Fish in relation to Man and Human Welfare-

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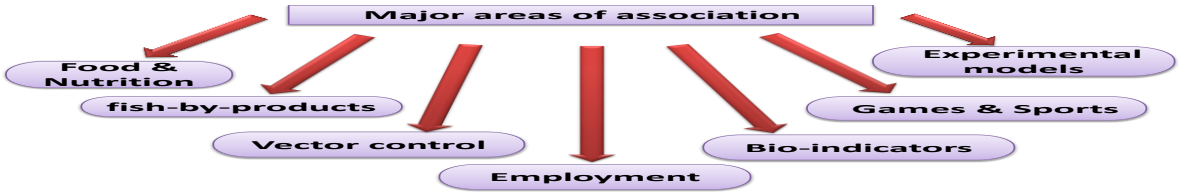

1. **Fish as Food**: About 75% of the world fish production is used for the human consumption. Fish Consumption is higher in developing countries and lowest in Africa. Around 60% of people of developing countries depend on fish for their animal protein requirements.
2. **Fish lipids & Human Nutrition:** Fishes are low in calories and many types of fish do not contain any saturated fat. Reduce the cholesterol level in the blood**:** Oil-rich fish such as mackerel, sardines, herring and sprats are rich in unsaturated fats containing Omega-3 fatty acids which are valuable for health. Fish oils can help to prevent cancer cells progressing to the tumor stage.
3. **Fish protein** contain sufficient amounts of essential amino acid similar to milk, egg and mammalian meat protein. fish protein improves blood lipid profile in human, Salmonids and herrings are best sources of fish proteins.
4. **Fish vitamins**: Fishes are excellent source of many essential minerals such as iodine, selenium, zinc, iron, calcium, phosphorus, potassium, vitamins A and D, and several B vitamins.
5. **Transgenic Fish may be better used for** increasing fish production to meet the growing demand of food, for production of pharmaceutical and other industrial products, as fish biosensors for monitoring aquatic pollution, for isolation of genes, for researches in embryonic stem cells and in-vitro embryo production, for production of anti-freeze protein.
6. **Ornamental fishes: M**ore than 100 varieties of indigenous ornamental fishes are available in our freshwater ecosystem in addition to a similar number of exotic species that are bred in captivity.

➢A list of India´s native ornamental fishes

Common name	Scientific name	distribution
Zebra danio	*Brachydanio rerio*	All Over India except north hill.
Golden banded loach	*Botia dario*	Assam, Bengal, Bihar, Orissa
Dwarf gourami	*Colisa lalia*	Throughout India.
Indian rosy barb	*Puntius conchonius*	Estern india
Jerdon carp	*Puntius jerdoni*	Western Ghats
Melon barb	*Puntius faciatus faciatus*	Western Ghats
Neon hatchet	*Chela cachius*	Assam
Black knife fish	*Notopterus notopterus*	All over India
Red gilled violet shark	*Labeo boga*	Ganga river
Pencil gold labeo	*Labeo nandina*	Assam

Common name	Scientific name	istribution
Tiger loach	*Botia birdi*	Punjab, North India
Twin banded loach	*Botia rostrata*	Assam
Striped loach	*Botia striata*	Tunga River, Kolhapur, Maharashtra
Butterfly catfish	*Hara hara*	Northern India
Elongated mouth catfish	*Hara horai*	North Bengal
Dwarf anchor catfish	*Hara jerdoni*	North-eastern India
Leaf fish	*Nandus nandus*	Throughout India
Giant glass fish	*Parambasis thomassi*	Western Ghats
Peacock eel	*Macrognathus aral*	Eastern India
Red tailed eel	*Macrognathus jacobbi*	North Bengal, Orissa
Clown catfish	*Gagata cenia*	North And Northeast India

Common name	Scientific name	distribution
Sidewinder loach	*Aborichthys bijulensis*	Garo hills, Meghalaya
Puma loach	*Acanthocobitis rubidipinnis*	Upper Assam
Leopard loach	*Acanthocobitis botia*	Northeastern India
Black line loach	*Nemachelius anguilla*	Western Ghats
Banded loach	*Shistura beavani*	North Bengal
Polka dotted loach	*Schistura corica*	North Bengal
Ring loach	*Shistura denisoni dayi*	Bihar
Panther loach	*Lepidocephalus gunthea*	Northern And Eastern India
Indian coolie loach	*Pangio pangia*	North-east Bengal, Eastern Madhya Pradesh
Sun catfish	*Horabagrus nigricollaris*	Kerala

