam bed, including small invertebrates, fish eggs, fish larvae and algae. They are a non-cannibalistic species.



Giant Freshwater Prawn

Macrobrachium Spinipes

The native Giant Freshwater Prawn's range is northern Australia and some parts of Southeast Asia, including Indonesia and Papua New Guinea.

Due to regulations, the hugely successful *Macrobrachium Rosenbergii* cannot be imported into Australia for aquaculture.

A native prawn known as "cherabin", found in northern Australian waterways, could have potential for commercial aquaculture in the northern Australia.

Trials at James Cook University have shown cherabin can be bred and grown in ponds to over 200 grams. In addition, there is strong market potential for it. The infrastructure needed to grow cherabin commercially is relatively simple and is not very labor intensive, making it suitable for remote areas.

Stocking rates are generally 4-20 individuals per m² with productivity ranging from 500-5000kg/ha/yr. For maximum productivity it is recommended to remove dominant males as this encourages more rounded growth. This species has great tolerance for high and low temperatures, surviving water temperatures up to 30°C.



Freshwater Mussel

Velesunio ambiguus

Two of the more common mussels in NSW are the river and the flood plain mussel. River Mussels require flowing water to live and breed. Flood Plain Mussels are the ones aquacultured in NSW as they require still static water and thrive in farm dams or ponds and are perfect for aquaculture, aquaponics and aquariums.

Mussels are excellent for dams, ponds or fish tanks. These Mussels grow well in farm dams and breed readily, a minimum of 100 mussels are required to establish a population in a normal farm dam or ornamental pond.

Freshwater Mussels are biological filters, they suck water in, filter algae, plankton and pollutants from the water and eject pure, clean, clear water.

They are the ideal remedy for dirty water, mussels will keep it clean without the need for power filters or chemicals. People with ornamental ponds want clean clear water but without chemicals and filters the water tends to go green with algae.

They will survive very high temperatures over 30°C and very low temperatures around 4°C.

AQUACULTURE FISH SPECIES



Jade Perch

Jade Perch has much higher concentrations of Omega 3 fish oils coming in at 2483mg/100g of fish fillet, vs 792mg/100g for Silver Perch. They are a sub-tropical fish, suited to water temperatures of 24 degrees celcius and can be harvested after 12 months. Stocking should be a maximum of 15,000 fish per hectare,



Golden Perch

Golden Perch are freshwater fish of the Murray Darling System. They are carnivores which eat yabbies, shrimp, fish and insect larvae. Yellowbelly grow to quite a large size, over 20 kgs but are best eating at under 2kgs. In an average farm dam Golden Perch can reach 400 grams in 18 months.



Eel Tailed Catfish

The Eel-tailed Catfish is native to the Murray-Darling river system and prefers to inhabit lakes, ponds and slow moving streams with fringing vegetation. The Eel-tailed Catfish feed on insect larvae, small crustaceans and small fish. When cooked the flesh is very white and quite firm with an excellent taste.



Silver Perch

The silver perch (*Bidyanus bidyanus*) is a native freshwater fish. Silver perch are known to grow up to 6kg, however, specimens over 3kg are rare. Research data has shown that silver perch can be successfully grown at stocking densities of up to 20,000 fish/ha.



Barramundi

The barramundi is a large predatory fish found in tropical regions of Australia. Barramundi are carnivorous, feeding on live prey such as fish and prawns. The fish grow large and rapidly and have been known to reach over 5ft in length and weighing 60 kg.



Black Bream

Black bream have a silver/olive brown upper body with brown/black fins. They grow to about 60 cm and 4 kg. They are opportunistic feeders and eat everything from small crabs and fish to vegetation. They also use their peg-like teeth to prise mussels and barnacles from rocks.



Australian Bass

The Australian Bass is a native species of the eastern drainage systems of Australia. Australian Bass fingerlings can be stocked for grow out in a farm dam at a maximum rate of 100 per megalitre (ML) of water. Common foods for Bass are earth worms, frozen prawns and spaghetti.



