UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

ALPHA HELIX RESEARCH PROGRAM

1975 - 1976

COMBINED ANNUAL REPORTS

EAST ASIA EXPEDITION

JOINT II - COASTAL UPWELLING ECOSYSTEMS ANALYSIS

AND

AMAZON RIVER EXPEDITION (TO JUNE, 1977)

R/V ALPHA HELIX IS A NATIONAL OCEANOGRAPHIC FACILITY SPONSORED BY THE NATIONAL SCIENCE FOUNDATION AND ADMINISTERED BY THE SCRIPPS INSTITUTION OF OCEANOGRAPHY

MARCH 1978

ALPHA HELIX RESEARCH PROGRAM

1975 - 1976

COMBINED ANNUAL REPORTS

EAST ASIA EXPEDITION

JOINT II - COASTAL UPWELLING ECOSYSTEMS ANALYSIS

AND

AMAZON RIVER EXPEDITION (TO JUNE, 1977)

R/V ALPHA HELIX IS A NATIONAL OCEANOGRAPHIC FACILITY SPONSORED BY THE NATIONAL SCIENCE FOUNDATION AND ADMINISTERED BY THE SCRIPPS INSTITUTION OF OCEANOGRAPHY

MARCH 1978

R/V ALPHA HELIX June 1976 on Amazon River at Benjamin Constant

Photo by P. Mangelsdorf
Swarthmore College

TABLE OF CONTENTS

INTRODUCTION

Prior to 1960, Professor P. Scholander of Scripps Institution of Oceanography envisioned that many fundamental biological problems could best be investigated where they occur, by teams of competent scientists supported by the advanced technology and equipment of a floating laboratory. The Research Vessel ALPHA HELIX, named to honor the helical configuration of proteins and genetic material, became the reality of this vision. This ship constitutes a laboratory facility singularly capable of supporting investigations of experimental biology and medicine in the various geographic regions of the earth.

Under a grant from the National Science Foundation, R/V ALPHA HELIX was designed by L. R. Glosten and Associates of Seattle, Washington and built by the Martinac Shipbuilding Corporation of Tacoma. The vessel was delivered to the Scripps Institution of Oceanography in February 1966, and sailed the following month for a one-half year program at the Great Barrier Reef of Australia.

Since then the ship has been engaged in extended studies in the Amazon River Basin during 1967, in the Bering Sea in 1968 and in New Guinea during 1969. In 1970 research efforts involving physiological, biochemical and biological oceanographic studies were conducted in the coastal waters of western North and South America. In 1971, studies were carried out at Antarctica, at Eniwetok, and in the eastern Pacific. During 1972 ALPHA HELIX was engaged in marine chemical, biological and ecological

studies in the Gulf of California, neurophysiological investigations off Southern California, a 2-phase program of physiological investigations in the Bering Sea, and three separate human medical programs were conducted in the central and southwestern Pacific.

The year 1973 saw ALPHA HELIX support biological studies north of Australia, at the Great Barrier Reef, in the Arctic, and off the Kona Coast. Nine research efforts were carried out in the North Pacific and off western North America during 1974. This work ranged from mass spectrometric analyses of halogen incorporation in marine plants and invertebrates to biomedical investigations of the degenerative processes of migrating and spawning salmon.

ALPHA HELIX continued her mission of supplying specialized on-site research facilities for conducting experimental biological investigations during the period 1975 through mid 1977 which is the period covered by this report. In 1975 ALPHA HELIX conducted the four-phase East Asian Expedition totalling 322 operating days. The expedition carried out bioluminescence work in Indonesia, comparative physiology studies off Brunei, multidisciplinary coral reef research, and intensive functional investigations of the chambered Nautilus in the Philippines.

In March of 1976 ALPHA HELIX departed San Diego on an 18-month expedition which brought her off the coast of Peru on an IDOE-sponsored CUEA program, thence through the Panama Canal to Belém and up to the tributaries of the Amazon River. During this

period, 142 scientists and 50 graduate students and technicians from 35 U. S. and 18 foreign institutions conducted investigations involving bio-and geo-chemistry, anthropology, human genetics, physiology, ecology, neurophysiology, and behavior. Figure 1 illustrates the cruise tracks of ALPHA HELIX during her first ten years of service.

The format of this report differs from that of previous reports in that only a summary statement of research completed on each phase is included. The detailed field report filed by each investigator for his portion of an expedition may be requested from the ALPHA HELIX Program Office or the UNOLS Office.

Other information in this report describes the facilities, the equipment inventory, the procedure for requesting the use of ALPHA HELIX, and the attending scientific responsibility. It is hoped that this presentation will alert and adequately inform the scientific community so that its members will advance imaginative research proposals which require and most effectively utilize this unique laboratory ship.

