



NATIONAL AQUACULTURE
TRAINING INSTITUTE

Breeding Special Species



SRI LANKA
EXPORT DEVELOPMENT
BOARD




National Aquaculture Development Authority of Sri Lanka
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BREEDING NEW SPECIES



TRAINING AND CONSULTING SERVICES FOR THE COMMERCIAL FISH INDUSTRY

Breeding New Species - Introduction

- An important part of expanding the Sri Lankan export industry is offering more species to customers
- Sri Lanka is well known for production of livebearers but other important commercial species do lack
- This presentation presents information on the production of a range of new species for Sri Lanka
- Some of these species require similar breeding techniques and have been grouped together under their taxonomic groups



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Elephantnose Fish

- *Gnathonemus petersii*
- Normally from wild. Some success in breeding but not economical



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BARB / CARP SPECIES BREEDING



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Barbs

- These fish are from the order 'Cypriniformes', of which there are over 1400 species. This order also includes the danios and rasboras, which are also popular ornamental fish and have similar features to barbs.
- This group includes species such as Koi carp, goldfish, Danios and Barbs, with approximately 35 species in the group.
- They are regarded generally as voracious egg eaters, so eggs need to be separated from parents as soon as possible after spawning.
- Some form of substrate is normally provided for the eggs to fall into to protect them from being eaten.



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Classification

Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes
Family:	Cyprinidae
Genus:	<i>Sahyadria</i>
Species:	<i>S. danisonii</i>

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General Information

Endemic to Kerala, India

- A stream dwelling Fish
- Prefers rock pools with overhanging vegetation
- Strict herbivore mainly on Filamentous Algae
- A shoaling fish
- IUCN Status – **Endangered**
- Fragile, with quick negative responses to environmental changes, exhausts rapidly

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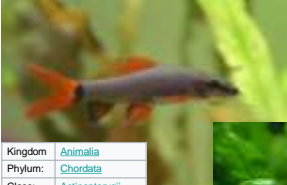
Observations on Reproductive Biology

Trait	Values
Smallest Mature Males (Length) (wt 15 gr)	8.5 – 9.0 cm
Smallest Mature Females (length) (wt 21 gr)	8.5 – 10 cm
Absolute fecundity between 7.8 – 10.0 cm length	74 – 284
Water Temperature	26 – 28 °C
pH	7.0 - 7.5
Dissolved Oxygen (mg L ⁻¹)	> 5
Total Alkalinity (mg L ⁻¹)	20 – 25
Hardness (mg L ⁻¹)	20 – 25
Ovaprim Dose (Single dose for both sexes)	0.4 ml/kg BW
Latency period	10 – 12 hours
Hatching since fertilization	36 hrs
Free swimming and first feeding	4 days
Completing metamorphosis	14 days
3.5 cm body length	4 months


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- ### Important Points
- No distinctive Sexual Dimorphism
 - Female has a slightly wider body
 - Natural Spawning between November to April
 - Rapidly exhausts
 - Yellow, heavily yoked, transparent adhesive eggs
 - Non guarder lithophile



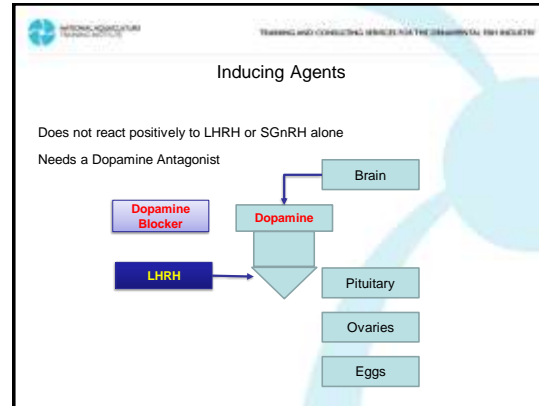
RAINBOW AND REDTAIL SHARKS



Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes
Family:	Cyprinidae
Genus:	<i>Epalzeorhynchus</i>
Species:	<i>E. bicolor</i>





Kingdom:	Animalia
Phylum:	Chordata
Class:	Actinopterygii
Order:	Cypriniformes
Family:	Cyprinidae
Genus:	<i>Epalzeorhynchus</i>
Species:	<i>E. frenatum</i>