Freshwater Eel

The two most common fresh water eels in Australia are the Long Fin Eel and Shoert Fin Eel. In well-developed tank systems, stocking rates can reach upwards of 80kg/m³, while in super intensive pond systems, stocking rates can exceed 20 tonne/ha.



Murray Cod

The iconic Murray Cod is the largest freshwater bony fish in Australia. Murray Cod can grow to 1.8 m in length and 113.6 kg in weight. In well-developed and highly advanced systems, stocking rates of up to 60kg/m³ may be obtained, however most systems average around 30-40kg/m³.

AQUACULTURE FISH SPECIES



Rainbow Trout

The rainbow trout is also the main species cultured in Victoria; it is sold fresh or smoked.

Water temperatures of 15°C are best.

For spawning and egg production, rainbow trout need 9-14°C. The fingerling size (8-10 cm) is reached after 6 months and market size (250-350 g) takes about a year.



Brown Trout

Optimum temperature range 4-19°C. The ideal trout stream should have spawning areas of gravel, with water depths 20-100 cm deep and fast flowing water, 30-100 centimetres per second (cm/sec).

Given good habitat and food, brown trout develop rapidly in the second and third years.



Atlantic Salmon

Similar to brown trout, but silvery overall, bluish to olive-brown dorsally with a white belly and fewer dark spots usually confined to the upper sides. Australian Atlantic Salmon are harvested at 4-6kg. Warmer temperatures mean that Tasmanian Atlantic salmon can grow to a harvestable size within 16-18 months.



Sleepy Cod

Adults inhabit rivers, creeks and billabongs, usually in slow-flowing water among structures. It feeds on insects, fishes and crustaceans and spawns between October and February. It has been argued that this species has the best eating quality of all Australian freshwater fish.



Koi

Koi grow best between 18 C and 21 C. Koi are not considered a good fish for eating, they are however able to reach lengths of up to two feet after four or five years if water quality and space in the tank are optimised, allowing opportunities to sell adults for ornamental purposes.



Goldfish

Goldfish make the ideal aquaponics fish since they produce and eat a large amount of excretion, which provides plenty of nitrate for all of the plants. Goldfish can live for 10 to 15 years and grow to more than 59 cm long, with a maximum weight of 4.5kg.



Guppy

Guppies are a good species of ornamental fish for aquaponics as they breed readily and can be sold for a profit. The size of guppies vary, but males are typically 1.5-3.5 cm long, while females are 3-6 cm long. Wild guppies feed on algal remains, diatoms, invertebrates, plant fragments, mineral particles, insect larvae.



Pleco

Plecos consume anything that is left on the floor of the fish tank such as uneaten fish food and solid material that may settle in the corners of the tank or around structures such as the pump. These fish process waste material from the reservoir and produce waste of their own to feed the plants.



Cichlids

Cichlids originate from Africa or South America, ranging in semi-acidic to hard alkaline waters so can suit wide range of plants. They like lots of structure and waters with high concentrations of tannins if from South America such as Oscars or Discus.

AQUAPONICS GUIDELINES

Aquaponics is a system where fish are grown in a tank and plants are used to cleanse the water.

Traditional Aquaponics

This traditional approach to Aquaponics relies on bio filtration to keep the fish healthy but does not produce nutritious plants for the grower. It sacrifices nutrition for simplicity but does not yield the best results from the fish or the plants.

