International Training Centre for Operational Oceanography
(ITCOocean), Hyderabad, India

Anthropogenic Threats to Fishery Resources

Manickavasagam S

Assistant Professor

தமிழ்நாடு டாக்டர் ஜெ. ஜெயலலிதா மீன்வளப் பல்கலைக்கழகம்
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Outline of Presentation

- What is an Anthropogenic Threats?
- What is Water Pollution?
- Diverse Form of Anthropogenic Threats to Fishery Resources
- Control Measures
- Conclusion

What is an Anthropogenic Threats?

Definition: The term anthropogenic threats designates a deleterious or harmful effects caused by **"human activity"** to environment

Factors: Rapid growing population, Industrialization, Urbanization, and Economic development

Cause: Pollution, Land degradation, Deforestation, and Soil erosion

Effects:

- ❖Discharges of toxic effluents and inflow of nutrients
- ❖Degradation of coastal and open sea ecosystem
- ❖Impairment of aquatic organisms (Fish,Mammals,Whales,Turtles etc.,)
- ❖Diseases and lose of biodiversity (Extinction)

What is Water Pollution?

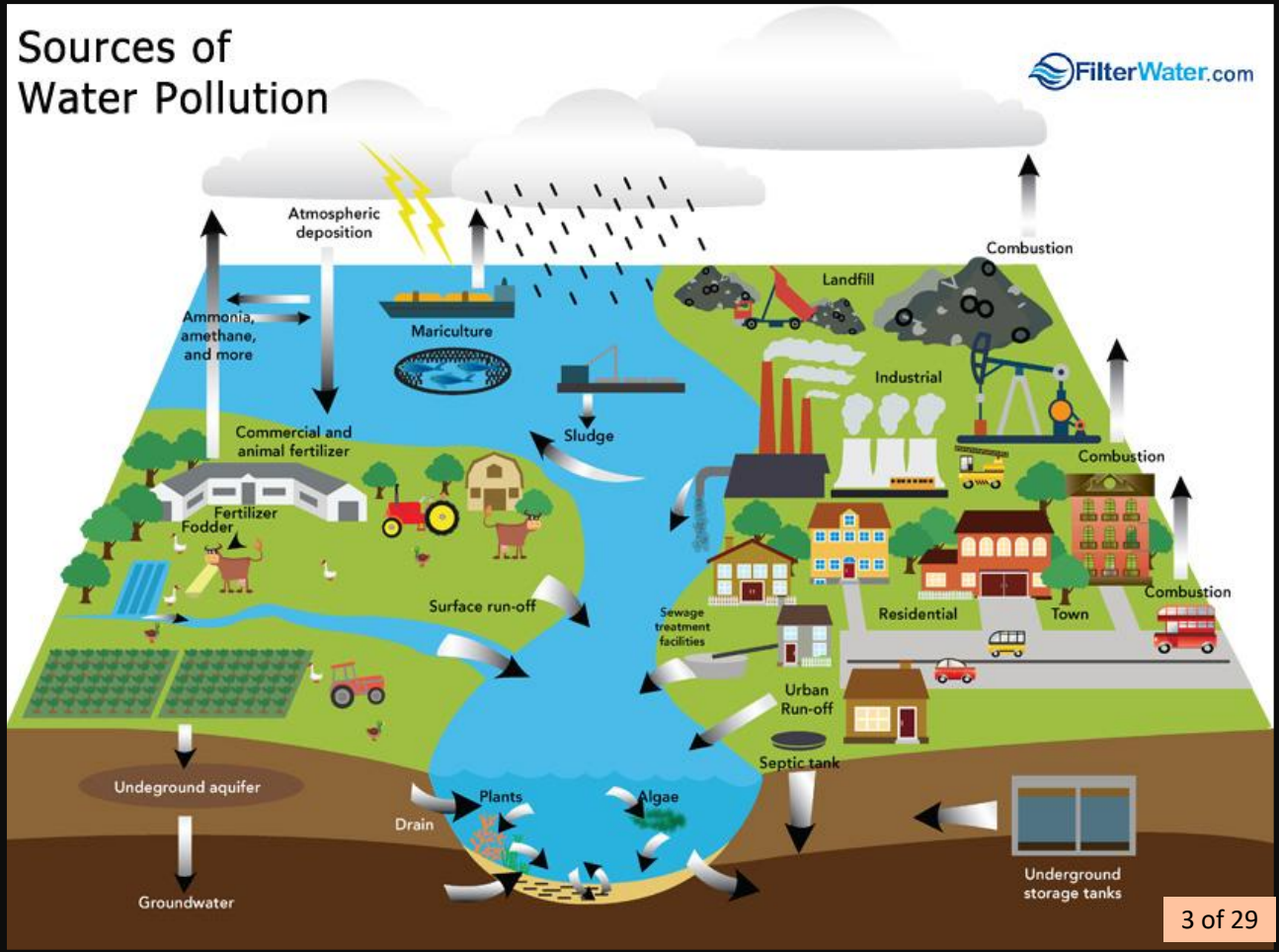
Water Pollution occurs when there is a change in the physical, chemical, or biological quality of water that has harmful effects on living organisms that consume it or live in it

