THE PLYMOUTH LABORATORY OF THE MARINE BIOLOGICAL ASSOCIATION OF THE UNITED KINGDOM[1]

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(Plates XVIII–XXV and Text-fig. 1)

In *The Times* of 31 March 1884, it was announced that a meeting would be held that day in the rooms of the Royal Society for founding a society having for its purpose 'the establishment and maintenance of a well-equipped laboratory at a suitable point on the English coast, similar to, if not quite so extensive as, Dr Dohrn's Zoological Station at Naples' (M.B.A., 1887*a*). With Prof. T. H. Huxley in the chair a gathering of distinguished gentlemen gave reasons why such a laboratory should be built. All stressed what its value would be from the purely scientific viewpoint, and all were agreed that both by fundamental research and by more direct investigations on our food fishes, knowledge of economic import would be gained. The last speaker, Mr George J. Romanes, said that there was one function of the proposed laboratory which had not received the attention it appeared to deserve; he meant the investigation of invertebrate physiology. 'In the invertebrate forms of life', he said, 'we saw life in its simplest shape, and in the shape which best admitted of observation and experiment, with the view of throwing light upon most of the great questions relating to the processes of life' (M.B.A., 1887*b*).

As a result of this meeting a corporate society, the Marine Biological Association of the United Kingdom, came into being. It was decided that the laboratory should be built at Plymouth where a rich and varied fauna was available. The building, which was opened on 30 June 1888 (M.B.A., 1888), is situated under the walls of Charles II's Citadel in a commanding position overlooking the waters of Plymouth Sound.

The Association, which owed its inception largely to the initiative and energy of Sir E. Ray Lankester, received and still receives financial support from persons interested in the study of biology and the sea, who are the members of the Association. In addition, considerable financial backing was given by a number of Universities and other public bodies, and notably the Fishmongers' Company. From its beginning an annual grant was made by H.M. Treasury,

[1] This lecture was delivered to the Royal Society on 6 March 1947 (*Proc. Roy. Soc., London*, B, Vol. 135, pp. 12–25, 1947), and is reprinted in this Journal by kind permission of the Council of the Royal Society.

and after the 1914–18 war this grant began to assume considerable proportions when it came under the control of the Development Commissioners.[1]

In 1902 the Association was asked by H.M. Treasury to undertake the English share of the scientific investigations which formed part of the programme of the International Council for the Exploration of the Sea (M.B.A., 1903). The English share of these international fisheries investigations was divided under two heads.

I. A survey of the trawling grounds and fisheries in the southern North Sea, together with scientific observations on migrations, feeding and rate of growth of the more important fish. For this purpose the Association also ran a laboratory at Lowestoft.

II. A hydrographic and plankton survey of the western half of the English Channel.

After the 1914–18 war the Lowestoft laboratory 'was re-established under the Ministry of Agriculture and Fisheries for the purpose of studying problems having a direct bearing on the commercial fisheries. At the same time a substantially increased grant was made to the Marine Biological Association for the maintenance of the Plymouth laboratory, so that researches of a more general or fundamental nature concerning life in the sea might be developed on a larger plan' (Allen & Harvey, 1928). The years between the two great wars saw an increased staff at the Plymouth laboratory, and constant additions to the buildings and improvement of facilities for research of all kinds.

Over the period that the Association has been in existence it is possible to trace a sequence in the development of the work from the titles of the many papers in the Association's own *Journal* and its other publications (M.B.A., 1928). It should be remembered that in the earliest days practically nothing was known about the life histories and habits of even our commonest food fishes, and few carefully compiled accounts of the commercial fisheries were in existence. Since the avowed objects of the Association (M.B.A. 1887*b*) were to establish one or more laboratories on the British coasts 'where accurate researches may be carried on leading to the improvement of zoological and botanical science, and to an increase of our knowledge as regards the food, life, conditions and habits of British food fishes, and molluscs in particular, and the animal and vegetable resources of the sea in general', it was only natural that the emphasis in the beginning had to be on fishes. Accordingly, we find that a large number of the earlier papers were devoted to observations on the habits of fishes, shellfish and other products from the sea, and to the collection of information on the methods and results of commercial fishing. This was very necessary, because the few naturalists concerned had to have a general picture of these matters to be able to answer with some feeling of authority the many questions that must have been put to them once the Association was founded.

[1] An interesting account of some of the early history of the Plymouth laboratory is given by G. P. Bidder (1943) in his obituary notice of Dr E. J. Allen.

I have no doubt that quick results were expected in those days as they still are in certain quarters to-day.

But in addition to doing fishery research, the few naturalists of the staff, together with a number of enthusiastic visiting workers, were building up a knowledge of the marine fauna and flora off Plymouth and its neighbouring coasts. This again was a first requirement, because in all branches of science the systematic observations must come first. More direct fishery research also naturally received considerable attention as a result of the assumption of the English share of the investigations under the International Council for the Exploration of the Sea. But some of the programme of these investigations gave opportunities for increasing the pure scientific observations and studying the environmental factors in the sea over a wide area. Thus much of the foundation was laid for our knowledge of the hydrological conditions round the British Isles, of the fauna of the sea floor, and of the microscopic plants and animals which drift with the water and form the plankton.

Looking back over the first twenty years of the Association's life it is remarkable how much ground was covered by the few research workers available and how well balanced on the whole had been the distribution of the investigations. A most valuable fauna list (M.B.A. 1904, 1931) had been produced, a beginning had been made in the study of the distribution of the animals in relation to their environment, and fishery research had been put on a solid basis. Many papers on the morphology and development of marine organisms had been published, and, in addition, here and there appeared a paper somewhat before its time which gave advanced indications of other possible uses to which the Plymouth laboratory might be put.

After the 1914–18 war there was a noticeable change in the subject matter of the contents of the Association's *Journal*. With the taking over of fisheries research by the Ministry of Agriculture and Fisheries the work at Plymouth became for the greater part fundamental in nature. All the emphasis was on the study of the chemical and physical conditions of the environment, the life histories and development of marine invertebrate animals, and the distribution in space and time of the animal populations. But at the same time the economic aims were not entirely lost sight of and a certain amount of research on the biology of fishes was continued. Such a preservation of a link with more direct fishery research is of value if only because it necessitates that contact shall be kept with current work elsewhere. The Association has, for instance, undertaken research on the breeding and habits of the mackerel, the distribution of seals, the effects of T.N.T. on oysters, and other problems, at the request of the Ministry of Agriculture and Fisheries. But such research should not nowadays be needed as a justification for receiving a Government grant. All fundamental researches in the long run justify themselves, and the bulk of the work done at Plymouth is essentially fundamental in nature.

Thanks to the valuable work of the Fisheries Departments our factual knowledge of the important food fishes is such that the populations of fish on which our food supply depends can now be watched with a view to the regulation of the catches. The major picture of the distribution, migrations, growth and spawning habits of the common fish is now well known. But what the underlying factors may be, on which the fishes' lives and habits depend, remain to a large degree unsolved, and their solution lies more in the realms of pure science. It seems likely, therefore, that all fisheries research will become more fundamental in nature and aimed at understanding the great natural fluctuations in the fish populations and the causes of the habits of the fish themselves.

