

# Introduction to the Marine Biology Thesaurus

## **Purpose:**

To provide a common language between researchers looking for articles and indexers indexing articles. By providing a common language to search for and index documents, both recall and relevance of the articles retrieved will improve.

## **Subject Coverage:**

The domain of the thesaurus is Marine Biology – the study of life in and near the ocean. Marine biology is a sub field of oceanography, the study of the ocean. The emphasis of this thesaurus is the impact of humans on marine ecology. Consequently the core facets are ecology, human impact, fisheries and policy. Oceanography concepts are on the periphery. While this area is admittedly fundamental to marine biology, it is treated superficially because it is expected a general oceanographic thesaurus already sufficiently cover this area. Taxonomic relationships of marine organisms are indexed and maintained by marine taxonomist organizations, so are not specified here. See the attached list from Sumitch, 1984 to view a top level taxonomy of marine animals.

## **Users:**

The intended users of the thesaurus are advanced students and professional researchers and scientists of marine biology and related fields.

## **Supported Information Systems:**

The thesaurus is intended for use as a printed manual to assist searching of electronic indexes of marine biology and allied subjects. The creators of the thesaurus imagine it could evolve to become part of an interactive, web based searching system for an integrated marine sciences database.

## **Vocabulary control:**

The preferred terms are controlled for grammatical form and punctuation. Nouns that can be counted, i.e. how many, are plural, while nouns that have volume, i.e. how much, are singular. For example, how many PLANTS and how much POLLUTION. Verbs are represented in the gerund form, for example, FISHING. Hyphens and other punctuation are not allowed, for example the term MICROORGANISMS could be hyphenated, but should be spelled as one word. Abbreviations are allowed only if they are commonly and frequently used in the literature, such as for chemical names like PCBs, but not for phrases that are not generally abbreviated, such as MARINE PROTECTED AREAS. Homonyms and other ambiguous terms are clarified with an accompanying word in parenthesis, for example, REGULATION (FISHING).

## **Structure and inter-relationships:**

The thesaurus is divided into two distinct arrangements, the notated classified schedule, and the main thesaurus, which is organized alphabetically including lead-in terms.

The classified schedule shows the relationships between preferred terms within the distinct facets. The facets, in order of display, are: biology, ecology, human impact, fisheries, policy and oceanography. The two broader terms expressed in red italics under ECOLOGY are used to group terms within a subfacet that share common characteristics, however, the broader term is merely a placeholder and is not indexed.

The main thesaurus is arranged alphabetically and includes both preferred terms and the lead-in, or non-preferred terms. A lead-in term will show which preferred term should be used for searching instead. The preferred terms will show what lead-in terms they should be used for (UF), and any broader (BT), narrower (NT), or related terms (RT) associated with it. A scope not may also be provided to further explain the term.

**Thesaurus layout and display:**

Preferred terms are in UPPER CASE, while non-preferred terms are in lower case.

Term Type	Example Entry	Explanation
<i>Main Entry</i>	COMMERCIAL FISHERIES D.1.4	
<i>Use for</i>	UF fisheries	-use COMMERCIAL FISHERIES instead of fisheries or marine fisheries
<i>Broader term</i>	marine fisheries	
<i>Narrower term</i>	BT FISHERIES MANAGEMENT D.1	-one level up in the classified hierarchy
	NT COMMERCIAL SPECIES D.1.4.1	-one level down in the classified hierarchy
	MARICULTURE D.1.4.2	
	OVERFISHING D.1.4.3	
	WHALING D.1.4.4	
<i>Related term</i>	RT MAXIMUM SUSTAINABLE YIELD E.1.2.3.1	-has a relevant relation with the main term
<i>Scope Note</i>	SN non-recreational harvest of marine life	-definition

**Filing Rules:**

The terms are arranged alphabetically using a word-by-word filing system. For example, FISH STOCKS comes before FISHERIES.

**How to use for searching:**

In order to gain the most advantage from the thesaurus, note the most specific expression of the concept under consideration. Look in the main thesaurus to learn if the chosen term is preferred or not. If not, use the term suggested, which may be a more general, broader concept than the one first expressed. Examine the main entry for the preferred term to learn of possible narrower and related preferred terms. It will be worthwhile to use the term’s notation to locate the term in the classified schedule in order to explore the hierarchical relationships of the preferred term to the rest of the terms in the thesaurus. Other, less obvious terms may be discovered from the classified schedule.

For example, if articles are desired about the impact of mercury on fish stocks from the open ocean, look up the concepts: mercury, fish stocks, open ocean and impact. The main thesaurus shows that the preferred terms for these concepts are TOXIC METALS, FISH STOCKS, OCEANIC ZONES and HUMAN IMPACT. After reviewing the main entries for each of the following preferred terms, additional search terms present themselves: POLLUTANTS, FISHERIES MANAGEMENT, HABITATS, EXPLOITATION and FISHING. In looking up TOXIC METALS in the classified schedule, one might find TOXIC EFFECTS just a few terms away, which has the narrower term BIOLOGICAL MAGNIFICATION, which may be a term previously unknown, but perfect for the desired articles on the impact of mercury on fish stocks.

**Total preferred and non-preferred terms:**

115 preferred, 114 lead-in (approximately!!)

**Sources of terms:**

Center for Marine Conservation. Global marine biological diversity: a strategy for building conservation into decision making. Washington, D.C.: Island Press, c1993

Levinton, Jeffrey S. Marine biology: function, biodiversity, ecology 2<sup>nd</sup> ed. New York: Oxford University Press, c2001.

Nybakken, James W. Marine biology: an ecological approach 2<sup>nd</sup> ed. New York: Harper Collins Publishers, c1988.