Effects

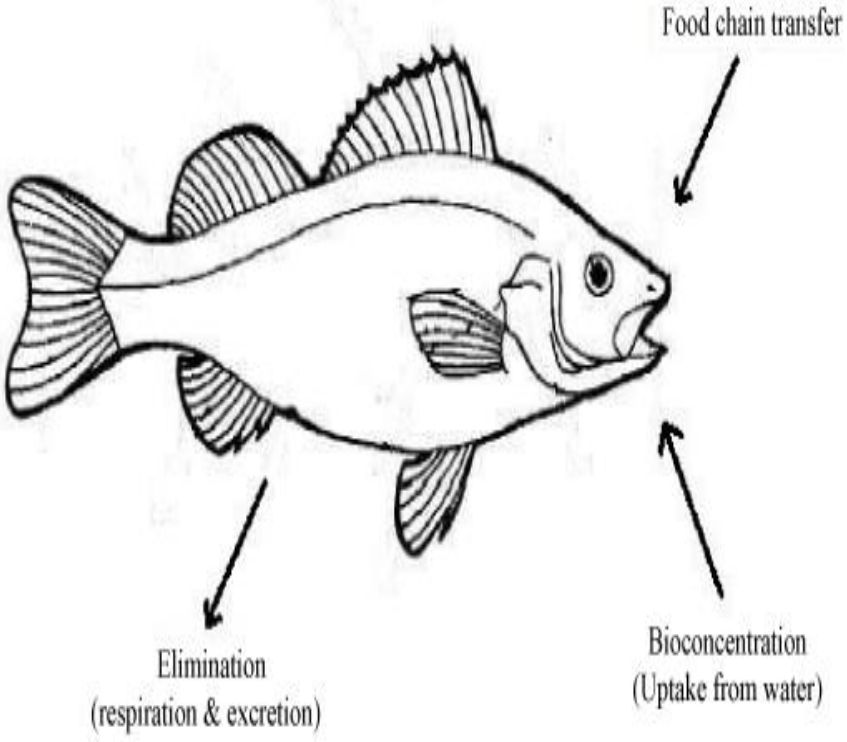
Destruction of aquatic ecosystem

and

Disruption of food chains

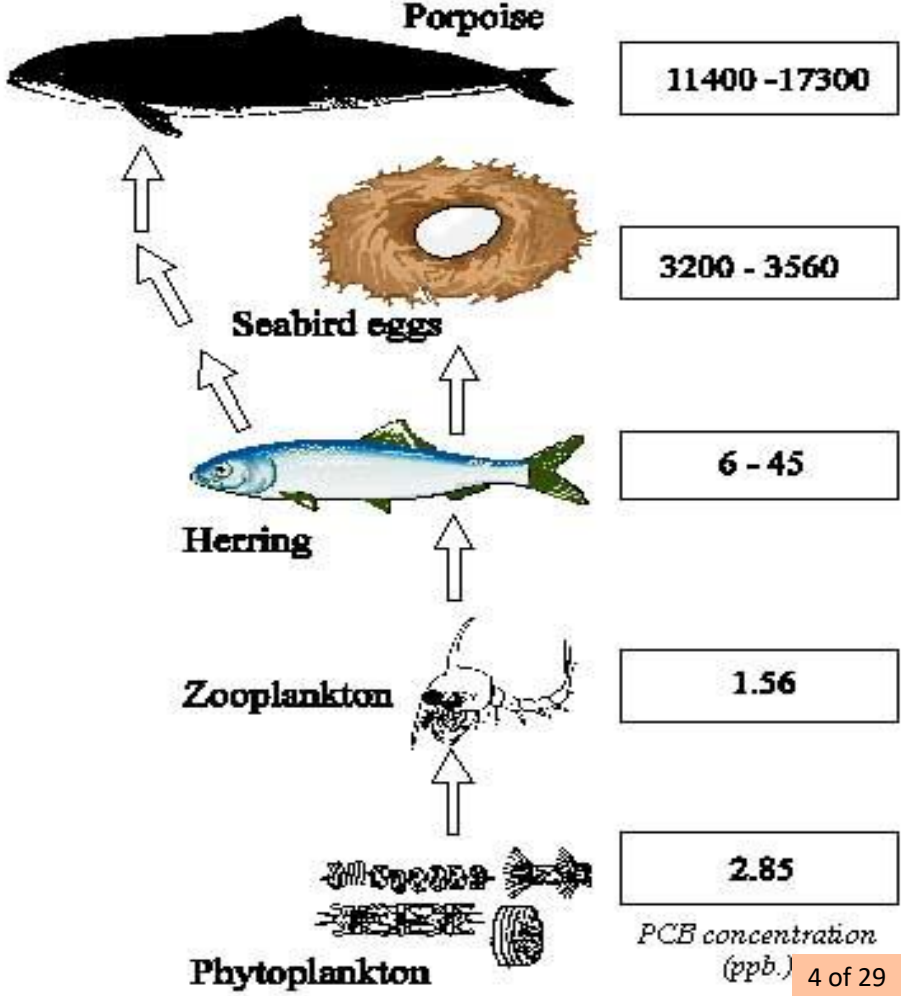


Bioaccumulation & Bioconcentration Process

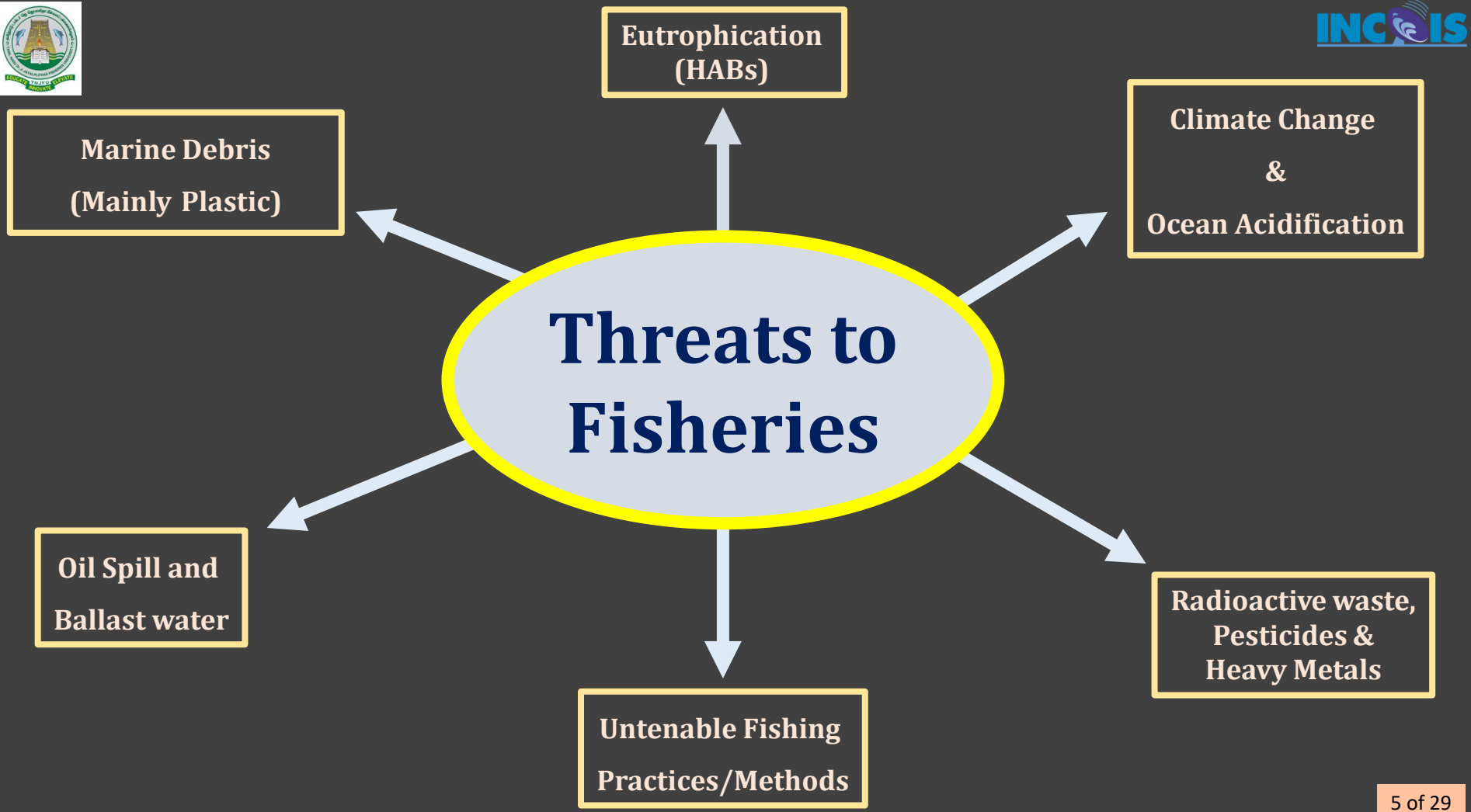


Bioaccumulation = bioconcentration + food chain transfer - (elimination+ growth dilution)