It may be noted that most of the researches that have been undertaken in recent years by the staff of the Plymouth laboratory can be built around two main underlying themes. The first is how much living matter can the sea produce, what are the variations and causes of variation in productivity, and how do the organisms obtain the materials necessary for life? The second is how do marine animals in general live, how do they fit their various individual environments, and what alterations in the conditions in their environment can they appreciate? Both require a knowledge of the physical and chemical conditions in the sea. Where the productivity of the sea is concerned the sea water is the medium which contains all the ingredients necessary for the successful growth and development of the living organisms; in so far as the general biology of the animals is being studied it is the conditions in the sea water which determine their distribution, habits and migrations.

The Plymouth laboratory is therefore equipped for studying the physics and chemistry of the sea. Researches of the staff are aimed at the development of methods for estimating the quantities of nutrients in the sea water upon which the unicellular plants depend and following the changes they undergo throughout the year and from place to place in relation to the plant crop. The approximate yearly cycle of the more abundant constituents, phosphorus, nitrogen and silicon is now known. But much remains to be done in studying their rate of turn-over, and long-term investigations have shown periodic fluctuations in the amounts available. This is now being linked with hydrological observations on the movements of water masses and their origins, for much will depend upon whether the water is drawn from the rich deep ocean layers upwelling on the continental shelf or from the more depleted surface waters.

One of the first necessities in this research is a knowledge of the amount of photosynthesis; photoelectric methods have therefore been adapted for the measurement of the penetration of light into the sea, and the extinction by absorption and scattering of its component wave-lengths at varying depths.

In order to solve some of the problems thus posed it is necessary to work with pure cultures of diatoms and flagellates, and for many years attention has been given to this side of the work. Advances have thus been made in our knowledge of the utilization of combined nitrogen and phosphorus by the plants, these constituents often being present in such exceedingly low concentrations in the sea as to limit plant growth. Research is also being made on other substances, necessary only in minute quantities as trace elements, now known to play a vital part in the growth of land plants. Thus the concentration of both iron and manganese is probably suboptimal in some waters and may indeed limit plant production.

It is on the production of these unicellular plants that all the animal life in the sea depends, and ultimately those fish which form so valuable a part of man's food supply. The first link in the chain from plant to fish is the minute animal life of the plankton. Not only are these eaten directly by such fish as the herring and the mackerel, but they are of direct importance to nearly all species of fish, because when first they hatch the young fish are too small to eat anything larger. Researches on distribution, abundance, growth and habits of the many species of animals in the plankton therefore form a necessary part in the general problem of productivity. The effects of grazing off the plant crops by these animals can be studied at sea by evaluation of their numbers in measured volumes of water, and in the laboratory by experiments on the rate the animals eat the plants when cultured.

Observations on the distribution of the plankton organisms are made also in connexion with the hydrological surveys. It is found that some species are restricted to certain types of water, and they can thus be used as indicators of their respective water masses. Some waters in the Plymouth area, which are thus clearly characterized biologically, are not readily distinguishable by the usual hydrological features such as salinity and temperature. Such biologically distinguishable waters may differ markedly between one another in the amount of life they carry. This must in turn be related to their chemical content.

Other links in the chain are the bottom animals upon which the growing fish feed. It is necessary first to know the distribution of these animals. The bottom deposits of the sea are not uniformly distributed, ranging as they do from the finest mud to the coarsest gravel according to the movements of the overlying water. Each kind of deposit has its characteristic fauna; and recent researches have shown that the microscopic larval stages of some animals will only undergo their normal metamorphosis if they can find the individual grade of soil they live in. The estimation of the food available in different deposits has received attention, and attempts have been made to evaluate the animal contents of standard samples of deposit.

There is another link in this productivity chain whose connexion may not at first appear obvious. Quite early in the history of the Marine Biological Association the opportunity was taken, while studying the distribution of bottom animals, to examine also the stones and rocks dredged up in order to throw light on the geology of the English Channel. A knowledge of the configuration of the sea floor is of importance for the study of water movements. The shape of the continental edge where it passes over from the shelf to the steeper continental slope may be of critical importance, for it is here that the deeper waters of the ocean, rich in nutrient salts, are brought towards the surface at times by upwelling and reach the photic zone. It may well be that embayments resulting from submerged valleys may cause submarine waves to increase their amplitude and thus reach higher levels.

Let us now consider the second major line of research, the biology of marine animals. Every species of animal in the sea can form a subject for enquiry, and each alone can pose nearly all the problems of biology. The sea provides a greater variety of animals than any other environment. In it are to be found representatives of all the groups of the animal kingdom, the insects alone being scarcely represented. Many groups indeed are found almost exclusively in the sea. The facilities offered by the Plymouth laboratory therefore afford an inexhaustible mine for any biologist, and it becomes difficult to canalize the work into any single objective line. There is scope for systematists, for morphologists and embryologists, for students of life histories and behaviour, for geneticists and so on. In general it may be said that, once the ground has been laid open by the systematists, research has chiefly been directed towards the description of the life histories of animals important in the general economy of the sea, of their food and methods of feeding, of their breeding and rate of growth, their parasites, and of their relationships with their animate and inanimate environment. Many of the results of investigation obviously have also a bearing on the general problem of productivity. In this wide field for research the emphasis tends to vary from one direction to another according to the predilections and aptitudes of the individual workers, but, apart from their value as contributions to general biology, any one of them can be shown directly or indirectly to have its practical bearing. Knowledge of the life histories and habits of fishes in general has obvious value, even where species of no commercial interest are concerned, since they are all competitors for the common food supply. Very useful results have accrued from investigations on the herring, which at one time formed an important winter fishery at Plymouth, attracting a hundred or more steam drifters from the east coast ports. In the early 1930's the herring ceased to come in their usual numbers to the grounds near Plymouth, and it became possible by local observations to warn the industry of the reduced chances of a successful fishery and thus save the considerable expense of sending ships to the area. The causes of the disappearance of the herring are, however, of the greater fundamental interest and the answer may be found when our knowledge of water movements grows.

Apart from the more obvious necessity of research on the biology of crabs, oysters, mussels and other shellfish used for food, knowledge gained about invertebrate animals in general has proved its worth. The annual cost to the nation resulting from damage to underwater structures by boring organisms and by the fouling growths on ships' bottoms is immense. All attempts to reduce this wastage by improved methods require at the start a knowledge of the natural history of the organisms concerned. Other departments are now taking up antifouling problems, but they begin with a basic knowledge already supplied by fundamental researches.

It is not wise in the long run to restrict observations only to those organisms known to be of economic interest. It has been noteworthy that our common coastal seaweeds attracted little attention in the past. In relation to the general economy of the sea as a whole the narrow fringe of weeds around our coasts is of small importance; probably largely for this reason the seaweeds were neglected. But during the war, when supplies of certain raw materials were cut off, seaweeds were needed as a source of supply of alginic acid, agar and mannitol. It was then realized that we knew practically nothing of the rate of growth and breeding of our commonest weeds, and investigations were immediately begun.

