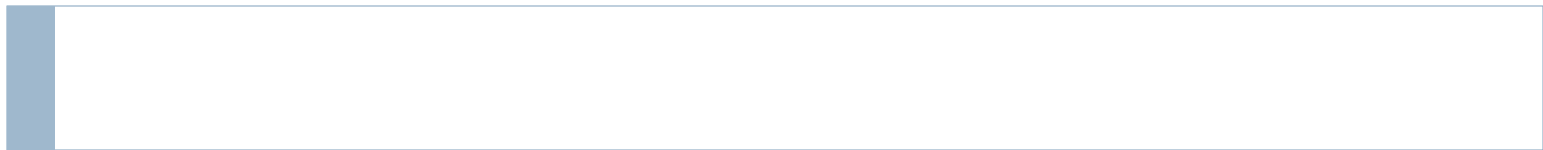


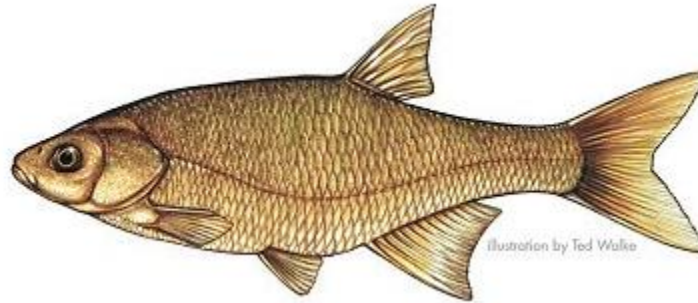
# Culture of Bait fish and Forage fish



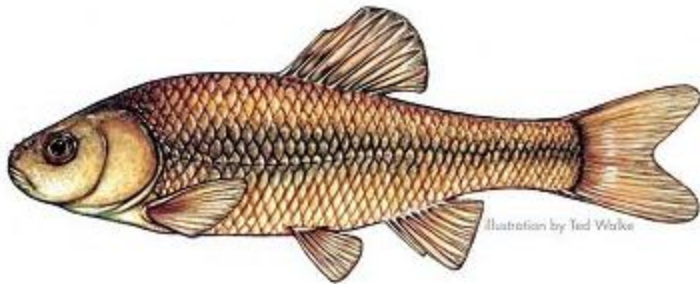
# Bait fish

- ▶ ~~Definition: It is defined as the live fish sold for fishing bait or feeder fish and is fed to fish with Piscivorous food habits~~
  - ▶ It is also used for recreational fishing
  - ▶ > 20 species are caught from wild and used as bait fish
  - ▶ Few bait fish species are farmed (50%) and rest are from capture sources
  - ▶ Major farm raised bait fish species are
    - ▶ Golden Shiner (*Notemigonus crysoleucas*)
    - ▶ Fathead minnow (*Pimephales promelas*)
    - ▶ Gold fish (*Carassius auratus*)
  - ▶ Most species belongs to Cyprinidae
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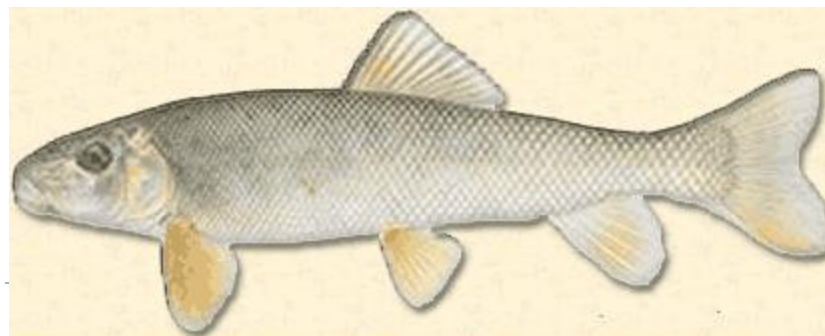
**Golden shiner (*Notemigonus crysoleucas*)**



*Fathead minnow*



*Goldfish*



**White Sucker (*Catostomus commersoni*)**

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# Development of baitfish farming

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- ▶ Use natural fish food as bait is ancient and common practice
- ▶ 75% total freshwater game fish caught are by using live baitfish.
- ▶ Sources of baitfish are capture, Extensive and Intensive culture
- ▶ In the past all baitfish were captured from wild
- ▶ Wild caught baitfish is often a mix of fish species
- ▶ Introduction of such wild caught non-indigenous bait fish effects the recipient water bodies
- ▶ Culture of baitfish on extensive scale in seasonal water bodies or on intensive scale.