Biomagnification Process



Source:researchgate.net


Eutrophication (HABs)
Marine Debris (Mainly Plastic)
Climate Change & Ocean Acidification
Threats to Fisheries
Oil Spill and Ballast water
Radioactive waste, Pesticides & Heavy Metals
Untenable Fishing Practices/Methods

Marine Debris

Marine Debris "any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment" **(NOAA, 2010)**

Classified into **7 major** categories

1. Plastic items
2. Metal
3. Glass
4. Rubber items
5. Processed lumber
6. Cloth/fabric and
7. Miscellaneous

Plastic consumption/year
India=11kg/person
World=28kg/person

Source:FICCI

Source: Lippiatt, S., et al., (2013)

Classification of Marine Debris Based on Origin

Ocean Based

e.g., gloves, plastic sheets, light bulbs/tubes, nets, fishing line, rope, floats/buoys, etc.,

Land Based

e.g., syringes, metal beverage cans, balloons,sixpack rings, straws, tampon applicators, cotton swabs, etc.,

General Sources

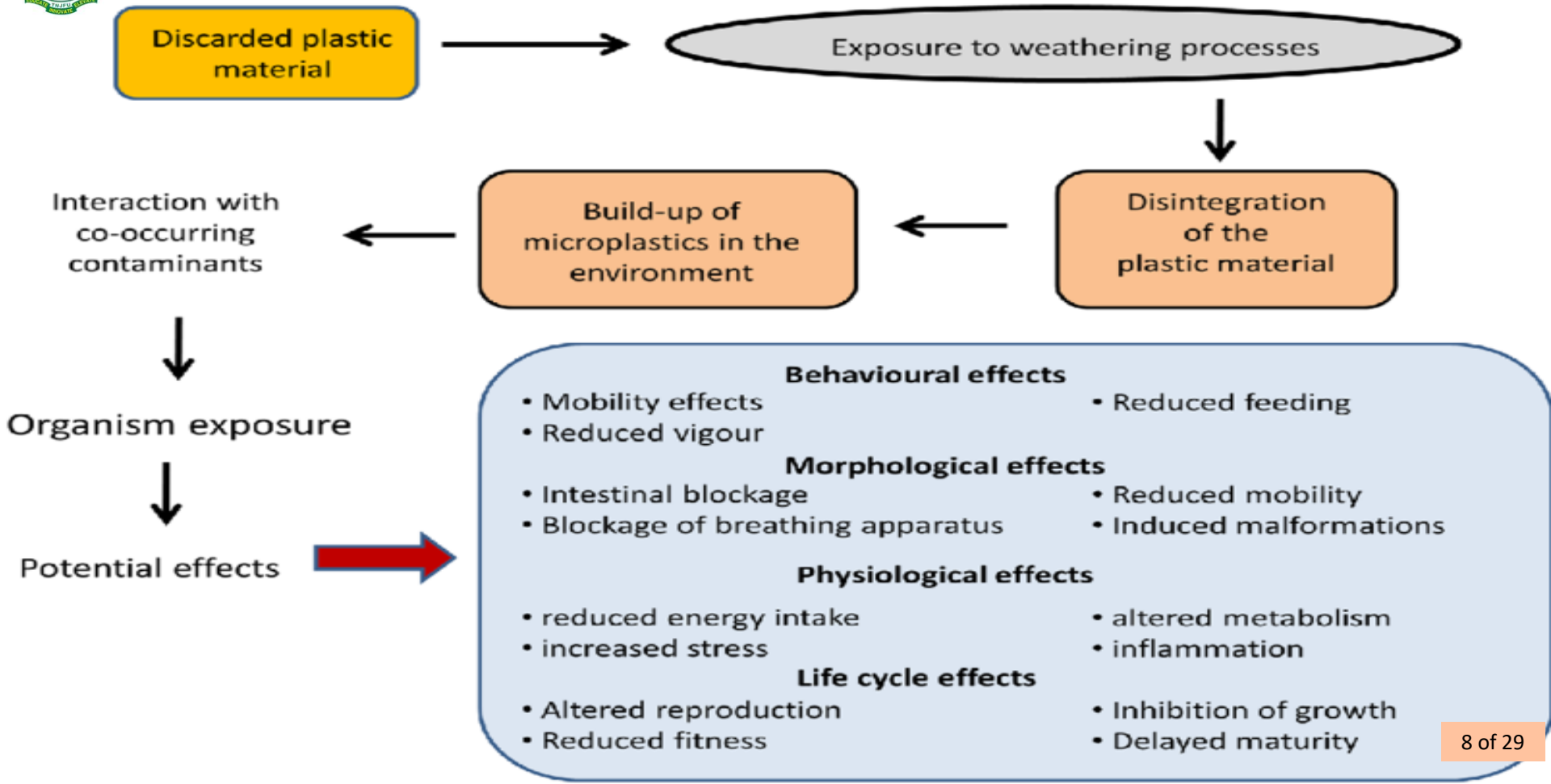
Debris that originates at unspecified ocean or land-based sources

e.g., plastic bags, strapping bands, plastic bottles, etc.,

8 million metric tonnes of plastics goes to oceans every year

Source: Cheshire et al., (2009)