Reseck, John, Jr. Marine biology. Reston, Va.: Reston Pub. Co., c1979

Sumich, James L. An introduction to the biology of marine life. Dubuque, Iowa: W.C. Brown, c1984

Thorne-Miller, Boyce. The living ocean: understanding and protecting marine biodiversity. Washington, D.C.: Island Press, c1999

Thorson, Gunnar. Life in the sea. Translated from the Danish by Manon C. Meilgaard and Alec Laurie New York: McGraw-Hill [1971]

Attachment 1:  
Taxonomy of marine animals from Sumich, 1984

**Table 2.2.** *A partial (and brief)\* taxonomy of the marine animal groups.*

---

**Phylum:** Protozoa (30,000, all habitats, some parasitic)—unicellular animals that reproduce by cell division. Found in benthic and pelagic habitats  
**Class:** Sarcodina—locomotion with pseudopodia  
**Order:** Foraminiferida  
**Order:** Radiolaria  
**Class:** Ciliata—locomotion with cilia  
**Order:** Tintinnida

**Phylum:** Porifera (10,000, mostly marine)—simple multicellular animals found attached to solid substrates in benthic habitats; reproduction is sexual resulting in free-swimming larval stages

**Phylum:** Cnidaria (9,000, mostly marine)—radially symmetrical animals with mouth, tentacles, and simple sensory organs and nervous system; common in both benthic and pelagic habitats; reproduction is both sexual and asexual by budding or fission  
**Class:** Hydrozoa—often colonial, with both polypoid and medusoid forms  
**Class:** Scyphozoa—free-swimming medusoid forms (most “jellyfish”)  
**Class:** Anthozoa—attached benthic polypoid forms (corals and anemones)

**Phylum:** Ctenophora (80, marine)—radially symmetrical, pelagic swimming animals with rows of cilia

**Phylum:** Platyhelminthes (12,700, all habitats)—free-living and parasitic flatworms  
**Class:** Turbellaria—small free-living flatworms, with incomplete digestive tracts and ciliated undersides; found in benthic habitats

**Phylum:** Nemertina (650, mostly marine)—small, inconspicuous worm-like benthic animals with complete digestive tracts

**Phylum:** Gastrotricha (175, mostly marine)—microscopic, with elongate bodies; in benthic habitats

**Phylum:** Kinorhyncha (64, marine)—elongate, less than 1 mm in length; in benthic habitats

**Phylum:** Priapulida (8, marine)—small, benthic worms

**Phylum:** Nematoda (10,000, all habitats)—parasitic and free-living roundworms a few mm in length; mostly benthic

**Phylum:** Entoprocta (60, mostly marine)—nearly microscopic benthic animals form colonial encrustations on solid substrates

**Phylum:** Ectoprocta (4,000, marine and freshwater)—superficially resembles Entoprocta

**Phylum:** Phoronida (70, marine)—tube-dwelling benthic worms

**Phylum:** Brachiopoda (260, marine)—benthic animals; bodies covered with hinged shell

**Phylum:** Mollusca (65,000, mostly marine)—unsegmented body usually covered with external shell of 1, 2, or 8 pieces  
**Class:** Monoplacophora—rare, benthic  
**Class:** Amphineura—shallow water benthic animals known as chitons; 8-piece shell  
**Class:** Gastropoda—mostly benthic, shell of 1 piece or absent; includes slugs, snails, and limpets  
**Class:** Scaphopoda—benthic; shell 1-piece and elongate; known as tusk shells  
**Class:** Pelecypoda—benthic; shell of 2 pieces; clams, oysters, and other bivalves  
**Class:** Cephalopoda—benthic and pelagic; shell usually absent, foot modified as tentacles with suckers; octopuses and squids

**Phylum:** Sipunculida (250, marine)—benthic worms a few cm in length; known as peanut worms

**Phylum:** Echiuroidea (60, marine)—benthic; cylindrical worms

*Continued*

\*The numbers in parentheses refer to the approximate numbers of described species in that group.  
 Data mostly from Villee, Walker, and Barnes 1978.

- Phylum:** Pogonophora (80, marine)—deep water benthic, tube-dwelling worms; to several m in length
- Phylum:** Hemichordata (80, marine)—elongate benthic worms
- Phylum:** Chaetognatha (50, marine)—pelagic, active predators; a few mm in length; known as arrowworms
- Phylum:** Annelida (8700, marine, freshwater, and terrestrial)—segmented worms, to several cm in length
- Class:** Polychaeta—mostly benthic, free-living
  - Class:** Hirudinea—leeches; some parasitic
- Phylum:** Arthropoda (920,000, all habitats)—segmented animals with bodies covered by exoskeleton of chitin; most a few cm or less in length; several classes not found in marine habitats
- Class:** Merostomata—horseshoe crabs; benthic nearshore animals
  - Class:** Pycnogonida—sea spiders; benthic animals with 4 pairs of elongate legs
  - Class:** Crustacea—mostly marine; with 2 pairs of antennae; numerous pelagic and benthic species
    - Subclass:** Branchiopoda—brine shrimps
    - Subclass:** Ostracoda—seed shrimps; pelagic animals usually less than 1 cm
    - Subclass:** Copepoda—abundant animals in pelagic and benthic habitats; microscopic to about 1 cm
    - Subclass:** Cirripedia—barnacles; larger benthic, attached animals
    - Subclass:** Malacostraca
      - Order:** Mysidacea—mysids; benthic and pelagic; size to a few cm
      - Order:** Cumacea—burrows in mud and sand; size to a few cm
      - Order:** Isopoda—benthic; body flattened dorsoventrally; size to a few cm
      - Order:** Amphipoda—benthic and pelagic; body laterally flattened; size to a few cm
      - Order:** Stomatopoda—mantis shrimps; benthic; size to 30 cm
      - Order:** Euphausida—krill; pelagic; size to several cm
      - Order:** Decapoda—crabs, shrimps, and lobsters; mostly benthic; several cm to 1 m in size
- Phylum:** Echinodermata (5300, marine)—5-sided radial symmetry; mostly benthic
- Class:** Echinoidea—sea urchins, sand dollars
  - Class:** Asteroidea—sea stars
  - Class:** Ophiuroidea—brittle stars
  - Class:** Crinoidea—feather stars, sea lilies
  - Class:** Holothuroidea—sea cucumbers
- Phylum:** Chordata (39,000, all habitats)
- Subphylum:** Urochordata
    - Class:** Ascidiacea—sea squirts; benthic; solitary or colonial
    - Class:** Larvacea—pelagic; less than 1 cm
    - Class:** Thaliacea—salps; pelagic; gelatinous
  - Subphylum:** Cephalochordata—slender, laterally compressed; benthic
  - Subphylum:** Vertebrata—fishes and tetrapods
    - Class:** Agnatha—lampreys and hagfishes
    - Class:** Chondrichthyes—sharks, skates, and rays
    - Class:** Osteichthyes—bony fishes; includes about 30 orders with marine species
    - Class:** Reptilia—marine turtles, iguanas, crocodiles, and sea snakes
    - Class:** Aves—marine birds; about 10 orders with marine species
    - Class:** Mammalia
      - Order:** Carnivora—sea lions, seals, walruses, sea otters
      - Order:** Cetacea—whales
      - Order:** Sirenia—manatees and dugongs