TESTED AND SUCCESSFUL INDUCING AGENTS

Inducing Agent	Temp °C	Males				Females		Interval
		Single	1st	2nd	H	Per Kg of Body Weight	Per Kg of Body Weight	
CPE	28	0.5 mg	0.5 mg	2.0 mg	6			
+ HCG		10 IU	10 IU	50 IU				
Reserpine	28	100 mg	100 mg	0 mg	7			
LHRH A		2 mic gr	2 mic gr	8 mic gr				






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TECHNIQUES AND CONSIDERATIONS OF SEXING FOR THE AQUACULTURE INDUSTRY

Tested and Successful Inducing Agents

Inducing Agent	Temp °C	Males	Females		Interval	
		Per Kg of Body Weight				
		Single	1st	2nd		
CPE +	28	2 mg +	0.5 mg	2.0 mg	6	
HCG		10 IU	10 IU	50 IU		
Reserpine +	30	50 mg	50 mg	0 mg	7	
LHRH A		5 mic gr	2 mic gr	8 mic gr		




- SUGGESTIONS
- We have used Ovaprim as the inducing agent successfully in Tamil Nadu
 - It is a combination of *Salmon Gonadotropin Releasing Hormone* and *Dopaperidone* which is a dopamine antagonist
 - The dosage used by us was 0.5ml per Kg of body weight
 - 2 Injections in 10%, +90% dose to females within 6 hour interval
 - One time injection at half dose at the time of the resolving injection time to males
 - Both Manual Stripping and Group spawnings were successful
 - This system also applies to Algae Eaters and Silver Sharks
- Special thanks to:
Living Gems (Pvt) Ltd
Madurai
Tamil Nadu, India



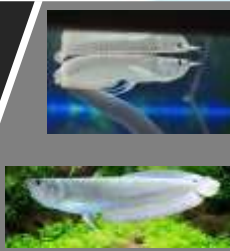
Arowana

- Arowanas are freshwater bony fish of the family Osteoglossidae, also known as bonytongues
- specialized surface feeders
- Also known as 'Dragon Fish'
- Highly prized, particularly in Chinese culture
- Red and Gold varieties most highly prized
- Quite specific climatic conditions needed – restricted production (Indonesia, Malaysia) – some reports of India and also Sri Lanka
- Requires large amount of land
- Not breed in tanks




Silver Arowana

- Osteoglossum bicirrhosum*
- Mature in about 2 years, mouth brooding by male for about 4-5 weeks, each brood about 120 to 200 fry,
- Spawn all year round but more frequent during raining season. Can spawn in earth pond or cement pond with earth bottom. 30ft x 60ft may put 20 female and 10 male. Mass spawning.




Golden Arowana

- Scleropages Formosus*
- These are much less productive than Silver Arowana as they only fewer eggs per spawn – around average brood is about 60pcs. All the rest is the same as silver Arowana
- Mature in 2.5 to 3 years.




Breeding Arowana

- The breeding and farming of Silver and Gold Arowana are very similar
- The following slides are relevant to both species
- The pH of water in the rearing tank should be maintained between 6.8 - 7.5 and 27 - 29°C
- Typical breeding pond is 30 to 60 feet with water depth was maintained at about 0.5 - 0.75 meters.



Broodstock Holding

- Spawn all year round but more frequent during raining season.
- Can spawn in earth pond or cement pond with earth bottom.
- Typical pond may stock 20 female and 10 male. Mass spawning.
- Males 'holding' eggs/fry are carefully crowded using seine nets and caught to collect eggs
- This is done very slowly and with great care so as not to stress the fish
- Arowana can accidentally swallow some of the young when stressed



Egg / Fry Collection

- To increase hatch rate and survival for fry it is preferable to harvest eggs and fry and incubate artificially
- Males 'holding' are recognized by:
 - by a distended operculum
 - swimming behaviour
 - Reduced feed
- Brood pouch under lower jaw (where eggs are)
- Need to handle fish carefully during process
- lower jaw of the fish is pulled backward slowly and the body is shaken slightly to release the hatched developed larvae from the male's mouth





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Incubating Eggs and Fry

- The yoke sac should be fully absorbed in around 60 days.
- When fry start to swim horizontally they are ready for first live food
- Bloodworms, small fish fry (baby guppies) can be used
- Use high quality Arowana diet