# Baitfish culture methods

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- ▶ Culture method vary depending on species and farm
- ▶ Marketing and distribution network and market volatility influence over production of baitfish
- ▶ Fish species raised for bait should be easily propagated, hardy, fast growing , widely distributed and attractive to game fish



# Culture methods : facilities

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- ▶ Most baitfish are raised in **earthen ponds**
- ▶ Pond size varies depending on the fish species
- ▶ Example: For Golden Shiners ----- 2- 8 ha
  - For Fathead Minnow ----- upto 4 ha
  - For Feeder Gold fish ----- in smaller ponds to 0.8 ha
- ▶ Water Depth : **shallow for easy harvesting** (0.8 -1.8 m)



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- ▶ Groundwater is to be exclusively used in baitfish culture, because surface water contains unwanted wild fish
  - ▶ If surface water is used, then fine mesh self cleaning mechanical filters are used to clean surface water
  - ▶ Prevent aquatic weeds to establish in ponds
  - ▶ Harvested baitfish are held in vats (shallow tanks constructed of cement concrete) before marketing.



# Propagation

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- ▶ Spawning techniques are similar for golden shiners and goldfish
- ▶ Both species reproduce by scattering adhesive eggs over vegetation and no parental care is given to eggs.
- ▶ Multiple spawning in a spawning season
- ▶ Propagation methods:
  - Wild Spawn Method : Brood fish stocked in flooded ponds spawn on vegetation and resulting young raised with parents. Poor survival and unpredictable.





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-- Egg transfer method: spawning mats are used and mats with eggs are transferred to rearing ponds containing shallow layer of fresh well water for incubation and hatching

- Eggs hatch out within 3-7 days depending on temperature

Ponds are stocked with eggs carried by spawn mats

▶ For Golden Shiners : 5-10 million eggs /ha

▶ For Feeder Goldfish : 25 million eggs /ha



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- ▶ Incubating eggs are usually reported with fungus infection and low dissolved oxygen
  - ▶ Care is taken to get maximum survival by treating eggs
  - ▶ Sodium Sulphite is used to detach Shinner eggs and then eggs are hatched in jar
  - ▶ Tank hatching method is also alternatively followed with proper management of water quality, feeding with micro particulate diet.
  - ▶ Fathead minnow continuously spawn every 4 days during the spawning season.
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# Rearing of fry to juvenile

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- ▶ Stocking of ponds with fry at different density
  - ▶ For Golden Shiners : 1.2-5 lakh fry/ha
  - ▶ For Feeder Goldfish : 1-4 million fry/ha
- ▶ Once the bait fish reach to juvenile of 2-3 cm, they are harvested and transferred to other ponds.



# Fertilization, natural foods, nutrition, feeds and feeding

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- ▶ Fertilization is done to promote development of natural foods
- ▶ Baitfish are usually **omnivorous in feeding habit** and feeds on zoo plankton, plant and animal materials.
- ▶ Nutritional requirement of bait fish are poorly understood.
- ▶ Feeding with artificial diet increases the baitfish production 2-3 times higher than that produced only by natural foods.
- ▶ Besides feeding, water quality, natural foods, diseases and other pond management issues influence production of baitfish.



# Water quality

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- ▶ Increase aeration as stocking and feeding rate is increased
- ▶ Aerators like electric aerator, tractor driven aerators, pumps, etc. are used.
- ▶ Low dissolved oxygen and high ammonia level are two water quality problems commonly noticed in baitfish culture ponds.
- ▶ Solution : Feeding rate is decreased and improve water quality by circulating water.



# Other pond management problems

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- ▶ Fish eating birds - a major problem
- ▶ Scare Programmes for control – expensive and time consuming
- ▶ Snakes feed on minnows when fish are spawning and insensitive to danger

## Harvesting, Holding, Grading, Marketing

- ▶ Partial or complete harvesting
- ▶ Holding of baitfish in well oxygenated vats
- ▶ Baitfish are graded into size categories depending on species like jumbos, mediums and crappie bait.
- ▶ Transportation in insulated trucks with better aeration system



# Culture of forage fish

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- ▶ Forage fish : it is a small fish called as prey fish consumed by larger predator fish or other animals
- ▶ Forage fish is even sometimes called as baitfish or feeder fish
- ▶ Forage fish also considered in fisheries point of view
- ▶ Examples of forage fish : tiny shrimp, squid, tilapia, minnows, shiners etc.

## **Food and feeding habits of forage fish**

- ▶ Feed on plankton
- ▶ Are filter feeder and omnivorous
- ▶ Copepods and tiny crustaceans are common feed for forage fish.