## CLASSIFIED SCHEDULE

A.1	MARINE ORGANISMS
A.1.1	FISH
A.1.2	INVERTEBRATES
A.1.3	MARINE MAMMALS
A.1.4	PLANTS
A.1.5	NEKTON
A.1.5.1	MICROORGANISMS
A.1.5.1.1	DECOMPOSERS
A.1.5.1.2	PLANKTON
A.1.5.1.3	BACTERIA
A.2	TROPHIC LEVELS
A.2.1	AUTOTROPHIC
A.2.2	HETEROTROPHIC
B.1	ECOLOGY
B.1.1	ECOSYSTEMS
B.1.1.1	POPULATIONS
B.1.1.1.1	COMMUNITIES
B.1.1.1.1.1	NICHES
	<COMMUNITY COMPOSITION>
B.1.1.1.1.20	SPECIES RICHNESS
B.1.1.1.1.21	SPECIES EVENNESS
B.1.1.1.1.22	SPECIES DIVERSITY
B.1.1.1.1.23	BIODIVERSITY
B.1.1.1.1.24	DOMINANTS
	<POPULATION DYNAMICS>
B.1.1.1.20	RESISTANCE (ECOLOGICAL)
B.1.1.1.21	RESILIENCE
B.1.1.1.22	STABILITY
B.1.1.1.23	TOLERANCE
B.1.1.1.24	EXTINCTION
B.1.1.1.25	VARIABILITY
B.1.1.1.26	SEASONAL SUCCESSION
B.1.1.1.27	VERTICAL MIGRATION
B.1.1.1.28	DISPERSAL
B.1.2	ZONES
B.1.2.1	APHOTIC ZONES
B.1.2.2	PHOTIC ZONES
B.1.2.2.1	PHOTOSYNTHESIS
B.1.2.2.1.1	CRITICAL DEPTH
B.1.2.3	OXYGEN MINIMUM ZONES
B.1.3	HABITATS
B.1.3.1	ESTUARIES
B.1.3.2	INTERTIDAL ZONES
B.1.3.3	NERITIC ZONES
B.1.3.4	OCEANIC ZONES
B.1.4	BIOLOGICAL FACTORS
B.1.4.1	ADAPTATION
B.1.4.2	COMPETITION
B.1.4.3	DISEASE
B.1.4.4	PARASITISM

- B.1.4.5 PREDATION
- B.1.5 ECOLOGICAL SUCCESSION
  
- C.1 POLLUTANTS
  - C.1.1 BACTERIA
  - C.1.2 NUTRIENTS
  - C.1.3 SEWAGE
  - C.1.4 GARBAGE
  - C.1.5 HARMFUL ALGAL BLOOMS
  - C.1.6 CHEMICALS
    - C.1.6.1 PAHs
    - C.1.6.2 PCBs
    - C.1.6.3 PESTICIDES
  - C.1.7 OIL
  - C.1.8 RADIOACTIVE WASTE
  - C.1.9 THERMAL POLLUTION
  - C.1.10 TOXIC METALS
  - C.1.11 POLLUTION
    - C.1.11.1 NON POINT SOURCE
    - C.1.11.2 POINT SOURCE
- C.2 EUTROPHICATION
- C.3 MARINE INVASIONS
- C.4 HUMAN IMPACT
  - C.4.1 EXPLOITATION
  - C.4.2 HABITAT DESTRUCTION
  - C.4.3 OFFSHORE DRILLING
  - C.4.4 FISHING (RECREATIONAL)
  - C.4.5 RECREATION
  - C.4.6 SHIPPING
  - C.4.7 SILTATION
- C.5 TOXIC EFFECTS
  - C.5.1 BIOLOGICAL MAGNIFICATION
    - C.5.1.1 MINIMATA DISEASE
- C.6 ENVIRONMENTAL IMPACT
  - C.6.1 GREENHOUSE EFFECT
  
- D.1 FISHERIES MANAGEMENT
  - D.1.1 BIOASSAY
  - D.1.2 BIOCHEMICAL MARKERS
  - D.1.3 FISH STOCKS
  - D.1.4 COMMERCIAL FISHERIES
    - D.1.4.1 COMMERCIAL SPECIES
    - D.1.4.2 MARICULTURE
    - D.1.4.3 OVERFISHING
    - D.1.4.4 WHALING
    - D.1.4.5 FISH KILL
  - D.1.5 GENETIC MANIPULATION
  - D.1.6 HATCHERIES
  
- E.1 POLICIES
  - E.1.1 CONSERVATION
    - E.1.1.1 ENVIRONMENTAL RESTORATION
  - E.1.2 ENVIRONMENTAL MANAGEMENT
    - E.1.2.1 MARINE PROTECTED AREAS
    - E.1.2.2 ZONING
    - E.1.2.3 REGULATION (FISHING)