I think this necessity for the accumulation of knowledge without regard for its immediate practical value should be stressed, for it has proved itself abundantly worth while. The Association has often advised Government departments with resulting savings in expense. A knowledge of the effects of temperature on the rate of growth of marine organisms was incidental in the destruction of fouling organisms and their prevention for many succeeding years in a large basin in one of our naval dockyards. And, in passing, it is worthy of mention that research on the preservation of ropes and nets, besides enabling the Plymouth laboratory to make considerable economy in the use of expensive silk plankton nets, resulted in great saving for the Ministry of Home Security when proven methods were adopted for preserving sand bags.

But marine animals live not only in the open sea. They inhabit the intertidal zones of the shore and they invade the estuaries. Work cannot therefore be limited to offshore waters; the shores and estuaries must also receive attention. The examination of the estuarine fauna is of great interest physiologically, and a detailed knowledge of the distribution of the different species in relation to the normal changing conditions is of value in assessing pollution. As a result of a close study of a water shrimp (*Gammarus*), primarily as a subject for genetics, certain species are proving to be valuable estuarine indicators.

From the point of view of life in the sea as a whole it should be realized that work at Plymouth touches only the borders of the great oceans, whose study lies within the province of the highly organized oceanographical expeditions. Nevertheless Plymouth plays its part in the promotion of oceanographical research. This is especially so in the development of methods. Many of the methods used on ocean-going expeditions have been developed at Plymouth. This is an essential part of the laboratory's work. Once an oceanographical expedition is equipped and its programme planned it is necessary that the majority of the observations should be carried on by routine methods, for results lose comparative value if they are constantly varied en route. At Plymouth, however, there is full opportunity to develop methods in the laboratory and test them out at sea. Each succeeding cruise by the ocean-going research vessels may therefore take advantage, and employ the improved methods and attack new problems for which the necessary technique had been awaiting development at a shore laboratory.

This brief review of the problems open to investigation shows some of the field of research available to the Plymouth staff. The scientific staff is small, only a dozen or so in number. The most that can be done is to distribute this staff in a balanced manner so that there is one engaged in each of the possible major lines of inquiry. Some might argue that it would be better to concentrate all the energy on to one specific problem. This could only be done by the formation of a school and the interests of the leaders of this school might determine a one-tracked course for many years.

This should never be at Plymouth, because there is another most important side of the laboratory's work upon which I have not yet touched. It has been a tradition of the Plymouth laboratory that it shall attract visiting research workers. The constant flow of visitors gives life to the buildings and, with its ever changing interests, affords invaluable points of contact for the staff. It is essential, therefore, that the interests and experience of the staff should cover as wide a field as possible so that visitors may receive assistance and mutual benefit be derived.

The additions to scientific knowledge produced by the many visitors must exceed those of the staff itself and they are for the most part published in journals other than that of the Association. Much of this work has been on traditional biological lines, but it may be noted that, even on the day of the Association's foundation, the words of Romanes pointed to other fields. When the time was ripe the scope was broadened to include the comparative physiology of marine animals. In this direction Plymouth has always been under-staffed, but it has for long been the aim as far as space will allow to equip the building with the necessary facilities and apparatus so that visiting workers may fill this gap.

The physiological researches made at Plymouth have been very varied, and mention only can be made here of some of the subjects which have received attention. The common spider crab (*Maia*) has been much used for studying the heat formation in nerves and other problems of the physiology of nerves; the same animal also supplies material for the study of the respiratory blood pigment, haemocyanin. The sea urchin (*Echinus*) has been a fruitful animal for experiments on fertilization and development since its eggs are most suitable in nature. Advances have been made in our knowledge of the nervous coordination of the movements of fishes and on the physiology of the regulation of their colour changes. The functions of the lateral line system in fishes have been partly elucidated, and our knowledge of the labyrinth has been advanced owing to the unique suitability of the dogfish (*Scyllium*) as a subject for experiments.

Nervous systems in their simplest form have been studied in the sea-anemone, and in recent years the squid (*Loligo*) and cuttlefish (*Sepia*) have received prominent attention because they possess giant nerve fibres on which much can be done which is not possible with other nerve fibres; these giant fibres are also to be found in other marine animals, notably some polychaete worms and Crustacea.

Much remains to be done on the physiology of marine animals, and one direction perhaps in which our knowledge is especially lacking is that of the sensory perceptions and environment of animals in the sea.

From these few examples it can be seen that the practical benefits resulting from the founding of the Marine Biological Association may have a wider application than is expressed in its original aims, for these physiological researches have a very definite connexion with the medical sciences.

In this account I have omitted to mention by name the many distinguished men of science whose researches have resulted in the success of the Plymouth laboratory, and who, together with the Association's many devoted benefactors, have raised the laboratory to its present position of world repute. I cannot, however, let the occasion pass without reference to the late Edgar Johnson Allen who, as Director for 42 years, was the guiding genius to whom the Marine Biological Association owes so much of its success (Bidder, 1943; Kemp & Hill, 1943). It is interesting to recall Dr Allen's published works. These were comparatively few, but it is noteworthy that they touched on nearly all the main fields of research covered by the laboratory. To him was due the pioneer work on the culture of diatoms which made possible the great advances in our knowledge of the productivity of the sea. He produced the first important publication on the bottom fauna with his work on the Eddystone-Start grounds, and he was an acknowledged authority on the systematics of polychaete worms. His writings cover many problems concerning fish and other products of the sea. He co-operated in work on development and heredity, and had a deep interest in evolution; and it is perhaps significant that his first researches were on the nervous system of Crustacea. I think this is sufficient to show why the Plymouth laboratory never developed into a one-sided institution.

It would be unfitting also if I failed to include the name of the late Director, Stanley Kemp, whose death came as so tragic a blow just as the war was ending (Hardy, 1946). Dr Kemp's name will go down in history as that of the leader of one of the greatest oceanographical expeditions of all time. The *Discovery* Expedition has become a living institution, and the loss of Dr Kemp is deeply felt by all biologists and most by the staff of the Plymouth laboratory.

I should like also to record one name out of those of the Association's many benefactors, that of George Parker Bidder, for whose wisdom, generosity, and unfailing help in times of need we shall always remain in debt.

The laboratory is managed by a Council of elected members and annual Governors appointed by certain governing universities and other bodies, including the Royal Society, which have given sums of £500 or more. A number of Universities also contribute to the Association by renting tables to which they can nominate research workers. All foreign visitors are welcomed as guests free of charge and every year sees an increasing number of foreigners coming to Plymouth to work and discuss common interests with members of the staff.

The private sources of income of the Association are from these grants and donations, from membership subscriptions and the proceeds of the sales of specimens, collecting gear and journals. By far the largest contributor at the present time is the Government which voted an annual maintenance grant last year of over £25,000. The grant is sanctioned by H.M. Treasury as a draft from the Development Fund, and the Association is deeply in debt to the Development Commissioners, their advisers, and their Secretary, E. H. E. Havelock, for the wisdom and foresight they have always shown in their recommendations for the laboratory's support.

The Laboratory is built of Devonian coral limestone of which the Plymouth Hoe is formed, and marine animals of a past age are clearly visible in the weathered stone. It is not very large; accommodation is restricted by the limited area available between the Citadel walls and the road. It consists of a main south building with the two upper floors divided into working rooms in which about twenty-four workers can be accommodated. Connecting with it is a north block containing the chemical and physiological laboratories. Underneath are cellars excavated from the solid rock which, on account of their uniform temperature and freedom from vibration, are most suitable for research requiring very delicately adjusted apparatus. There is a small constant temperature building with two compartments for controlled low temperatures.

The north block can take about sixteen research workers. The whole laboratory can thus accommodate some forty people[1] at one time, although this number can always be increased by a little 'crowding up'. The present permanent scientific staff numbers twelve, and there are also usually half a dozen or so investigators on long-term grants of a year or more duration. Over and above these about twenty visiting research workers can therefore be accommodated at one time, and it is of course normal for the laboratory to be especially crowded during the summer months when University staffs are on long vacation and visitors come to this country from abroad.

[1] The eastern block of the south building, which was the Director's house, was gutted by fire in a bomb attack. It is being rebuilt as a laboratory and should increase the working accommodation by ten rooms.

There is a valuable library, which is probably the most complete in the country in publications concerned especially with marine biology and oceanography. The library also takes a number of other periodicals likely to be needed by visiting research workers. Many visitors remark on the pleasure of using a library of so compact a nature and with such careful selection of publications.

On the ground floor of the main south building there is an aquarium which is open to the public. Apart from its educational value for the many adults and children who visit the aquarium, the tanks with their living exhibits are a never failing source of interest to the research worker on the habits and behaviour of animals. The exhibits are restricted to the local fauna and provide a representative view of the chief fishes and larger invertebrates of the district.

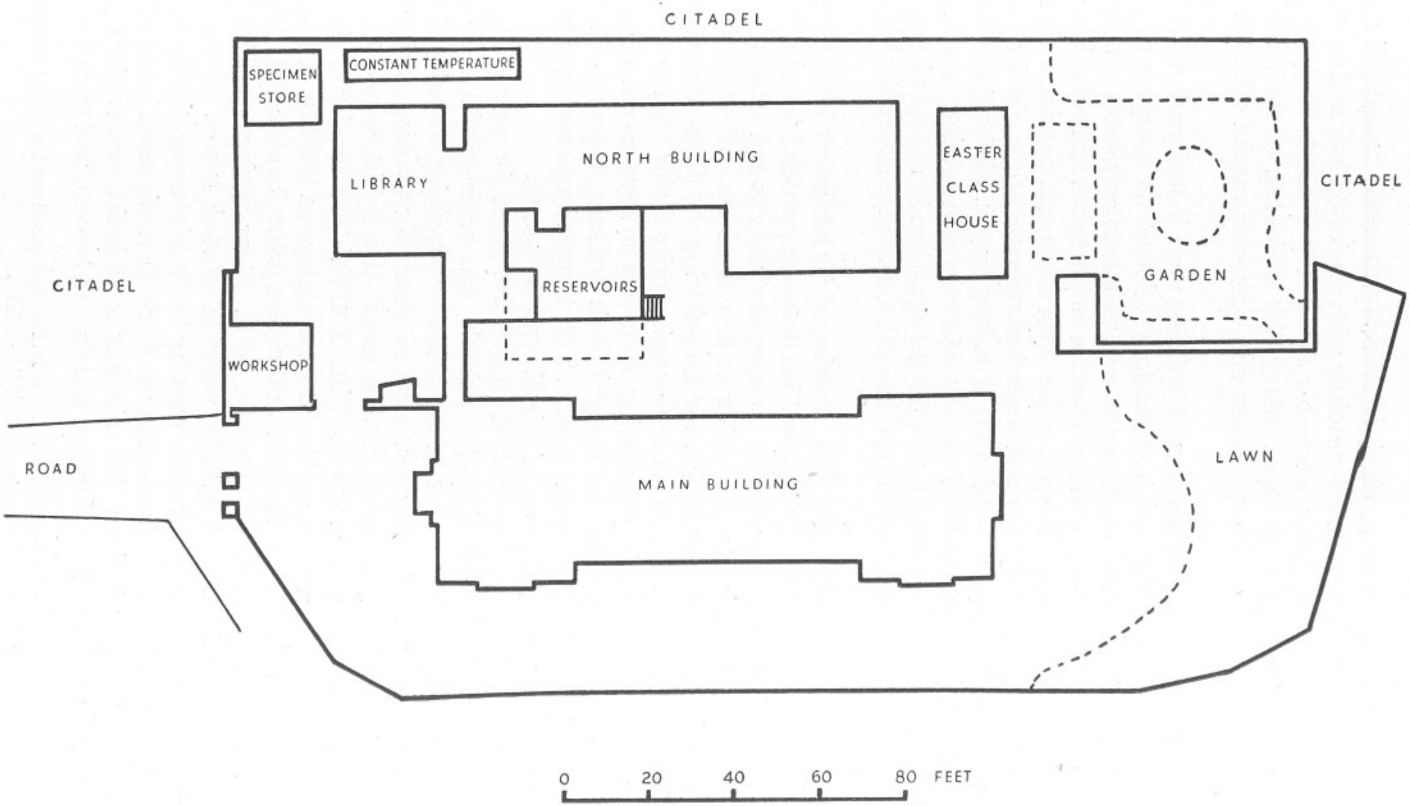
The tanks, the largest of which is 30 ft. 6 in. long by 9 ft. wide, with a depth of water of 4 ft. 6 in., are supplied from two reservoirs each holding 50,000 gal. of sea water. This sea water which supplies the aquarium is also led to certain parts of the laboratory where small experimental tanks and seawater circulation benches are available.

A subsidiary, but nevertheless vital, function of the laboratory is the part it plays in the general training of biologists. Facilities are provided for courses of instruction during the Easter vacation to university students and schools, who have unrivalled opportunities for seeing at first hand the variety of living organisms which abounds in the sea, and for studying the different environments in which they live. There can be few universities in this country whose zoology staffs do not contain a sprinkling of those who have passed some of their time at Plymouth, either as Easter Course students, members of the scientific staff, or visiting research workers. This is most important in view of the overwhelming preponderance of animal types in the sea.

From time to time more specialized courses are given for post graduate students on the physiology of marine animals, and other special subjects. Plymouth also plays another part in education by supplying to universities and schools preserved and living specimens necessary for teaching purposes.

In order to enable the demands of these manifold activities to be met the Association runs two research vessels (Plate XXIV).[1] The smaller of these, a 25 ft. motor boat, the *Gammarus*, is used for dredging and trawling in waters close inshore, and for visiting the shores at different points for collecting intertidal specimens. The larger, at present a 90 ft. motor fishing vessel (R.V. *Sabella*) on charter from the Admiralty, works in offshore waters. As well as making collections generally for those working in the laboratory, for stocking the aquarium, and for the specimen trade, the first call on this vessel is naturally for research at sea. It is from this ship that quantitative observations are made on the organisms of the plankton and the sea bottom, and from which

[1] Since this lecture was first printed the Association has purchased a third research vessel, a 61½ foot motor fishing vessel, the *Sula* (Plate XXV).



