

Name of species/group

Chanos chanos Forsskal (Osteichthyes: Chanidae)

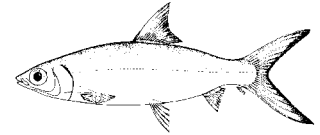
Milkfish

Primary potential

Aquaculture for human consumption; juveniles as tuna bait.

Attributes for aquaculture

- ▶ Milkfish is a warm water species. It prefers water temperatures 20–33°C.
- ▶ Unlike many other large saltwater fish it is herbivorous and feeds on cyanophyta (*Lyngbya* spp.), diatoms and other similar food items.
- ▶ Larvae eat zooplankton. Juveniles and adults eat cyanobacteria, soft algae, small benthic invertebrates, and even pelagic fish eggs and larvae.
- ▶ Can be grown in monoculture or in polyculture with other finfishes and crustaceans.
- ▶ Wild fry occurs in the tropical and sub-tropical seas of the Indo-Pacific region and extends to the Red Sea, the East Coast of Africa, South California and the West Coast of Central America.
- ▶ Technology for broodstock development and hatchery for large scale seed production is already established.
- ▶ Technology for nursery and grow-out in ponds, pens and cages in fresh, brackish and marine environment is developed.
- ▶ Juveniles can be grown to maturity (broodstock size) in 5–7 years in ponds, tanks and cages under proper management.
- ▶ Artificial feeds for intensive farming have been developed.
- ▶ Fingerlings (25 g) are also used as tuna bait.
- ▶ Recommended as biomanipulators to produce greenwater for environmentally friendly intensive shrimp farming.
- ▶ No known occurrence of disease outbreak in aquaculture.



Culture methods

- ▶ A typical milkfish farm comprises nursery and transition ponds representing about 10–15% of the total farm area. The rest of the farm is rearing ponds and canal system.
- ▶ Pens or floating netcages may be used instead of ponds for grow-out.

Fry

- ▶ Milkfish spawn only in fully saline water. Females spawn up to 7 million epipelagic eggs (1.1–1.2 mm diameter), which hatch in about 24 hours. Spawning and fertilisation take place at night. Frequency of spawning is unknown. Eggs and larvae are pelagic up to 2–3 weeks. The larvae seek out clear coastal and estuarine waters warmer than 23°C with salinity 10–32 parts per thousand and abundant phytoplankton.
- ▶ Incubating eggs and newly hatched larvae are transported to the shore by currents,.
- ▶ Older larvae migrate onshore and settle in coastal wetlands (mangroves, estuaries) during the juvenile stage, or occasionally enter freshwater lakes.
- ▶ Under natural conditions, larvae and fry migrate inland, seeking tidal pools. They settle in them for 1 month until they become juveniles, then migrate into lagoons, lakes and shallow waters. When they reach adolescence (24–45 cm fork length) they return to the sea for further growth and sexual maturation.
 - Larvae for aquaculture can be collected from brackish waters such as shallow sandy areas, mouths of rivers, and lagoons.
 - Intensive milkfish farming depends heavily on hatchery bred fry.
 - Hatchery production technology is well developed. A mature female can produce 1–7 million eggs after about 5–7 years of rearing. Survival rate of 35% has been attained from Day 0 of fertilized egg to Day 21 (fry)
 - Significant survival rate of 70% has been attained in nursery operation after 30–45 days of culture. Stunted milkfish fingerlings reared from 6 months to 1 year in transition pond attain 50–60 % survival at an average body weight of 35–50g.

Fingerlings

- ▶ Nursery ponds are prepared by sun drying, liming and application of organic and inorganic fertiliser to enhance growth of benthic algae (*lab-lab*).
- ▶ Supplemental feeding with rice bran and other feedstuff is often done.
- ▶ Wild or hatchery bred fry are available all year round with peak in April–June and again in October–December
- ▶ Fry are stocked in 1–5 hectare nursery ponds, at the rate of 30–40 fry per square metre, for 30–45 days. Densities are reduced as the fish grow. Some are directly stocked in grow-out ponds and the rest go to transition or stunting ponds at 15 fingerlings per square metre for 6 months to about a year. Bigger sized fingerlings (40–80g) are preferred for pens and floating netcages.

