CONCEPTS IN BIOLOGICAL OCEANOGRAPHY pdf

1: Concepts of Physical Oceanography

The book's text and theories are www.enganchecubano.com is an advanced level textbook which introduces biological oceanography via the interaction of biological and physical processes for biological and physical oceanographers.".

Barber and Anna K. The pace of biological investigation of the ocean quickened as this period began in the s. To appreciate the magnitude of the acceleration, a brief look at biological oceanography in the first half of this century is useful. Before World War II, biological oceanography had two main themes. The first and more important by far was as a handmaiden to fisheries science. Where were exploitable resources, why did they vary so in abundance, and how could more resources be found? These were the demanding questions asked of biological oceanography. These questions, particularly the old question of why recruitment to exploitable fish stocks varies so much from year to year and from place to place Hjort, , have proved to be profoundly complex questions that biological oceanography still struggles with today cf. The second major theme was discovery per se. Exotic and strange animals, and to a lesser degree plants, commanded interest among scientists as well as the general public; they illustrated the marvels of adaptation and evolution. Exploration for its own sake has always motivated biological oceanographers, but as the discipline matured, this motivation became less fashionable. NSF has never supported biological oceanographers for the sole purpose of looking for strange new organisms, yet discovery is what makes biological oceanography so much fun. After World War II the climate of oceanographic research was different. One of the authors RTB spent an undergraduate summer in Woods Hole in the mids, a time when the overriding impression was that there were many exciting questions and unlimited opportunities. Ideas newly aired then were the ecosystem constructs of the Odum brothers Odum and Odum, , the quantitative and predictive plankton studies of Riley , and the elegant ecology and evolution theories of Hutchinson ; the brilliance of these ideas inspired students and researchers. The relative merits of applied versus basic research became a topic of frequent discussion. At the same time, the distance between biological oceanography and fisheries science widened here in the United States until, by the s, there was little significant intellectual exchange between the two disciplines. A few iconoclastic individuals argued for studying ocean biology whether or not an application for the new knowledge could be envisioned, implying that knowledge per se was good. In addition to knowledge for the sake of knowledge, there arose in the postwar period the specter of pollution and the notion that it was necessary to know how the ocean functioned to avoid inadvertently destroying it. All of these needs or objectivesâ€”food from the ocean, discovery, knowledge for its own sake, and the custodial sense arising from pollution concernsâ€”provided motivations to expand and reshape the field. But by far the most important impetus driving the expansion of biological oceanography was the cornucopia of new resources available for science. Financial resources that flowed to American science as a result of Sputnik, the scientific race with the Soviets, and the Cold War trickled down or up to biological oceanography. It should be noted that NSF made a conscious decision to support biological oceanography in the s because it foresaw that biological oceanography was unlikely to receive support elsewhere, including the Office of Naval Research. These new resources drove the increase in basic, NSF-supported, research during this period. Responding to the increased supply of resources by recruiting young scientists in large numbers, biological oceanography became a discipline of its own and settled into a steady rate of progress and expansion. Understanding and Vision for Research. Next we queried about practicing biological oceanographers on their opinions of the landmark achievements of the past 50 years. Almost everyone responded to our query, and it was fascinating to see this thoughtful self-evaluation of our discipline. Organizing and collating the many replies was educational, but this informal survey did not lend itself to quantitative analysis. We also looked at citation indices McIntosh, ; Parsons and Seki, but did not use this information because biological oceanography was not a specific category. In the end we made a subjective selection which was, for the most part, consistent with the suggestions provided by the community. We thank the respondents and acknowledge how much we learned from their replies, but we absolve them from responsibility for the following. Because neither of the authors has formal training as a historian, we are in every sense amateurs at writing history. Our strongest, or perhaps weakest, characteristic is a passionate interest in biological oceanography and its history. Another important weakness is that we are practicing biological oceanographers. It is unrealistic to expect an objective history of baseball from players who are in the middle of a playoff game. Our paper is very subjectiveâ€”interesting and informative, we hope, but not necessarily objective. Selecting achievements to include was not difficult; the agonizing aspect was what to leave out. In biology there are many kinds of achievements. In this short paper we do not do justice to the diversity of biological oceanography. Also, as any NSF program manager in biological oceanography will tell you, there is no tidy framework for organizing the different parts of biological oceanography. Our list is therefore eclectic as well as subjective. Vents and Ocean Color We begin with two landmark achievements that more or less fell into the laps of biological oceanographers. Chemosynthetic Hydrothermal Vent Communities Plate 1 This is an easy landmark to start with because it has all the dramatic elements of discovery. We may no longer set out on voyages of discovery, but in the past 50 years the pace of biological discovery has been awesome. In , when geologists discovered the hydrothermal vents, biological oceanography received a much-appreciated jolt of intellectual stimulation Corliss et al. The existence of a new kind of ecosystem with dramatic new biochemical adaptation fueled the imagination of everyone. The names associated with this pioneering work on chemosynthesis are a cross section of the gentry of biological oceanography. Cavenaugh, Childress, Grassle, Jannasch, Karl, Lutz, and Somero were early leaders in this work, but the list soon expanded to include several dozen individuals see references below. From this work we learned how organisms adapt biochemically to temperature extremes and lack of oxygen, a line of investigation that has led to the discovery of active microbes deep in the Earth. This work also provides a rational organizing paradigm for the search for life on other celestial bodies. What is amazing about the discovery of chemosynthetic ecosystems is that, once discovered, they have turned up everywhere in the ocean: They are hot vents or cold seeps; their reducing power comes from hydrogen sulfide or methane. Chemosynthetic ecosystems even exist on whale carcasses Smith et al. The mystery is how we overlooked these ubiquitous ocean ecosystems for so long, and we wonder what other surprises the ocean holds. The disco, cry, response by scientists, and response by NSF provide a model of science at its best. Chemosynthetic Hydrothermal Vent Communities References 1 Submarine thermal springs on the Galapagos Rift. Chemosynthetic primary production at East Pacific sea floor spreading centers. Deep-sea primary production at the Galapagos hydrothermal vents. Procaryotic cells in the hydrothermal vent tube worm Riftia pachyptila Jones: Calvin-Benson cycle and sulphide oxidation enzymes in animals from sulphiderich habitats. Sulfide binding by the blood of the hydrothermal vent tube worm Riftia pachyptila. Larval development and dispersal at deep-sea hydrothermal vents. Biological communities at the Florida escarpment resemble hydrothermal vent taxa. The first underwater observation on living habitat and thanatocoenoses of Calyptogena soyoae in bathyal depth of Sagami Bay. Japanese Journal of Malacology Vent fauna on whale remains. Biogeography of hydrothermal vent communities along seafloor spreading centers. Trends in Ecology and Evolution 5: Vents at higher frequency. Deep-sea clams feel the heat. Biological oceanography became a global discipline in a single step. It is, of course, somewhat facetious to call this new satellite-based remote sensing capability an "accident. However, the real drivers in the early days were the spirit of NASA, its engineers, and their unquenchable drive to build whatever could be built and flown on satellites. Our reading of the event is that NASA was looking for challenges, and the quantitative assessment of ocean surface chlorophyll and related pigments by reflected light was a challenge they took on with enthusiasm. The first CZCS data of reflected light that became available in the late s started a scramble to put together systems to process and interpret this new kind of data. As CZCS images flooded into our consciousness it became obvious that we needed to train a cohort of biological oceanographers who would know how to use the new technology. This hard work has paid off. When a new, much improved U. As a result, the pace of biological oceanography has quickened all around the globe. Space-based analysis changed not only our perception of the ocean, but also our ideas of what constitutes good biological oceanography. Of the various landmark achievements mentioned here, this is one that profoundly affects all biological oceanographers and indeed each citizen of the planet. Having seen the totality of the oceans, mankind can no longer maintain the concept of discrete or isolated components of the ocean. NASA, of course, was the major patron of this work, but NSF has been and remains an important supporter of the synthesis and interpretation of this exciting new way to view the ocean. Ocean Color References Atmospheric effects in the remote sensing of phytoplankton pigments. Phytoplankton pigment concentrations in the Middle Atlantic Bight: Comparison of ship determinations and CZCS estimates. Monthly satellite-derived phytoplankton pigment distribution for the North Atlantic Ocean basin. Ocean color, availability of the global data set. Distributions of phytoplankton blooms in the Southern Ocean. Annual cycles of phytoplankton chlorophyll concentrations in the global ocean: Global Productivity and Productivity Regimesâ€"The Stepchildren of Ocean Color Soon after Steeman-Nielsen introduced the radioactive carbon tracer method to measure primary productivity, biological oceanographers began to use the new productivity observations to speculate about the existence of differing oceanic productivity regimes and to estimate global productivity Ryther, Both contributions advanced biological oceanography, but under-sampling compromised both efforts. Global CZCS chlorophyll coverage provided a way to break out of this sampling limitation using the productivity-chlorophyll-light relationship described first by Ryther and Yentsch High-resolution spatial and temporal patterns of phytoplankton biomass permitted objective estimates of global primary productivity see references below as well as the size and seasonal variability of the various productivity regimes or biogeochemical provinces of the world ocean Longhurst, Arguably the most important scientific contributions of the satellite ocean color breakthrough to date have been improved estimates of global productivity and the birth of an objective ecological geography of the sea. Global Productivity and Productivity Regimes References

