TITLE :AQUACULTURE

"The animals which live in the watery depths, above all in ocean waters are protected against the destruction of their species at the hand of man. Their reproductive rate is so large and the means which they have to save themselves from his pursuits or traps are such that there is no evidence that he can destroy the entire species of any of these animals".

Jean-Baptist de Lamarck (1908)

Introduction :

Aquaculture involves cultivation of freshwater and saltwater populations under controlled conditions. In India, two types of aquaculture are practice, ie freshwater aquaculture and brackish water aquaculture. Freshwater aquaculture involves the breeding of freshwater fish like carp, catla, rohu, magur, freshwater prawn, freshwater pearl culture as well as ornamental fish farming. Brackishwater aquaculture, has more salinity than fresh water, but less than sea water. It is practiced in States like West Bengal, Andhra Pradesh, Kerala and Goa, fish farmers use a mixture of oil cakes, rice bran, locally available snail to feed the fish.

The water in which fish are farmed is important for the development of a good harvest. The farmer should monitor the level of water quality ie, hardness, acidity/ alkalinity, contaminants, industrial chemicals and pesticides present in the water. They should also see that there is enough dissolved oxygen in the water for the survival of aquatic animals. Common chemicals used in aquaculture are EDTA (ethylene diamine tetra acetate) disodium salt for removing water hardness, sodium nitrate for algae formation, ammonium chloride for boosting water fertility and formaldehyde, a bactericide. Aquaculture and fisheries can meet the huge demand for nutritive, value food it , contributes, 50% of total animal protein consumed in Indonesia, Japan, India, Sri Lanka, Bangladesh and Cambodia.

Fish oils contain the omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), precursors of certain eicosanoids that are known to reduce inflammation in the body, and have other health benefits.The omega-3 fatty acids in fish oil are thought to be beneficial in treating hypertriglyceridema and possibly beneficial in preventing heart

disease. Fish oil and omega-3 fatty acids have been studied in a wide variety of other conditions, such as clinical,anxiety,cance.r,

Dear Students, in to-day's lecture, we will discuss about "**Aquaculture"**

1. History
2. What is Aquaculture:
3. Types
4. Benefits
5. Conclusion

Abbreviation used in the test:

EPA: eicosapentaenoic acid

DHA: docosahexaenoic acid

EDTA : ethylene diamine tetra acetate

BOD: Biological Oxygen Demand

US: United States

Fish farm – locations used to grow populations of aquatic organisms, primarily fish.

Fish Hatchery – one form of a fish farm, managed with the intent of resupplying native wild populations in natural environments.

Ornamental fish – are small fish, such as koi, which are typically grown to be kept in aquariums or small landscape ponds.

Extensive aquaculture – managed aquaculture dependent on the local natural setting, such as a pond or coastal sea area.

Intensive aquaculture – managed aquaculture controlled through human engineered means, such as managing water quality and sources of food.

Fish meal – commercially processed food source used in fish farming as a source of protein for the fish stock.

1:History of Aquaculture:

In the last few decades, worldwide aquaculture production has increased significantly. More sustainable development alternatives are needed to ensure that in the future aquaculture can contribute to the growing need for seafood products.

The practice of aquaculture is very old, according to literature evidence that Egyptians were probably the first in the world to culture fish as far back as 2500 B.C. come

from pictorial engravings of an ancient Egyptian tomb showing ,figure of fish ,fished out from an artificial pond. Writings in India made in 300 B.C. suggest means of rendering fish poisonous in the Indian sub-continent during the times of war. This shows that tte fish culture prevailed in some Indian reservoirs and some historical documents written in 1127 A.D., describe methods of growing fish in ponds. Culture of Gangetic carps in Bengal in the Indian Sub-continent is of historical origin. The Chinese carried with them their traditional knowledge of carp culture since many years and the Philippines, fish culture has been done in brackish water ponds for centuries. Aquaculture was operating in China circa 2500 BC. Japanese cultivated seaweed by providing bamboo poles and, later, nets and oyster shells to serve as anchoring surfaces for spores.

