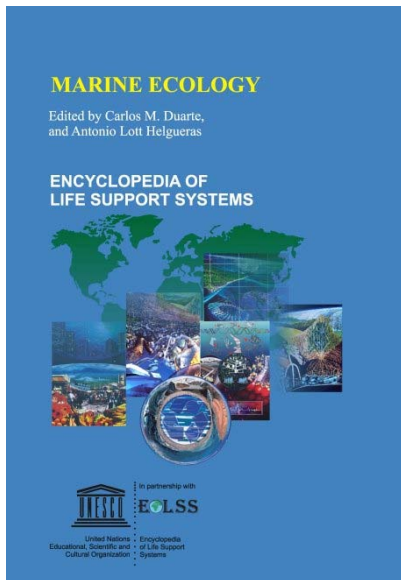


CONTENTS

MARINE ECOLOGY



Marine Ecology - Volume 1

No. of Pages: 478

ISBN: 978-1-84826-014-6 (eBook)

ISBN: 978-1-84826-464-9 (Print Volume)

For more information of e-book and Print
Volume(s) order, please [click here](#)

Or [contact : eolessunesco@gmail.com](mailto:eolessunesco@gmail.com)

CONTENTS

Marine Ecology **1**

Carlos M. Duarte, *IMEDEA (CSIC-UIB), Instituto Mediterráneo de Estudios Avanzados, Esporles, Majorca, Spain*

1. Introduction: The Sea as an Ecosystem
2. Marine Biodiversity and Marine Habitats
3. Marine Ecology: Definition and Goals
4. The Formation and Destruction of Organic Matter in the Sea: Primary Producers and Respiration
5. Transformations of Organic Matter: The Structure and Dynamics of Marine Food Webs
6. External Drivers of the Function and Structure of Marine Food Webs
7. Profiles of Marine Ecosystems
 - 7.1. Benthic Ecosystems
 - 7.2. Pelagic Ecosystems
8. Services Provided by Marine Ecosystems to Society
9. Human Alteration of Marine Ecosystems

Productivity of the Oceans **34**

Alan R. Longhurst, *place de l'Eglise, Cajarc, France*

1. Introduction
2. Photosynthetic processes of planktonic cells.
3. The ecological geography of productivity
4. Computation of global and regional productivity in the ocean.
5. What are the anticipated consequences of the response of phytoplankton as atmospheric carbon dioxide progressively increases?

Ocean Currents and their Impact on Marine Life **52**

Martín Merino, *Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, México*

María Adela Monreal-Gómez, *Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, México*

1. Introduction
2. Impacts on nutrient circulation and productivity of the oceans
 - 2.1. Upwelling systems
 - 2.1.1. Eastern boundary upwelling regions
 - 2.1.2. Equatorial upwelling systems
 - 2.1.3. Other upwelling systems
 - 2.2. Rotatory circulation
 - 2.2.1. Western boundary currents and rings
 - 2.2.2. Cyclonic eddies
 - 2.2.3. Anticyclonic eddies
 - 2.3. Tidal currents
 - 2.4. Fronts
3. Other impacts of ocean currents on marine life
 - 3.1. Plankton distribution and its patchiness
 - 3.2. Larvae transport and recruitment
4. Concluding Remarks

Role of Marine Microbes in Carbon and Nutrient Cycles **75**

Josep M. Gasol, *Dept. de Biol. Mar. i Oceanogr. Institut de Ciències del Mar, Barcelona, Spain*

1. Microbes in the sea. Defining the subject of study in marine microbiology.
2. The role of microbes in the cycles of nutrients and carbon. A historical view.
 - 2.1. The abundance of pelagic microbes. How many are there?
 - 2.2. The growth and production of bacteria
 - 2.3. The control of bacterial abundance
 - 2.4. The rediscovery of planktonic viruses
 - 2.5. The concept of the Microbial Food Web
3. The end of the black box approach to the study of the ecology of plankton microbes.
 - 3.1. Heterogeneity in the ecological roles of microbes
 - 3.2. Heterogeneity in the activity of the different microbes
 - 3.3. Heterogeneity in the phylogeny of the different microbes
 - 3.4. From phylogenetic probing (“who is there ?”) to molecular probing (“who is doing what?”)
4. Evolving perceptions on the role of microorganisms in the organic matter fluxes in planktonic food webs.
 - 4.1. Pomeroy’s still-changing paradigm
 - 4.2. Sources of carbon for bacterial use
 - 4.3. Bacterial use of “old” or allochthonous organic carbon
 - 4.4. Bacterial respiration, and bacterial nutrient deficiency
 - 4.5. Newer paradigms on the role of bacteria in the ocean and their relationships to phyto- and zooplankton
5. Evolving perceptions on the role of microorganisms in the inorganic nutrient fluxes.
 - 5.1. Microbe cell structure and nutrient cycling
 - 5.2. Nutrient-recycling mechanisms
 - 5.3. Dual role of bacteria as nutrient-scavengers or releasers
 - 5.4. Microbes and plankton microstructure
6. Conclusions