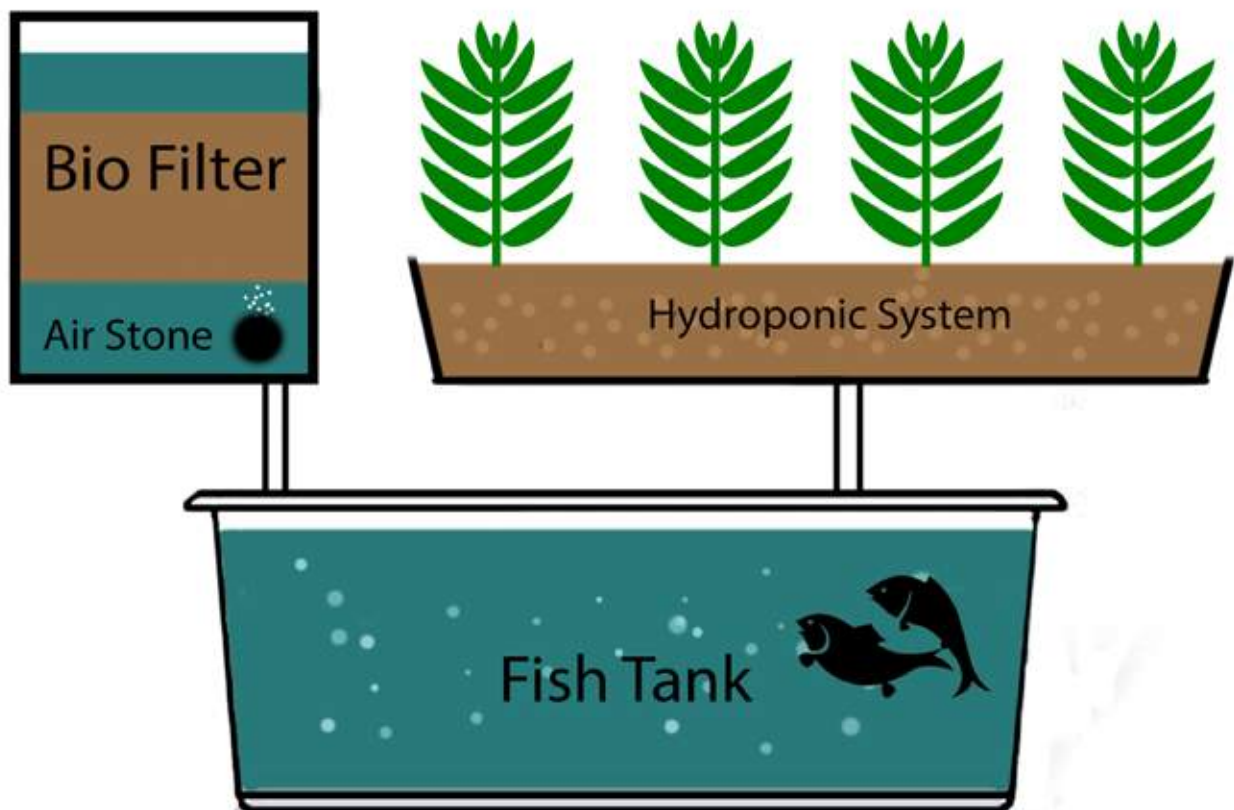
It only has one tank of water and uses a bio-filter to convert the fish waste into a form which the plants can use. It relies heavily on the Nitrogen cycle of the system to maintain a good balance of fish waste.

Nitrifying bacteria feed on the Ammonia which breaks down into Nitrite and then into Nitrate.

The nitrifying bacteria take time to adjust to the levels of ammonia in the system, which is why newly established tanks and aquariums have sudden spikes in deadly Ammonia as the bacteria can't keep up with the levels of waste being produced. It takes a few months before a system is ready to handle a full bioload of fish. It is recommended to slowly build up a system before adding all your fish.

AMMONIA (NH_3) > NITRITE (NO_2) > NITRATE (NO_3)