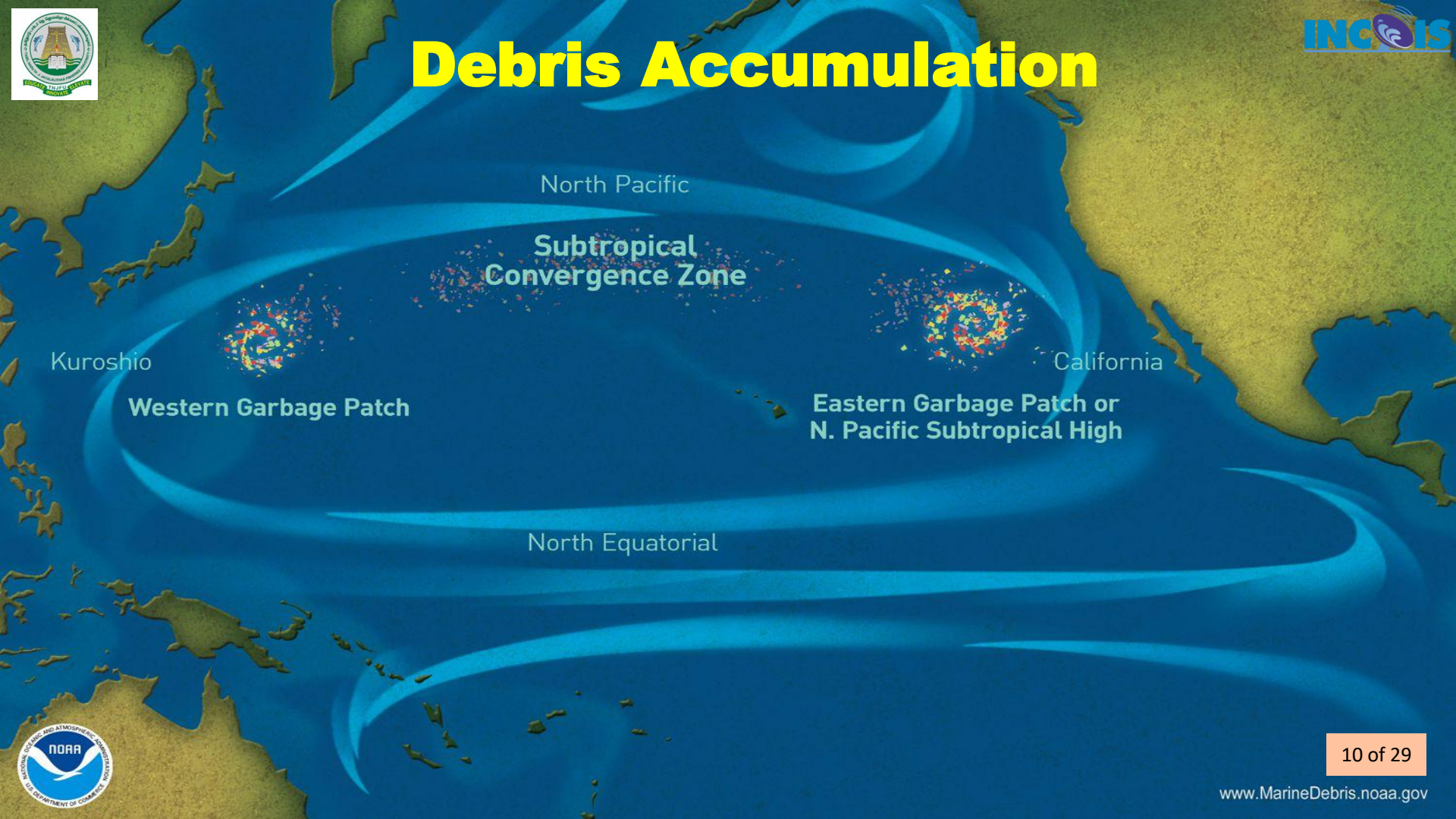
Ecological Effects of Plastic Debris



Examples of Marine Debris

Source: Manickavasagam, S., et al., (2021)

Debris Accumulation



What is an Oil Spill at Ocean/Sea?

- Contamination of seawater due to an oil pour, as a result of a ship accident/collision, oil exploration activity or human error, is termed an **oil spill**

- Two most common reasons for oil spills

    1. When oil is being transferred internally (sounding pipe or oil vents)
    2. Bunker operation

- These spills contaminate the coasts and estuaries and can cause serious health problems to marine environment and its habitats

Ecological Effects of Oil Spills

- Public health impacts include illnesses caused by toxic fumes or by eating contaminated fish or shellfish

- Obvious impacts including losses and disruptions of commercial and recreational fisheries, seaweed harvesting, and boating etc.,

- It may affect organisms both ways
  - **Directly** - Through physical and toxicological processes
  - **Indirectly** - Through habitat impacts food chain disruption and community alteration

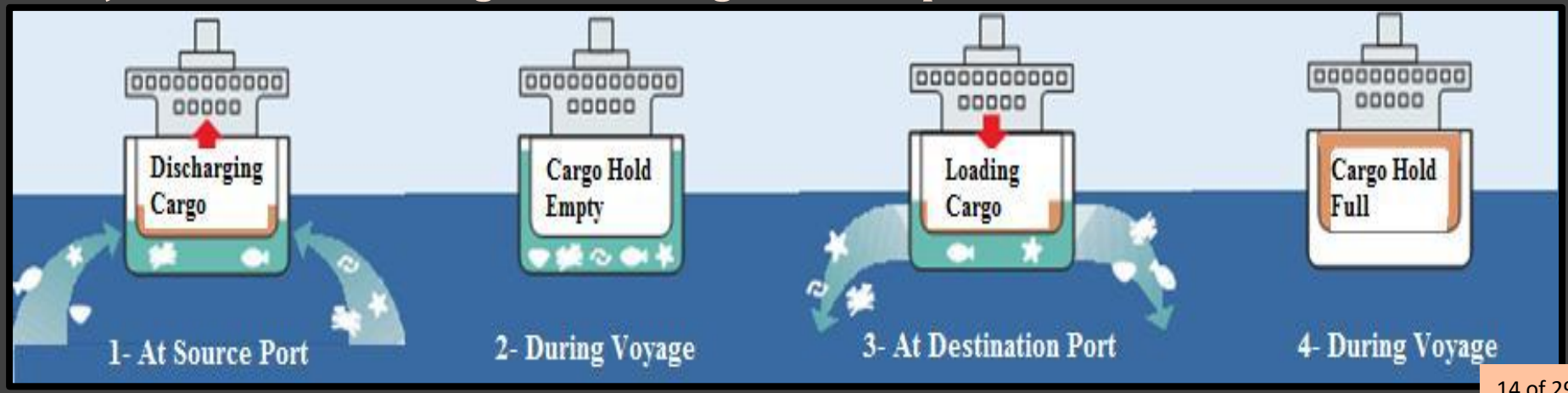
- Plankton species response differently to different oil and affects nutrients cycling in aquatic ecosystem