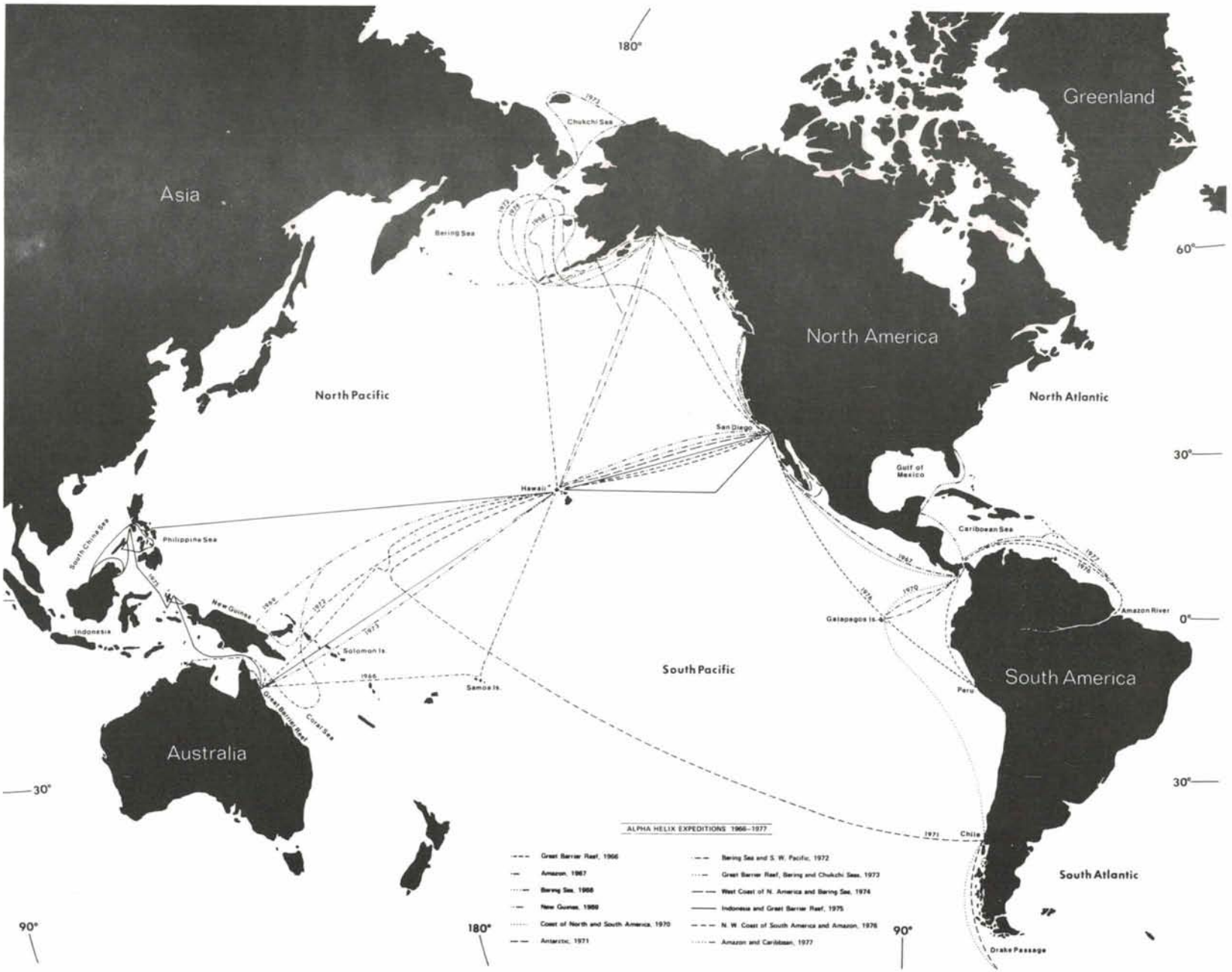


Figure I. Cruise Tracks ALPHA HELIX Expeditions, 1966-1977.

SOUTHEAST ASIAN EXPEDITION

R/V ALPHA HELIX

Scientific Efforts

ALPHA HELIX was principally engaged in a 4-phase Southeast Asian Expedition during 1975, departing San Diego on 27 January and returning on 20 December. Sixty-four established scientists and 20 graduate students and technicians carried out research studies during this period.

The Phase I bioluminescent work, concerning the generation and detection of light by deep-sea and nocturnal animals, was led by Dr. James F. Case, University of California at Santa Barbara and Dr. G. Adrian Horridge of the Australian National University. The area of operations composed the Central Indonesian islands of Ambon, Banda, Ceram, Halmahera, and Sulawesi.

The Phase II comparative physiology studies--ecological and behavioral responses of marine and land animals to their environment, including the functional adjustments of spiders, fishes, amphibians, birds, and mammals--were under the direction of Dr. Brian K. McNab of the University of Florida. These studies were carried out within the territory of Brunei.

The Phase III sea snake and coral reef research activities involved coordinated studies of reef fishes and their predators, venomous sea snakes, corals, and sponges. Dr. William A. Dunson of Pennsylvania State University served as Chief Scientist for

this work, conducted in the central Philippines.

The Phase IV nautilus studies constituted the first intensive functional investigations to be carried out on living chambered nautilus shellfish. Dr. James R. Redmond of Iowa State University headed this research effort, at a site near Dumaguete in the central Philippines.

Other programs of shorter length as well as work carried out while enroute follow. Scott Daubin, Jr. of Lamont-Doherty Geological Observatory directed an attempted retrieval of two arrays of current meters off Hawaii. Dr. Richard E. Young and associates of the University of Hawaii, and others from Johns Hopkins University, conducted studies of bioluminescence and genetics of mid-water organisms in the waters off Oahu. Dr. Ju-shey Hoy of the California State University, Long Beach, analyzed parasites from mid-water and bottom fishes collected on the run between Cairns, northeast Australia, and Ambon. Marcia Rottman, University of Colorado, carried out net tows and grab sample operations between the Philippines and Borneo to provide plankton and sediment samples for her thesis research study. During the Honolulu to San Diego transit, Gary Lopez of the Scripps Institution of Oceanography made a collection of Haliobates spp. for subsequent heavy metal analyses to determine the extent of atmospheric pollutant fallout.

Clearances

Problems were encountered with the timely obtaining of

clearances for ship operations in Indonesian and Sebah waters. Ultimately, the problems were resolved, with the Indonesian clearance being authorized on the day ALPHA HELIX was to enter Indonesian waters, and with the work proposed for Sabah being carried out in Brunei.

ALPHA HELIX

1975 Utilization

DATES	CRUISE	CHIEF SCIENTIST	PROJ. TITLE/OPERATION	SPONSOR
JAN 27 - FEB 10	San Diego - Honolulu Crosspac*	A. Amos	Current meter retrieval, transit	NOAA NSF
FEB 11 - FEB 15	Crosspac* (OAHU)	R. E. Young	Aspects of the ecology of midwater cephalapods off Oahu, Hawaii	NSF
FEB 16 - MAR 9	In Transit Honolulu-Cairns, Australia	Thomas Forhan	Trawls made by marine tech.	NSF
MAR 10 - JUNE 10	East Asian Phase I Bioluminescence Exp.*	James Case & G.A. Horridge	Generation and detection of light by deep sea and Nocturnal Animals	NSF
JUNE 11 - AUG 20	East Asian Expedition Phase II (Brunei)	Brian K. McNab	Physiological and Ecological Basis of Homeostatic mechanisms	NSF
AUG 21 - AUG 27	E. Asian Expedition		Non-operating: repairs underway & accomplished	
AUG 28 - OCT 7	Visayan Sea Expedition* Phase III	W. A. Dunson	The Otter Reef Ecosystem: to be studied on board the A/H	NSF
OCT 8 - NOV 13	Phase IV - Nautilus*	James Redmond	Physiology, Reproduction and Behavior of the Pearly Nautilus	NSF
NOV 14 - DEC 10	E. Asian Exp. Phase V Transit Manila-Honolulu	None	None	NSF
DEC 11 - DEC 21	E. Asian Exp. Phase VI Transit	Gary Lopez	Neuston examination, Honolulu - San Diego Transect	NSF

*These "Expedition" names are for field use only; they are not recognized and recorded in the SIO data collection listings.

JOINT II March 5 - June 18, 1976

Chief Scientists:

Leg 0	-	Theodore Packard, Bigelow Lab for Ocean Sciences, West Boothbay Harbor, Maine
Leg 1A	-	Robert Smith, Oregon State University Corvallis, Oregon
Leg 1B	-	Richard Dugdale, Bigelow Lab for Ocean Sciences
Leg 2	-	Richard Barber, Duke Marine Laboratory, Beaufort, North Carolina

During the JOINT II Phase, ALPHA HELIX participated in the multi-vessel multi-disciplinary CUEA program, the long-term goal of which is to understand coastal upwelling ecosystems adequately to predict their response to environmental changes far enough in advance to be useful to mankind. JOINT II was an integrated biological and physical field study of the Peruvian upwelling region ecosystem with special emphasis on the anchoveta (Engaulis ringens) fishery.

Coastal upwelling off Peru is essentially a mesoscale (0-100 km) air-sea interaction phenomenon where the seasonally prevailing southeast trade winds transport near-surface water offshore, necessitating a compensatory upwelling of deep nutrient-rich water near the coast.

The specific objective of ALPHA HELIX March-June cruise off Peru was to determine the biological mesoscale pattern with enough resolution to understand how the physical environment (circulation, winds, etc.) regulates phytoplankton processes.