Fingerlings

► Non-aerated ponds:

- *Shallow water culture.* In the traditional culture method, milkfish are cultured in shallow (40–60 cm) brackish water ponds of 2–50 hectares. Water exchange is tidal. The growth of benthic algae is encouraged through photosynthesis and fertilisation. Other natural foods like filamentous algae (lumut) maybe resorted to, but yield is less compared with lab-lab. Stocking rate 2,000–3,000 fingerlings (5–10 g) per hectare; 1–2 croppings per year; yield 1.5–2.0 tonnes per hectare per year.
- *Deep water culture.* Also known as the plankton method. Milkfish are cultured in ponds, with a depth 80–110 cm and area 1–10 hectares. Water exchange is tidal. Production: 1–2 croppings per year; yield 1–2 tonnes per hectare per year.
- *The modular system* allows 6–8 crops per year with yield of 2–4 tonnes per hectare per year. The growing fish are moved through three adjoining ponds of increasing sizes, at the ratio of 1:2:4 or 1:3:9. Ponds are prepared by the lab-lab method of growing natural food. Water exchange is tidal. The program involves pond preparation, stocking, transfer and harvest in regular intervals. To sustain year-round production, an inventory of milkfish fingerlings, organic and inorganic fertilisers, and organic pesticides needs to be maintained.

► Aerated ponds:

- Increased productivity can be gained through culture in deep ponds (0.1–1.5 m) using paddle wheel aerators, feeding machine and water pump to increase primary productivity. At the minimum stocking density of 8,000–12,000 fingerlings per hectare, production of 4–6 tonnes per hectare per year can be attained. At the highest density of 30,000 fingerlings per hectare, yield is 12–15 tonnes per hectare

► Floating netcages:

- Fingerlings (40–60 g) from the nursery ponds are reared to marketable size in netcages. Stocking density of 40–100 fish per cubic metre can produce 20–45 tonnes per crop.

► Pens

- Fingerlings (40–60 g) from the nursery ponds are reared in fish pens, 5,000–10,000 square metres in size constructed in shallow water, with a stocking density of 30,000–40,000 per hectare. Fingerlings forage for natural food from the bottom or plankton. Supplemental feeding is needed if there is depletion of natural food. Production of 15–20 tonnes can be attained.

Current production status

- Culture of this species is well developed in Asian countries, especially the Philippines, Indonesia and Thailand. Currently Hawaii, Kiribati and Fiji Islands are the only Pacific Islands countries culturing milkfish.

- ▶ Milkfish production in Fiji Islands was worth approximately AUD30,000 per year for 1996–1998, with total pond area of about 80 ha.
- ▶ Hatchery-reared juveniles in Kiribati are exported to Fiji.
- ▶ Few other Pacific Islands countries are culturing milkfish, and production levels are uncertain.
- ▶ Large-scale commercial hatchery and nursery operations have been established in the Philippines, Indonesia and Taiwan.
- ▶ Current Philippines price of milkfish fry is 1 cent a piece. A 2–3 cm pre-fingerling size costs 1.75–2 cents a piece.

Marketing

- ▶ In general, milkfish operations are market oriented. Milkfish commands reasonable prices at population centres.
- ▶ Milkfish is marketed fresh, fillet, deboned, smoked, canned and frozen.
- ▶ Processing increases the commercial value and palatability of milkfish.
- ▶ Processing provides additional employment opportunities.
- ▶ Cultured juvenile milkfish (25 g) are excellent bait fish for tuna longline fishing. This market is the driving force behind the development of the milkfish industry in Fiji.
- ▶ Introduction of intensive culture has led to an increase in demand for fingerlings.

Comparative advantages/disadvantages (risks) of producing the species in the Pacific

Advantages

- ▶ Widely distributed in the Indo-Pacific region. Wild milkfish fry has been reported throughout the Pacific region in countries such as Palau, Kiribati, French Polynesia and nearby countries.
- ▶ Broodstock maybe developed as possible source of hatchery bred fry in the region for possible large-scale seed production operation.
- ▶ A continuous supply of seedstock can be guaranteed from hatchery technology.
- ▶ Employment potential for fry gatherers, and in post harvest and processing activities.
- ▶ Milkfish is low in the food chain (a herbivore/detritivore), and so food inputs are relatively simple.
- ▶ Feeding technology is well established.

- ▶ Potential for development of feed manufacturing, input supplier, broodstock supplier, seed production and marketing enterprises.
- ▶ International market available. Exported from Philippines.

Disadvantages

- ▶ Environmental problem from effluents from intensive culture ponds.
- ▶ Overcrowding of pens and floating netcages leads to environmental pollution that eventually triggers fish kills.