Ocean Food Webs and Trophic Dynamics

96

H. Stibor, *Department of Aquatic Ecology, University of Munich, Germany*
 Ulrich Sommer, *Institute for Marine Science, Kiel, Germany*

1. Introduction
2. The pelagic food web
 - 2.1. The structure of the pelagic food web
 - 2.2. Phytoplankton community structure
 - 2.2.1. Bottom up determinants of phytoplankton size structure
 - 2.2.2. Top-down determinants of phytoplankton size structure
 - 2.3. Zooplankton of marine pelagic food webs
 - 2.3.1. Protozoa
 - 2.3.2. Copepoda
 - 2.3.3. Tunicata
 - 2.3.4. Mesozooplankton feeding selectivity
 - 2.3.5. Herbivory by protozoa versus herbivory by metazoa
 - 2.4. The configuration of the lower food web
 - 2.5. The jellyfish-fish interaction
 - 2.6. Future research questions
3. Benthic food webs
 - 3.1. Euphotic benthic communities
 - 3.2. Aphotic benthic communities

Ecology, Behavior and Productivity of Marine Fish

114

B. Morales-Nin, *CSIC/UIB-Institut Mediterrani d'Estudis Avançats, Esporles, Spain*

1. Introduction
2. Fish life history
 - 2.1. Life histories

- 2.2. Reproduction
- 2.3. Fecundity, maturation and spawning
3. Population dynamics
 - 3.1. Recruitment
 - 3.2. Growth
 - 3.3. Mortality
4. Fish behavior
 - 4.1. Fish relationships with environment
 - 4.1.1. Sensory organs
 - 4.1.2. Fish communication
 - 4.2. Behavior
 - 4.2.1. Interspecies relationships
 - 4.2.2. Trophic relationships
 - 4.3. Fish movements
 - 4.3.1. Reproductive and feeding migrations
 - 4.3.2. Ontogenic and other migrations
 - 4.3.3. Mechanisms of migration control
5. Fish communities
 - 5.1. Shelf and upper-middle slope habitats
 - 5.1.1. Upwelling areas
 - 5.1.2. Tropical areas
 - 5.2. Deep-sea
 - 5.3. Oceanic waters
 - 5.4. Polar Oceans
6. Production and fisheries

Harvesting the Ocean

141

Yngvar Olsen, *Trondheim Biological Station, Norwegian University of Science and Technology, Trondheim, Norway*
Anders Endal, *Department of Marine Engineering, Norwegian University of Science and Technology, Trondheim, Norway*

1. Introduction
2. History of human harvesting technology
3. Harvesting marine biological resources
 - 3.1. Global potential and distribution of harvesting
 - 3.2. Overall harvesting history
 - 3.3. Important species of trophic categories
 - 3.4. Case analysis of species variability
 - 3.5. Variability and trophic composition
4. Future challenges and scenarios

Adaptations to Life in the Oceans. Pelagic Macrofauna

168

Joan E. Cartes, *Institut de Ciències del Mar de Barcelona (C.S.I.C.), Barcelona, Spain.*

1. Introduction
 - 1.1. Definition of pelagic macrofauna
 - 1.2. Taxonomic composition
2. The distribution of pelagic macrofauna
 - 2.1. Pelagic domains
 - 2.2. Vertical migrations
 - 2.3. Connections with the sea-floor: the interface of the Benthopelagic Boundary Layer
3. Sensorial physiology
 - 3.1. Chemoreception and mechanoreception
 - 3.2. Vision and bioluminescence
4. Feeding and metabolic rates

- 4.1. Feeding
- 4.2. Metabolic (and feeding) rates
- 4.3. Physiological adaptations to metabolic rates
 - 4.3.1. Abiotic factors
 - 4.3.1.1. Temperature
 - 4.3.1.2. Hydrostatic pressure
 - 4.3.1.3. Oxygen concentration
 - 4.3.1.4. Light
 - 4.3.2. Biotic factors
 - 4.3.2.1. Food availability
 - 4.3.2.2. Activity
 - 4.3.2.3. Other factors
5. Reproduction and life histories

Marine Benthic Flora

199

Rui O.P. Santos, *Department of Marine and Environmental Sciences, University of Algarve, Faro, Portugal*

