OF FISHERIES AND FAUNA

WESTERN AUSTRALIA

MONTHLY SERVICE BULLETIN

Vol XV No. 7 July, 1966

Staff Notes

The Supervising Inspector, Mr. J.E. Bramley, left by road on June 24 on a tour of inspection in the Shark Bay area. He is expected to be absent from Perth until July 4.

* * * * *

Research Officer R.J. Slack-Smith left by air on June 19 for the Division of Fisheries and Oceanography, C.S.I.R.O., Cronulla, N.S.W., where he will carry out the final computer analysis of the 1965 prawn research data. Mr. Slack-Smith expects to return to Perth on July 15.

* * * * *

Congratulations are extended to Senior Research Officer B.K. Bowen and his wife, and to Technical Assistant D. Donnelly and his wife, both of whom have announced additions to their families.

* * * * *

Technical Officer J.S. Simpson resumed duties June 21 after an illness that kept him in bed for three weeks.

* * * * *

Senior Inspector A.K. Melsom is back on duty after suffering two broken ribs.

* * * * *

Three new appointments to the Inspection Branch were made recently. We wish the new appointees well. They are Assistant Inspector L.J. Silvester and Cadet Inspectors J. Neal and R. Silbert.

MINISTER TO VISIT KURI BAY.

The Minister for Fisheries and Fauna, Mr. G.C. MacKinnon will fly to Broome on July 10 to board Pearls Pty. Ltd.'s vessel "Broome" for Kuri Bay, some 250 miles north.

The Minister will be accompanied by Mr. K.F. Dureau, Managing Director of Pearls Pty. Ltd. and the Director, Mr. Fraser.

TRAVELLING CLAIMS

The following is the context of a memo recently received from the Accountant, Chief Secretary's Department, concerning submission and delay in the payment of travelling expenses.

"This Department processes over 400 travelling claims every month and every effort is made to ensure that these claims are passed promptly to the Treasury for payment.

As a general rule officers are required to submit their claims as early as possible every month. This enables payment to be effected within a reasonable time and generally obviates requests for special payments.

In recent months several Fisheries and Fauna Department officers have approached this Department seeking almost immediate payment of amounts due for travelling expenses. In these cases the submission of claims to this Office had been delayed.

The latest instance was an Inspector who sought an advance of $200 against travelling claims for March, April and May, 1966. These claims were handed over together with the request for payment and the advice that the officer concerned was to leave Perth within less than 24 hours.

We are always prepared to assist in special cases, but feel that requests for very urgent payment

should not be brought about because claims have not been submitted promptly. Apart from inconvenience and disruption to work within this office and at the Treasury, this Department must bear the brunt of severe criticism from the Treasury when apparently undeserving cases are accorded special treatment.

It would be appreciated if you would remind your staff that all travelling claims should be submitted to and processed by your office early every month.

There have been complaints made in recent months regarding the slow payment of travelling claims. However, it is important to make sure our own house is in order and that claims and diaries are lodged on the first day of each month.

STOCK ASSESSMENT - W.A. CRAYFISH.

There has just been published -- in the Australian Journal of Marine and Freshwater Research -- a paper dealing with certain preliminary findings arising out of the crayfish stock assessment work at present being undertaken under the aegis of the Western Fisheries Research Committee. Mr. B.K. Bowen, the Department's Senior Research Officer, and Dr. R.G. Chittleborough, a Principal Research Scientist of the Division of Fisheries and Oceanography, C.S.I.R.O., are the joint authors. The latter, it will be recalled, also holds the position of Project Leader for the Research Committee.

The paper shows that the catch of crayfish in this State rose from about 600,000 lb. in the year 1944-45 to about 21,400,000 lb. in the peak year 1962-63. During this period fishing effort had increased rapidly with the result that the catch per unit of effort has progressively decreased. Since 1963 effort has been limited by law (no new boats; reduction in numbers of craypots; excape - gaps).

The paper carefully examines records of both catch and effort at selected localities at monthly intervals. From this examination estimates are made of both natural and fishing mortality and also catchability. From these, further estimates are made of the size of the stock, recruitment to the stock and the rate of exploitation, (fishing). These estimates, say the authors, may be applied to the whole of the crayfisheries as the catch per unit of effort followed the same trend in each of the areas sampled.

Originally the fishable stock stood at approximately 140 million lb. of crayfish, but this had declined to some 35 million lb. by 1963. As effort increased the fishing rate rose and then levelled off to a figure generally in excess of 60% of the total stock, i.e. three fifths of the "size" fish on the grounds at the start of the season had been caught by the end of the season.

Owing to the high exploitation rate in recent years, the stock actually available to be fished at the commencement of each open season is largely dependent on the level of recruitment (by growth) of juveniles during the immediately preceding close season. Recruitment has been falling away from year to year, probably because of the mortality of undersize crayfish in craypots.

Mr. Bowen and Dr. Chittleborough suggest the level of catch which might be sustained is in the vicinity of 16,000,000 lb. annually, plus or minus 2,000,000 lb. This is subject to suitable action being taken to stabilise recruitment.

A few reprints of the paper have been ordered, and any officer desirous of studying it in full may have a copy. The supply will be limited, and issues will be made in strict order of receipt of application.

CRAYFISH - VARIATION IN MEASUREMENT.

Observations have been made by the Senior Research Officer B.K. Bowen, Technical Officer N.E. McLaughlan and Senior Inspector B.A. Carmichael in the variation in measurement caused by the use of a standard brass crayfish gauge and a gauge with a knife edge.

One male and one female crayfish were selected which measured exactly three inches by a brass gauge of the kind formerly issued. The crayfish could be raised slightly by simply lifting the gauge. The brass gauge was checked to be exactly three inches by means of a vernier gauge and a standard three inch stainless steel measure.

The two crayfish were then measured by a "clock-face" vernier gauge, which has knife edge measuring points, and observed to be 0.1 mm less than three inches.

1 mm = 0.03937 inch
0.1 mm = 0.003937 inch

$$= \frac{3.937}{1000} \text{ inch}$$

$$= \frac{4}{1000} \text{ inch}$$

Therefore the two crayfish were, in fact, 4/1000 inch under the legal minimum length.

Reversing the procedure, if an inspector had a clock-face gauge, he could, theoretically, take a crayfish which had been called "size" by a fisherman who had tested it with a brass gauge and show it to be undersize. However to do this without using a vernier gauge (which is what an inspector with a crayfish gauge would have to do) an inspector would have to be convinced that he could differentiate between a "size" and an "undersize" crayfish with a tolerance of 4/1000 inch (with a steel gauge the tolerance would be less). It is believed that he is unable to do this. The amount of tolerance an inspector uses before he is able to say that a crayfish is undersize is about 16/1000 inch. This being so, crayfish which are up to 16/1000 inch undersize are still passed as size. Therefore, crayfish which are only 4/1000 inch undersize would most certainly be passed as being not less than the minimum length.

If the normal tolerance given by an inspector is 16/1000 inch and if the greatest difference which could arise between a brass and a steel gauge is less than 4/1000 inch then this difference falls well within the degree of tolerance.

A fisherman could of course still argue that he also gauges to an accuracy of 16/1000 inch (on the undersize side) with his brass gauge, and when the inspector tests the same fish with his steel gauge it measures, say, 18/1000 inch undersize and is therefore rejected. However this cannot be accepted, if we are getting technical as the fishermen seem to be doing, as the crayfish is undersize and outside the limits of gauge variation.

MUSK DUCK RESEARCH.

Mr. A.H. Robinson, of Yanjettee, