

Reader file

Summary Report on Cruise 5

R/V TE VEGA, Mombasa to Singapore, Autumn 1964

Personnel

Faculty: Donald P. Abbott, Stanford University. Chief Scientist and marine zoologist
Richard V. Bovbjerg, State University of Iowa. Ecologist
Margaret G. Bradbury, San Francisco State College. Ichthyologist

Richard N. Mariscal, predoctoral student, University of California, Berkeley, Faculty assistant

Students: **Men** - Richard T. Barber, Stanford University
Jay P. Christofferson, University of Hawaii
R. Merrill McPhearson, University of Alabama
John C. Ogden, Stanford University
Paul M. Stromborg, Northern Illinois University
Leighton R. Taylor, University of Hawaii
John P. Wourms, Stanford University
Michael J. Wynne, University of California, Berkeley

Women - Vicki Buchsbaum, Stanford University
Jeanne Christofferson, University of Hawaii East-West Center
Sharon J. Proctor, Stanford University

General plan of work

Since it was known that the cruise was to cover well over 5000 nautical miles of open sea, plans were made in advance to organize the major work of the ship around a community-type ecological study of the mesopelagic or "DSL" biota. It was expected that students and faculty would work together, as junior and senior colleagues, to jointly plan and execute the project. Formal teaching, in the form of prescribed lecture and laboratory sessions, was to be minimized, and insofar as possible all instruction was to take place in the context of the research project. Lectures were given when deemed necessary by the faculty, but much heavier emphasis was placed on: (1) active participation by all the students in all aspects of planning the work, operating the instruments and gear, gathering data and organisms, working up the collections and data, analyzing and interpreting the data, and writing up the results; (2) joint faculty/student seminars and discussions on a variety of topics; and (3) assigned background reading in marine biology and oceanography. The approach required flexibility and the continuous evaluation of results and modification of plans, as is necessary in any complex research program. The results obtained and the general response of the students indicates to us it was well worth the effort involved.

Shore work in Africa, southeast Asia, and on islands in between, provided desirable breaks in the main program, and offered opportunities to examine a variety of different marine habitats (e.g. rocky shores, coral reefs, turtle grass beds, estuaries, mangrove swamps, sandy beaches, etc.). Field surveys of most of these were undertaken, often followed by laboratory study of specimens taken and discussion of observations and findings.

Some free time was made available to students who had special interests and wished to follow up individual projects.

Log of Activities

Mombasa, prior to departure

Assembled, checked, and inventoried gear and supplies. Set up and tested instruments (Beckman spectrophotometer, salinometer, etc.).

Survey of reef and turtle grass beds; workup of collections and monition observations.

Trip to Tsavo Game Reserve

Survey of mangrove swamps, upper Kilindini Harbor

Collection of biota from floats and pilings, Kilindini Harbor

Departed from Mombasa, 5 Oct 1964

Testing of nets and trawls of various sizes and types

Familiarization with gear (e.g. BTs, bucket thermometers, meter block, inclinometer, current meter, salinometer, depth recorder, fathometer, sonar, etc.)

Designing and constructing plankton examination cells for use under way.

Initial familiarization with common epipelagic and mesopelagic plankton and nekton

Lectures on pelagic fishes and crustaceans

Assigned reading (four books) on marine biology and oceanography

Seminar on dangerous marine animals

Selection by students of the particular plankton groups in which each would specialize

Discussion and plans for work on mesopelagic community

Arrived in Seychelles, 14 Oct

Made numerous trips to reefs and other shallow water marine associations. Some trips made in collaboration with British reef ecologists working in the area.

Several fish poisoning stations were made, both with and without SCUBA gear.

Laboratory survey of common reef fishes, algae, and corals and other invertebrates.

Made survey of food habits of large variety of reef fishes through field observations and stomach analyses, then made field studies to check sources of foods and habitats of fishes.

Collected and examined microfauna from selected spots on reefs.

Tested and used underwater photographic equipment

Held seminars on types of coral reefs, and on the structure, zonation, and dynamics of reef communities.

Work on individual student problems.

Took trip to Praslin Island to see National Park

Departed from Seychelles, 27 Oct

Daily trawling and working up of pelagic animals taken and physical data collected.

Review of pelagic work thus far, analysis and discussion of data

Lecture and discussion on the nature of biotic communities

Breakdown of study of mesopelagic community or "DSL community" into three aspects, each aspect to be tackled by 1/3 of the student body working as a small group.

Sonar group: behavior and pattern of the DSL under various conditions and at different times of day and night; correlation of DSL behavior with physical variables.

Population group: relation between numbers and distribution of pelagic organisms and strata of DSL; vertical movements and migrations of species; change in composition of mesopelagic community with shift in longitude.

Food group: in charge of analysis of data on food habits of mesopelagic fauna, with the object of trying to get a picture of food relations in the community.

Work was organized so that each student (1) spent alternate days on deck (streaming and recovering the gear, taking hydrologic and meteorological data) and in the lab, carrying out preliminary sorting of plankton collections; (2) was responsible for making identifications and counts of species, and determining food habits of species, within a particular taxonomic group of organisms; (3) and was a member of one of the three groups outlined above (sonar, population, and food groups), charged with working up and analyzing data collected by the whole student body and faculty.

