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TECHNICAL REPORT
ONRL-62-65

THE BIOLOGICAL INSTITUTE OF HELGOLAND

BY

L. EUGENE CRONIN

28 December 1965

THE BIOLOGICAL INSTITUTE OF HELGOLAND

The island of Helgoland is a very small strange bit of red sandstone and beach in the south-east corner of the North Sea. Over the centuries it has been held by Denmark, England, and Germany, but it has always had an intimate association with the sea, and Helgolanders are highly respected among the watermen of the world. This is a suitable setting for the oldest and largest marine biological station of Germany.

Many biologists worked in the area in the mid-nineteenth century. Johannes Müller collected in this area, and there is an interesting picture of Anton Dohrn, Ernst Haeckel and others at Helgoland in 1865. In 1890, the Island became part of Germany, and the Biologische Anstalt was established in 1892. Its program included general marine zoology and botany, plankton research and fisheries biology, and the station was at various times affiliated with several different institutions. All structures on the island were obliterated by aerial attack during World War II and by post-war use as a practice bombing target. The Anstalt had been withdrawn to its field station on the mainland near the German-Danish border, and its Helgoland buildings were levelled.

Excellent new buildings were constructed under the direction of Dr. Adolf Bückmann and dedicated in 1959. These facilities (and the history of the Anstalt) were described in detail at that time as Band 7, Heft 1 of the Helgolander wissenschaftliche Meeresuntersuchungen, and the dedication program was summarized by Dr. Marston C. Sargent in ONRL-60-59. As Dr. Sargent pointed out, the isolation of the laboratory in a small insular community presents real hazards to optimal achievement, and it is interesting to examine the program and activities seven years later to assess the progress and potentials of this important station.

The Anstalt is presently a semi-autonomous agency within the German Federal Research Board for Fisheries, although its primary functions are directed toward basic research and education. It does contribute to the solution of biological problems of the fisheries, however. Other agencies of the Board were recently described in ONRL-20-65. Professional affiliation has been established with several of the major universities of Germany, and the administration relationships of the Anstalt may change in the future.

FACILITIES

The Anstalt conducts research at three locations:

Zentrale, with other parts of the Federal Research Board for Fisheries at 9 Palmaille, Hamburg-Altona.

Meeresstation, Helgoland

Litoralstation, List, on the island of Sylt near the Danish border.

The Zentrale is the administrative center of the Anstalt and also the center of several types of research. About 40 rooms are utilized in the excellent 1962 building, including offices, laboratories and aquarium rooms. There is a salt water system, but it provides recirculating water of rather poor quality and there are plans for replacement. The special research emphasis here will be on the rearing of marine animals, especially in artificial sea water.

The Meeresstation is centered in the two fine large buildings and attached public aquarium described in 1959. Only the briefest description is pertinent here. About 85 rooms were provided, and most of them are suitable for research. Excellent provision has been made in these rooms for a plentiful electric supply, running salt water, gas, air, fresh water, chemical hoods and work tables, in various combinations. Two classrooms are divided by a long folding partition to permit fusion for lectures, symposia and conferences. All utilities have been surface mounted and are readily available for repairs or modification. The plans are included in the 1959 description, and I would recommend that any designers of a new marine laboratory include them in his search for valuable ideas. These buildings back against the sandstone face of the "Oberland" and face a small secondary harbor.

The aquarium is well-planned and attractive, so that it yields a substantial income during the tourist season. As in many stations, the pumping facilities, collecting vessels, and maintenance crews are shared in a simple and highly practical manner by the aquarium project and the research program.

A very useful harbor laboratory with 2000 square feet of floor area has more recently been constructed near the dock site of the Anstalt, about a quarter of a mile from the main buildings. There is space for the storage of

field gear and boat equipment, several workshops, and an aquarium room with a variety of types of tanks and containers. A small glass addition has been added to provide a well-lighted area for some new fish-rearing tanks.

The present boats include the UTHÖRN, a converted fishing vessel of 24.5 m, and the 10 m Helgoland fishing boat ELLENBOGEN. An interesting new ship of 34 m length has been designed for the program at Helgoland and should be completed in 1967. Preliminary plans are included in ONRL-37-65, "New Small Research Vessels in Europe" Increasing use is being made of skin diving as a tool in direct study of animal behavior and ecology, and suitable equipment is available. Field gear is plentiful for collection of benthic organisms, a wide variety of fish, plankton (mostly by variations in the famous "Helgoland net") and other biota.