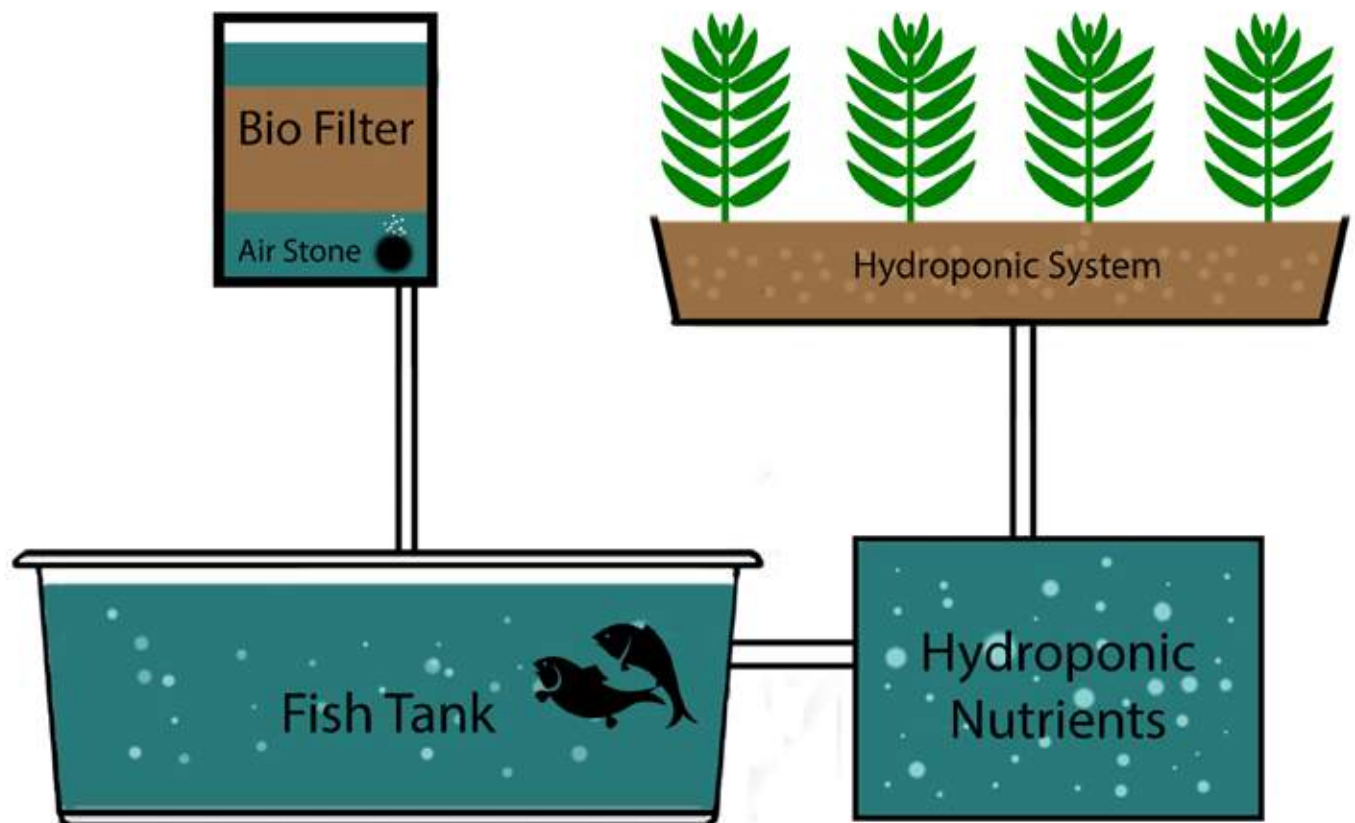
Plants require nutrients and elements in concentrations that are deadly to fish and invertebrates, such as **Iron (Fe)**. Unfortunately with a single tank system you can either risk poisoning your fish or having plants that have very low nutritional value. A much better approach to this problem is having a second tank that runs between the grow bed and the fish tank, allowing the grower to add the correct nutrients and adjust pH as much as they need to. Plants and fish require different pH levels and neither will cope with the wrong level for very long.



Hydrocentre Aquaponics

We have found that a Aquaculture system works best if there is a separate tank for nutrients as this allows plants to gain all the nutrients they need to thrive and ensure the fish remain healthy. The only downside to this system is it does not recirculate the water back into the system as trace elements and minerals could potentially poison the fish if the bio-filter is unable to remove them from the water.