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Nursery Culture


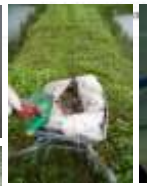

- Generally kept in glass aquaria
- enhance the colour and promote the formation of chromatophores we suggest to illuminate with artificial lighting at least 10 -12 hours a day
- partial water change of about 30% of total tank volume every 2-3 days to maintain water quality
- Feed generously with quality feed and live feeds (fish, shrimp etc)
- After 6 -7 months of free-swimming the fry measure about 20 -25cm in length and are suitable for market








Arowana Johor Baru









Arowana Johor Baru



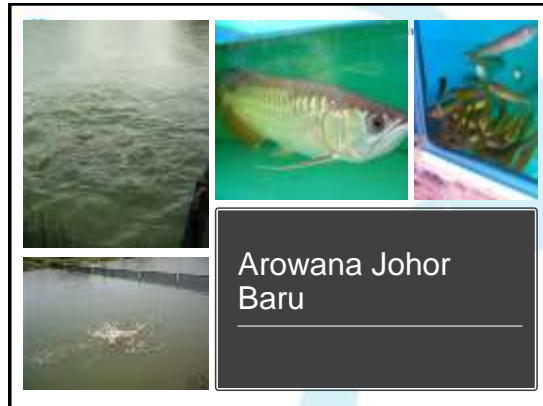


Arowana Johor Baru





Arowana Johor Baru



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Polypterus / Bichir White

- *Polypterus senegalus*
- While breeding in aquariums is reported very little commercial production
- Information here is based on breeding by hobbyists
- Pairs kept minimum 4 foot, preferably 6ft
- Shallow as they take air from the surface – no more than 18 inch deep water
- Temp 25 to 28
- Soft to slightly hard, neutral pH
- Nocturnal species so avoid bright lighting of tanks and sunlight

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Polypterus / Bichir White

- Males and females can be readily easily distinguished
- Males have a wide, muscular/fat anal fin and *sometimes* a pointed tailfin tip.
- Females have a smaller, thinner anal fin and *sometimes* a rounded tailfin tip. Females tend to grow faster, get larger and thicker-bodied than males.
- Females mature at around 5-6 years, whereas males can be mature at 12 months
- Young females can still carry undeveloped eggs, but successful breeding will be difficult until 5-6

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Polypterus / Bichir White

- Males will approach the female and shake their heads, twitch their tails and follow the female until she accepts. Once she has, they will find a hiding spot and later she will release her eggs for the male to catch in his anal fin. He will then fertilize the eggs in his cupped anal fin and scatter them.
- It is thought one of the breeding triggers for *P. senegalus* is a **grassy substrate**, so the eggs can be scattered inside the grass without risk of being eaten.

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Polypterus / Bichir White

- The eggs hatch in 3-4 days, with the fry becoming free swimming around 3 days later.
- Fry are ready to feed when they swim-up. First foods should be brineshrimp
- The fry are not particularly mobile, so care should be exercised to ensure they are well fed.
- Juveniles will take a high protein diet but also benefit from live and frozen foods

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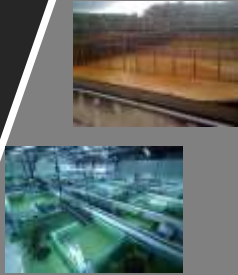
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Ocellate river stingray

- *Potamotrygon motoro*
- Originates from Sth America and inhabits a variety of biotopes
- Generally shallow, slow moving rivers with sandy / muddy bottoms
- Can grow up to 90cm across the body, captive species generally only grow to 60cm
- Most farms originally large outdoor tanks, nowadays more specialised indoor breeding

Tanks and Water Quality

- Tanks need to be large with 240cm x 90cm x 75cm or larger commonly used by breeders
- Need good water quality and filtration is necessary to remove wastes from water
- Rays eat a lot of meaty foods and make a mess of water quality
- Large water changes
- Lots of aeration to ensure good oxygen levels
- Water quality
 - 24-26OC
 - pH 6.0 – 7.5
 - Hardness: 1 – 12dH



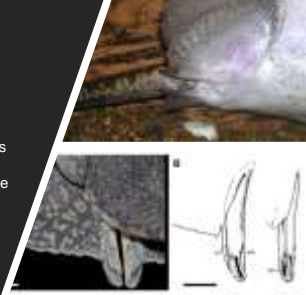
Breeding Stingray

- The young fish (often referred to as "pups") develop inside the mother and are born live and fully-formed.
- Litter size usually varies between 1-8
- The ideal way to obtain a pair is to buy a group of juveniles, housing them in a large tank and allowing them to select their own partners.