## MAIN THESAURUS

- abyssal zones
  - USE APHOTIC ZONES B.1.2.1
- ACCEPTABLE LEVELS E.1.2.4
  - BT ENVIRONMENTAL MANAGEMENT E.1.2
  - RT POLLUTANTS C.1
  - TOXIC EFFECTS C.5
- ADAPTATION B.1.4.1
  - UF intraspecific
  - BT BIOLOGICAL FACTORS B.1.4
- alien species
  - USE MARINE INVASIONS C.3
- ammonia
  - USE NUTRIENTS C.1.2
- anoxia
  - USE NUTRIENTS C.1.2
- APHOTIC ZONES B.1.2.1
  - UF abyssal zones
  - bathal zones
  - hadal zones
  - BT ZONES B.1.2
- aromatics
  - USE OIL C.1.7
- AUTOTROPHIC A.2.1
  - UF chemosynthetic
  - photosynthetic
  - BT TROPHIC LEVELS A.2
- BACTERIA A.1.5.1.3
  - BT MICRO ORGANISMS A.1.5.1
  - RT POLLUTANTS C.1
- bacteriological contamination
  - USE BACTERIA C.1.1
- bathal zones
  - USE APHOTIC ZONES B.1.2.1
- benthic
  - USE OCEANIC ZONES B.1.3.4
- BIOASSAYS D.1.1
  - BT FISHERIES MANAGEMENT D.1
  - RT POLLUTANTS C.1
  - TOXIC EFFECTS C.5
- BIOCHEMICAL MARKERS D.1.2
  - UF dna markers
  - genetic composition
  - molecular markers
  - BT FISHERIES MANAGEMENT D.1
- BIODIVERSITY B.1.1.1.1.23
  - UF speciation
  - BT COMMUNITIES B.1.1.1.1
- BIOGEOCHEMICAL CYCLES F.1
  - NT CARBON CYCLES F.1.1
- BIOLOGICAL FACTORS B.1.4
  - BT ECOLOGY B.1
  - NT ADAPTATION B.1.4.1
  - COMPETITION B.1.4.2
  - DISEASE B.1.4.3
  - PARASITISM B.1.4.4
  - PREDATION B.1.4.5
- BIOLOGICAL MAGNIFICATION C.5.1
  - BT TOXIC EFFECTS C.5
  - NT MINIMATA DISEASE C.5.1.1
- breeding stocks
  - USE FISH STOCKS D.1.3
- brevetoxin
  - USE HARMFUL ALGAL BLOOMS C.1.5
- cadmium
  - USE TOXIC METALS C.1.10
- CARBON CYCLES F.1.1
  - BT BIOGEOCHEMICAL CYCLES F.1
- carnivorous
  - USE HETEROTROPHIC A.2.2
- Center of Origin Theory
  - USE DISPERSAL B.1.1.1.28
- CHEMICALS C.1.6
  - UF detergents
  - solvents
  - methyl-mercury chloride
  - DDT
  - BT POLLUTANTS C.1
  - NT PAHs C.1.6.1
  - PCBs C.1.6.2
  - PESTICIDES C.1.6.3
  - RT MINIMATA DISEASE C.5.1.1
- chemosynthetic
  - USE AUTOTROPHIC A.2.1
- coastal waters
  - USE NERITIC ZONES B.1.3.3
- commensal
  - USE HETEROTROPHIC A.2.2
- COMMERCIAL FISHERIES D.1.4
  - UF fisheries
  - marine fisheries
  - BT FISHERIES MANAGEMENT D.1
  - NT COMMERCIAL SPECIES D.1.4.1
  - FISH KILL D.1.4.5
  - MARICULTURE D.1.4.2
  - OVERFISHING D.1.4.3
  - WHALING D.1.4.4
  - SN Non-recreational harvest of marine life.

COMMERCIAL SPECIES D.1.4.1  
     BT COMMERCIAL FISHERIES D.1.4  
     RT HARMFUL ALGAL BLOOMS C.1.5  
         MINIMATA DISEASE C.5.1.1  
 COMMUNITIES B.1.1.1.1  
     UF marine communities  
         soft bottom communities  
     BT POPULATIONS B.1.1.1  
     NT BIODIVERSITY B.1.1.1.1.23  
         DOMINANTS B.1.1.1.1.24  
         NICHEs B.1.1.1.1.1  
         SPECIES DIVERSITY B.1.1.1.1.22  
         SPECIES EVENNESS B.1.1.1.1.21  
         SPECIES RICHNESS B.1.1.1.1.20  
 COMPETITION B.1.4.2  
     UF interspecific competition  
     BT BIOLOGICAL FACTOR B.4  
 CONSERVATION E.1.1  
     BT POLICIES E.1  
     NT ENVIRONMENTAL RESTORATION E.1.1.1  
 CRITICAL DEPTH B.1.2.2.1.1  
     BT PHOTOSYNTHESIS B.1.2.2.1  
 crude oil  
     USE OIL C.1.7  
 ddt  
     USE CHEMICALS C.1.6  
 DECOMPOSERS A.1.5.1.1  
     BT MICROORGANISMS A.1.5.1  
     RT HETEROTROPHIC A.2.2  
 DENSITY F.4.1  
     BT WATER QUALITY F.4  
 detergents  
     USE CHEMICALS C.1.6  
 dinoflagellate  
     USE HARMFUL ALGAL BLOOMS C.1.5  
 DISEASE B.1.4.3  
     BT BIOLOGICAL FACTORS B.1.4  
 DISPERSAL B.1.1.1.28  
     UF Center of Origin Theory  
         sink populations  
         migration  
         Vicariance Hypothesis  
     BT POPULATIONS B.1.1.1  
 diversity  
     USE SPECIES DIVERSITY B.1.1.1.1.22  
     or BIODIVERSITY B.1.1.1.1.23  
 diving  
     USE RECREATION C.4.5  
 dna markers  
     USE BIOCHEMICAL MARKERS D.1.2  
 DOMINANTS B.1.1.1.1.24  
     BT COMMUNITIES B.1.1.1.1  
 domoic acid saxitocin  
     USE HARMFUL ALGAL BLOOMS C.1.5  
 drift nets  
     USE FISH KILL D.1.4.5  
 DYNAMIC VISCOSITY F.4.2  
     BT WATER QUALITY F.4