The following were the objectives of the various legs:

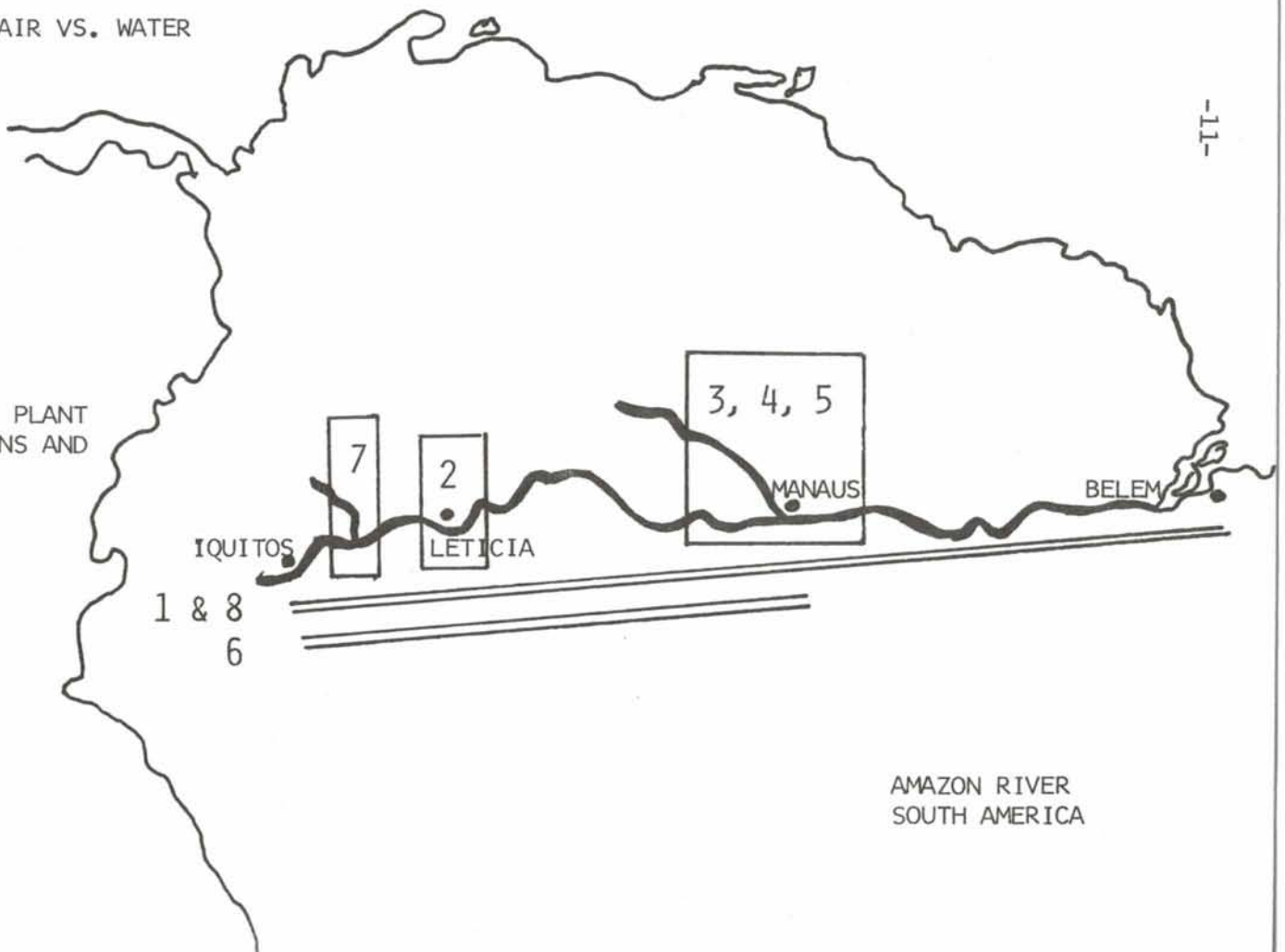
Leg-0	To gather preliminary data in order to plan following legs (current meter and meterological studies)
Leg 1A	An initial reconnaissance of the chemical and biological characteristics for intensive JOINT II operations.
Both Leg 1B and Leg 2	Experiments to obtain an understanding of the magnitude and time scale of the physiological phytoplankton processes and obtain an understanding of nutrient regeneration in relation to grazing activities of zooplankton and anchoveta.

Although the processing of JOINT II data is presently in its early stages, it is clear that the cruise produced exciting and unexpected observations in addition to the anticipated enhanced understanding of the Peruvian coastal upwelling ecosystem.

R/V ALPHA HELIX

AMAZON EXPEDITION 1976-1977

PHASE	SCIENCE
1 AND 8 EDMOND	SEDIMENT LOAD; WATER CHEMISTRY
2 NEEL	GENETICS - BLOOD STUDIES OF PRIMITIVE TRIBES IN BRAZIL, PERU, COLOMBIA
3 RANDALL/ HOCHACHKA	RESPIRATORY STUDIES: AIR VS. WATER BREATHING FISH
4 RIGGS	FISH HEMOGLOBIN
5 NICOL	EYE PHYSIOLOGY - FISH
6 PRANCE	PLANT TAXONOMY
7 SCHULTES	PHARMACOLOGICAL STUDY: PLANT HALLUCINOGEN; AMPHIBIANS AND INSECTS



AMAZON RIVER
SOUTH AMERICA

AMAZON PHASE I May 18 - July 13, 1976

Chief Scientist: John Edmond, Massachusetts Institute of Technology

Phase I was divided into two legs, the first leg from Balboa, Canal Zone to Belém, Brazil and the second from Belém, Brazil to Iquitos, Peru.

The scientific objective of Leg I was to study the chemical processes that occur during mixing of the freshwater plume of the Amazon with the surface seawater of the equatorial Atlantic. Previous work in this region and in other estuaries has shown pervasive precipitation of iron, solution of barium, and uptake of silicate, nitrate and phosphate by organisms. These processes were investigated in considerable detail and samples were collected in order to extend the study to other elements.

Leg II was concerned with a "synoptic" study of the geochemistry of the Amazon and its major tributaries. All the major tributaries were sampled for water, suspended sediment, and bed material. The flux of suspended material was determined at 5 locations along the river from Belém to Iquitos.

Participation in Phase I included scientists from Massachusetts Institute of Technology, the U. S. Geological Survey, the University of Pisa, Italy, and Brazilian scientists from INPA and the University of Sao Paulo.

AMAZON PHASE II July 14 - August 28, 1976

Chief Scientist: James V. Neel, University of Michigan

Phase II was devoted to a multidisciplinary study of six Amerindian tribes of the Amazonian Basin. The overall objectives of the group were to collect demographic, genetic, anthropometric, medical, and linguistic material on these tribes. A total of 2,736 blood samples were collected from the tribes, processed for long-term storage, and delivered to the University of Michigan for completion of the planned studies.

It is anticipated that it will require some two years to complete the genetic typings. The resultant data, together with previous studies, will then be utilized in the analysis of the following questions:

1) Based on a survey of the serum proteins and erythrocyte enzymes and hemoglobin for variants, what can be postulated concerning the rate of gene mutation in these populations?

2) What are the most probable relationships of the various tribes to one another?

3) What is the effect of social/economic evolution on man and his diseases?

INPA CRUISE August 29 - September 4, 1976

Chief Scientist: Aurelina Lopez Castrillon
Institute Nacional de Pesquisas Amazonia,
Manaus, Amazonas, Brazil

Since several days of ship time became available between Phases II and III, an offer to utilize its laboratories was accepted by a group of 11 from Inst. Nacional de Pesquisas Amazonia (INPA). A cruise of 100 miles up the Rio Negro from Manaus was made to collect material for various studies. Samples collected included 90 plant specimens, 15 of oligocheta, 7 of water for microbiological studies and 43 of soil, human hair and animal fur for mycological studies. The cruise was also an expression of international goodwill and cooperation which was imperative for successful completion of the Amazon Expedition.