Almost all marine laboratories are faced with problems in the housing of staff and students, but the isolation of Helgoland and its massive tourist invasions during the summer are worse than most. Unusual efforts are required, and unusual steps have been taken. For the present, students live inexpensively at a nearby youth hostel, but plans for even better quarters will be described in a later section on future developments. In a modern and very comfortable "Gasthaus" of 25 rooms, up to 30 professors and scientists can be housed, with access to a small kitchen for breakfast; the charge per night is about $1.50 for short visits and 50 cents if used for more than two months. Nine houses are owned by the Anstalt and rented to permanent members of the staff. All of these buildings are relatively new, since every building in the island has been constructed since the devastation during and following World War II.

The Litoralstation is located among extensive and impressive sand dunes with good access to estuaries, intertidal mud flats and other inshore environments. The modest laboratory building contains laboratories for three scientists, two course rooms for 20 and 30 students, and a small library. Running salt water is available and a small boat is maintained. A separate building provides a dormitory for students.

The existence of three research centers has many special advantages, since they provide (a) variety in the available ecological conditions, (b) several degrees of association with or isolation from fisheries problems and (c) urban, coastal and insular habitat for scientists and

their families. Within reasonable limits, staff members are occasionally moved from one location to another in accordance with professional needs or personal preferences.

STAFF AND PROGRAM

Leading Director and Professor Dr. Otto Kinne has headed the program of the Anstalt since May of 1962, and he is clearly the strong central focal point of its program. Reconstruction was planned by the preceding director and completed under Professor Buckmann, but Kinne has now been here long enough to shape the policies and practices of the Anstalt. He has a life-time appointment, and thinks of the program in terms of decades. Kinne is unusually well-known to Americans, since he spent a year with Bullock at U.C.L.A., five years at the University of Toronto, two summers at the Hopkins Marine Station, one summer on a Guggenheim fellowship at Duke University Marine Laboratory, and taught in 1963 and 1964 in the Ecology course at the Marine Biological Laboratory at Woods Hole. He has been unusually productive in research since he graduated from the University of Kiel in 1952, with principal contributions in the quantitative study of the response of organisms to their environment. Recently, he completed valuable reviews on "The Effects of Temperature and Salinity on Marine and Brackish Water Animals" as two contributions (I. Temperature, 1963, and II. Salinity and Temperature-Salinity Relations, 1964, which appeared in Volumes I and II respectively of Oceanography and Marine Biology: An Annual Review, Harold Barnes, Ed., publ. George Allen and Unwin Ltd., London.) With a staff of about 100, his principal research influence is now manifest through graduate students and general advisement to the staff.

As the result of Kinne's vigorous leadership, the primary field of research at Helgoland is experimental ecology, especially in the North Sea. Older staff members, many of whom preceded Kinne, continue to work in their own fields, but some have changed to ecology and now staff is chosen to strengthen the broad team that Kinne visualizes. This is a change from the "balanced" staff of Buckmann, with representation from many fields of marine science, but Kinne feels that a large group with a strong central theme will be necessary for effective study of the complete ecosystem from primary producers through all consumers, especially if the underlying genetic, biochemical and physiological mechanisms are to be probed.

A rather unusual emphasis has arisen from the attention given to experimental ecology. Such research is almost

totally dependent upon the availability of appropriate marine species in healthy cultures, representing normal and "reproducible" populations. Therefore, special attention has been and will be given to the rearing of a wide variety of animals and plants. These efforts will have at least two kinds of value, since they will provide additional experimental species and also fill in many gaps in knowledge of the life history and ecology of marine organisms. Inability to culture a species is rather obvious evidence of ignorance of its needs. The following list of species which can now be carried in serial culture indicates their excellent progress in this field.

Protozoa:	Noctilunca scintillans
	Metafolliculina andrewsi
	Eufolliculina (sp)
	Diafolliculina rotunda
	Dunaliella (sp)
	Cryptomonas (sp)
Coelenterata:	Coryne tubulosa
	Rathkea octopunctata
	Bougainvillia superciliaris
	Cladonema radiatum
	Cordylophora caspia
	Eucheilota maculata
	Halitholus tirratus
	Eutima gegenbauri
	Eutonina iuditaus
	Gonionemus vertens
	Craspedacusta sowerbyi
	Aurelia aurita
	Chrysaora hyostella
	Stephanoscyphus (sp)
Mollusca:	Crepidula fornicata
Arthropoda:	Tisbe helgolandicus
	Gammarus duebeni
	Gammarus zaddachi
	Gammarus salinus
	Gammarus oceanicus
	Gammarus locusta
	Homarus gammarus
Chordata:	Solea solea