Fisheries in India is a very important economic activity and a flourishing sector with varied resources and potentials. India's aquaculture production basically can be classified into freshwater and brackish water production. There are 429 Fish Farmers Development Agencies (FFDA) and 39 Brackish water Fish Farmers Development Agencies (BFDAs) for promoting freshwater and coastal aquaculture. Some of the important species cultured in India are the Indian major carps and shrimp. Besides these, ornamental fish culture and seaweed farming, are slowly gaining importance in the aquaculture scenario in the last few years as alternative livelihood supporting sectors as small-scale activities. Aquaculture, probably the fastest growing food-producing sector, now accounts for nearly 50 percent of the world's food fish

Aquaculture is now fully comparable to capture fisheries when measured by volume of output on global scale. The contribution from aquaculture to the world total fish production of capture and aquaculture in 2012 reached 42.2 percent, up from 25.7 percent in 2000. Asia is the only continent producing more fish (54 percent) than capture fisheries. The share of aquaculture in total fish production also rose in all other continents with Europe staying at 18 percent and others below 15 percent. Geographically tilapias are the most wide spread species for aquaculture production in the world. Close to 140 countries and territories are now recorded for farming of tilapias in FAO database.

Water source for aquaculture: Rivers, Lakes & Streams: Large Volumes – Inexpensive But often Excessive Nutrients & Potential for Contaminants (Toxins & Pathogens) Surface Water: Inexpensive – But Strong Contaminant Potential (Toxins & Pathogens) Springs:

Harbor Few Predators – No Toxins or Pathogens Wells: No Predators or Pathogens – Low O2 Levels Groundwater: Hard to Drain or Remove Fish Municipal Supplies: No Predators But Disinfectants Chloramines Seawater: Plentiful But Chemistry & Pathogens Variable

Alternative Water Sources: Rainwater: Free, Unpredictable, Only a Supplement, Often Acidic, Poorly Buffered City Water: Limited Potential Due to Cost, also Contains Disinfectants (eg Chlorine) Saltwater Wells: Via Saltwater Intrusion, Ancient Seabeds Mineral Composition Variable – High Cost Recycled Water: Stay within Permitting

2:<u>What is Aquaculture and R&D research centers India.</u>

Aquaculture nothing but ,breeding, rearing, and harvesting of plants and animals in all types of water environments and it serves a variety of purposes.

Aquaculture is also known as aqua farming, is the farming of aquatic organisms such as fish, crustaceans, molluscs and aquatic plants.

Mariculture - Fish farming - Shrimp farming - Aquaculture in Australia

Aquaculture produces food fish, sport fish, bait fish, ornamental fish, crustaceans, mollusks, algae, sea vegetables, and fish eggs. About 567 aquatic species are currently farmed all over the world, representing a wealth of genetic diversity both within and among species.Demands of the consumer has increased .Aquaculture is practiced by both some of the poorest farmers in developing countries and by multinational companies.

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3:Major types of aquaculture.

There are three categories of waters, used for aquaculture, ie

Fresh water

Salt water

Brackish water

Commercially cultured species:

- Catfish
- Tilapia
- Trout
- Salmon
- Striped Bass
- Oysters
- Clams
- Shrim

DIFFERENT KINDS OF AQUACULTURE

As habitats of aquaculture, there are three categories of waters, viz. fresh, salt and brackish. Fresh waters, generally abounding in the inland areas of a country, and the salt water of the seas and oceans, are characterized by a wide difference in their salinities ranging from nil in the former to nearly 35 ppt in the latter. The difference in salinity within each category of water, fresh and sea, is restricted to rather narrow limits. Brackish water normally naturally occurs in deltas of rivers, lagoons and backwaters.