AMAZON PHASE III September 5 - November 4, 1976

Chief Scientists: Leg I - Peter Hochachka, Univ. of British Columbia

Leg II - David Randall, Univ. of British Columbia

Phase III was carried out 1,000 miles upriver in the Brazilian Amazon at Lake Janauaca, 30 miles upstream from the city of Manaus. In this area of seasonal drought and flooding, there are several species of fish which have evolved divergent morphological and functional mechanisms for survival. This phase was devoted to a comparative physiological and biochemical study of air breathing vs. non-air breathing fish.

Leg I was divided into working groups addressing themselves to the following topics:

a) Metabolic and enzymatic biochemistry; hydrogen shuttles.
b) Ultrastructure of selected tissues.
c) Lipid metabolism, general; lung surfactants.
d) Ion regulation and nitrogen excretory metabolism.
e) Biochemical representation of ion pumps.
f) Metabolic features of RBC in water and air breathing fish.
g) 0_2 equilibrium of whole blood and its regulation.
h) 0_2 uptake and gas exchange; roles of gills and lungs; correlations with ion and pH regulation.

Leg II was also devoted to the study of various aspects of land/water transition in air-breathing fish, including the mechanics of breathing, pattern of CO_2 elimination, pharmacology of the circulation, microanatomy of the gills and related structures, acid-base regulation during water-to-air transition, presence or absence of surfactants, and kidney function. Studies were concentrated on two species a) Hoplerythrinus or "Jeju"

and b) Arapaima gigas or "Piraracu".

An issue of the Canadian Journal of Zoology will be devoted to the studies carried out on this phase of the Amazon River Expedition. The publication of this composite report should occur during 1978.

Funding for Phase III of the Amazon River Expedition came primarily from the National Research Council of Canada rather than from the National Science Foundation.

AMAZON PHASE IV November 5, 1976 - January 4, 1977

Chief Scientist: Austin Riggs, University of Texas at Austin

Operations for Phase IV were located in the Lake Janauaca region of Brazil. Blood and hemoglobin from more than 850 individual fish, representing approximately 100 species, were examined by the techniques of gel electrophoresis and isoelectric focusing. The hemoglobin of all the major air-breathing fish were studied by measurement of oxygen equilibria, kinetics of carbon monoxide combination and of oxygen dissociation, and by the technique of flash photolysis. An extensive immunological study of the major fraction of fish hemoglobin was completed.

A total of thirty-four papers are projected on the work directly done on ALPHA HELIX during Phase IV. These papers are planned for dual publication in Acta Amazonica and in a special supplemental issue of Comparative Biochemistry and Physiology.

AMAZON PHASE V January 5 - February 8, 1977

Chief Scientist: J.A. Colin Nicol, University of Texas at Port Aransas

Phase V of the Amazon River Expedition was devoted to the study of fish visual acuity. Eyes from several species of fish from the turbid Rio Solimoes and the relatively clear Rio Negro were used for comparative studies on the visual strategies of similar species. The major work involved fixation and embedding of fish eyes for later examination of visual components by light and electron microscopy.

Studies completed included spectral characteristics of the visual pigments, corneas and lenses of Amazonian fishes, a detailed evaluation of photoreceptor distribution, size and mobility, a determination of photoreceptor types to elucidate strategies used to adapt to turbid water, and a determination of the occurrence of tapeta lucida in these fish. Also studied were the distribution of red retinal pigments in characines and the morphological strategies adopted by the retinas of fishes, enabling them to adapt to various types of photic environments. A total of 10,000 fish, representing about 200 to 250 species, were collected for detailed taxonomic and growth studies.

AMAZON PHASE VI February 9 - March 11, 1977

Chief Scientist: Ghillean Prance, New York Botanical Museum

The primary objectives of Phase VI were to carry out en-route botanical investigations and river studies, obtaining samples as the ship steamed from Manaus, Brazil to Iquitos, Peru. The primary botanical investigation concerned enzyme categorization of populations of some common riverside plants, using disc gel electrophoresis. This type of species analysis provides an unique experimental system for the study of gene flow. In addition to the enzyme study, over 600 herbarium collections were made in sets of 6 replicate specimens, and many new field observations were made on the Brazil Nut family (Lecthidacae).

The river continuum research team investigated and characterized the organic transport along the main river as well as on various tributaries. The samples were quantified as milligrams ash-free dry weight, M^{-3} and sorted into 8 size classes. Chlorophyll was extracted from each size class to estimate the potential for autrophy of the transport load. Samples of each size class were kept for C/N analysis and dissolved organic matter analysis for molecular weight and chemical composition.

In addition to the botanical/river studies, 1585 human blood samples were collected from the riverine population for immunological research on common Amazonia diseases. These diseases included malaria, toxoplasmosis, syphilis and leishmaniasis. Data were also obtained on the occurrence and feeding strategies of net-spinning caddisflies and mayflies.

AMAZON PHASE VII March 17 - May 17, 1977

Co-Chief Scientists: Richard Schultes, Harvard University
Bo Holmstedt, Karolinska Institute, Sweden

The scientific party of Phase VII researched the ethnopharmacology, and chemistry of toxic plants, amphibians, and insects of the region of Pebas, Rio Amazonas, Peru.

The botanists collected a total of 960 plants, representing approximately 3,500 specimens, mostly from the vicinity of Pebas, the Rio Ampiyacu and Rio Yaguasyacu. Although general collecting was done, much of the time was spent in procuring material for chemical and pharmacological research and in gathering ethnobotanical data from Witoto and Boro Indians.

Chemical and biological studies of interest included work on Virola, which is employed in western Amazonia to prepare hallucinogenic snuffs or pastes, studies on Psychotria which is used as an additive for stunning fish, identification of defensive and communicative compounds produced in the exocrine glands of insects and millipedes, and studies on extracts from the skins of a variety of frogs, which have sedative activity.

The LKB 2091 Gas Chromatography-Mass Spectrometer, which was loaned and assembled by LKB Instrument Company for this phase, was the major tool used for chemical analysis of specimens. As a result of the stability of the multiple ion detection system of this instrument, the group was able to complete a very thorough study of cocaine and beta-carbolines in blood, insect and plant materials. The Spectra/Physics, High Pressure Liquid Chromatography

was especially useful for work on the acetylenes of Clibadium and the toxic principles of Brunfelsia.

AMAZON PHASE VIII May 18 - June 11, 1977

Chief Scientist: John Edmond, Massachussetts Institute of Technology

This phase was a continuation of geochemical work done in Leg II of Phase I, as the ship moved down river from Iquitos, Peru to Belém, Brazil. Members of the river continuum project that participated in Phase VI were also involved in this program.