Division of Botany:	Dr. P. Kornmann (M), Leader Dr. H. Kesseler (L) Dr. G. Drebes (M)
Division of Physiology:	Prof.Dr. Fr. Krüger (Z),Leader Dr. H.P. Bulnheim (Z) Dr. H. Bohling (Z)
Division of Microbiology:	Dr. W. Gunkel (M), Leader vacancy
Division of Planktology:	Dr. H. Aurich (L), Leader Dr. M. Gillbricht (M,Z) Dr. E. Hagmeier (M)
Division of Nchttyslogy:	Dr. A. Kotthaus (Z) Dr. J. Flüchter(M) vacancy
Radiobiology:	Dr. H. Aurich (L), Leader Dr. M. Hoppenheit (C)
Research Associate:	Dr. F.W. Tesch (Z)

Supporting staff (administrative, fishermen, maintenance, clerical, and technicians) complete the total of about 100 -- 45 at Helgoland, 9 at List and 40 at Hamburg.

In the Zoology group Kinne is continuing his work on the effects of temperature and salinity on the morphology and physiology of the fish Cyprinodon macularis. He is also observing the responses of the hydroid (Clava multicornis) to salinity and temperature as expressed in its growth, number of tentacles, size, and other characteristics. He may begin study of the lobster population around Helgoland, which is probably discrete from all other populations and therefore interesting as well as economically important. Werner is now publishing a series of important papers on nematocysts in the Cnidaria, with special reference to the Hydroida. His first paper dealt with the classification of nematocysts and their importance in systematics and evolution. He has cultured many hydroids, studying the effects of temperature on morphogenesis, and now has several Indian Ocean species under observation. Ziegelmeier works at the Littoralstation on bottom communities, and is examining the mechanisms utilized by the boring molluscs. Uhlig has become interested in the interstitial fauna and recently published an interesting technique for the quantitative extraction of the mobile fraction of the mesopsammal microfauna by

addition of salt ice which drives out animals by a temperature gradient followed by a salinity gradient.

Kornmann is carrying various macrophytes, especially Chlorophyceae, through their life cycle to clarify and complete knowledge of all of the stages involved. He is finding that adequate knowledge of some of the stages is essential for competent systematic treatment. Most of his rearing is in the semi-artificial mediums provided by Schreiber's solution, and he does not explore the physiology or ecology of the species, except as they may affect development and morphology. Kesseler has become especially adept at the extractions and study of tissue fluids. Drebes is new to the staff, and will give special attention to the rearing of various species of diatoms and study of their role in primary production

Krüger's recent interests have included study of the mechanisms of water flow and feeding in the lug-worm Arenicola and especially the development and testing of new formulations which provide mathematical expression of animal growth. A new basic formula was presented and extensively compared with older expressions in Vol. 12, No. 1-2 of Helgoländer wiss. Meeresunters (see section below on publication), published in July 1965, pp. 78-136. Bulnheim works with gammarids, studying the effects of environmental factors -- especially temperature -- on various life processes. Bohling, a biochemist, is interested in the ecological importance of the dissolved organic matter in sea water. At present, he is working on improved methods for separating and identifying these substances.

Microbiological research has been concerned principally with period surveys of the principal forms at the stations regularly sampled by the Anstalt. In addition, Gunkel is giving much attention to the bacteria which modify the natural and exogenous oils present in the North Sea.

Plankton and hydrographic research are also largely descriptive at the present time. The Biologische Anstalt at Helgoland maintains the oldest oceanographic station in the world, where observations have been made since 1834. The station is between Helgoland and the nerby "Dune", in the channel which washed through in 1721. At present, daily observations of salinity and temperature are supplemented by periodic intensive sampling of nutrients, productivity rates and standing crops. A series of six permanent stations is also maintained from the mouth of the Elbe River out to Helgoland and six others extend on to the north-