ecological  
     USE ECOLOGY B.1  
 ECOLOGICAL SUCCESSION B.1.5  
     UF facilitation model  
         inhibition model  
         tolerance model  
     BT ECOLOGY B.1  
 ECOLOGY B.1  
     UF ecological  
     NT BIOLOGICAL FACTORS B.1.4  
         ECOSYSTEMS B.1.1  
         HABITATS B.1.3  
         ZONES B.1.2  
 ECOSYSTEMS B.1.1  
     BT ECOLOGY B.1  
     NT POPULATIONS B.1.1.1  
     RT ENVIRONMENTAL MANAGEMENT E.1.2  
         GREENHOUSE EFFECT C.6.1  
         HUMAN IMPACT C.4  
         MARINE INVASIONS C.3  
 ecosystem disturbance  
     USE HABITAT DESTRUCTION C.4.2  
 ecosystem management  
     USE ENVIRONMENTAL MANAGEMENT E.1.2  
 entangling  
     USE FISH KILL D.1.4.5  
 entrainment  
     USE THERMAL POLLUTION C.1.9  
 environmental consequences  
     USE ENVIRONMENTAL IMPACT C.6  
 environmental effects  
     USE ENVIRONMENTAL IMPACT C.6  
 ENVIRONMENTAL IMPACT C.6  
     UF environmental consequences  
         environmental effects  
     NT GREENHOUSE EFFECT C.6.1  
 ENVIRONMENTAL MANAGEMENT E.1.2  
     UF ecosystem management  
         international agreement  
     BT POLICIES E.1  
     NT ACCEPTABLE LEVELS E.1.2.4  
     MARINE PROTECTED AREAS E.1.2.1  
     REGULATION (FISHING) E.1.2.3  
     WASTE MANAGEMENT E.1.2.5  
     ZONING E.1.2.2  
     RT ECOSYSTEMS B.1.1  
         FISH STOCKS D.1.3  
         HABITATS B.1.3  
         HATCHERIES E.1.2  
 ENVIRONMENTAL RESTORATION E.1.1.1  
     BT CONSERVATION E.1.1  
     RT HABITAT DESTRUCTION C.4.2  
         HABITATS B.1.3  
 ESTUARIES B.1.3.1  
     UF estuarine  
     BT HABITATS B.1.3  
 estuarine  
     USE ESTUARIES B.1.3.1

EUTROPHICATION C.2  
 UF nutrient input  
 RT PLANKTON A.1.5.1.2  
 SN The addition of dissolved nutrients to a water body resulting in large increases in phytoplankton production, microbial activity and oxygen depletion.

EXPLOITATION C.4.1  
 UF human exploitation  
 BT HUMAN IMPACT C.4  
 RT OVERFISHING D.1.4.3

EXTINCTION B.1.1.1.24  
 UF species extinction  
 BT POPULATIONS B.1.1.1

facilitation model  
 USE ECOLOGICAL SUCCESSION B.1.5

factory discharge  
 USE SEWAGE C.1.3

FISH A.1.1  
 BT MARINE ORGANISMS A.1  
 RT FISHERIES MANAGEMENT D.1  
 FISHING (RECREATIONAL) C.4.4  
 MINIMATA DISEASE C.5.1.1

FISH KILL D.1.4.5  
 UF entangling  
 drift nets  
 traps  
 trawling  
 BT COMMERCIAL FISHERIES D.1.4

FISH STOCKS D.1.3  
 UF breeding stocks  
 BT FISHERIES MANAGEMENT D.1  
 RT ENVIRONMENTAL MANAGEMENT E.1.2

fisheries USE COMMERCIAL FISHERIES d.1.4

FISHERIES MANAGEMENT D.1  
 NT BIOASSAYS D.1.1  
 BIOCHEMICAL MARKERS D.1.2  
 COMMERCIAL FISHERIES D.1.4  
 FISH STOCKS D.1.3  
 GENETIC MANIPULATION D.1.5  
 HATCHERIES D.1.6  
 RT FISH A.1.1

FISHING (RECREATIONAL) C.4.4  
 UF sports fishing  
 BT HUMAN IMPACT C.4  
 RT FISH A.1.1  
 MARINE PROTECTED AREAS E.1.2.1  
 REGULATION (FISHING) E.1.2.3

food chain  
 USE TROPHIC LEVELS A.2

food web  
 USE TROPHIC LEVELS A.2

fundamental niches  
 USE NICHES B.1.1.1.1.1

GARBAGE C.1.4  
 UF litter  
 BT POLLUTANTS C.1

genetic composition  
 USE BIOCHEMICAL MARKERS D.1.2

GENETIC MANIPULATION D.1.5  
 UF genetics  
 BT FISHERIES MANAGEMENT D.1  
 RT POPULATIONS B.1.1.1

genetics  
 USE GENETIC MANIPULATION D.1.5

GREENHOUSE EFFECT C.6.1  
 BT ENVIRONMENTAL IMPACT C.6  
 RT ECOSYSTEMS B.1.1

habitat degradation  
 USE HABITAT DESTRUCTION C.4.2

HABITAT DESTRUCTION C.4.2  
 UF ecosystem disturbance  
 habitat degradation  
 BT HUMAN IMPACT C.4  
 RT ENVIRONMENTAL RESTORATION E.1.1.1  
 HABITATS B.1.3

HABITATS B.1.3  
 BT ECOLOGY B.1  
 NT ESTUARIES B.1.3.1  
 INTERTIDAL ZONES B.1.3.2  
 NERITIC ZONES B.1.3.3  
 OCEANIC ZONES B.1.3.4  
 RT ENVIRONMENTAL MANAGEMENT E.1.2  
 ENVIRONMENTAL RESTORATION E.1.1.1  
 HABITAT DESTRUCTION C.4.2

hadal zones  
 USE APHOTIC ZONES B.1.2.1

HARMFUL ALGAL BLOOMS C.1.5  
 UF red tides  
 domoic acid saxitocin  
 brevetoxin  
 dinoflagellate  
 paralytic shellfish poisoning  
 neurotoxins  
 neurotoxic shellfish poisoning  
 BT POLLUTANTS C.1  
 RT COMMERCIAL SPECIES D.1.4

harvestable amounts  
 USE MAXIMUM SUSTAINABLE YIELD E.1.2.3.1

HATCHERIES D.1.6  
 BT FISHERIES MANAGEMENT D.1  
 RT ENVIRONMENTAL MANAGEMENT E.1.2  
 POPULATIONS B.1.1.1

herbivorous  
 USE HETEROTROPHIC A.2.2

HETEROTROPHIC A.2.2  
 UF carnivorous  
 commensal  
 herbivorous  
 omnivorous  
 parasitic  
 predatory  
 saprophytic  
 BT TROPHIC LEVELS A.2

human degradation  
     USE HUMAN IMPACT C.4  
 human exploitation  
     USE EXPLOITATION C.4.1  
 HUMAN IMPACT C.4  
     UF human interaction  
         human degradation  
         impact  
     NT EXPLOITATION C.4.1  
         FISHING (RECREATIONAL) C.4.4  
         HABITAT DESTRUCTION C.4.2  
         OFFSHORE DRILLING C.4.3  
         RECREATION C.4.5  
         SHIPPING C.4.6  
         SILTATION C.4.7  
         WATER QUALITY F.4  
     RT ECOSYSTEMS B.1.1  
 human interaction  
     USE HUMAN IMPACT C.4  
 hypoxia  
     USE NUTRIENTS C.1.2  
 impact  
     USE HUMAN IMPACT C.4  
 impingement  
     USE THERMAL POLLUTION C.1.9  
 industrial waste  
     USE SEWAGE C.1.3  
 inhibition model  
     USE ECOLOGICAL SUCCESSION B.1.5  
 insecticides  
     USE PESTICIDES C.1.6.3  
 international agreement  
     USE ENVIRONMENTAL MANAGEMENT E.1.2  
 interspecific competition  
     USE COMPETITION B.1.4.2  
 INTERTIDAL ZONES B.1.3.2  
     UF littoral zones  
     BT HABITATS B.1.3  
 intraspecific  
     USE ADAPTATION B.1.4.1  
 INVERTEBRATES A.1.2  
     BT MARINE ORGANISMS A.1  
 lead  
     USE TOXIC METALS C.1.10  
 litter  
     USE GARBAGE C.1.4  
 littoral zones  
     USE INTERTIDAL ZONES B.1.3.2  
 MARICULTURE D.1.4.2  
     BT COMMERCIAL FISHERIES D.1.4  
     SN The process of rearing marine organisms in controlled conditions in sea water.  
 marine communities  
     USE COMMUNITIES B.1.1.1.1  
 marine fisheries  
     USE COMMERCIAL FISHERIES D.1.4  
 MARINE INVASIONS C.3  
     UF alien species  
     RT ECOSYSTEMS B.1.1  
     SN An unintentional species.  
 MARINE MAMMALS A.1.3  
     BT MARINE ORGANISMS A.1  
 MARINE ORGANISMS A.1  
     NT FISH A.1.1  
         INVERTEBRATES A.1.2  
         MARINE MAMMALS A.1.3  
         NEKTON A.1.5  
         PLANTS A.1.4  
 MARINE PROTECTED AREAS E.1.2.1  
     UF MPA  
         no take areas  
     BT ENVIRONMENTAL MANAGEMENT E.1.2  
     RT FISHING (RECREATIONAL) C.4.4  
 MAXIMUM SUSTAINABLE YIELD E.1.2.3.1  
     UF harvestable amounts  
     BT REGULATION (FISHING) E.1.2.3  
     RT OVERFISHING D.1.4.3  
 mercury  
     USE TOXIC METALS C.1.10  
 metals  
     USE TOXIC METALS C.1.10  
 methyl-mercury chloride  
     USE CHEMICALS C.1.6  
 MICROORGANISMS A.1.5.1  
     BT NEKTON A.1.5  
     NT BACTERIA A.1.5.1.3  
         DECOMPOSERS A.1.5.1.1  
         PLANKTON A.1.5.1.2  
 migration  
     USE DISPERSAL B.1.1.1.28  
 MINIMATA DISEASE C.5.1.1  
     BT BIOLOGICAL MAGNIFICATION C.5.1  
     RT CHEMICALS C.1.6  
         COMMERCIAL SPECIES D.1.4.1  
         FISH A.1.1  
 molecular markers  
     USE BIOCHEMICAL MARKERS D.1.2  
 mpa  
     USE MARINE PROTECTED AREAS E.1.2.1  
 naphthenes  
     USE OIL C.1.7  
 natural gas  
     USE OIL C.1.7  
 NEKTON A.1.5  
     BT MARINE ORGANISMS A.1  
     NT MICROORGANISMS A.1.5.1  
 NERITIC ZONES B.1.3.3  
     UF coastal waters  
     BT HABITATS B.1.3  
 neurotoxic shellfish poisoning  
     USE HARMFUL ALGAL BLOOMS C.1.5  
 neurotoxins  
     USE HARMFUL ALGAL BLOOMS C.1.5

NICHES B.1.1.1.1  
     UF fundamental niches  
         realized niches  
     BT COMMUNITIES B.1.1.1.1  
 nitrates  
     USE NUTRIENTS C.1.2  
 no take areas  
     USE MARINE PROTECTED AREAS E.1.2.1  
  