ALPHA HELIX

1976 Utilization

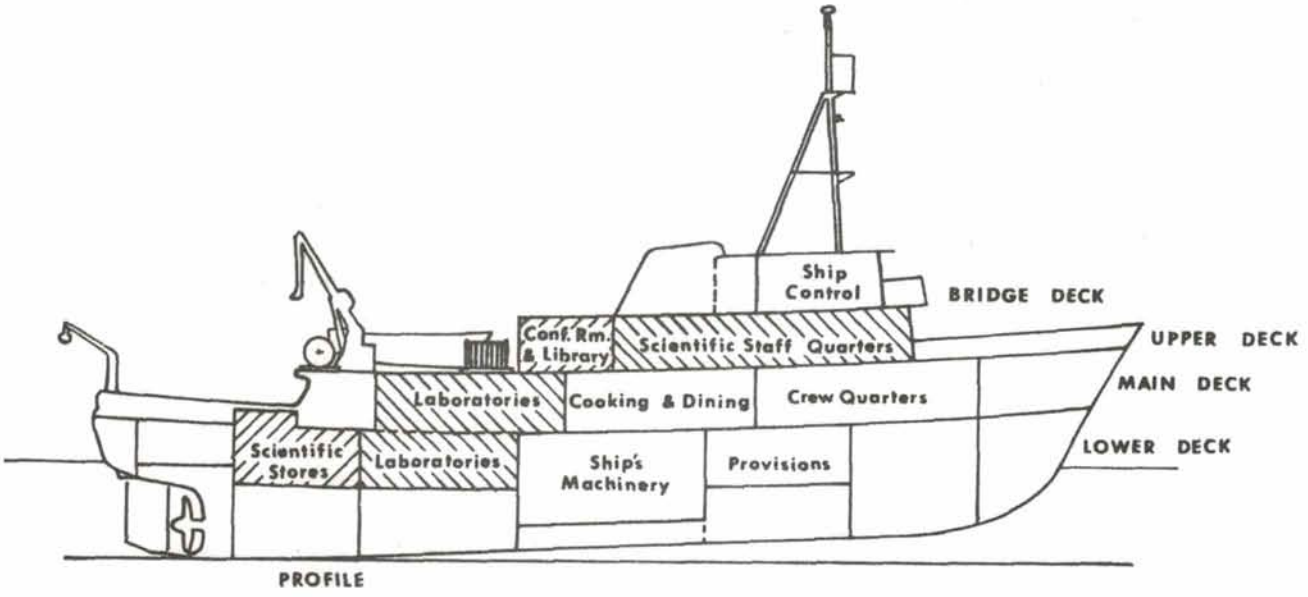
DATES	CRUISE	CHIEF SCIENTIST	PROJECT TITLE	SPONSOR
3/5/76 - 3/21/76	JOINT II, Leg 0	Thomas T. Packard	CUEA Transit San Diego to Callao	NSF
3/22/76 - 3/26/76	JOINT II, Leg 1A	Robert Smith	Coastal Upwelling Ecosystem Analysis	NSF
3/27/76 - 4/15/76	JOINT II, Leg 1B	Richard Dugdale	Coastal Upwelling Ecosystem Analysis	NSF
4/16/76 - 5/17/76	JOINT II, Leg 2	Richard T. Barber	Coastal Upwelling Ecosystem Analysis	NSF
5/18/76 - 6/8/76	Amazon, Phase I, (1)	John M. Edmond	Geochemical research in the Amazon during the ALPHA HELIX Expedition	NSF
6/9/76 - 7/13/76	Amazon, Phase I (2)	John M. Edmond	Geochemical research in the Amazon during the ALPHA HELIX Expedition	NSF
7/14/76 - 8/28/76	Amazon, Phase II	James V. Neel	Studies of Amerindian tribes residing in the tropics	NSF
8/29/76 - 9/4/76	INPA Cruise	Aurelia Castrillon	Cruise by scientists & students of the Inst. Nacional de Pesquisas da Amazonia	NSF
9/5/76 - 10/1/76	Amazon, Phase III, Pt. I	Peter Hochachka	Air-breathing vs water-breathing fishes	(Univ. of B.C.) CNRC
10/2/76 - 11/4/76	Amazon, Phase III, Pt. II	H. Randall	Study of Airbreathing Fish	NSF, UBC
11/5/76 - 1/4/77	Amazon, Phase IV	A. Riggs	Biochemistry, Physiology and Evolution of the Hemoglobins of Fishes	NSF

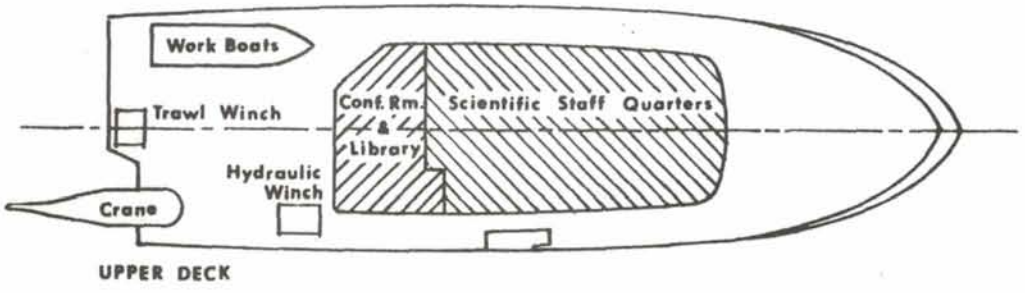
ALPHA HELIX

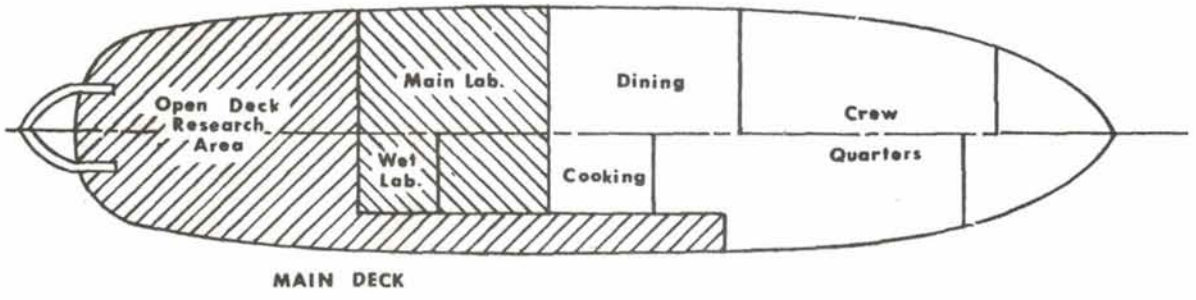
1977 Utilization
through Amazon Program

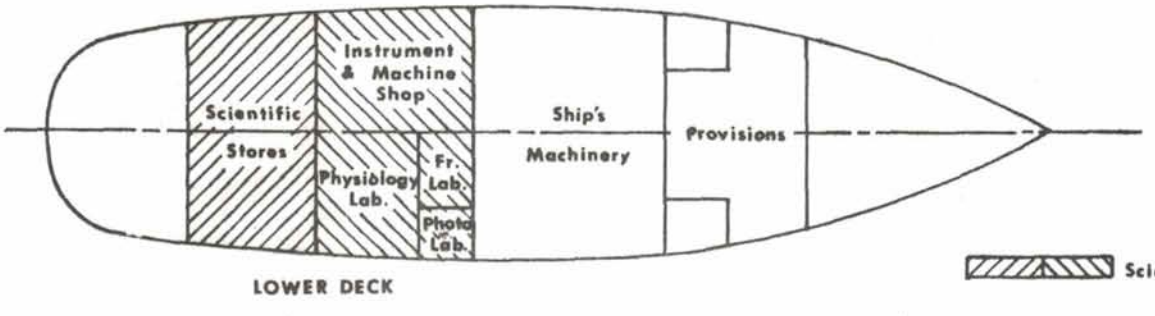
DATES	CRUISE	CHIEF SCIENTIST	PROJECT TITLE	SPONSOR
1/5/77 - 2/8/77	Amazon Phase V	J.A.C. Nicol	Vision and Behavior	NSF
2/9/77 - 3/11/77	Amazon Phase VI	Ghillean T. Prance	Enzyme study of varzea plant population	NSF
3/12/77 - 3/16/77	Transit	Dennis Popp	Transit and port call, no scientific program	NSF
3/17/77 - 5/17/77	Amazon Phase VII	R. E. Schultes	Food, Medicinal and Toxic Plants of the Amazon with Utilization of the A/H	NSF
5/18/77 - 6/11/77	Amazon Phase VIII	John M. Edmond	Geochemical research in the Amazon during the ALPHA HELIX Expedition	NSF