Text-fig. 1. Site plan of the laboratory buildings.

physical and chemical investigations are made at sea. The ship also makes periodical cruises farther afield to study the hydrology over a larger area including the western approaches to the English Channel.

I hope I have said enough to give some idea of the general activities of the Plymouth laboratory and the possibilities it affords for work. One might sum it up by saying that it aims to give facilities for any research, not necessarily only biological, on problems for which the sea can provide the materials or the environment required. Its position is unique, lying as it does between the extremes of a fishery research laboratory and of an oceanographical institution, yet serving both, and at the same time offering facilities for visitors like the laboratory at Naples on whose pattern it was first founded. Let us hope it may be allowed to continue to hold this focal position and attract all those interested in the science of the sea and indeed of life itself.

Note. There have been extensive alterations to the Plymouth laboratory since the account written by Allen & Harvey (1928). A new library was built in 1931, and in 1932 the north block was farther extended to the eastward, to give increased accommodation for physiological and chemical laboratories, and improved photographic darkroom facilities. A small constant temperature building was added in 1938. In 1939 the centre of the south building, the original main laboratory, was completely renovated and a new floor added. A site plan as at the present date is shown in Text-fig. 1.

I wish to thank Miss E. J. Batham, Mr D. P. Wilson and Mr G. A. Steven for permission to reproduce the photographs.

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EXPLANATION OF PLATES

Plate XVIII

View of the Plymouth Marine Biological Laboratory, taken from the Smeaton Tower on the Hoe looking eastwards towards the Cattewater (summer, 1946).

Plate XIX

Fig. 1. Tank room on the first floor of south building (south side).

Fig. 2. Tank room on first floor of south building (north side).

Plate XX

Fig. 1. Museum on second floor of south building

Fig. 2. Typical work room in south building.

Plate XXI

Fig. 1. Reading room on first floor of library.

Fig. 2. Corner of physiological laboratory.

Plate XXII

Fig. 1. Chemical laboratory.

Fig. 2. Yard between north and south buildings showing reservoirs for sea water on left, outside tanks and circulation bench on right, and end of Easter Course building in distance on left.

Plate XXIII

Fig. 1. General view of aquarium.

Fig. 2. Anemone tank in aquarium.

Plate XXIV

Fig. 1. R.V. *Sabella.*

Fig. 2. Motor Boat *Gammarus.*

Plate XXV

M.V. *Sula.*

The photographs for Plates XVIII and XXV were taken by Miss E. J. Batham. All the other photographs are the work of D. P. Wilson, except Pl. XXIV, figs. 1 and 2, which were taken by G. A. Steven.

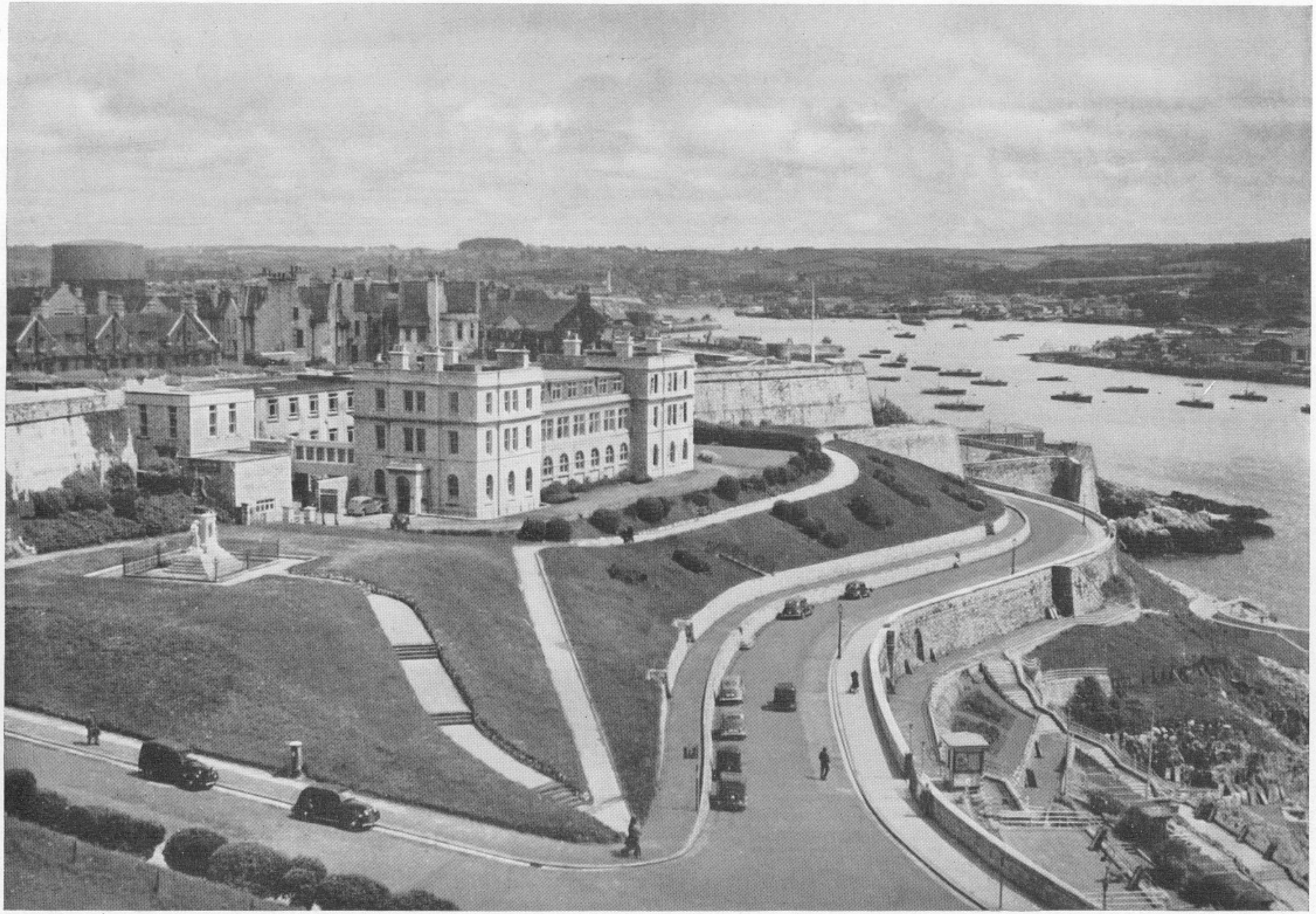

PLATE XVIII

Fig. 1.