Examples of Oil spills

Source:Wikipedia

Ballast Water

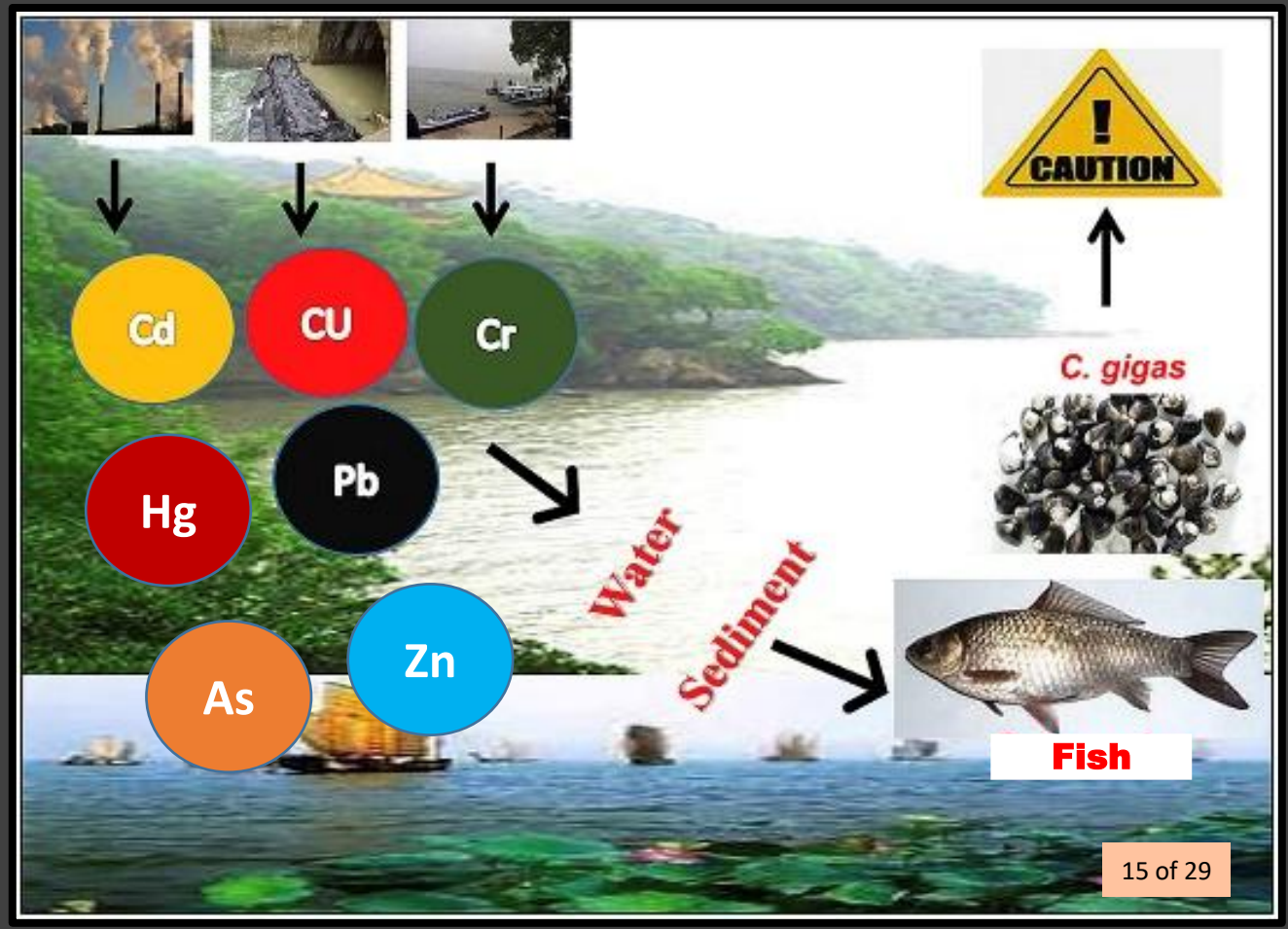
- Translocation of organisms through ships' ballast water is considered an important bioinvasion vector and threat to naturally evolved biodiversity
- Ballast water is used to maintain safe operating conditions throughout a voyage
- Alien organisms become dominant components of the invaded biota and cause major economic damage and ecological disruptions



Source: Elçiçek, H., et al (2013)

Heavy metals

Metallic chemical element that has relatively high density and is toxic or poisonous at low concentrations



Source: Sivakumar et al., (2018)

Toxicants in Fish

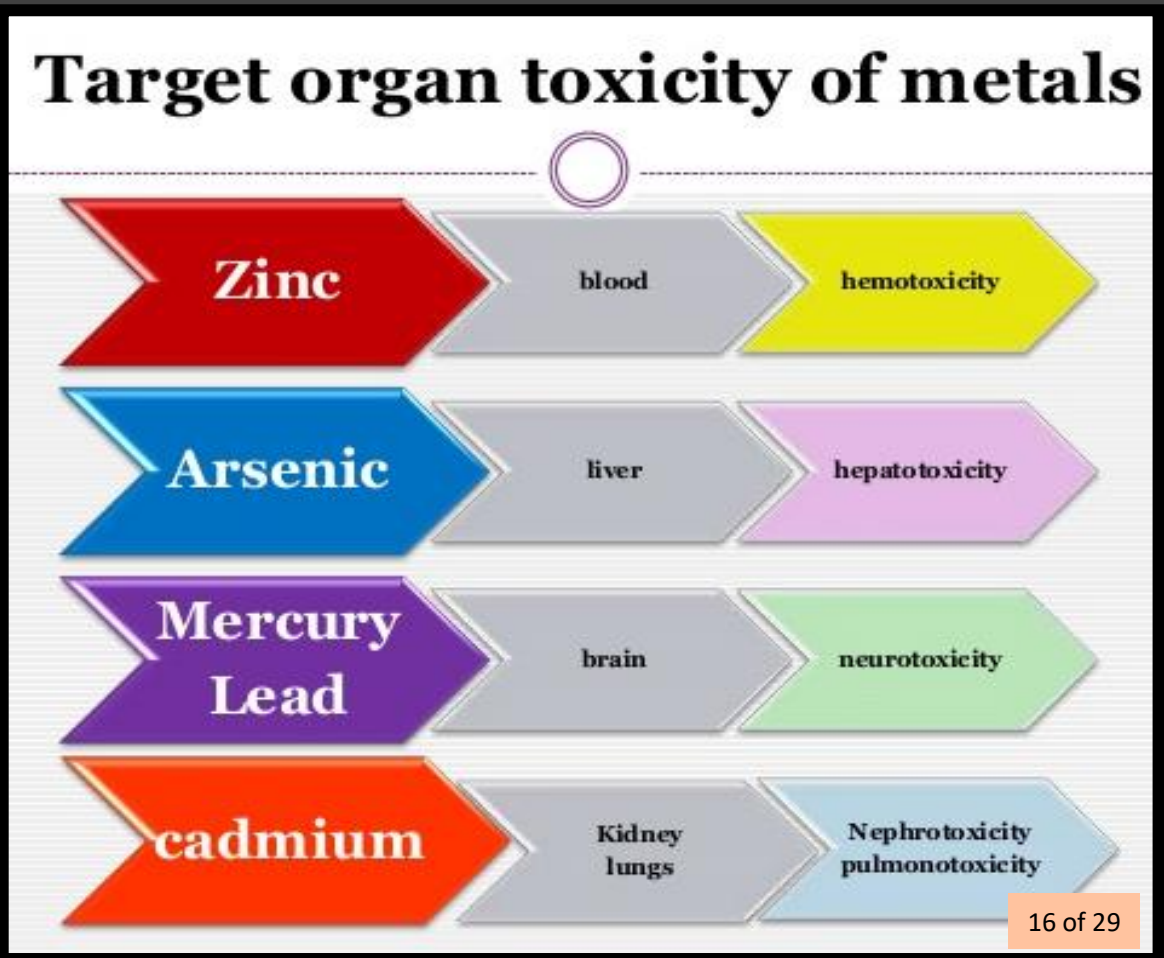
Exposure Routes

1. **Dermally** - By swimming in toxicants contaminated waters

2. **Breathing** - By direct uptake of toxicants through the gills during respiration