1. Diversity of benthic marine flora
2. Adaptations of benthic marine flora.
 - 2.1. Light
 - 2.2. Hydrodynamic forces
 - 2.3. Nutrients and temperature
 - 2.4. Competition and herbivory
3. Human uses
4. Short term changes
 - 4.1. Seasonal cycles
 - 4.2. Disturbances
 - 4.3. Over-harvesting
5. Long term changes
 - 5.1. Atmospheric changes
 - 5.2. Eutrophication
 - 5.3. Toxic contamination
 - 5.4. Introduced species
6. Conservation

Life in Extreme Ocean Environments: Anchialine Caves

230

D. Jaume, *IMEDEA (CSIC-UIB), Esporles (Balears), Spain*
 G. A. Boxshall, *Dept. of Zoology, The Natural History Museum, London, UK*

1. Introduction
2. The anchialine environment: a subterranean marine/freshwater ecotone
3. The marine condition of anchialine caves
4. Typology and distribution of anchialine environments
5. Sources of organic matter and trophic relationships in anchialine caves
6. Characteristics of the anchialine fauna
7. Origin of the anchialine fauna
8. Conservation aspects

Population Dynamics of Phytoplankton

251

Ulrich Sommer, *Institute of Marine Research, University of Kiel, Germany*

1. Introduction
2. Reproduction
 - 2.1. The reproductive rate

- 2.2. The maximal growth rate
- 2.3. Limitation of reproductive rates
- 3. Losses
 - 3.1. The loss rate
 - 3.2. Grazing
 - 3.3. Sinking
 - 3.4. Pathogens and physiological death
- 4. Perennation
 - 4.1. Hidden microflora
 - 4.2. Sinking as a survival strategy
 - 4.3. Resting stages
- 5. The balance between reproduction and losses
 - 5.1. Phytoplankton blooms
 - 5.2. Crashes
 - 5.3. Steady State
- 6. Seasonality
 - 6.1. Segregation of nutrients and light
 - 6.2. The oligotrophic scenario
 - 6.3. The eutrophic scenario

Nitrogen Metabolism in Phytoplankton

262

Y. Collos, *Laboratoire d'Hydrobiologie CNRS, Université Montpellier II, France*

J. A. Berges, *School of Biology and Biochemistry, Queen's University of Belfast, UK*

- 1. Introduction
- 2. Availability and use of different forms of nitrogen
 - 2.1. Nitrate
 - 2.2. Nitrite
 - 2.3. Ammonium
 - 2.4. Molecular N₂
 - 2.5. Dissolved organic N (DON)
 - 2.5.1. Urea
 - 2.5.2. Amino acids
 - 2.5.3. Humic substances
 - 2.5.4. Purines
 - 2.5.5. Vitamins
 - 2.6. Particulate nitrogen (PN)
- 3. Assimilation pathways
- 4. Accumulation and storage
 - 4.1. Inorganic compounds
 - 4.2. Organic compounds
- 5. Nutrient classification and preferences
- 6. Plasticity in cell composition
- 7. Overflow mechanisms: excretion and release processes
- 8. Recycling of nitrogen within the cell
- 9. Degradation pathways
 - 9.1. Requirements for and roles of degradation
 - 9.2. How is degradation accomplished?
 - 9.3. Variation in degradation
 - 9.4. Pathogenesis and Cell Death
- 10. From uptake to growth: time-lag phenomena
- 11. Relationships with carbon metabolism
- 12. Future directions

Virus and Heterotrophic Microplankton**280**Markus G. Weinbauer, *Department of Biological Oceanography, Netherlands Institute for Sea Research, The Netherlands*Gerhard J. Herndl, *Department of Biological Oceanography, Netherlands Institute for Sea Research, The Netherlands*

1. Introduction
2. The main players
 - 2.1. Viruses
 - 2.2. Prokaryotes
 - 2.3. Protists
3. Future perspectives

Zooplankton Ecology**295**Miguel Alcaraz, *Institut de Ciències del Mar, CSIC, Barcelona, Catalonia, Spain.*Albert Calbet, *Institut de Ciències del Mar, CSIC, Barcelona, Catalonia, Spain.*

1. Introduction
2. Zooplankton in the context of marine life
 - 2.1. Size and taxonomic composition: holoplankton and meroplankton
 - 2.2. Spatial patterns
 - 2.3. Vertical and horizontal distribution
 - 2.4. Temporal variability: from day-night vertical migrations to multi-year changes
3. Trophic ecology
 - 3.1. Food sources
 - 3.2. Feeding mechanisms
 - 3.3. Factors affecting zooplankton feeding rates
4. Zooplankton production
 - 4.1. Life cycles
5. Zooplankton and marine food webs
 - 5.1. Control of carbon turnover in marine systems: global change
 - 5.2. Zooplankton, fisheries and mankind