How to Pair Stingrays

- Males have distinctive 'claspers' can be seen from above, but younger males may need to be seen from below to be sure.
- Claspers are located on the underside of the ray, below the tail. There are two of them, and they are the males genitals
- Male is reproductively mature once claspers 'role'
- Females 2.5 yrs plus
- Try to ensure females are larger than the males – this will help with aggression




Breeding Motoro Rays

- spawn in cement or glass tank, 1 male to 3 male for breeding, size at least 240cm x 90cm x 75cm
- Male elasmobranchs bite and grip the body of their female mates during courtship and copulation.
- Mating can be very aggressive – males can potentially damage females
- Pairs or small groups of sexually mature fish into large tank
- Feed generously on foods
 - Fish, shrimp/seafood, Worms (bloodworms, earthworms etc)




Breeding Motoro Rays

- You should closely monitor breeding tanks. When you see mating activity, record the date
- Some breeders prefer to immediately separate females from male. – or if females are being harassed separate them
- Gestation is normally 4 months
- 1st brood only 2-3 fry, maximum about 15 fry, spawn all year round about 4 time a year, once mating
- When pups are born, separate from female – generally floating basket in tanks



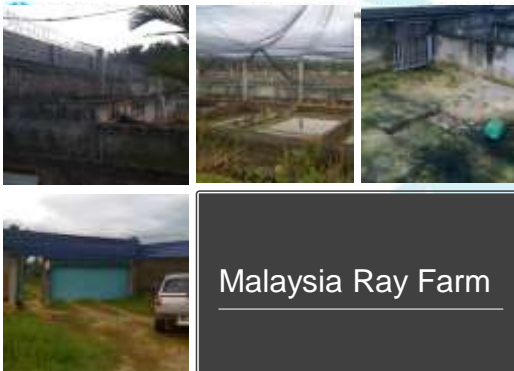
Breeding Motoro Rays

- The pups start to feed 1-3 days after birth
- Feed quality live or frozen food
- Bloodworms, and other frozen food ok. Mixing live and frozen food is good
- Feed at least 3 times per day
- Pup tanks should have a layer of sand in the bottom
- Most time of the day they are buried in the sand, at night they are more active.
- Growth is rapid, can grow to market size of 5" disc size in 4 to 6 weeks




Breeding Mottoro Rays

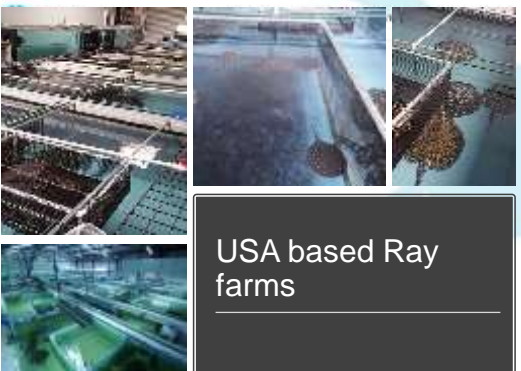
- The patterning of Mottoro Rays is highly variable.
- Some of these variants have been given their own P numbers (listed above), whilst others are sold under trade names such as Mottoro Rays "blue", "orange", "black" or "marbled"

Malaysia Ray Farm



Malaysia Ray Farm




USA based Ray farms

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CATFISH

Catfish

- Catfish order has over 15 families and over 1000 species.
- These fish live at the bottom of tanks generally and are great scavengers.
- Every tank should have them to eat algae and keep tanks clean.
- They come in a wide variety, and some of the rare, wild-caught varieties can fetch high prices.
- Life span can reach up to 3 years for smaller forms and over 10 years for the larger forms, with sexual maturity also occurring much later.





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TRAINING MODULE 2

TRAINING AND CONSULTING SERVICES FOR THE SUBSARAHAN FISH INDUSTRY

Life History

- Breeding of many species is difficult, not yet achieved
- A change of water, drop in temperature or the presence of a low pressure system can stimulate spawning's of pairs or groups.
- Soft acid water best for most species
- Eggs may be laid on a surface or in clumps – species dependant
- Mostly no parental care is given and the fry hatch after 4 days.