3. **Oral** - By drinking toxicants contaminated water or feeding on contaminated prey

Source: Wikipedia



Ecological Effects of Heavy Metals

- Associated with disease -Induced mortality i.e. **mercury** may damage the immune system and lesions in the liver and other tissues
- Decrease nutritional state and abnormal swimming activity
- Neurotoxin, Teratogen (formation of abnormal structures) and affects fertility of organisms
- Alteration of genetic structures **(DNA and RNA)** of an organisms, inhibit enzyme secretions and protein synthesis etc.,

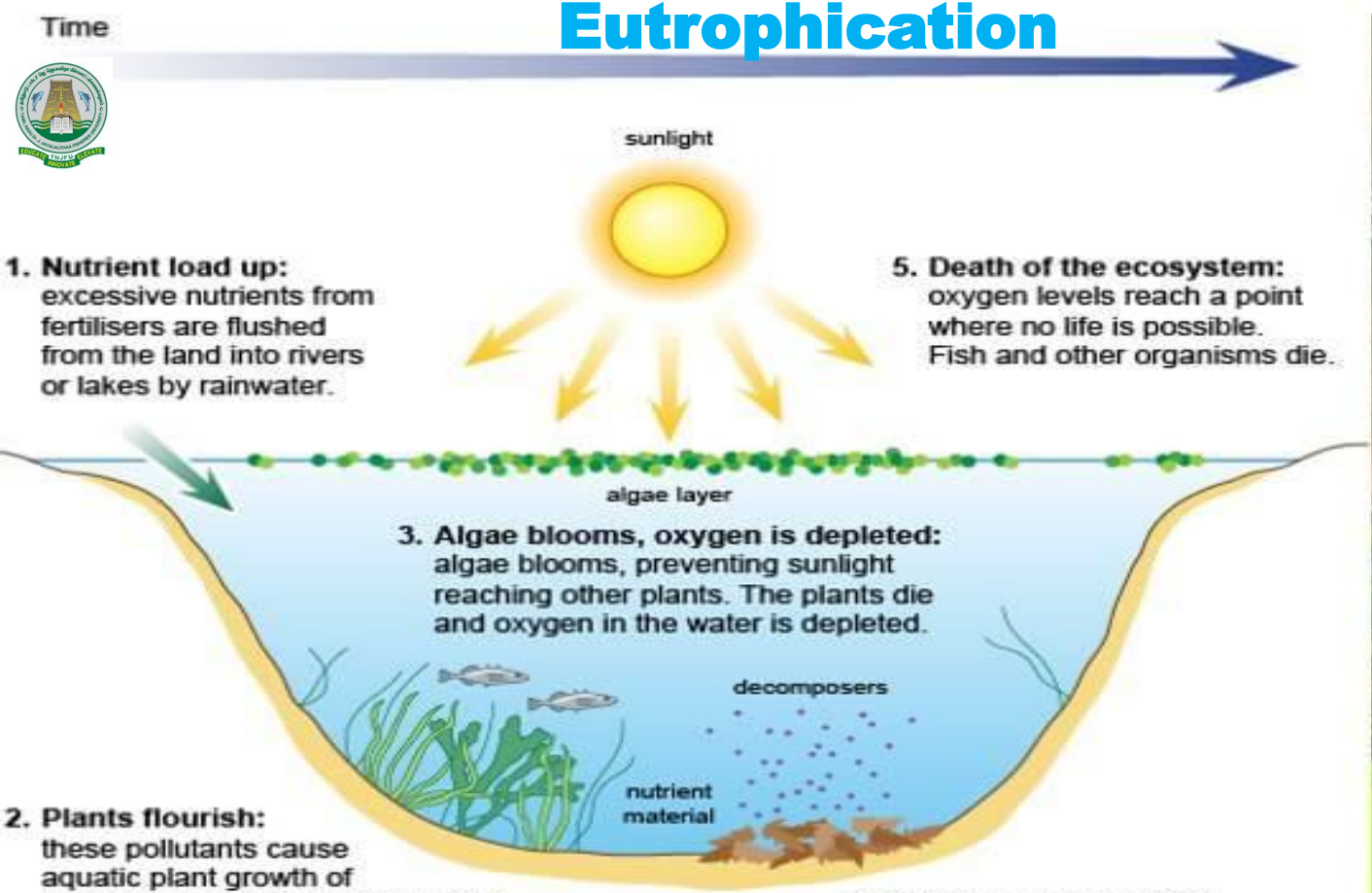
Pesticides

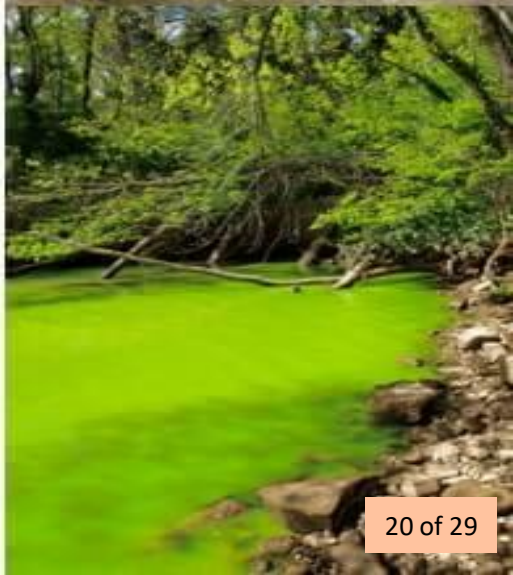
- **EPA** defines "Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest
- It includes all chemicals that are used to kill or control pests includes herbicides (weeds), insecticides (insects), fungicides (fungi), nematocides (nematodes), and rodenticides
- **Insecticide**-Dichlorodiphenyltrichloroethane **(DDTs)** major concern because of their persistence in the environment and accumulation in the food chain
- **Plankton** – Initial step for the entry of these pollutants into aquatic environment

Ecological Effects of Pesticides

- Inhibit normal migration to the sea, resulting in severe disruption of the life cycle and schooling
- Pesticides at low concentrations may act as **blockers of sex hormones and nervous system**
- Abnormal sexual development, sex ratios, unusual mating behaviour, delayed spawning, and reduce reproductive success of fish and aquatic animals
- Intergenerational effects (Effects are not apparent until subsequent generations of the organism)
- Fish egg shell thinning and increase stress in juvenile fish - more susceptible to predation