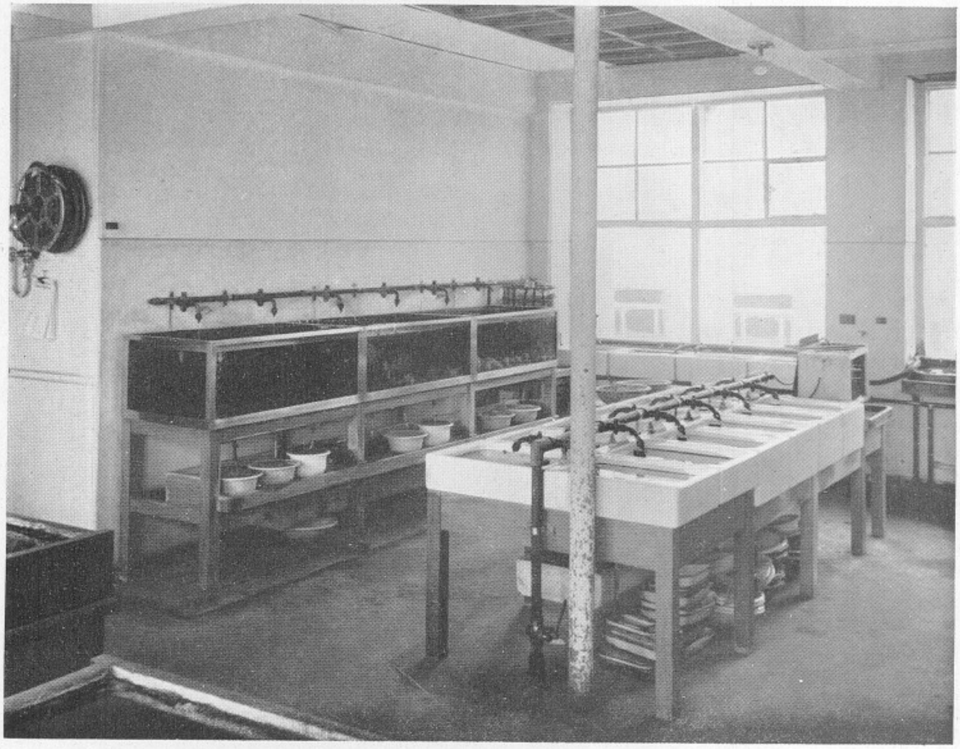

Fig. 2.

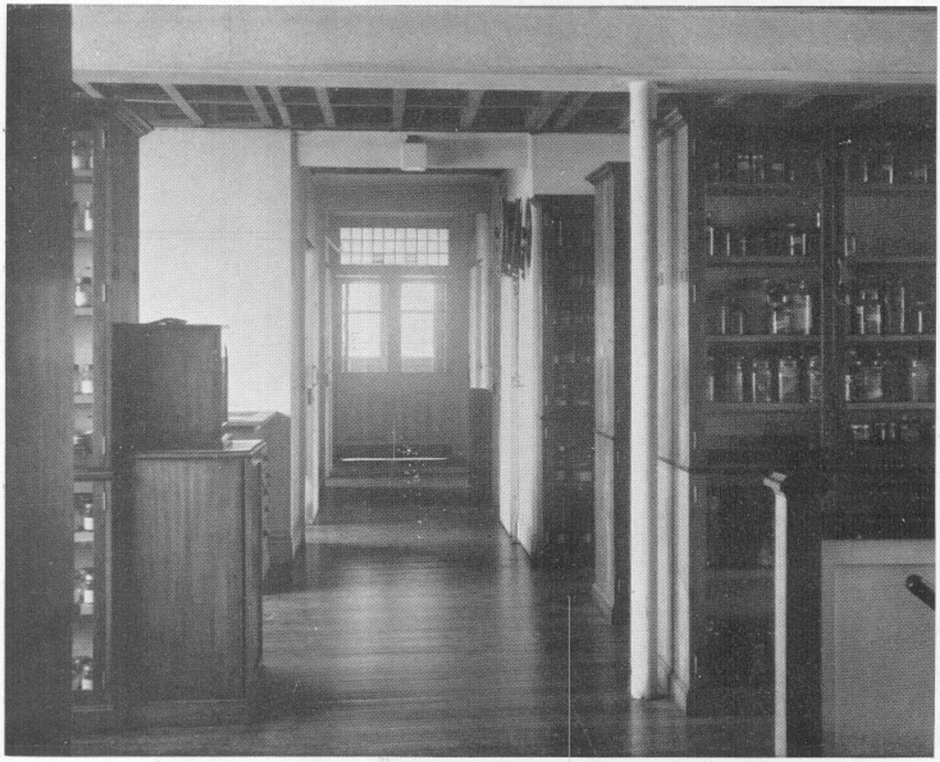

Fig. 1.

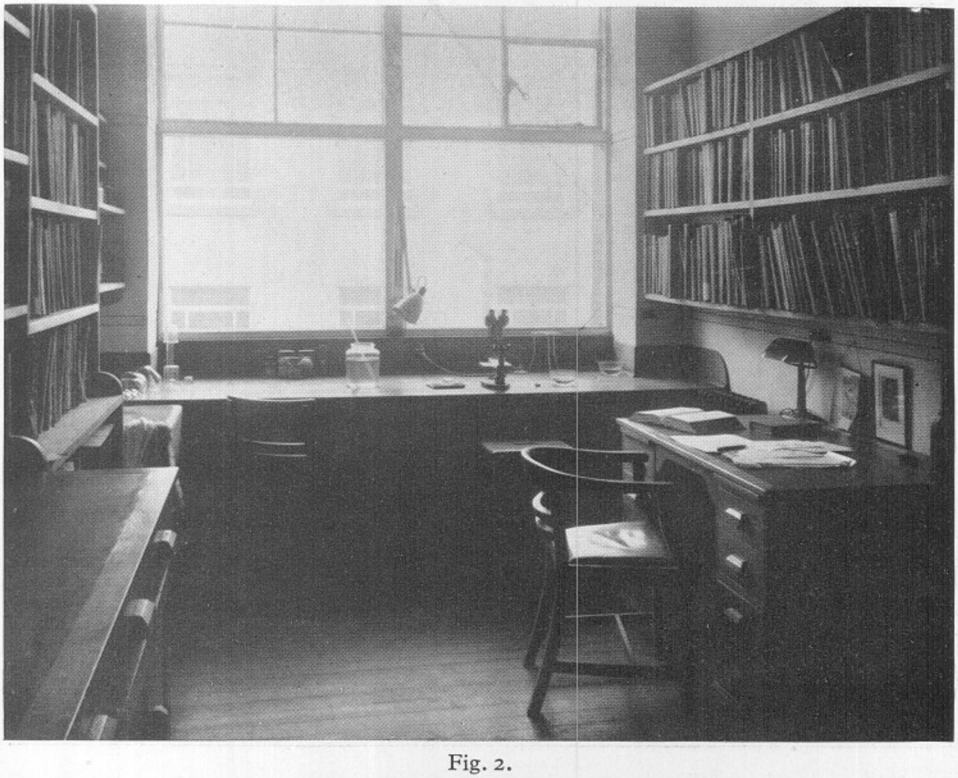

Fig. 2.