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TRAINING MODULE 2

TRAINING AND CONSULTING SERVICES FOR THE SUBSARAHAN FISH INDUSTRY

Bumblebee Catfish

- *Microglanis iheringi*
- Commercial breeding does not occur
- Reports of breeding in aquariums and on some farms but production not economical
- Production methods unknown
- Supply is still from wild collection
- From Sth America, prefer soft acidic waters
- It is difficult to determine the sex of these fish

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TRAINING AND CONSULTING SERVICES FOR THE SUBSARAHAN FISH INDUSTRY

Glass Catfish

- *Kryptopterus bicirhis*
- There have been isolated reports of fish spawning in aquariums
- So far no success in breeding commercial breeding
- In the wild, Catfish spawns during the rainy season.
- It is suggested that a combination of induced spawning using hormones such as Ovaprim and simulating a rainy season could be used




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Redtail Catfish

- *Phractocephalus hemiliopterus*
- Successfully spawned in Thailand, later in Malaysia and Indonesia. By hormone injection
- Water conditions:
 - Temperature 21-26OC
 - pH 6.0-7.5
 - Hardness 2-12dH
- Predatory so readily takes fish, crustaceans etc
- Needs high protein pellet for fast growth.
- Grows large – suggest caution with this species as it is highly invasive
- Limited market - not recommended to do this species






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Redtail Catfish

- Broodstock are kept in large concrete ponds 2.5 mx 2.0 mx 0.8 m concrete pool with a water depth between 50-60 cm equipped with a circulation system.
- The ratio between male and female is 1: 2.
- The average weight of the ready-breeding parent is about 2.5 kg and is at least two years old.





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Redtail Catfish

- The number of eggs produced per one parent can reach 300,000 eggs with an average hatchability of 80%.
- The eggs will hatch all within 15 19 hours at temperatures ranging from 26oC-30oC.
- Hatching larvae remain left in the aquarium until the egg yolks that stick to the body are consumed.
- The success of the hatchery begins with proper parent management to mature the gonads, so the egg quality is good and will produce quality seeds.



Breeding Synodontis Catfish

- Synodontis catfish are regularly produced in Indonesia
- Not easily spawned under natural conditions in aquaria, although captive breeding has occurred on commercial fish farms via the use of hormone injections.
- Ovaprim is generally used at the normal dose rate
- Success can be improved by a cold water change in conjunction with hormone injection to simulate rain storms




Upside-down catfish

- *Synodontis batensoda*
- Farmed in Indonesia using hormone injection but little information on the actual process is available
- So called 'upside-down' as it naturally swims on its back and feeds on under surface of vegetation
- They are omnivorous and feed on many things – livefeeds like bloodworm and daphnia are useful for conditioning
- Water quality parameters
 - 24 to 27°C
 - pH 6.5 – 7.5
 - Hardness 6dh




Featherfin catfish

- *Synodontis eupterus*
- Also produced in Indonesia by hormone injection, again very little information is available on farming this species
- In nature, *S. eupterus* breeds in areas of seasonal flooding that are rich in micro-organisms.
- They are egg scatterers and exhibit no parental care
- Grows up to 30cm, individuals generally mature at 12 to 18 months and greater than 12cm
- Water quality
 - 22 to 27°C
 - pH 6 – 7.5
 - Hardness 8-20dH




Breeding Synodontis catfish

- Synodontis catfish can be distinguished by the experienced eye when they reach adulthood the male is usually more slender, while the female is much more bulky.
- Venting is the best way to sex them



Breeding Synodontis catfish

- Condition broodstock using quality livefeeds like bloodworm, tubifex, mosquito larvae, Daphnia
- Depending on size and species they can produce between 100 and 1,000 eggs per spawn
- Eggs are scattered and hatch after 7 days at 24°C
- Fry are ready for swim-up after another 5 days
- Fry should be fed Artemia
- Weaning onto to quality high protein dry feeds can start around 2 weeks after swim-up
- Juveniles are quite hardy and grow quickly
- Can reach market size of 4cm in around 12 weeks



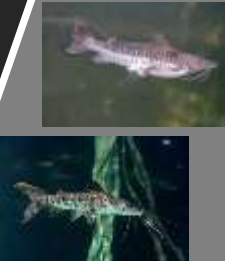
Tiger Shovelnose Catfish

- *Pseudoplatystoma tigrinum*
- Native to Sth America and the Amazon basin
- Broad range of habitats from fresh to brackish water
- Large and predatory species grows to over 100cm
- Feed on fish, crustaceans etc – require high protein pellet
- As it grows so big it is not recommended as a production species here due to low marketability