 NON POINT SOURCE C.1.11.1  
     BT POLLUTION C.1.11  
     SN Pollution that cannot be attributed to a single  
     source.  
 nuclear waste  
     USE RADIOACTIVE WASTE C.1.8  
 nutrient input  
     USE EUTROPHICATION C.2  
 NUTRIENTS C.1.2  
     UF ammonia  
         anoxia  
         hypoxia  
         nitrates  
         organic particles  
         organic compounds  
     BT POLLUTANTS C.1  
 OCEANIC ZONES B.1.3.4  
     UF benthic  
         open ocean  
         pelagic  
     BT HABITATS B.1.3  
 OFFSHORE DRILLING C.4.3  
     BT HUMAN IMPACT C.4  
 OIL C.1.7  
     UF aromatics  
         crude oil  
         naphthenes  
         natural gas  
         olefins  
         paraffins  
         petroleum  
     BT POLLUTANTS C.1  
     RT OFFSHORE DRILLING C.4.3  
         OIL CONTAINMENT E.1.2.5.1  
 OIL CONTAINMENT E.1.2.5.1  
     UF oil spill management  
     BT WASTE MANAGEMENT E.1.2.5  
     RT OIL C.1.7  
         SHIPPING C.4.6  
 oil spill management  
     USE OIL CONTAINMENT E.1.2.5.1  
 oil transportation  
     USE SHIPPING C.4.6  
 olefins  
     USE OIL C.1.7  
 omnivorous  
     USE HETEROTROPHIC A.2.2  
 open ocean  
     USE OCEANIC ZONES B.1.3.4  
  
 organic compounds  
     USE NUTRIENTS C.1.2  
 organic particles  
     USE NUTRIENTS C.1.2  
 OVERFISHING D.1.4.3  
     BT COMMERCIAL FISHERIES D.1.4  
     RT EXPLOITATION C.4.1  
         MAXIMUM SUSTAINABLE YIELD E.1.2.3.1  
         UNREGULATED ACCESS E.1.3  
 OXYGEN MINIMUM ZONES B.1.2.3  
     BT ZONES B.1.2  
 PAHs C.1.6.1  
     UF polycyclic aromatic hydrocarbons  
     BT CHEMICALS C.1.6  
     SN Derivatives of fossil fuels severely disrupt  
     endocrine functions and may be cause of  
     reproductive failure.  
 paraffins  
     USE OIL C.1.7  
 paralytic shellfish poisoning  
     USE HARMFUL ALGAL BLOOMS C.1.5  
 parasitic  
     USE HETEROTROPHIC A.2.2  
 PARASITISM B.1.4.4  
     BT BIOLOGICAL FACTORS B.1.4  
 PCBs C.1.6.2  
     UF polychlorinated biphenyls  
     BT CHEMICALS C.1.6  
     SN Used as lubricants in industrial machinery.  
 pelagic  
     USE OCEANIC ZONES B.1.3.4  
 PESTICIDES C.1.6.3  
     UF insecticides  
     BT CHEMICALS C.1.6  
 petroleum  
     USE OIL C.1.7  
 PHOTIC ZONES B.1.2.2  
     BT ZONES B.1.2  
     NT PHOTOSYNTHESIS B.1.2.2.1  
 PHOTOSYNTHESIS B.1.2.2.1  
     BT PHOTIC ZONES B.1.2.2  
     NT CRITICAL DEPTH B.1.2.2.1.1  
     RT WATER QUALITY F.4  
 photosynthetic  
     USE AUTOTROPHIC A.2.1  
 phytoplankton  
     USE PLANKTON A.1.5.1.2  
 PLANKTON A.1.5.1.2  
     UF phytoplankton  
         zooplankton  
     BT MICROORGANISMS A.1.5.1  
     RT EUTROPHICATION C.2  
 PLANTS A.1.4  
     BT MARINE ORGANISMS A.1  
 plutonium  
     USE RADIOACTIVE WASTE C.1.8

POINT SOURCE C.1.11.2  
     BT POLLUTION C.1.11  
     RT EUTROPHICATION C.2  
     SN Pollution from a single source.

POLICIES E.1  
     NT CONSERVATION E.1.1  
         ENVIRONMENTAL MANAGEMENT E.1.2  
         UNREGULATED ACCESS E.1.3

POLLUTANTS C.1  
     UF toxic materials  
     NT BACTERIOLOGICAL CONTAMINATION C.1.1  
         CHEMICALS C.1.6  
         EUTROPHICATION C.2  
         GARBAGE C.1.4  
         HARMFUL ALGAL BLOOMS C.1.5

POLLUTANTS C.1 continued  
     NUTRIENTS C.1.2  
     OIL C.1.7  
     POLLUTION C.1.11  
     RADIOACTIVE WASTE C.1.8  
     SEWAGE C.1.3  
     THERMAL POLLUTION C.1.9  
     TOXIC METALS C.1.10  
     RT ACCEPTABLE LEVELS E.1.2.4  
     BIOASSAY D.1.1  
     WATER QUALITY F.4

POLLUTION C.1.11  
     BT POLLUTANTS C.1  
     NT NON POINT SOURCE C.1.11.1  
     NT POINT SOURCE C.1.11.2  
     RT WATER QUALITY F.4  
     SN The result of using marine waters for industrial cooling.

polychlorinated biphenyls  
     USE PCBs C.1.6.2

polycyclic aromatic hydrocarbons  
     USE PAHs C.1.6.1

POPULATIONS B.1.1.1  
     BT ECOSYSTEMS B.1.1  
     NT COMMUNITIES B.1.1.1.1  
         DISPERSAL B.1.1.1.28  
         EXTINCTION B.1.1.1.24  
         RESILIENCE B.1.1.1.21  
         RESISTANCE (ECOLOGICAL) B.1.1.1.20  
         SEASONAL SUCCESSION B.1.1.1.26  
         STABILITY B.1.1.1.22  
         TOLERANCE B.1.1.1.23  
         VARIABILITY B.1.1.1.25  
         VERTICAL MIGRATION B.1.1.1.27  
     RT GENETIC MANIPULATION D.1.5  
     HATCHERIES D.1.6