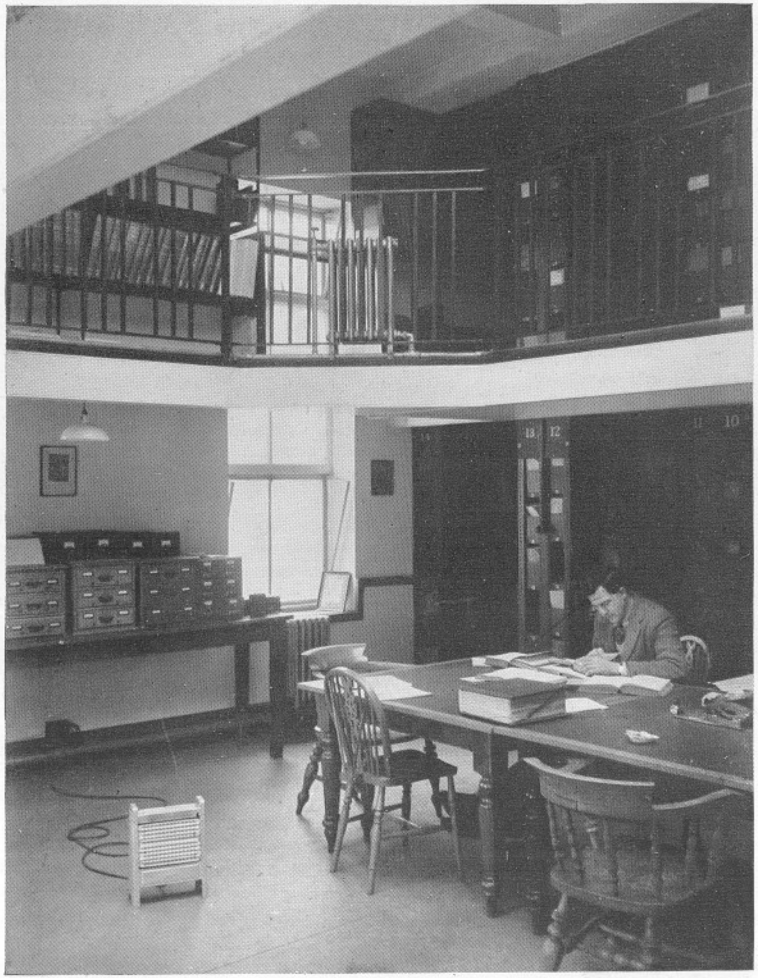

Fig. 1.

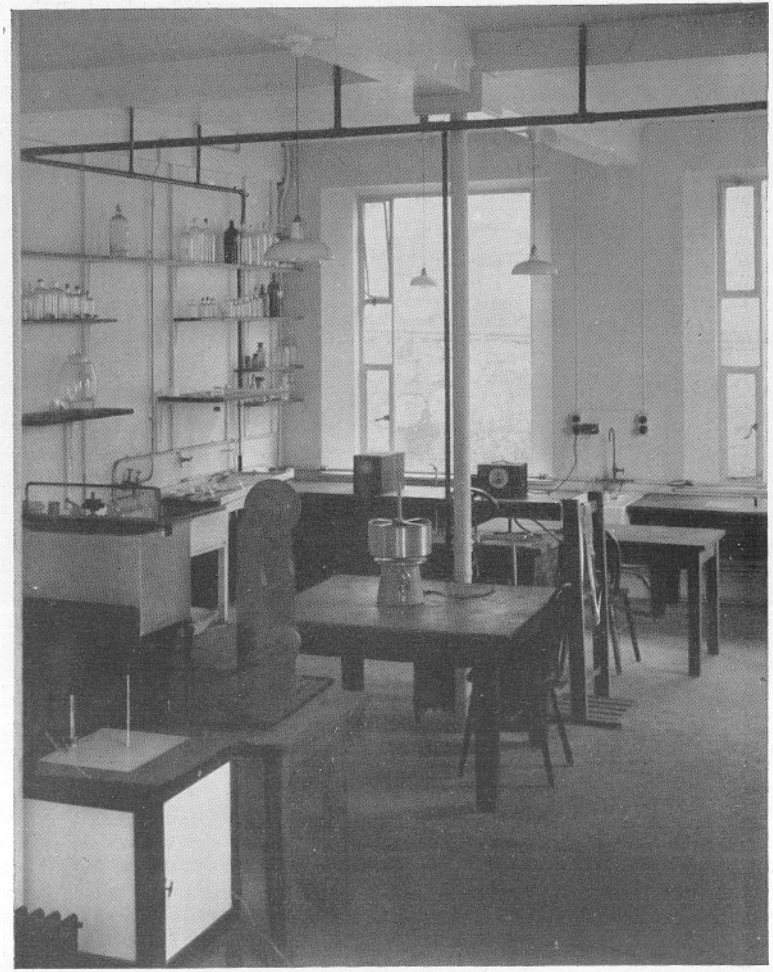

Fig. 2.

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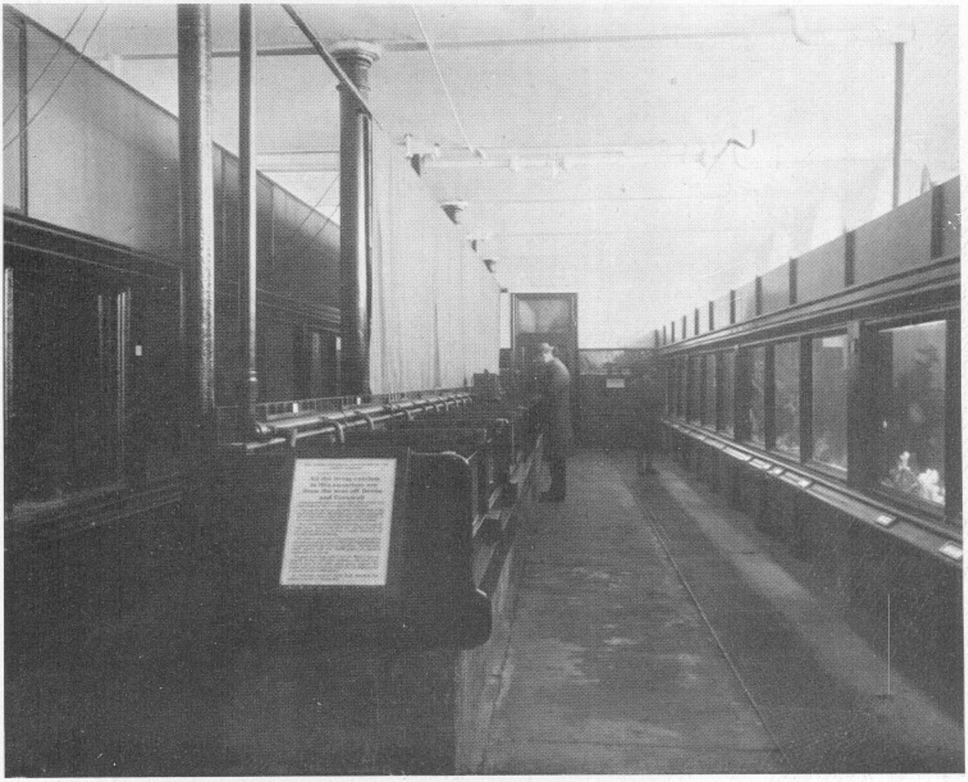
Fig. 1.

Fig. 2.