Tiger Shovelnose Catfish

- Size at maturity is 40cm plus
- Fish are kept in large tanks / concrete ponds and fed a range of livefeeds and quality artificial diet
- Ripe fish are checked for maturation and injected with Ovaprim
- Males are generally more slender
- Females generally have a larger, more rounded stomach
- Ovulation occurs quickly within 15 hrs and fish are then hand stripped to collect eggs and semen



Tiger Shovelnose Catfish


- Sperm and ova are obtained by gentle stripping of male and female brooders.
- Fertilized eggs were incubated in 60 L containers with moderate aeration
- Hatching rate of over 70% occurs after 24 h at 26.5 °C.
- At swim up feed *Artemia* nauplii in total darkness.
- Cannibalism is a problems, a high level of aggressiveness between larvae and precocious appearance of jumpers was observed,
- these need to be controlled with frequent size grading



CICHLIDS – FLOWERHORN AND RED PARROT


Cichlids

- Cichlids belong to the Family 'Cichlidae', of which there are several hundred species suitable for collection for the ornamental trade.
- Most are aggressive especially when breeding, and show a high degree of parental care and aggressive behaviour.
- Recently 2 hybrid 'species' have been developed with high marketability:
 - Flowerhorn
 - Red Parrot




Flowerhorn

- The original hybridisation was done in Malaysia in early 1990's
- Brightly coloured and large head known as a nuchal hump which is most prominent in males
- Fish are selectively bred to produce brighter colours and larger nuchal humps
- There are many different varieties based on colour



Breeding Flowerhorn Cichlids

- Large aquariums are best 40 to 50 gallon tanks generally used for breeding
- No strong filtration, many breeders just use basic sponge filter or airstone
- Low lighting (do not turn off all lights)
- Water quality typical for cichlids
- Medium hard water 100 to 200ppm
- Temperature ideally 29 -30 degrees
- pH 7.0 – 7.5
- Avoid strong filtration, many breeders use daily water changes to manage water quality



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Breeding Flowerhorn Cichlids

- Pair with the same variety – avoid mixing variety/strains as this will reduce the quality of the fish
- Spawn like other cichlid
- Many males are infertile
 - Need to be at least 8 months old – preferably 12 months
- Trial by breeding pair with female and test results – if spawns are infertile swap with new male
- Therefore need plenty of new broodstock coming on
- Most females are fertile




VENTING

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Breeding Flowerhorn

- Aggression can be big problem – can severely damage and/or kill each other
 - Try vitamin B – add to diet at or the water
- only pair when female looks like she will spawn (egg tube is extended then add male)
- After spawning take male away asap (within 1 to 2 hours)
- Provide hiding place for female to get away from male




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Breeding Flowerhorn Cichlids

- A female Flowerhorn is able to produce approximately 500-2000 eggs at a time
- Hatching and rearing of eggs is same as for most cichlids
- Eggs hatch 2 to 3 days, with Fry free swimming within 4 days
- Live brine for first 2 to 3 weeks then on to dry food / moina
- Grow to around 3 inches at 3 months
- Use quality high protein foods with colouring agents (astaxanthin) to maximise the colour
- Select for colour and shape (hump)







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Growing Flowerhorn




- To get the best quality fish, males need to be grown individually
- When the fry about 4cm, select those with small hump on the head and keep in individual tank. (normally you get 20-50%)
- The young fish should not see each other all the time. They see each other 3-4 time a day and about -10min each time.
- Can also use mirror for this purpose
- Keep them in slightly harder water

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Red Parrot Hybrid Cichlid

- This fish is from the hybrid of *Cichlasoma citrinellum* x *C. synspilum*
- Very popular in Asia and Middle east markets but not as valuable as Flowerhorns
- Successful spawning has resulted when the females have cross bred with non hybrid fish such as the convicts and other cichlids such as the Severums and Midas. to create the Jelly Bean and Bubblegum Parrot. These are usually dyed Red, Green, Blue, Purple or Pink.
- These coloured varieties are not popular in western markets

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Breeding Red Parrot Cichlids