Seminar on selected cases of symbiosis in marine situations.

Stormy weather restricted work for 3 days.

Arrived in Maldives, 4 Nov

Trips to study and collect reef organisms in a variety of reef situations, from outer reef margins to protected lagoon reefs, on Funidu and Hulele islets, Male Atoll.

Continued workup of trawled collections to bring biological records up to date.

Lecture on atolls and atoll reefs

Free time for work on individual problems by students.

Departed from Maldives, 9 Nov

Resumption of trawling in epi- and mesopelagic levels, and workup of collections.

Seminar reports by each student on results obtained so far with particular taxonomic groups; species found, distribution and numbers in relation to DSL strata, and food habits.

Seminar report by sonar group.

Discussion of information needed to complete community study

Arrived in Ceylon, 12 Nov

Three day trip into interior of Ceylon
 Work on plankton collections on board ship to bring project records up to date

Departed from Ceylon, 19 Nov

Group planning of work to be done while crossing Bay of Bengal
 Day and night trawling, and workup of catches
 DSL seminar, relating our results so far with the work of others elsewhere
 Ship stopped on dead calm sea for two days, for prolonged continuous monitoring of sonic scattering layers; night light stations, collection and study of luminescent organisms, etc.
 Completion of all trawling operations, and identifications and counts for most groups of planktonic organisms insofar as this could be done on the ship
 Preparation of outline for a single long paper on the results obtained, to be written by all faculty and students.

Arrived in Phuket, West Thailand, 28 Nov

Picked up Thai scientist, Thumnoon Sunpanish, for work aboard
 Observation and collection of organisms from rocky shores and adjacent silted reefs
 Shipboard conferences with students on writeups of sections of paper on main project

Departed for Goh Pipidon Island, 1 DecArrived at Goh Pipidon Island, 1 Dec

Day and night collecting and observation on island reefs
 Trip to reefs and fjords of nearby island, Goh Pipithall
 Fish poisoning stations made
 Plankton hauls for visiting Thai scientist
 Faculty conferences with student groups dealing with sonar, population, and food aspects of the community study. Writing and preparation of plates for final paper.

Returned to Phuket, 6 DecDeparted for Penang, Malaysia, 7 Dec

Work on final report

Arrived Penang, 8 DecDeparted for Singapore, 10 Dec

Cleanup and stowage of equipment, packing of specimens and personal gear.
 Completion of all sections of the project paper, in rough draft.
 Agreement by Dr. Bradbury to supervise final editing of paper, checking of field identifications of pelagic species, etc.

Arrived at Singapore, 18 Dec 1964, on schedule

Trip ended.

Outline of projected paper

"Ecological studies on the animal community associated with sonic scattering layers in the equatorial Indian Ocean, conducted on R/V Te Vega in October and November, 1964."

Introduction

The expedition and personnel
Statement of problem, scope of research, limitations
Acknowledgments

Equipment and methods**Trawling Station data**

Chart showing track of Te Vega and all station locations, with depth profile

Table of station data

Profile diagrams of all trawls

BT and other data

Discussion**Sonic scattering pattern, shallow and deep layers**

37 hour continuous recording in Bay of Bengal

Comparison with diurnal picture obtained in various localities from recordings made every 3 hours

Generalized scattering pattern for equatorial Indian Ocean

Significant variations in pattern, discussed in relation to variations in light, etc.

Comparison of findings with the work of others

Annotated checklist of the macrofauna of the mesopelagic community

Siphonophores

Medusae

Ctenopheres

Annelids

Molluscs

Crustaceans

Teniacates

Fishes

Distribution and abundance of mesopelagic organisms

Table showing distribution and abundance of all species

Change in composition of the mesopelagic community with longitude, from Mombasa to the Nicobar Islands

Diurnal movements of selected species populations, and correlation of common species with particular levels at particular times of day and night

Food relations in the mesopelagic community

Table of foods eaten, based on stomach analyses, for all common species for which data could be obtained

Food web diagram, and characterization of food habits of selected groups of organisms

Discussion

General discussion of results obtained

Summary

Literature cited

General comments on cruise and program.

The experiment of trying to organize the main work of the cruise around a single broad and many-sided research project, planned and carried out cooperatively by faculty and students, was generally successful. The procedure is recommended for future cruises. However, it requires not only a faculty experienced in the conduct and supervision of research and congenial to one another, but also a student body of high calibre such as might be drawn from among predoctoral students at major universities. The good students in our group responded magnificently to the challenge and became truly junior colleagues; the two poorest ones performed little better than technicians, and contributed little intellectually, though they came well recommended. The ship and its gear proved adequate for the project, though by no means ideal. However, the intellectual quality and enthusiasm of the students is a much more important factor in the success of a project such as we undertook, than the refinement or sophistication of the gear, as long as certain standards are met. Indeed the necessity to improvise and "make do" with what is available in itself provides a desirable stimulus and intellectual challenge to a competent and energetic group. Periodic interruption of effort on the main project for work on other and unrelated things is highly desirable, and all students should be encouraged to undertake small individual projects of their own, and allowed time to work on them.

Donal P. Abbott
Chief Scientist, Cruise 5