Swimming Dynamics of Zooplankton**319**Enric Saiz, *Institute of Marine Sciences, CMIMA, CSIC, Barcelona, Spain*

1. Introduction
2. How do they swim?-The study of zooplankton locomotion
 - 2.1. Physics of water
 - 2.2. Description of the locomotion
 - 2.2.1. Appendicularians
 - 2.2.2. Chaetognaths
 - 2.2.3. Copepods
 - 2.2.4. Doliolids
 - 2.2.5. Jellyfish
 - 2.2.6. Fish larvae
 - 2.2.7. Salps
3. Why do they swim?-The study of swimming behavior
 - 3.1. Encounter theory
 - 3.2. Food-searching swimming strategies
 - 3.3. Predator detection and escape behavior
 - 3.4. Mate-searching swimming
 - 3.5. Vertical migration
4. Conclusions

Induction of Settlement in Merozooplankton

339

Manuel Maldonado, *Centro de Estudios Avanzados de Blanes (CSIC), Blanes, Spain*
 Craig M. Young, *Harbor Branch Oceanographic Institution, Florida., USA.*

1. Introduction
 - 1.1. Scope of the approach
 - 1.2. Importance of settlement in mezoplankton
2. Biological and environmental challenges faced by merozooplankters
 - 2.1. Life-span constraints
 - 2.2. Constraints of locomotion and substratum exploration
 - 2.3. Constraints of feeding and energy resources
 - 2.4. Sensory constraints
3. Settlement cues and signal transduction
 - 3.1. Natural and experimental settlement cues
 - 3.2. Signal transduction
4. Overview of natural settlement cues
 - 4.1. Physical cues
 - 4.1.1. Light
 - 4.1.2. Gravity
 - 4.1.3. Temperature
 - 4.1.4. Salinity
 - 4.1.5. Water density
 - 4.1.6. Hydrostatic pressure
 - 4.1.7. Water flow
 - 4.1.8. Surface properties
 - 4.2. Chemical cues
5. A case study: Settlement induction in barnacles
6. Future challenges

Ecology and Behavior of Seabirds

364

D. Oro, *IMEDEA (CSIC-UIB), Esporles (Mallorca), Spain*
 A. Martínez-Abraín, *IMEDEA (CSIC-UIB), El Saler (Valencia), Spain*

1. Prologue
2. Taxonomy and distribution of seabirds
3. Feeding ecology of seabirds
 - 3.1. Feeding habitats for seabirds
 - 3.2. The role of seabirds in marine ecosystems and nutrient cycling
 - 3.3. Mechanisms used by seabirds for obtaining food
4. Seabird migration
5. Life cycles and breeding behavior of seabirds
 - 5.1. Social breeding and mating systems
 - 5.2. Breeding parameters of seabirds
 - 5.3. Seabird physiology
6. Population dynamics and regulation of seabird colonies
7. Conservation of seabirds
 - 7.1. Relationships with humans
 - 7.1.1. Fisheries
 - 7.1.2. Urbanization and introduced fauna
 - 7.1.3. Other threats
 - 7.2. Endangered species
 - 7.3. Policy challenges
 - 7.3.1. Seabird as indicators of marine environments
8. Conclusions

Marine Reptiles: Adaptations, Taxonomy, Distribution and Life Cycles 390A. Bertolero, *Department of Animal Biology, University of Barcelona, Spain*J. Donoyan, *Documentary Centre, Ebro Delta Natural Park, Tarragona, Spain*B. Weitzmann, *DEPANA, Project of Sustainable Management of Punta de la Mora, Tarragona, Spain*

1. Introduction
2. The fossil marine reptiles
3. Physiological adaptations to sea life
 - 3.1. Salt and water balance
 - 3.2. Respiration and diving adaptations
 - 3.3. Thermoregulation
 - 3.4. Locomotion
4. Sea Turtles
 - 4.1. Morphology and adaptations
 - 4.2. Life cycle and behaviour
 - 4.3. Feeding
 - 4.4. Predators
 - 4.5. Habitat and distribution
 - 4.6. Conservation
5. Marine Iguana
 - 5.1. Morphology and adaptations
 - 5.2. Life cycle and behavior
 - 5.3. Feeding
 - 5.4. Predators
 - 5.5. Habitat and distribution
 - 5.6. Conservation
6. Sea Snakes
 - 6.1. Morphology and adaptations
 - 6.2. Life cycle and behaviour
 - 6.3. Feeding
 - 6.4. Predators
 - 6.5. Habitat and distribution
 - 6.6. Conservation

Index 415**About EOLSS** 425