A bio-filter is not necessary but is still recommended to assist the system in breaking down the waste produced by the fish. One way to remove the bio-filter from the system is to buy high quality, easily digestible feed for your fish as this will result in much smaller faeces and stops excess waste from building up around the roots of the plants and causing them to coat the roots with brown slime and reduces the plant's ability to take up nutrient and breathe. Roots should always be healthy and white - if they are brown and slimy - change your feed and aerate the nutrient with airstones.



Fish Foods and Edible Plants

Feeding your fish a balanced diet is crucial to growing the biggest and most nutritious fish if you are growing them to eat rather than ornamental species. Your fish can be fed a wide range of feeds such as live foods, flakes and pellets.

In the wild fish get their nutrients from insects that fall into the water as well as plants that grow naturally in their environment.

Growing your own live feeds can be quite easy with a wide range of foods such as a worm farm, crickets, soldier flies, cockroaches, bloodworms, microworms, blackworms, tubifex worms, grindal worms, daphnia, brine shrimp mosquito larvae, tadpoles, snails, silkworms, gammarus, moth larvae.

You can introduce water plants into your system to act as a bio-filter that removes excess ammonia from the water and to feed certain species as well as give shelter to small fish from predators. Edible species of plants include duckweed, algae, elodea, water lettuce, and azolla. Spirulina is another option but needs high temperatures of 35 degrees and alkaline water with a pH of 8-11.

Edible water plants for human consumption include: Cattails, Chinese water chestnut, Chameleon plant, Duck potato, Pickerel rush, Water cherry, Watercress, Water fern, Water mint, Water spinach, Wild rice.

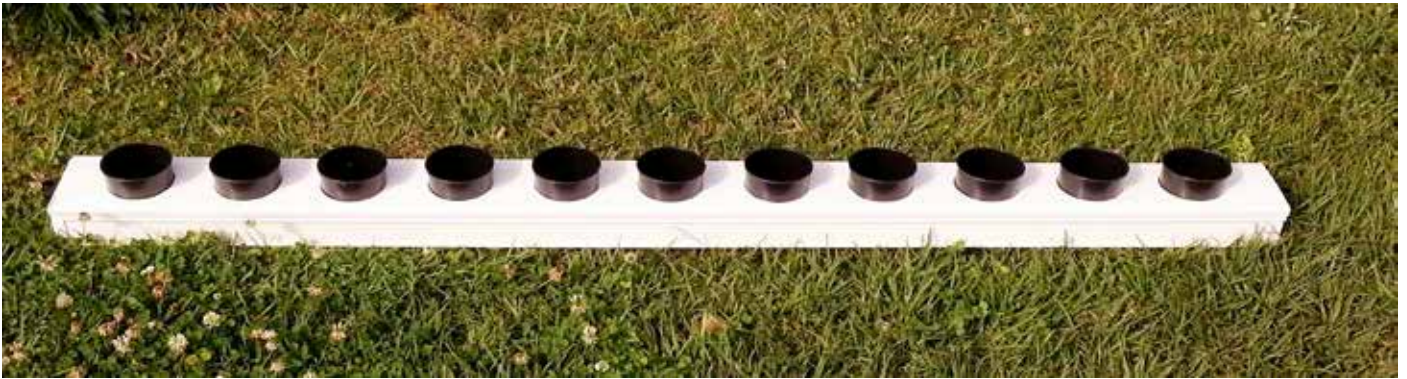
You can also use your harvest from your garden to feed your fish, creating a self-sustaining system.

Veggies and fruits that fish love include apples, strawberries, grapes, pineapple, spinach, orange, watermelon, papaya, cabbage, beans, carrots, kangkung, zucchini, peas, radish, melon, cataloupe, leek, broccoli, cauliflower, pears, mandarins, berries, kiwi fruit, kale, lettuce, watercress, garlic, and capsicum leaves. If your fish have only ever been fed pellets or flakes it may take some time for them to learn this new food source. These veggies and fruits should be used to supplement your fish's diet, not replace.