west of the island. These are sampled monthly with more frequent trips in the spring and fall periods. Present sampling includes temperature, salinity, turbidity, phosphate, nitrate, nitrite, oxygen, organic substances (as total, dissolved, carbon, protein, and amino acid). Water circulation in this corner of the North Sea is complex and highly variable, so that the station pattern will be extended when the new vessel is obtained. Kinne feels that there are unusual opportunities in this region for study of the biology of the "interfaces" between adjacent water masses since the lines of demarkation are often visible and persistent. He also hopes to extend this program into the biochemical comprehension of both the needs of organisms and the products and results of biological activity. Species of plankton are determined, and the patterns of vertical, seasonal, and regional distribution are under study. Gillbricht examined the effects of the cold winter of 1962-63 on phytoplankton dynamics, and is now in charge of the hydrographic portion of the program. Hagmeier has recently published summaries of the seston (particulate matter) and microbiota for the tropical Atlantic and for the Indian Ocean between Australia and Indonesia. Substantial attention is being given to marine yeast-like fungi. Many of these flourish only at a pH lower than that of sea water, but the group has observed enormous increases in these species after mass mortality of Noctiluca, which contains a large vacuole of pH 4.

Kotthaus has made intensive studies of the redfish, Sebastes marinus viviparus, off the coast of Iceland and Greenland, with emphasis on definition of the breeding grounds and spawning season. Apparently there are major feeding grounds on rocky bottoms which protect the fish from exploitation by netting, so that only the surplus production is available to fishing efforts. There are, however, other areas of clear bottom where over-exploitation is much more likely. Kotthaus has made large collections of fish from the Indian Ocean which contain about 400 species, of which about ten appear to be new, and he is now very busy with study of the systematics of the collected forms. Flüchter is rearing fish larvae, with considerable assistance from the simple but valuable system for filtering water which he described last year. (Helgoländer wiss. Meeresunters., Vol. 11, No. 3-4, pp. 168-270.) He is now rearing Solea solea on the eggs and larvae of Artemia and on Tisbe and studying the effects of light on behavior. He has learned that feeding difficulties are especially acute for those species of marine fishes which are of commercial value, since they are all fast-growing and starve much more quickly

than most other species. He is now deeply concerned with the planning of the new culture building which will be described in a later section.

Radiobiological research is a new field for the Anstalt. One laboratory at Helgoland and about ten rooms in a new radiobiological center to be built soon near Hamburg (see section below on future development), will be utilized. Emphasis will be placed on the physiological effects of radiation on organisms, especially on plankton. Hoppenheit has been working on physiological psychology at Kiel, and has recently been occupied with the development of the new facilities. He hopes to examine the mechanisms of blood formation, especially in Crustacea, and to learn the effects of radiation on these mechanisms. Other interesting or potentially useful avenues will be followed, since the objectives and projects of the program are quite free from rigid definition.

The Research Associate (Mitarbeiter) position is used in an interesting way by Kinne. He has funds for at least two postdoctoral fellowships, and sometimes uses these as opportunities to observe potential staff members before offering them permanent employment.

A supply service is maintained for German schools and universities. A large variety of plants and animals is available at reasonable cost as fresh or preserved material.

VISITING SCIENTISTS

Excellent facilities are available for visitors, and they are cordially encouraged. Several German universities retain research rooms at Helgoland at modest cost and send anyone they wish to occupy them. Kinne reserves at least five small laboratories and two large ones for additional guests. International exchange is actively encouraged, with a natural special interest in quantitative ecology, and an increasing number of biologists visit Helgoland for research.

LIBRARY AND PUBLICATIONS

The principal library of the Anstalt is being developed at Helgoland. It has a considerable number of pertinent books, receives about 400 journals, and is expanding through a special three-year grant of funds. It will contain about 500 journals and all of the pertinent books and earlier literature which can be located. The library at List will remain modest and rather specialized, and the scientists at Hamburg

can draw upon the resources of the several fisheries libraries, the German Hydrographic Institute and the University of Hamburg (which maintains a nearby Institute for Hydrobiology and Fishery Research).

Most of the research completed at the Anstalt appears in the journal Helgoländer wissenschaftliche Meeresuntersuchungen, published in annual volumes of four numbers. With Kinne and Aurich as editors, it has excellent format and content. Papers are accepted in German, French, or English, with an abstract in a second language and summary in the principal language. Most papers are in German and from the staff, but the journal is open to all pertinent contributors. Special issues have been devoted to several symposia at Helgoland in recent years, as described in the next section.

Every paper published by the staff in other journals is abstracted in the Addendum of each issue of Helgoländer wiss. Meeresunters., so that it provies an almost complete summary of accomplishments. In addition, a report is included in each "Jahresbericht"(annual report) of the Federal Fisheries Research Board.