PREDATION B.1.4.5  
     BT BIOLOGICAL FACTORS B.1.4

predatory  
     USE HETEROTROPHIC A.2.2

RADIOACTIVE WASTE C.1.8  
     UF nuclear waste  
         plutonium  
     BT POLLUTANTS C.1

realized niches  
     USE NICHES B.1.1.1.1.1

RECREATION C.4.5  
     UF diving  
         snorkeling  
         tourism  
     BT HUMAN IMPACT C.4  
     RT ZONING E.1.2.2

red tides  
     USE HARMFUL ALGAL BLOOMS C.1.5

REGULATION (FISHING) E.1.2.3  
     NT MAXIMUM SUSTAINABLE YIELD E.1.2.3.1  
     RT FISHING (RECREATIONAL) C.4.4

RESILIENCE B.1.1.1.21  
     BT POPULATIONS B.1.1.1  
     SN Refers to the speed with which functional variables and species diversity return to equilibrium following a disturbance.

RESISTANCE (ECOLOGICAL) B.1.1.1.20  
     BT POPULATIONS B.1.1.1  
     SN Refers to the degree to which the ecosystem changes following a disturbance

runoff  
     USE SILTATION C.4.7

saprophytic  
     USE HETEROTROPHIC A.2.2

SALINITY F.4.3  
     BT WATER QUALITY F.4

SEASONAL SUCCESSION B.1.1.1.26  
     BT POPULATIONS B.1.1.1

SEWAGE C.1.3  
     UF factory discharge  
         industrial waste  
     BT POLLUTANTS C.1  
     RT WASTE MANAGEMENT E.1.2.5

SHIPPING C.4.6  
     UF oil transportation  
         supertankers  
     BT HUMAN IMPACT C.4  
     RT OIL CONTAINMENT E.1.2.5.1

SILTATION C.4.7  
     UF runoff  
     BT HUMAN IMPACT C.4  
     RT WATER QUALITY F.4

sink populations  
     USE DISPERSAL B.1.1.1.28

snorkeling  
     USE RECREATION C.4.5

soft bottom communities  
     USE COMMUNITIES B.1.1.1.1

solvents  
     USE CHEMICALS C.1.6

speciation  
     USE BIODIVERSITY B.1.1.1.1.23

SPECIES DIVERSITY B.1.1.1.1.22  
 UF diversity  
 BT COMMUNITIES B.1.1.1.1

SPECIES EVENNESS B.1.1.1.1.21  
 BT COMMUNITIES B.1.1.1.1

species extinction  
 USE EXTINCTION B.1.1.1.24

SPECIES RICHNESS B.1.1.1.1.20  
 BT COMMUNITIES B.1.1.1.1

sports fishing  
 USE FISHING (RECREATIONAL) C.4.4

STABILITY B.1.1.1.22  
 BT POPULATIONS B.1.1.1  
 SN A community's persistence over time.

supertankers  
 USE SHIPPING C.4.6

TEMPERATURE (WATER) F.2  
 RT THERMAL POLLUTION C.1.9

thermal discharges  
 USE THERMAL POLLUTION C.1.9

thermal emissions  
 USE THERMAL POLLUTION C.1.9

THERMAL POLLUTION C.1.9  
 UF entrainment  
 impingement  
 thermal discharges  
 thermal emissions  
 BT POLLUTANTS C.1  
 RT TEMPERATURE (WATER) F.2

TIDES F.3

TOLERANCE B.1.1.1.23  
 BT POPULATIONS B.1.1.1

tolerance model  
 USE ECOLOGICAL SUCCESSION B.1.5

tourism  
 USE RECREATION C.4.5

TOXIC EFFECTS C.5  
 NT BIOLOGICAL MAGNIFICATION C.5.1  
 RT ACCEPTABLE LEVELS E.1.2.4  
 BIOASSAY D.1.1

toxic materials  
 USE POLLUTANTS C.1

TOXIC METALS C.1.10  
 UF cadmium  
 lead  
 mercury  
 metals  
 BT POLLUTANTS C.1

traps  
 USE FISH KILL D.1.4.5

trawling  
 USE FISH KILL D.1.4.5

TROPHIC LEVELS A.2  
 UF food chain  
 food web  
 NT AUTOTROPHIC A.2.1  
 HETEROTROPHIC A.2.2

UNREGULATED ACCESS E.1.3  
 BT POLICIES E.1  
 RT OVERFISHING D.1.4.3

VARIABILITY B.1.1.1.25  
 BT POPULATIONS B.1.1.1  
 SN The natural change in population densities over time.

VERTICAL MIGRATION B.1.1.1.27  
 BT POPULATIONS B.1.1.1

Vicariance Hypothesis  
 USE DISPERSAL B.1.1.1.28

WASTE MANAGEMENT E.1.2.5  
 BT ENVIRONMENTAL MANAGEMENT E.1.2  
 NT OIL CONTAINMENT E.1.2.5.1  
 RT SEWAGE C.1.3

WATER QUALITY F.4  
 NT DENSITY F.4.1  
 DYNAMIC VISCOSITY F.4.2  
 SALINITY F.4.3  
 RT HUMAN IMPACT C.4  
 PHOTOSYNTHESIS B.1.2.2.1  
 POLLUTANTS C.1  
 POLLUTION C.1.11  
 SILTATION C.4.7

WHALING D.1.4.4  
 BT COMMERCIAL FISHERIES D.1.4

ZONES B.1.2  
 BT ECOLOGY B.1  
 NT APHOTIC ZONES B.1.2.1  
 PHOTIC ZONES B.1.2.2  
 OXYGEN MINIMUM ZONES B.1.2.3

ZONING E.1.2.2  
 BT ENVIRONMENTAL MANAGEMENT E.1.2  
 SN i.e. research, national park, general use.  
 RT RECREATION C.4.5

zooplankton  
 USE PLANKTON A.1.5.1.2