2: Concepts in Biological Oceanography - Peter A. Jumars - Oxford University Press

This textbook for advanced level courses in oceanography focuses on the interaction of ecological and physical processes that govern the ocean. The book begins with an introduction to ecology, using foraging theory and analytic formulation of encounter rates of predator and prey as organizing principles.

3: Achievements in Biological Oceanography - 50 Years of Ocean Discovery - NCBI Bookshelf

The last part treats interdisciplinary topics as the arena in which the non-biological environmental scientist is most likely to find need for some biological background. The book is designed to introduce and develop concepts rather than to give extensive factual detail.

4: Biological Oceanography by Charles B. Miller

This text provides an introduction to the principles and major questions of biological oceanography for physical scientists. It introduces basic ecology, presents an overview of biological oceanography and discusses the interaction of the biological and physical processes that govern the ocean.

5: Graduate Studies in Biological Oceanography | Marine Sciences

Biological Oceanography is concerned with the interactions of populations of marine organisms with one another and with their physical and chemical environment. Because these interactions are frequently complex, and because the concepts and techniques draw from many fields, biological oceanography is, of necessity, an interdisciplinary science.

6: Rykaczewski Lab - Teaching

"Biological oceanography is the branch of environmental science whose goal is to predict what kinds of organisms will be found in what abundances where and when within.

7: University of Washington announces new marine biology major | College of the Environment

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Of all published articles, the following were the most read within the past 12 months.

8: Concepts and Practices in Biological Oceanography and Marine Ecology - Part 1 | IMBRSea

Uses a flipped classroom for enhanced development of quantitative skills to measure these patterns, emphasizing hands-on data collection and analyses, multiple field trips aboard DUML research vessels, and participatory activities to demonstrate core concepts in biological oceanography.

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