You can also feed them bread, rice and pasta dipped in raw honey. It contains a high amount of enzymes, antioxidants, minerals, trace elements and vitamins. Raw, unprocessed, locally sourced honey is unpasteurized and has antimicrobial, anti-inflammatory, antifungal and antiseptic properties.



Hydrocentre Systems



Solo Channel Systems

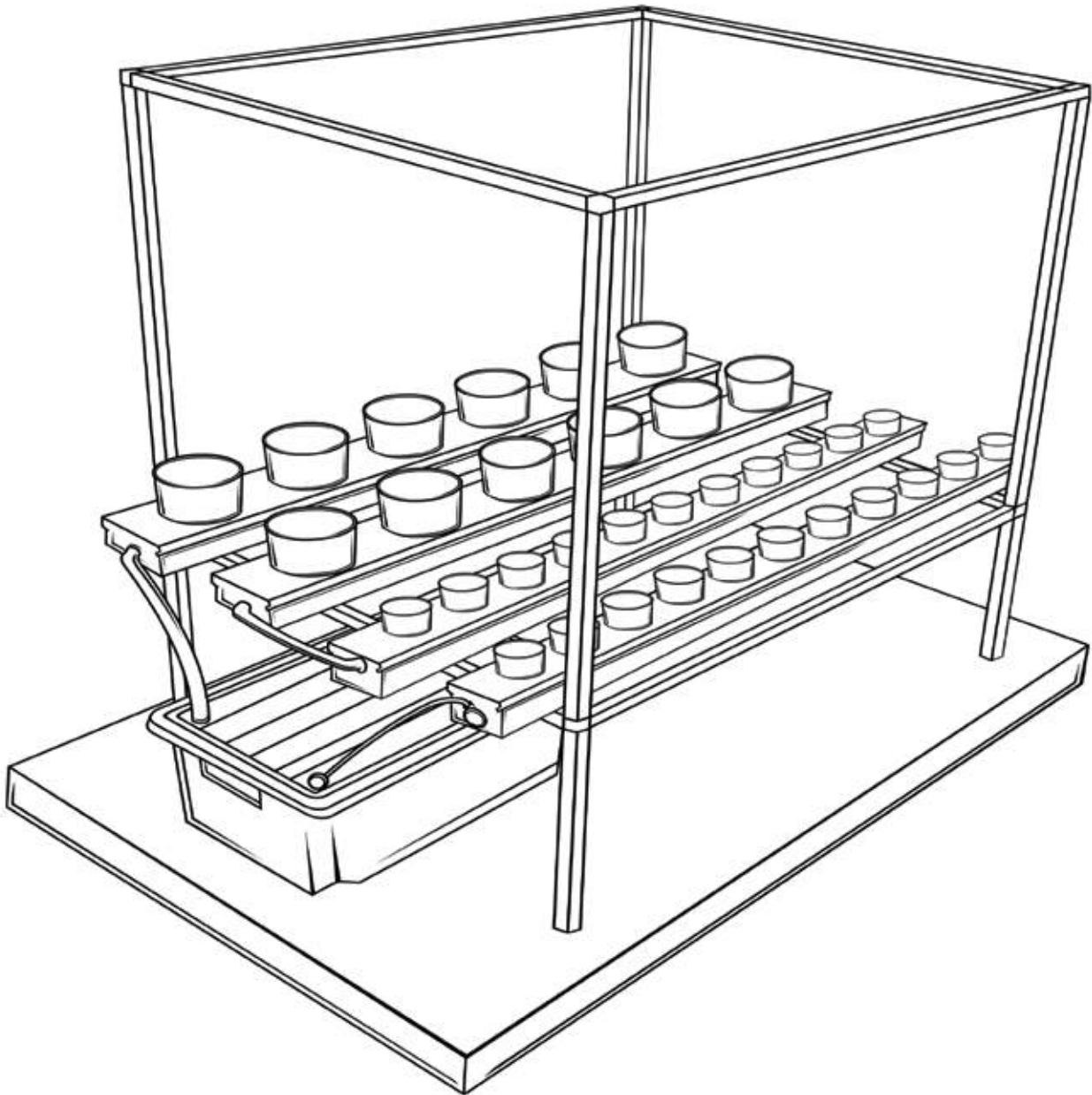
Solo channels suit hydrocentre aquaponics as they can be added to at any time as your growing needs expand. There are two sizes of pots available, 80mm or 165mm and can be ordered in either 1.5m or 3m lengths.