The different kinds of aquaculture are:

- Running water culture.
- Culture in recirculating systems:
- Culture in rice fields.
- Aquaculture in raceways, cages pens and enclosures
- Hanging, ‘on-bottom’ and stick methods of oyster culture.
- Static water ponds

Aquaculture has a number of benefits. But if it is done without adequate environmental safeguards it can cause environmental degradation. The main environmental effects of marine aquaculture can be divided into the following five categories:

1. Biological Pollution: Fish that escape from aquaculture facilities may harm wild fish populations through competition and inter-breeding, or by spreading diseases and parasites. Escaped farmed Atlantic salmon (*Salmo salar*) are a particular problem, and may threaten endangered wild Atlantic salmon in Maine. In the future, farming transgenic, or genetically modified, fish may exacerbate concerns about biological pollution.
2. Fish for Fish Feeds: Some types of aquaculture use large quantities of wild-caught fish as feed ingredients, and thus indirectly affect marine ecosystems thousands of miles from fish farms.
3. Organic Pollution and Eutrophication: Some aquaculture systems contribute to nutrient loading through discharges of fish wastes and uneaten feed. Compared to the largest U.S. sources of nutrient pollution, aquaculture’s contribution is small, but it can be locally significant.
4. Chemical Pollution: A variety of approved chemicals are used in aquaculture, including antibiotics and pesticides. Chemical use in U.S. aquaculture is low compared to use in terrestrial agriculture, but antibiotic resistance and harm to non target species are concerns.
5. Habitat Modification: Marine aquaculture spreads over 26,000 marine hectares, or roughly 100 square miles. Some facilities attract marine predators, and can harm them through accidental entanglement or intentional harassment techniques.

The most common form of marine aquaculture is the production of mollusk shellfish, which include clams, mussels, and oysters. Farm raised salmon is another popular product in marine aquaculture, as is shrimp. While most of the production of these animals occurs in coastal waters, there are several open ocean aquaculture locations.

4:<u>Benefits:</u>

- Fish provide a high quality and rich protein supply of meat
- The increased production of food for human consumption;
- Opening of commercially viable business opportunities;
- Creation of employment, especially in rural areas;
- Increased national exports; and easier to harvest
- Substitution of imports by local production
- Fish are ectothermic (cold-blooded)this means less energy goes into maintaining a constant body temp
- Fish have a higher percentage of edible meat (up to 85%)
- Up to 5000-6000 pounds fish can be raised on one acre

These fatty acids are crucial for your body and brain to function optimally,
Fatty fish are also much higher in omega-3 fatty acids and are strongly linked to reduced risk of many diseases like serious neurodegenerative diseases like Alzheimer's disease. Grey matter is the major functional tissue in your brain, containing the neurons that process information, store memories. Since fish oil is a combination of two different fatty acids, these numbers reflect a combined total. Total eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) consumption should come from a mix of real food and supplements.

Fish oil can be taken throughout the day. To minimize the "fish burp" taste, take fish oil with meals.Pregnant women should increase their intake of DHA by at least 200mg a day, as long as there is no risk of elevated mercury levels.

This includes the fat-soluble vitamin D, a nutrient that most people are deficient ,it functions like a steroid hormone in the body.Fatty types of fish are even more beneficial for heart health, because of their high amount of omega-3 fatty acids.Omega-3 fatty acids are absolutely essential for growth and development.The omega-3 fatty acid (DHA) is especially important, because it accumulates in the developing brain and eye . Fish and omega-3 fatty acids may also help with other mental disorders, such as bipolar disorder.

Many research have also found that omega-3 fatty acids are beneficial against depression and significantly increase the effectiveness of antidepressant medications. Fish and fish products are the best dietary sources of vitamin D, by far. Fatty fish like salmon and

herring contain the highest amounts. Many fish eaters believe that fish consumption may also lower the risk of rheumatoid arthritis and multiple sclerosis.

Economy: Aquaculture plays an important role in the economy, providing thousands of jobs in operations and maintance services. According to the Environmental Defense Fund, a non-profit environmental organization, global fisheries exports now earn more revenue than any other traded food commodity in the world.

Many countries are heavily investing their resources into aquaculture in the world, top 10 countries are listed:

1. China
2. Japan
3. India
4. Chili
5. Vietnam
6. Indonesia
7. Thailand
8. Bangladesh
9. Korea
10. Philippines

Impact of aquaculture

Chemical inputs

Excessive use of chemicals,such as antibiotics, anti-foul ants and pesticides or the use of banned chemicals can have unintended consequences for marine organisms and human health.

Disease and parasites

Viruses and parasites that transfer between farmed and wild species as well as among farmed species present a risk to wild populations.

Escapes

Escaped farmed species can compete with wild fish and interbreed with local wild stocks of the same population, altering the overall pool of genetic diversity.