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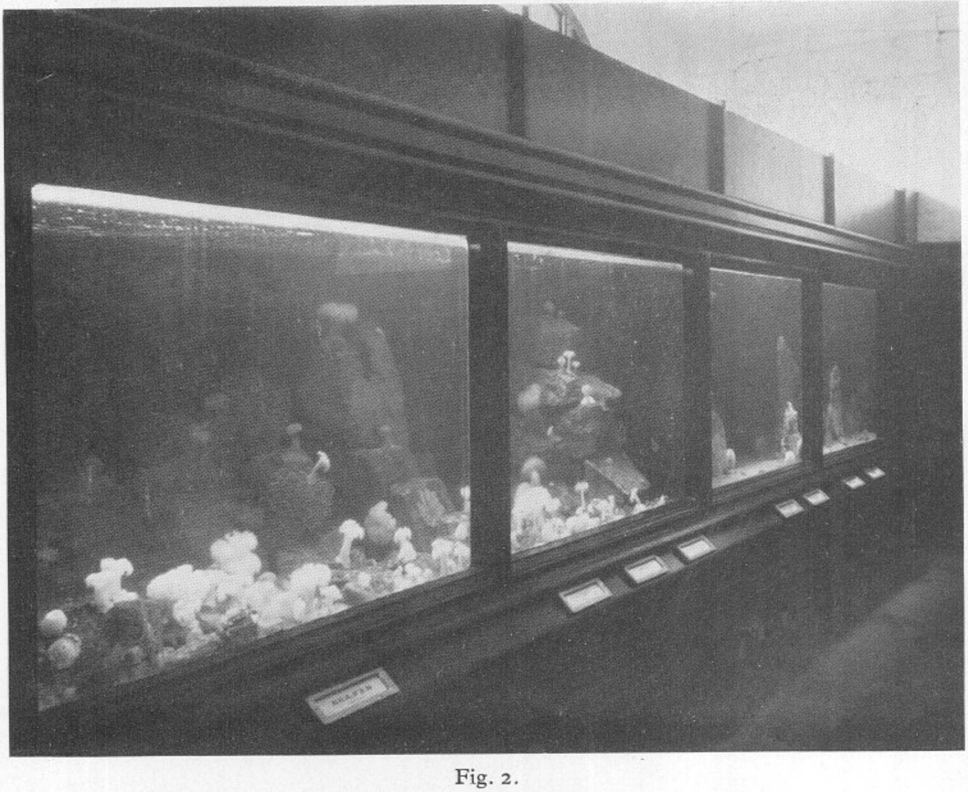

Fig. 2.

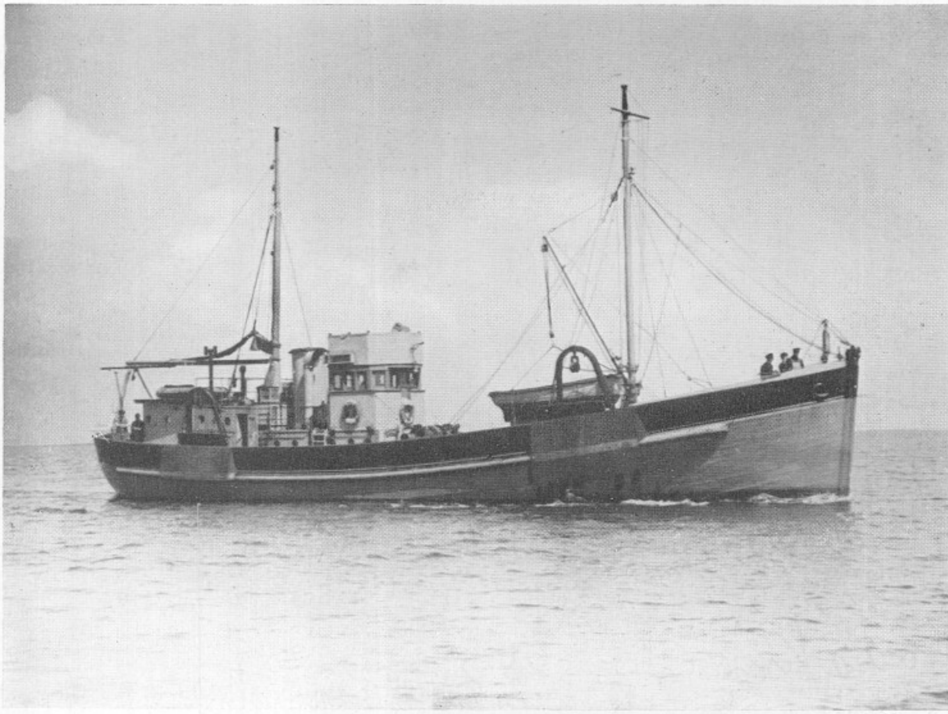

Fig. 1.

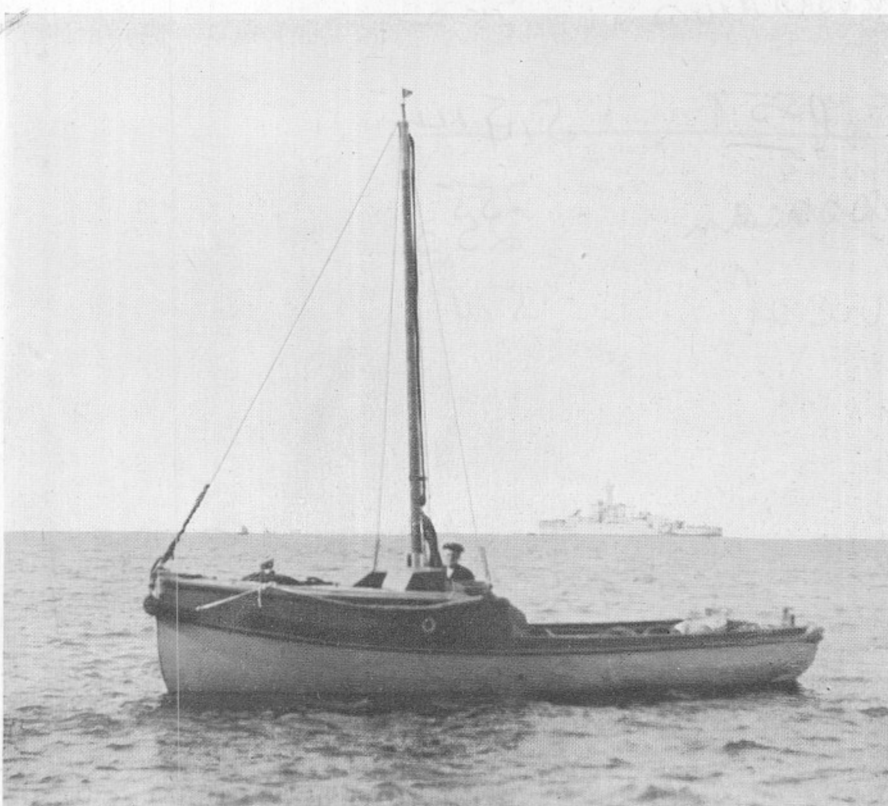

Fig. 2.