FUNCTIONAL ARRANGEMENT OF THE R/V ALPHA HELIX









Scientific Spaces

20 FT
SCALE

FACILITIES OF THE SHIP

DESIGN CONSIDERATIONS

The *R/V ALPHA HELIX* was designed and built as a research vessel capable of operating in both tropical and polar regions. A principal design objective was the provision of optimal laboratory space for scientific research on a vessel of limited size. The ship has no external keel, thus, protected anchorages and quiet sea conditions are important to the successful conduct of many laboratory-centered studies. The addition of an oceanographic and trawling winch provides a limited open sea capability.

CHARACTERISTICS

Length, 133 ft; beam 31 ft; draft 10.5 ft; displacement 512 tons; gross tonnage 294.

Cruising speed 9.5 knots; maximum speed 11 knots; economical speed 8.0 knots; minimum speed less than one knot. Range 6500 mi; endurance 30 da. A diesel engine developing 820 BHP at 800 rpm drives a single variable pitch propeller. Fuel capacity, 29,250 gal.

Two 100 KW diesel electric generators produce 440 V of 60 cycle AC electricity which is transformed to 220,208 and 115 V. 50 KW isolated scientific power supply available.

HABITABILITY

The vessel is air conditioned and accommodates 24 individuals. The space allocation is as follows: 12 crew members, 1 resident technician, 1 foreign observer, 10 scientific party members. A conference room-library serves for compiling data, preparing reports, staff meetings, seminars and recreation. A section of this room is devoted to a technical library. An AM-FM-short wave radio including an integrated cassette tape stereo unit is located in the library-conference room. A Texas Instruments SR-52 programmable calculator with printer, a Hermes 3000 manual typewriter, a Smith-Corona electric typewriter and a 3M Model 107 copy machine for data processing and reporting are located here. Laundry facilities, consisting of an automatic washer and dryer, are available. The ship carries 5,000 gal of fresh water and is equipped with an evaporator capable of producing an additional 500 gallons daily.

LABORATORY AND SUPPORT FACILITIES

Main laboratory: 457 ft^2; 149 ft^2 of lab top working area; hot and cold fresh water and sea water; 23.5 ft^3 refrigerator-freezer; 3 sinks and one vented and hooded enclosure.

All weather wet laboratory: 121 ft^2; 42 ft^2 lab top working area; fresh and salt water; sink, 0-50°C temperature control.

Physiology laboratory: 168 ft^2; 63 ft^2 lab top area; fresh and salt water; sink, Sorvall refrigerated centrifuge, Model RC-2B.

Photo laboratory: 42 ft^2; 23 ft^2 lab top area; fresh water; sink.

Instrument and machine shop: 280 ft^2; equipped with machine lathe, milling machine, band saw; drill press, bench grinder, electric welder, machinist tools, general metal and wood-working tools and supplies.

Research sea water supply: 50 gal/min; provided in the main, all weather and physiology laboratories and on the fantail. Includes two 1200 liter aquaria.

High-pressure air system: 1000 ft^3 at 3000 psi; for SCUBA diving and lab use.

Echo sounders: EDO Fathometer, model 185 and Bendix D1-6 Portable echo sounder indicator. Gifft model 4000 T depth recorder (use must be requested in advance of the expedition).

WINCHES, A-FRAME AND CRANE

Trawl winch: Ricker winch carries 4200 m of 3/8 in wire, with a mean drum pull of 2900 kg and line speeds to 61 m/min possible.

Hydrographic winch: Ricker winch carries 9000 m of 3/16 in wire, with a mean drum line pull of 730 kg and line speeds to 107 m/min possible.

A-frame: Mounted on the stern; is hydraulically operated. Has a 10 ft throat dimension; when inboard the sheave is 11 ft above the deck. Has capability to lift 3 ton load from water to main deck. Test load against stops is 35,000 lbs.

Crane: Marco, has an electro-hydraulic articulated boom, carries 900 m of 3/8 in wire and has a lifting capacity of 2270 kg.

SKIFFS AND OUTBOARD MOTORS

The boat complement consists of two 4 m Boston Whalers, one 5 m Boston Whaler and one 3 m Zodiac. Six outboard motors, ranging from 25 to 40 hp, power these boats.

LABORATORY EQUIPMENT - partial listing

1. Balance

   a. Cahn Gram Electrobalance, Cahn Cat. 1501
   b. Double Hook, Mfg. Precision Balance, Model LG0500 MG
   c. Torsion, Brand Torbal, Model PL-12

2. Bath, Constant temperature, Brand Sero-Utility-Thelco (two small, two large)

3. Blender - Waring

4. Blood Chemistry Analyzer, Brand Accu-Stat, Model 2000

5. Blood Micro System - Digital Acid-Base Analyzer, 5 digit display

6. Buret, Micro metric syringe, Mfg. Micro Metric Inst. Co., SB-2

7. Burners

   a. Flameless
   b. High Temperature -2
   c. Multi-Flamax -1

8. Calculator, Programmable-Texas Inst., Model SR-52 w/printer

9. Centrifuges

   a. Superspeed, Sorval Model RC-2B
   b. Clinical, I.E.C. 458, Model CL
   c. Table-Top, I.E.C. 3560, Model HN
   d. Table-Top, I.E.C. 3472, Model HN-S

10. Circulator, constant temperature

    a. Brand Lauda (2)
    b. Brand Microtemp (2)

11. Desiccator, vacuum plastic sphere, brand Dura vac (4)

12. Distillation Apparatus - Mfg. Corning, Model AG-3

13. Electrophoresis System - research disc, Mfg. Canalco.

14. Evaporator, Evapo-Mix Rotary - Mfg. Buchler, Cat. 3-2147

15. Fluorometer, Turner Cat. 111-000

16. Fraction Collector - Brand mini-rac LKB cat. 17001-1

17. Freezer, Upright, Ultra Low Temp - Mfg. So Low, Model ADS-130

18. Furnace, Muffle stepless control - type 1400, Mfg. Thermolyne.

19. Homogenizer, Macro aerosol free - Virtis Inc. Model super 30.

20. Hot plate - 10" x 10", Corning (1), 6" x 6", Thermolyne (1)

21. Ice maker, flake-water automatic front access - Scotsman

22. Incubator, Dual program freas - Precision Scientific Model 808

23. Infrared Analyzer, Carbon Dioxide - Beckman, Model IR-215

24. Meter, pH

    a. Digital, Mfg. Chemtrix type 60A
    b. Millivolt, Radiometer PHM4
    c. General purpose, Corning Model 7

25. Meter, Volt-ohm-millimeter Hewlett Packard Model 410-B

26. Microscope, Medicine and Marine Biology, Elgeet Model EC-4-B1-E2; Stereoscop Zoom, Elgeet Model SZ-M (2); Stereoscopic Binocular, Elgeet Model VA-2 (2)

27. Mixer, lab Aloe brand Sensaur

28. Oscilloscope, dual beam, Hewlett-Packard Model 132A

29. Osometer, Advances Inst. Model 31LA

30. Oxygen Analyzer, Dissolved, YSI Model 54RC

31. Oxygen Analyzer, Gaseous Portable, Beckman Model E-2

32. Oven, Lab-Line catalogue 3605 M

33. Power Supply, regulated solid state, Allied Cat. 755-1033

34. Press, disruption biological material, Yeda Model 92-50.

35. Pump

    a. Gas mixing, Wosthoff Model EG725
    b. Vacuum, pressure, Millipore Cat. 60-000-00
    c. Vacuum, Brand duo seal

36. Recorders

    a. Analog portable two channel-Techni-rite Model TR-72
    b. Dynagraph, Beckman Model RS
    c. Linear-Log, Beckman Model 1005, for DB or IR-215
    d. Cassette tape

37. Refrigerator

    a. Laboratory, 19.9 cu. ft.
    b. Isotope, 5.5 cu. ft.