Feed

Aquaculture must responsibly source and reduce its dependency upon fishmeal and fish oil a primary ingredient in feed so as not to put additional pressure on the world's fisheries. Fish caught to make fishmeal and fish oil currently represent one-third of the global fish harvest.

Nutrient pollution and carrying capacity

Excess food and fish waste increase the levels of nutrients in the water and have the potential to lead to oxygen-deprived waters that stress aquatic life.

Social issues

Seafood farming often employs a large number of workers on farms and in processing plants, potentially placing labor practices and worker rights under public scrutiny. Additionally, conflicts can arise among users of the shared coastal environment.

Health hazards.

Biotoxins

Many fish eat algae and other organisms that contain biotoxins (defensive substances against predators). Biotoxins accumulated in fish, shellfish include okadaic acid, saxitoxins, ciguatoxin and domoic acid. Both domoic acid and ciguatoxine can be deadly to humans; the others will only cause diarrhea, dizzyness and a (temporary) feeling of claustrophobia.

Allergens

A seafood allergy is a hypersensitivity to an allergen which can be present in fish and particularly in shelfish. This can result in an overreaction of the immune system and lead to severe physical symptoms. Most people who have a food allergy also have a seafood allergy. Allergic reactions can result from ingesting seafood, or by breathing in vapours from preparing or cooking seafood. The most severe seafood allergy reaction is anaphylaxis, an emergency requiring immediate attention.

Importance of aquaculture

Having defined aquaculture and mentioned some of the reasons which have contributed to imparting a fillip to aquaculture in recent times, it is proper to state the objectives of aquaculture. These are:

i. Production of protein rich, nutritive, palatable and easily digestible human food benefiting the whole society through plentiful food supplies at low or reasonable cost.
ii. Providing new species and strengthening stocks of existing fish in natural and man-made water-bodies through artificial recruitment and transplantation.
iii. Production of sportfish and support to recreational fishing.
iv. Production of bait-fish for commercial and sport fishery.
v. Production of ornamental fish for aesthetic appeal.
vi. Recycling of organic waste of human and livestock origin.
vii. Land and aquatic resource utilization: this constitutes the macro-economic point of view benefiting the whole society. It involves (a) maximum resource allocation to aquaculture and its optimal utilization; (b) increasing standard of living by maximising profitability; and (c) creation of production surplus for export (earning foreign exchange especially important to most developing countries).

ix. Providing means of sustenance and earning livelihood and monetary profit through commercial and industrial aquaculture. This constitutes the micro-economic point of view benefiting the producer. In the case of small-scale producer, the objective is to maximise income by greatest possible difference between income and production cost and, in the case of large scale producer, by maximising return on investment.
x. Production of industrial fish.

5: Conclusion

India is also an important country that produces fish through aquaculture in the world. India is home to more than 10 percent of the global fish diversity. Presently, the country ranks second in the world in total fish production with an annual fish production of about 9.06 million metric tonnes. Good quality of protein low in fat,Better Production to Cost Ratio.Fish oil can reduce blood clotting and should be supplemented with caution if blood-thinning medications, asprin, warfarin or clopidogrel are already present in the body.

There have been significant increases in demand for fish and seafood in the United States and throughout the world. Aquaculture is a form of agriculture which involves the propagation, cultivation, and marketing of aquatic plants and animals in a Culture Tank Pump Culture Tank Culture Tank Primary Settling Chamber Biological Filter Schematic diagram for water recirculating systems. A Basic Overview of Aquaculture - 9 more-or-less controlled environment.Fish can consume more protein than other animals and can efficiently convert nitrogen in feed into structural proteins in the body. The higher efficiency of nitrogen excretion in fish is another reason for fish to benefit from a bioenergetic point of view

According to the reports of the National Fisheries Development Board, Government of India, during 2007-08 India contributed about 4.4% of the global fish production. In India, fisheries sector contributed to 1.1% of the GDP and 5.30 % of the agricultural GDP. Per capita fish availability had been 9.0 kgs and annual export earnings were 7,200 Crore (INR). 14 million employment opportunities have been generated by this sector till 2008-09.