SYMPOSIA

Two series of symposia are now identified with the Biologische Anstalt Helgoland. The first originated as the Marine Biological Symposium held in 1960 at Helgoland. German scientists found the exchange to be fruitful, and annual sympcsia have been held; sponsored in series by the Helgoland Anstalt, the Institut für Meereskunde of the University of Kiel, and the Institut für Meeresforschung in Bremerhaven. The host institution each year establishes the theme and scope of the meeting, and the program varies accordingly. Kinne favors international exchange and provides translation services and publication in German, French, or English, whereas the other hosts have emphasized German science. Since these are interesting conferences, not well known to Americans, a brief summary of the meetings may be of interest.

Marine Biological Symposia (Meeresbiologisches Symposium)

1. May, 1960, at Helgoland. (Not published)

2. October, 1961, at Kiel. (Published in Kieler Meeresforschung 18, Heft 3, 1962.) Topics:

A. Das Laboratoriumsexperiment als Mittel der meeresbiologischen Forschung

B. Probleme des Stoffhaushaltes im Meere

C. Ozeanographisch-Meeresbiologische Hochseeforschung

D. Vorführung ozeanographischer und meeresbiologischer Geräte und Methoden

3. October, 1962, at Bremerhaven. (Published in Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven, Sonderband 1963). Topics:

A. Zur Biologie der Tiefe und des Meeresbodens

B. Evolutionsfragen im maritinem Raum

C. Beiträge aus der Verhaltensforschung

D. Neuere Anschauungen über die Entstehung des Ozeans

4. October, 1963, at Hamburg. (Published in Helgoländer wiss. Meeresunters. Bd 10, 1964, 476 p.)

This was an international meeting on the general theme of the abiotic factors in the marine environment and the biological consequences. Topics:

A. Metabolism and activity

B. Growth, nutrition and reproduction

C. Hydrophysics and hydrochemistry

D. Effects of extreme low temperature

E. General ecology

F. Production

5. September, 1964, at Göteborg, Sweden. As guests of the Marinbotaniska Institutionen of the University of Göteborg. (Published as Proceedings of the 5th marine biological symposium. Ed. T. Levring, Acta Univ. Gothoburghen, Botanica. Gothoburgensia III, 1965, 258 p.) A wide variety of papers were presented on the general theme of the vertical and horizontal distribution of marine organisms. Participants were from Germany,

England, Scotland, Sweden, Denmark, Norway, Finland, The Netherlands, and the United States.

6. October, 1965, at Bremerhaven. The theme was "Mikrofauna und Mikroflora des Meeres," with sections on microfauna, merofauna, bacteria, fungi and algae. Participation was primarily or exclusively German.

7. 1966, at Helgoland. Detailed planning has not been completed, but this will be an international and translated exchange.

German marine scientists favor these exchanges, but the series has stirred interest in the possibilities of increased international association and exchange. There has been discussion of an association of marine biologists of Europe and of other possible patterns, but no action has come to my attention in northern Europe (see ONRL-6-65, The Meditteranean Association for Marine Biology and Oceanology, for one approach to similar problems.)

A second series of meetings has been created by Kinne, Krüger, and Dr. Alfred Locker of the University of Vienna. The First International Symposium on Quantitative Biology of Metabolism was held at Helgoland in September of 1963, the second is being held in September of 1965, and in alternate subsequent years about 30-35 contributions are invited and proceedings are published in Helgoländer wiss. Meeresunters. The 1963 volume (Bd. 9, No.1-4, 496 pp) includes groups of papers on: General principles; Growth, temperature effects and coordination; Hibernation, hypothermia and radiation protection; Basic and active metabolism; Metabolism and body temperature in homoiotherms; Oxygen, metabolism and development; and Metabolism under adaptive conditions (ecology). Abstracts are distributed in two languages and it is hoped that this series will provide valuable summaries and effective stimuli for further work. The Second International Symposium on Quantitative Biology of Metabolism was held at Helgoland in September 1965. Papers and discussions will be published in Helgoländer wiss. Meeresunters., Bd. 13, 1966.

TEACHING

About 500 students visited the Anstalt in 1964 for some type of training. Most of these came with their professors in about 15 classes from various universities in Germany, Sweden, Switzerland and other countries. Three courses are presented by the staff under Ziegelmeier's

general supervision. Two of these, as Introduction to Marine Biology, are provided for high school teachers and for advanced students. A third program, quite an innovation for German science training, has been inaugurated this summer. Ten selected students are taking Advanced Physiological Ecology by conducting individual supervised research. The program will be shorter than similar U.S. offerings, but the staff is interested in this new technique and enthusiastic about its potential. Kornmann is also giving a special course on Algae to a small group.

Kinne and Kesseler hold faculty appointments at the University of Kiel, and Krüger is on the faculty of the University of Hamburg. They and other staff members participate in the lectures of these universities and supervise graduate research at the laboratories.

FUTURE DEVELOPMENTS

The Anstalt has apparently recovered completely from war damage and re-established itself in local and international opinion as a vigorous and productive institute. Further developments are planned for the future, and some of them have already been funded.

At Hamburg, the new radiobiological laboratory will be utilized cooperatively by the German Hydrographic Institute, the Institute for Biochemistry and Technology of the Fisheries Research Board, and the Helgoland Institute. Additional staff will probably be available, and there will apparently be an excellent opportunity for research on the biological effects of radiation.

At the Littoralstation, a second floor will be added to the laboratory to increase its capacity for research staff. Future possibilities may include construction of a second building of two stories to house four new permanent scientists and five guests. Emphasis will undoubtedly continue on the interesting region.

Most advanced planning, and governmental persuasion, is centered on Helgoland. The new boat is certain to be built, and will provide a new level of capability. 120,000 DM ($40,000) has been provided over a three-year period to expand and modernize the library. A second librarian will be required, and consideration must soon be given to new and appropriate facilities to house the library (thereby freeing more space for research). Funds are available to construct a new dormitory for 50 students with a dining room for 60

to correct the recurring summer housing problem. During the rest of the year, this space will be available for guest investigators, conference use, short courses, etc. Eleven additional apartments are planned to assure housing for the permanent staff in this tourist-priced location.

All of these, however, are essentially supporting facilities. The most significant addition to the research facilities will probably be the new building for experimental ecology which is now taking shape in the minds of Kinne and a committee of his staff. It may eventually take the shape of a large square group of buildings around experimental ponds, but the first stage will be a two-story wing. Construction will probably be near the site of the old Anstalt laboratory, of which only the foundation now remains.

This building promises to be one of the most interesting in marine biology. It will be planned to permit maximum manipulation and measurement of temperatures, light, salinity, and other important environmental conditions. Its second emphasis will be the culture of the widest possible variety of species from all parts of the food chain. Kinne wishes to learn the normal response of organisms to environmental variation, the limits and nature of their tolerance, and the fundamental effects of various stresses. He will then be especially interested in comparing the optional and tolerable environments observed in the laboratory with the natural distribution of the species. He feels that the differences are most likely to be biotic (competition, predation, parasites, etc.) and that this sequence of quantitative experiment and field ecology can be unusually productive. It is certain that he and his staff bring high competence to this imaginative effort, and the results will be of interest and value to many marine biologists.

The emphasis on quantitative ecology will continue, probably as long as Kinne remains. At the present time he is engrossed with a major project which will prove a summary of work in this field and suggest future avenues for research. He will edit a series of books under the general title of Marine Biology, planned as "a comprehensive, integrated treatise on life in oceans and coastal waters". The first volume will deal with environmental factors, and authors are being selected from all over the world. The second volume will probably treat of ecological dynamics, and subsequent books will be organized in response to the interests of research scientists and teachers. He welcomes suggestions or comments about the treatise.

FOR AMERICANS

Perhaps no major marine laboratory in Europe would make Americans more welcome. Kinne feels that many North American individuals could make valuable contributions in research there, and also that many of the inquisitive attitudes and uninhibited approaches frequent in American research would be refreshing in Europe. I would add the opinion that large numbers of our students and young scientists could also profit from association with the "old-fashioned" investigators who have produced much of our present marine knowledge. Helgoland is one of the best meeting points.

Guest facilities are generally excellent and inexpensive. Kinne would like to encourage visits by any competent individuals. Naturally ecologists will usually have the greatest opportunity for exchange, but the staff is diverse enough to aid those in many other fields. Special efforts are being made to strengthen the opportunities in biochemistry, electrophysiology, radiobiology, and cellular physiology.

Kinne suggests that the good facilities and semi-isolation of Helgoland may be attractive to those who wish to spend a sabbatical half-year or year in intensive research. Living costs are low (hotel at $4 - $6 with meals), space for research is plentiful, and inquiries are obviously encouraged.

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