38. Salinometer, portable laboratory - Bisset Berman model 6230

39. Scintillation System, liquid, Beckman LS-100C

40. Spectrophotometer, Beckman model DB and DU-2

41. Stirrer, mechanical - several; magnetic (2)

42. Thermistor meter, YSI model 46 TUC

43. Voltage Regulator, Brand Adjust-a-volt model PA 3

44. Ultrafiltration - High Flow, Amicon 2000; Thin Channel; Amicon TCF-1U

OVER-THE-SIDE GEAR

1. Skiffs and Outboard Motors

    a. Two 4 M. Boston Whalers
    b. One 5 M. Boston Whaler
    c. One 3 M. Zodiac

2. Bathythermograph system, expendable, Sippican Model MK214-1

3. Bottle, Nansen with messengers, 1.5 liter capacity (12) with deep sea reversing thermometers, + or - 0.001 deg. C (12)

4. Bucket thermometer (1)

5. Free Vehicle Equipment

6. Net, dip bag, 15 in. dia. x 22 in. length, 1/4 in. mesh, 10 foot handle (2)

7. Net, Isaacs-Kidd Midwater Trawl, 6 foot diameter, Mfg. Mario Balestreri (1)

8. Net, otter with boards and bridle, 16 foot semi-ballon (1)

9. Net, Plankton, 0.5 meter dia. 505 mesh, white nylon (2)

10. Net, Plankton, 1 meter dia. 505 mesh, Mfg. Elton Ballas (1)

11. Net, Nekton 1 meter dia. 1/4 inch mesh nylon black, Mfg. Elton Ballas (1)

12. Net, Neuston, 1 meter, 505 mesh (1)

13. Salinity, Temp.-depth recorder, Bisset Berman Model 9060

14. Underwater camera - Nikonnos III with strobe

EXPENDABLE SUPPLIES

A standard package of expendable laboratory supplies is available onboard ALPHA HELIX. These supplies consist of basic glassware, clamps, plastic tubing, stationery, etc. Amounts needed beyond those listed in the standard inventory must be supplied by individual investigators.

A basic supply of chemical reagents is also aboard the ship. Amounts of chemicals in addition to those listed can be requested.

LIVE SPECIMEN FACILITIES AND COLLECTION GEAR

Holding facilities, consisting of 2 three-hundred gallon and 5 twenty gallon aquaria are available. Running seawater can be supplied to these tanks. A small inventory of collecting gear, such as rods, reels and nets (beach seines, gill nets and throw nets) may be available. Due to the difficulty in maintaining this type of gear, the inventory varies from group to group. Availability can only be determined immediately preceding the planned expedition.

NEW EQUIPMENT AND IMPROVEMENTS

A proposal for the purchase of new equipment to replace worn units aboard has been submitted to NSF and approved for funding in 1978. The updating of this instrumentation will allow ALPHA HELIX to offer a major improvement in laboratory investigation capabilities. The addition of a basic scientific electronic test facility is planned for May, 1978. The detailed list of improvement items will be available in 1978.

REQUESTING USE OF ALPHA HELIX

Use of the *R/V ALPHA HELIX* is initiated by a UNOLS Ship Time Request (copy overleaf) to Chairman, Alpha Helix Review Committee, c/o UNOLS Office, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543. This must be accompanied or followed by a related research proposal or informal pre-proposal which addresses the following:

1. The nature and significance of the proposed research.
2. The scientific questions being asked and the approaches that would be used toward their resolution.
3. Justification of the use of *ALPHA HELIX*, rather than another research vessel or facility.
4. The research site and its justification; alternate sites that might be acceptable.
5. Ship time requirement and any seasonal considerations.
6. Proposed number of scientists.
7. Curricula vitae of principal participants.
8. Dates of any previous *ALPHA HELIX* use.
9. List of your publications resulting from any previous work aboard *ALPHA HELIX*.
10. Potential or realized support for the proposed research effort.

The research proposal, if not already funded, is submitted by the investigator to his sponsoring agency in the same manner as any proposal. The review by the Alpha Helix Review Committee is for the purpose of evaluating ship use only. In addition the Committee will submit its review for the optional consideration of the research sponsor.

It is not necessary that a single applicant request the use of the ship in its entirety. The Committee will attempt to identify complementary projects which can share concurrent use of the ship and its facilities.

Projects under NSF grants or proposed grants do not include ship operations costs in the research grant. Ship costs for NSF funded projects are separately funded as a part of annual fleet support grants. All other costs such as travel, equipment & consumables (other than available on board) should be included in the research project grant.

Research projects supported by agencies other than NSF should provide for ship operating funds for the period of their project and required transit time. Concurrent projects can share ship costs on a prorated basis. Ancillary (piggy-back) projects of a minor not-to-interfere nature may occasionally be accommodated at no cost.

The planning and development of *R/V ALPHA HELIX* projects include reviews, funding procedures, scheduling, site selections, foreign clearances, equipment acquisition, staging and testing, and detailed cruise planning - all of which involve many activities and a great deal of time. Requests for ship time which are likely to determine the selection of a cruise or expedition area of operation need to be submitted to the Alpha Helix Review Committee 2-3 years in advance of the beginning date of the cruise. Similarly, research proposals to the funding agencies for support of these principal projects should be submitted 1 1/2 - 2 years in advance. Ancillary projects added after cruises are in the planning stage may need somewhat less lead time.

ALPHA HELIX REVIEW COMMITTEE

E. Chin, University of Georgia, *Chairman*
V. Alexander, University of Alaska
J. F. Case, Univ. of Calif., Santa Barbara
J. D. Costlow, Duke University
O. Holm-Hansen, Univ. of Calif., San Diego, *ex-officio*
W. H. Hulet, University of Texas
H. W. Jannasch, Woods Hole Oceanographic Institution
C. B. Miller, Oregon State University
H. B. Steinbach, Oceanic Foundation

UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

Warren S. Wooster, *Chairman, UNOLS*
University of Washington

SCRIPPS INSTITUTION OF OCEANOGRAPHY

Robert L. Fisher, Associate Director
Scripps Institution of Oceanography
3232 Ritter Hall, A-015
La Jolla, CA 92093

ALPHA HELIX Program Office
Univ. of Calif-San Diego - A-015
Scripps Institution of Oceanography
La Jolla, CA 92093
(714) 452-2190

Thomas Stetson
Executive Secretary, UNOLS
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
(617) 548-1400 X-352

THE CHIEF SCIENTIST

The ALPHA HELIX Review Committee (AHRC) will name Chief Scientists and their alternates for stated periods of an upcoming expedition, as part of their overall cruise planning responsibility. Criteria for selecting a chief scientist will include the candidate's experience and knowledge in regard to similar field research efforts, scientific reputation, and proven or potential leadership and administrative abilities. Nearly always the Chief Scientist will be a Principal Investigator on a grant involving a substantial part of the shipboard program.