- Males are usually infertile. Can be bred with Midas, Severum and Convict Cichlids.
- Minimum 42 gallons, additional 10 gallons for each thereafter.
- Many breeders remove the teeth of both parents fish, if not they will fight to death
- Also try adding vitamin B to the water
- If the pair don't produce high percentage of ghost body or short, than must change partner and observe again until the pair give good result and keep the pair together for ever
- Successful breeding needs a lot of fish being grown up to select new broodstock





INTERNATIONAL AQUACULTURE TRAINING CENTRE
TRAINING AND CONSULTING SERVICES FOR THE SUBSISTENTIAL FISH INDUSTRY

Breeding Red Parrot Cichlids

- Eggs take about 2-3 days to hatch
- Can leave with parents or incubate artificially as for other cichlids
- If the eggs don't hatch after 5 days start again and after a couple failed attempts don't take it as defeat switch the pair and try again.
- Fry are ready to feed when they swim-up after 2 to 3 days
- Feed with brine shrimp 3 times daily



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Breeding Red Parrot Cichlids

- The fry need to feed a lot and with higher protein feed, so the body can be more round
- Feed the fry with high quality feed with asthaxanthine to gain red color – many specialty feeds on market
- Select the fry with ghost body color for on growing and inject with color a few days before selling



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Israeli style farming of Guppies

- Israeli guppy farms generally built inside green-house
 - Protects from extreme temperature
 - Fish-houses are heated with heat exchangers, keeping water temperature at 24-27 C
- Cement floors and good drainage. No outside open ponds are used.
- Most of the culture tanks are made of plastic materials.
- Smooth plastic tanks are very easy to clean and disinfect between culture periods.
- Tank size and configuration, is adapted to age and size of the guppy. Generally small tanks are used for breeding stock and fry, and bigger tanks for outgrown fish.



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Israeli Guppy Tank Design


- Each tank is isolated from the others. Water is recirculated through a biological filter located inside each tank (10% of tank volume), with 5-10% daily new water change.
- Water recirculation is done by using an airlift for each filter. The biofilter medium is made of different plastic materials.
- The filter is cleaned periodically. In every farm there are a bank of active biological filters, these filters are used to replace filters after sterilization.
- water level is important. For guppy culture it is better to have less than 100 cm. For fry 60-80 cm high is used.



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Water Quality

- The water in Israel is alkaline and hard, with pH 7.5-8.5, hardness 15-30 dH, conductivity: 1,000-3,000 µS/cm.
- Before entering the fish tanks, water passes through active-carbon filters. Water is aerated before use to avoid gas problems (especially gas-bubble diseases).
- Shadecloth over the greenhouses reduces algae development.
- Using these methods together with a biofilter in each tank makes the culture water crystal clear.
- Cultivating fish in this type of water also makes them adaptable to aquarium water in the customer place. In crystal clean water the farmer can better monitor the condition of the fish.



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Breeding

- Breeding stock: 250 Females + 50 Males in cage in 500 litre tank
- Generally have broodstock in a floating cage
- Collect fry 2 to 3 times daily and remove from tanks
- Breeding stock are also fed with frozen food like blood-worm and vitamins-rich meat (beef-heart).



Feeding

- Fish are fed on high quality dry feed, consisting of 30-40% protein and incorporated with vitamin premix, and carotenoids.
- Size of the food pellets is graded according to the fish size.
- Fish are fed at least two types of dry food from different sources.
- The fry are also fed with Artemia nauplii.
- Dry food is given at about 5% of the total biomes daily. This amount is divided to 3-5 times a day.




Production Cycle

- At the end of every stage fish are graded with special graders to uniform size and re-stocked to new tanks in density according to their size and age.
- The stocking density varies with the age and size of the guppy, as shown below:
 - Fry: (1 day-30 days): 2,000-4,000/500 litre.
 - Fish (31-90 days): 10,000-30,000/ 20 m³



Harvest


- Guppies reach market size at 2.5-3 month age (3.5-4 cm total length) Male and female are grown together.
- Before marketing females are separated from males with the help of special graders for guppies.
- Final separation for size and quality is done manually.