Eutrophication





Source: Wikipedia

Radioactive Waste

- Radioactive waste is the deposition of,or presence of radioactive substances on surfaces or within solids,liquids or gases (including the human body),where their presence is unintended or undesirable **(IAEA)**

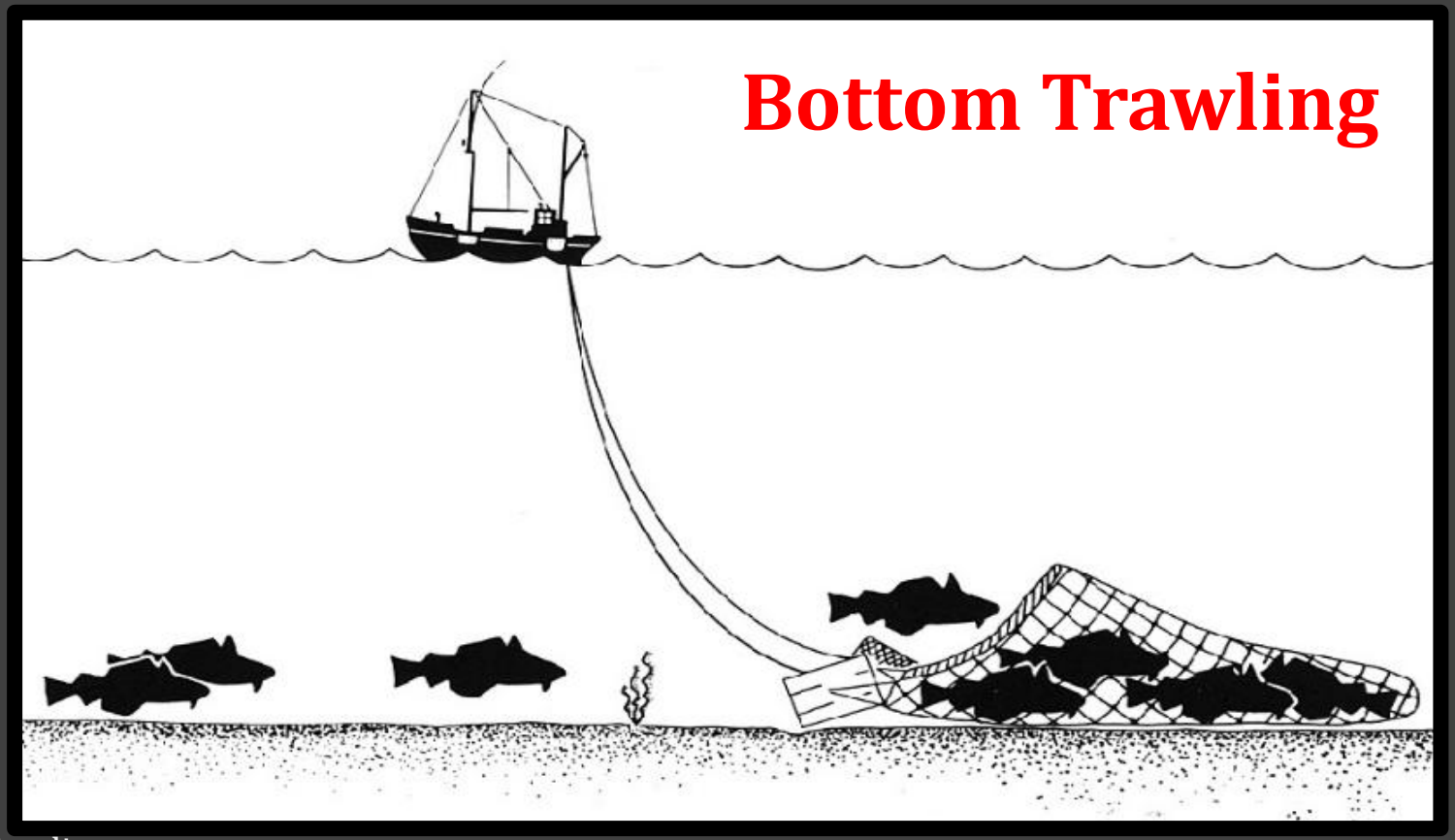
- Radioactivity refers to the radiation or particles which are emitted from nuclei as a result of nuclear instability

- Manmade sources such as nuclear power plants, nuclear weapon testing, medical waste etc.,

- Radioactive effect depends on mainly: Exposure time, radiation intensity and ionizing radiation type (penetration power)

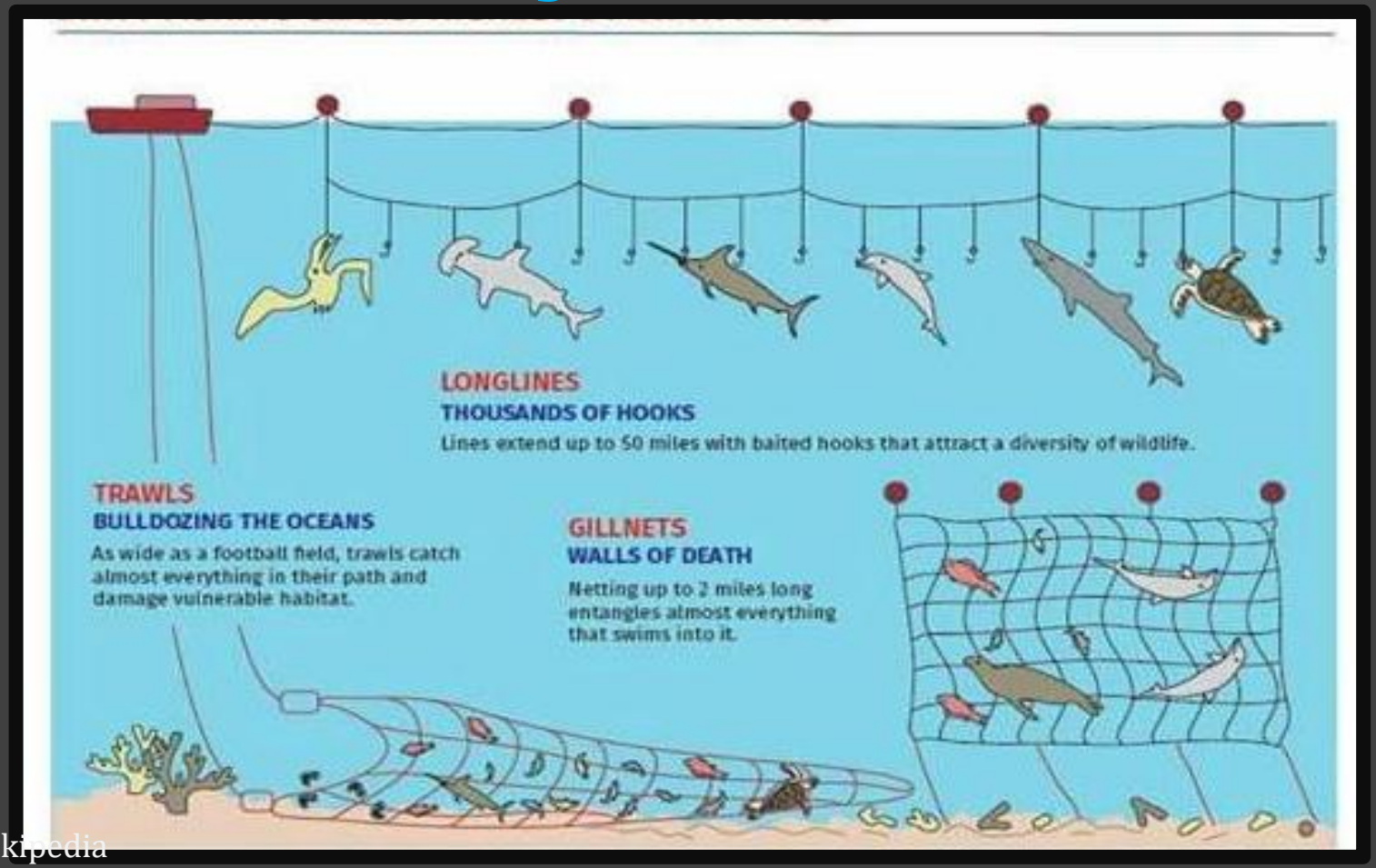
  Major effects are **Genetic and Somatic** structure change