11 x 80mm Pot Solo 100 Channel 1.5m - \$55

22 x 80mm Pot Solo 100 Channel 3m - \$125

6 x 165mm Pot Solo 150 Channel 1.5m - \$75

12 x 165mm Pot Solo 150 Channel 3m - \$145



4 Row Solo Table System - \$477

2x Solo 100 11 pot

2 x Solo 150 6 pot

1 x Aluminium frame table

1 x Pump

Irrigation Fittings/Hoses

60L Tank

Perlite Media

Nutrient

Solar is also available for \$518



Network Gravity Systems

\$110 2 x 290mm pots

\$210 6 x 290mm pots

\$310 10 x 290mm pots

\$499 18 x 290mm pots

\$25 - Add additional grow cell

(includes perlite, hose, top and bottom pots)

All Network Gravity Systems include growing media, irrigation fittings, hoses and controller pot with float valve switch to regulate feeds.





Flood and Drain Trays

Length	Width	Height	Price
1380mm	770mm	180mm	\$120
1080mm	1080mm	180mm	\$150
2160mm	1080mm	180mm	\$260
2610mm	1380mm	180mm	\$385

Flood and Drain Table and Tray Kit

Length	Weight	Height	Price
1880mm	770mm	180mm	\$350
1080mm	1080mm	1080mm	\$495
2160mm	1080mm	180mm	\$899

**Includes Hydrocorn clay ball media 50L
\$45 per bag**



Other equipment you may need to get started:

pH Meters and EC

Brand	Description	Price
Flairform	PH test kit - strips	\$12
N/A	Yellow PH Tester Budget model	\$40
HM Co	EC/CF meter	\$45
HM Co	COM-80 EC/TDS meter	\$75
HM Co	1 year warranty reliable digital pH meter PH-80	\$95
HM Co	pH meter kit with calibration solution PH-80	\$103
Bluelab	pH pen handheld meter	\$125
Bluelab	EC/PPM Truncheon	\$135
HM-Co	PH-80 and EC COM-80 meters	\$195
Bluelab	PH Meter	\$250
Bluelab	PH/EC/CF meter	\$375
Bluelab	Guardian PH/CF/Temperature	\$399
Bluelab	Dosetronic - Commercial Grade PH/EC	\$3200

Wall Garden Aquaponics System

\$299

Wall Garden system includes 5 x levels, tank, pump, clay, fittings and a frame to attach to the wall.

Suits Ornamental Fish species such as Goldfish, Bettas and Koi



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Small Aquaponics System

The small system includes 1 x 1080 x 1080 x 180mm grow bed, 1 x 160L tank, 1 x 220L tank, pump, irrigation fittings, clay and a support frame.

Suits Ornamental Fish species such as Goldfish, and Koi as well as freshwater invertebrate species such as Yabbies, Mussels, Giant Freshwater Prawns and Crayfish.



\$860

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Large Aquaponics System

Suits Koi, Yabbies, Mussels,
Giant Freshwater Prawns,
Crayfish, Marron, Australian
Bass, Black Bream,
Long/Short Finned Eels,
Silver, Golden and Jade
Perch, Eel Tailed Catfish,
Barramundi, Rainbow
Trout, Murray Cod,
Atlantic Salmon

\$2400

The large system includes
1 x 2160 x 1080 x 180mm
grow bed, 220L tank,
5000L tank, pump,
irrigation fittings, clay and
a support frame.

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