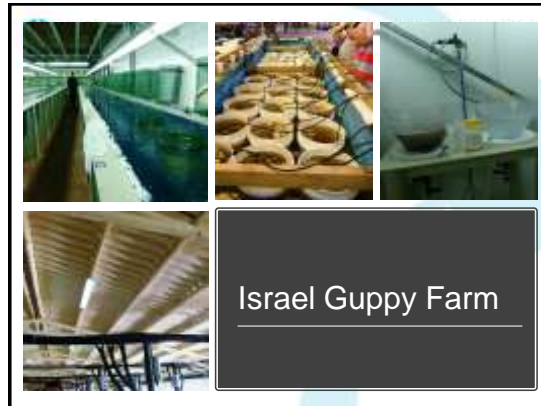
**Israelis Style
Guppy farm - India**



Israeli Guppy Farm



Israel Guppy Farm



Israel Guppy Farm

INTERNATIONAL AQUACULTURE TRAINING CENTRE
TRAINING AND CONSULTING SERVICES FOR THE INTERNATIONAL FISH INDUSTRY

Intensive Production of Neon Tetra

- Neon tetras are one of the most popular species in the aquarium trade
- They are produced in large numbers in Hong Kong/Shenzhen, Malaysia and Indonesia
- As they are a small fish the number of eggs per spawn is low – maybe 20 to 40, so mass production means mass spawning
- Water quality is critical – must have soft acidic water for successful breeding and hatching

INTERNATIONAL AQUACULTURE TRAINING CENTRE
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Water Quality Requirements

- Water quality:
 - 22 – 26°C (72 – 79°F)
 - pH: 6.0 – 7.0
 - GH: 10 – 100 ppm
- Water hardness is not an important factor in keeping and growing these fish although any sudden, significant changes will bring about a stress response.
- However for spawning should target 10 to 20ppm, pH 6.0 – 6.4 (some breeders target as low as 5.5)
- Breeding may be induced by raising the temperature by 2 – 3°C (4 – 7°F) and by using soft water, ideally below 20 ppm.
- Addition of humic acid (use Indian Almond Leaves) can help with spawning and providing correct water quality... should lightly colour water

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Broodstock conditioning

- Tetras are generally considered easy to breed, however,
- Sexes should be conditioned for spawning separately, and spawned as pairs.
- Need to be fed lots of livefeed – bloodworms preferred by most breeders, can also use tubifex worms, Daphnia, Mosquito larvae
- Supplement with 1 or 2 feeds per day of quality fish feed
- Females can condition for spawning within 2 to 3 weeks

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Breeding

- These fish are egg scatterers, and will spawn in groups or pairs, usually at dusk or dawn.
- They will also eat their own eggs if given the chance and show no parental care for the eggs or fry.
- Water chemistry plays a major role in fertility and hatch rate of eggs – taker care in preparing
- Water free from bacteria and fungus is essential to successful breeding as the eggs are very sensitive to infection.

INTERNATIONAL AQUACULTURE TRAINING CENTRE
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Breeding

- Small spawning tanks used – 2 to 5 litres
 - Can be glass or plastic tanks
 - Substrate to prevent eggs being eaten
- Pairs added to spawning tank late afternoon
- Covered to keep dark
- Parents should be removed soon after spawning, normally by lunchtime.
- Typically set up to spawn 100's of pairs at a time
- Farm in Malaysia does 1,000 pairs every second day

SEXING NEON TETRA

TRAINING AND CONSULTING SERVICES FOR THE COMMERCIAL FISH INDUSTRY


- Sexually mature males and females are fairly easy to distinguish
- Males are slightly more coloured and have a more slender body
- Females have a deeper more rounded body shape



TETRAS

TRAINING AND CONSULTING SERVICES FOR THE COMMERCIAL FISH INDUSTRY


- The eggs hatch within 3 days, and will feed off an egg sac until they are free swimming 2 days later.
- Fry are small and ideally need to be fed on infusoria, paramecium, rotifers
- Some breeders start feeding on Artemia from day 1
- Weaning onto powdered dry food after 1 to three weeks.
- After then move to ponds



TETRAS

TRAINING AND CONSULTING SERVICES FOR THE COMMERCIAL FISH INDUSTRY


- Fry must be fully weaned before being stocked into ponds or grow-out tanks (ie. three to four weeks old).
- Typical stocking into 8m by 3m concrete would be 16,000
- Feed on a quality diet, protein of about 40-42%
- Fish generally reach market size after 2 to 3 months at 2 to 3 cm in length.




Shenzhen Tetra Farm



Malaysian Tetra Farm



Malaysian Tetra Farm