Untenable Fishing Methods/Practices



Source: Wikipedia

Bycatch

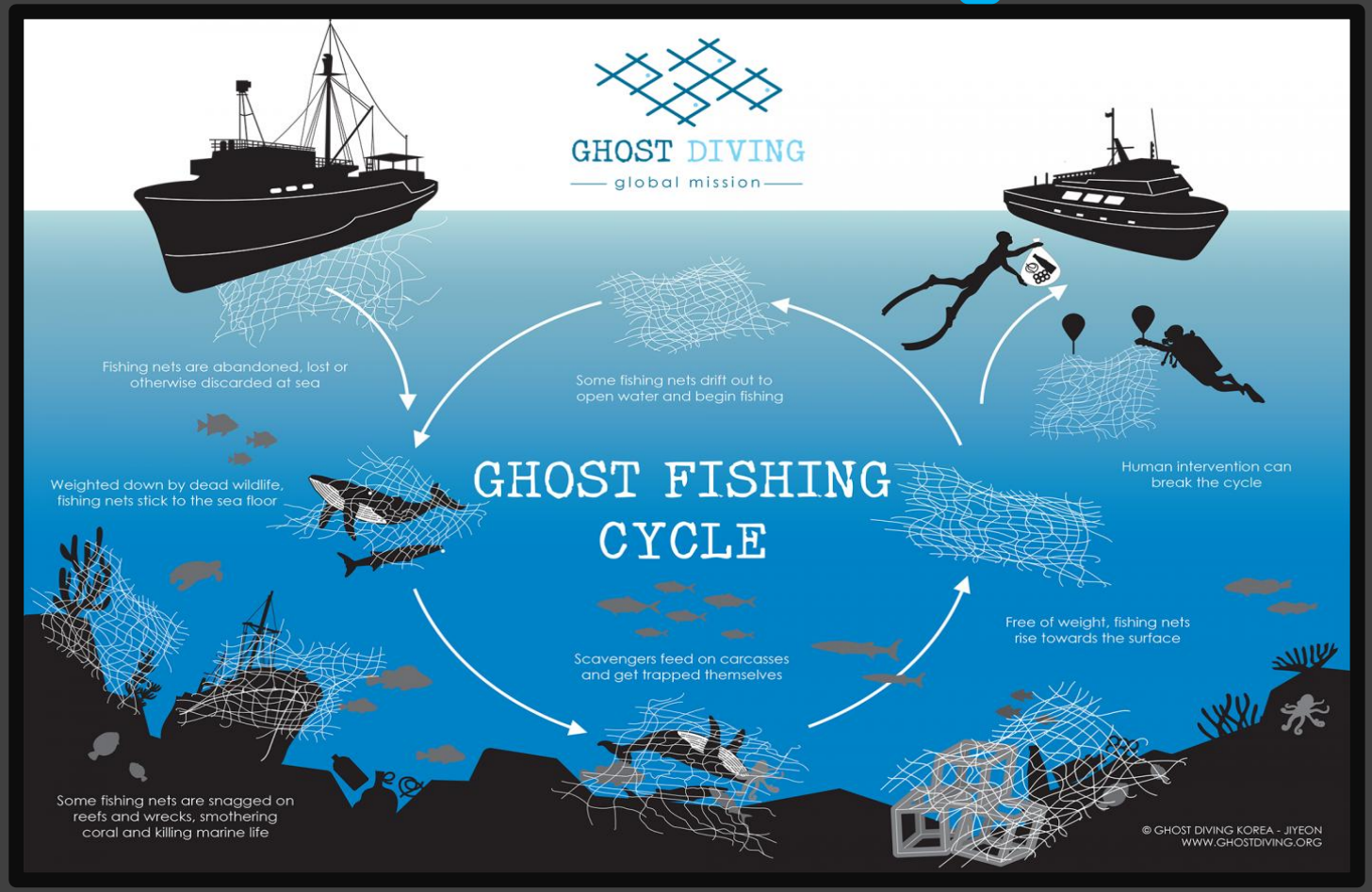


Source: Wikipedia

Dynamite Fishing

Source: www.mirror.co.uk

Ghost Fishing



Control Measures

- Follow - **4R principles** such as Refuse, Reduce, Reuse, and Recycle
- **Coordinated Approach** - Entrapment device/booms/traps , doorstep waste collection methods, incentive base approach and beach cleaning operations can find an efficient solution for plastic pollution management
- Oil tank in ships should not be overfilled and some clearance space should be left for fuel expansion
- Tighten bolts on your engine to prevent oil leaks in ships, replace cracked or worn hydraulic lines, and fittings before failure in ships

Control Measures

- Regulate or control of pollutant(s) discharge at the point of generation
- Different plants (Thermal, Nuclear etc.,) wastewater can be pretreated by scientific methods before discharge to municipal treatment sources
- Setting up of Sewage Treatment Plants **(STP)** and Effluent Treatment Plants **(ETP)**
- Regulate or restrict the use of synthetic fertilisers, plastic items, and pesticides etc.,
- Public awareness and peoples' involvement is essential to control the pollution

Conclusion

- Fisheries have changed rapidly during the last few decades due to new technological development and expansion

- **Regulatory Measures** - Declaration of closed season, Protection of endangered species and Prohibition of destructive fishing methods by all maritime states will help in protecting the fishery resources for future generation

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www.tnjfu.ac.in

INCOIS Director and FOFP Online Training Course Coordinators

INCOIS Organizers

www.incois.gov.in

Email:manickavasagam.1994@gmail.com


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