7. **Employment**: In India, marine fisheries sector employs around 2.9 million people of which 12.47 lakh people are in active fishing, 14.97 lakh in secondary sector avocations and 2 lakhs in tertiary sector, around 30 per cent are women workers of which 81 per cent are residents of fishing villages in the coastal belt.
8. **Iindicators of environmental water quality** because of their differential sensitivity to pollution fishes serve as good indicators of pollution. Fish have the ability to uptake and concentrate metals directly from the surrounding water or indirectly from other organisms such as small fish, invertebrates, and aquatic vegetation, in addition, fish are located at the end of the aquatic food chain and may accumulate metals and pass them to human beings, fish diversity may be a useful biological indicator of water quality and this could be used in bio-monitoring networks and programmes to assess water quality and in mapping out fish species hot-spot areas
9. **Vector Control**: larvivorous fishes are suitably adapted to feed upon mosquito larvae and are thus helpful in controlling the population of mosquito which are vectors of many dreadful diseases, e.g. malaria, yellow fever, filarial, dengue etc.

Some important Larvivorous Fishes

Some important Larvivorous Fishes	
Gambusia affinis (a cichild)	An exotic fish
Lebistes reticulatus (a cichild)	An exotic fish
Carassius carassius (a cyprinid fish) commonly known as 'gold fish'	An exotic fish
Aplocheilus lineatum	An indigenous fish
Oryzias melanostigma (a minnow)	An indigenous fish
Aphanius dispar	An indigenous fish
Amblypharyngodon (a cyprinid)	An indigenous fish

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Rasbora daniconius (a cyprinid)	An indigenous fish
Esomus danricus (a cyprinid)	An indigenous fish
Punctius sophore (a cyprinid)	An indigenous fish
Colisa faciata (a anabantid)	An indigenous fish
Barillius vagra (a cyprinid)	An indigenous fish
Notopterus notopterus (an osteoglossis)	An indigenous fish
Oxygaster (a cyprinid)	An indigenous fish

10. **Fish food is rich in micro-nutrients**: renewed emphasis on the production, access, distribution and utilization of common, micronutrient-rich foods. Fish, especially nutrient-rich small fish, from the wild and from aquaculture, can play a vital role in improving human nutrition, but this will require changes to government policies, investment in infrastructure and encouragement of research.
11. **Fish genes** are highly conserved like humans Thus, any type of disease that causes changes in the body parts of humans could theoretically be modelled. Further, they also possess 0.32 to 133 billion base pairs.
12. Small laboratory fish like **zebra fish** and **medaka** are primed to provide useful experimental models to investigate causes of morphological and physiological variation in other fishes. *Channa punctatus*, possesses

just 32 (2N) chromosomes that is too of larger size, thus is suitable for studies of chromosomal abnormalities (CAT: Chromosomal Aberration Test).

13. Fish by-products: Several fish body parts and by-products finds immense application for human welfare.

SIGNIFICANT FISH BYPRODUCTS

S.NO.	BY- PRODUCTS	FISH ORGAN FOR EXTRACTION	SPECIES USED	COMMERCIAL USES
1.	Oil			
a.	Cod liver oil	Liver	*Gadus morhua*, halibut, heddock, tuna, sharks.	Medicines, soap making, currying.
b.	Fish body oil	Whole fish, fatty tissues	Sardines, herrings, pilchard, salmon, spart.	Used in the manufacture of soaps, candles, paints, varnishes, cosmetics, lubricants, printing inks, plastics.
2.	Fish meal	Whole fish	Sardines, mackerels, sharks, rays, silver bellies.	Food source for poultry and cattles.
3.	Fish silage	Whole fish, commercial fish waste	Most species except sharks and rays.	Serves as source of amino acids for protein synthesis. Used in fish feed pellets.
4.	Fish manure	Mixing ash with dried fish	Fish waste (any fish species).	Manuring of plants.
5.	Isinglass	Air bladder	Sturgeons	Confectionary, adhesives, plasters, emulsifiers, agent in beer industries.
6.	Fish glue	Bones, scales, fins, skin.	Sturgeons, Tilapia	Act as binders, glazing agents, adhesives.
7.	Fish leather	Skin	Sharks, rays	Used in the making of belt, shoes, bags, etc.
8.	Fish soap	Fins	Sharks	Soap making.
9.	Artificial pearls		Bleak fish	Glass beads.
10.	Fish insulin	Pancreas	Tunas, cods	Medicinal value.