In requirements of behavior and procedure ALPHA HELIX conforms to the patterns set for all vessels of the SIO fleet. Information necessary to the potential chief scientist is summarized in the institution's Chief Scientist's Manual, available on request from the SIO ship scheduler or via the ALPHA HELIX Program Office.

The Chief Scientist has full responsibility for the scientific program, accomplishment of its objectives, and the performance of members of the scientific party. During the course of an expedition the program can be modified by the Chief Scientist, within reasonable limits of the vessel's and the crew's capabilities, in order to achieve the greatest scientific returns.

The role of the chief scientist in preparing for a cruise will vary somewhat depending on the nature of the expedition. He or she will design the overall research plan for utilizing

the ship either in consultation with the principals of the scientific party; or in coordination with the other investigators. The makeup of the scientific party will be determined by the P.I.s whose projects have received funding and have been appropriately scheduled by the ALPHA HELIX Review Committee. Significant departures from the agreed-upon research plan will be taken only with the approval of the ALPHA HELIX Review Committee and the agency funding the investigation. Once in the field, 1) the Chief Scientist arranges an open session early in the program at which investigators will describe succinctly their proposed work, its significance and potential requirements, for benefit of the ship's crew and their colleagues in research; 2) the Chief Scientist represents the ALPHA HELIX Program in contacts with local scientific or media representatives; 3) in addition to routine operational traffic, the Chief Scientist prepares a weekly progress report or summary addressed to the Director, SIO, and radioed to that office; 4) before disembarkation and dispersal of the scientific party, the Chief Scientist collects from each group leader or senior scientist an abstracted field report, complete with supporting grant data. From these he prepares and signs the UNOLS post-cruise report before leaving the ship; 5) the Chief Scientist shares with the Captain and the Program Office any suggestions for improving the vessel and its scientific usefulness.

PROGRAM OFFICE

The ALPHA HELIX Program Office is located at Scripps

Institution of Oceanography (SIO), University of California at San Diego, La Jolla, California. This office serves as a focal point for dissemination of informaiton concerning ALPHA HELIX and assists in expedition planning and logistics from inception to completion. The staff of this office consists of two Marine Technicians who alternate aboard the vessel and an Administrative Assistant. After Ship Time Requests and preproposals have been approved by the ALPHA HELIX Review Committee, it is suggested that a potential Principal Investigator contact this office in order to assist in planning an operational budget for submittal to the National Science Foundation for supporting funds.

MARINE TECHNICIANS

This individual will be aboard to assist in the ongoing research effort. By virtue of prior experience on ALPHA HELIX expeditions and as a result of coordinating requests for facilities, equipment and supplies, he is most knowledgeable concerning the supporting features of the ship and scientific gear. His primary responsibility is to assure that the ship's facilities and equipment receive optimal utilization. He also acts as liaison between the crew and scientific party.

FOREIGN CLEARANCE

To obtain approval of the country or countries off which the cruise is planned, a detailed explanation of science to be done, specimens to be collected and areas of operation is re-

quired. The forms which are used for clearance application to the various contries are the Cruise Prospectus and Foreign Clearance Request. The clearance is negotiated by the U.S. Department of State after being submitted by SIO's Ship Scheduling Office. It is absolutely necessary that the Ship Scheduler at SIO receive the information on your science plans at least six months prior to the date of departure in order to submit and process the mentioned forms. This information can be directed to the Ship Scheduler through the ALPHA HELIX Program office.

CUSTOMS REQUIREMENTS

All equipment items and supplies expendable or otherwise loaded onboard must be itemized, with a list sent to the Program Office. Equipment of foreign manufacture must be registered with U.S. Customs to prevent making a duty payment upon return of the instrument to the U.S. If specimens are to be taken back to the U.S., proper clearance must be applied for and approval for removal from the host country obtained.

SHIPPING

Assurance that shipped items will arrive as scheduled is difficult to obtain. If ALPHA HELIX is in a U.S. port it is possible to onload items for upcoming expeditions at that time; otherwise, foreign shipping, with inherent custom difficulties, etc. must be attempted. Be advised that chemicals and gases require special packing and clearance for shipping. All shipping

should be planned with more than sufficient lead time and alternatives, such as hand carrying critical supplies, should be considered. The Program Office is available for advice and assistance on coordinating shipping.

SCUBA DIVING OPERATIONS

With the availability of small boats and an air compressor, ALPHA HELIX has successfully served as a base for diving operations in many past expeditions. Safety is the overriding consideration in the conduct of diving from the ship. To this end, the program conforms to SIO diving rules regulated by the Scripps Institution of Oceanography Diving Control Board. Under the auspices of this board, applicants are screened for approval to SCUBA dive and a Diving Officer is appointed to exercise final authority in all matters pertaining to safe diving during the expedition.

UNIVERSITY - NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

9/77

R/V ALPHA HELIX SHIP TIME REQUEST

(MUST BE ACCOMPANIED BY INFORMATION DESCRIBED ON OVERLEAF)

TO
CHAIRMAN, ALPHA HELIX REVIEW COMMITTEE, C/O UNOLS OFFICE

DATE

PRINCIPAL INVESTIGATOR (name,title,address,tele.no.)

OTHER SCIENTISTS INVOLVED

TOTAL NUMBER OF SHIPBOARD PARTY

THIS IS ORIGINAL ☐ UPDATED ☐ REQUEST. IF UPDATE, ORIGINAL REQUEST DATED: _____

PROJECT TITLE

PRINCIPAL SHIP USE ☐ (where project will be chief use of ship)

ANCILLARY SHIP USE ☐ (on a shared or not-to-interfere basis)

PREVIOUS A/H USER? YES ☐ when? _____ NO ☐

PURPOSE (brief outline of scientific objective)

PROJECT REQUIREMENTS

STATE SPECIAL NEED FOR ALPHA HELIX

MINIMUM NUMBER OF SHIP DAYS NEEDED

OPTIMUM INCLUSIVE DATES

ACCEPTABLE ALTERNATIVES

SPECIAL EQUIPMENT OR INSTRUMENTS REQUIRED

AREA OF OPERATIONS (attach page size track chart)

ACCEPTABLE ALTERNATIVE AREA

FUNDING STATUS

FUNDED		
FUNDING AGENCY		
GRANT NO:		
AMOUNT OR ANNUAL RATE	BEGIN. DATE	DURATION

NOT-FUNDED	
PROPOSAL SUBMITTED ☐ WILL BE SUBMITTED ☐	TO:
DATE:	AMOUNT REQUESTED:
NEW PROPOSAL ☐ or	RENEWAL OF GRANT NO:

Mail to:
Chairman, ALPHA HELIX Review Committee
c/o UNOLS Office
Woods Hole Oceanographic Institution
Woods Hole, MA 02543

With copy to:
ALPHA HELIX Program Office
A-015
University of California-San Diego
Scripps Institution of Oceanography
La Jolla, CA 92093

SUBMITTED BY (name,title,address,tele.no. if different from chief investigator)

SIGNATURE

APPROVED BY (department chairman or lab. director)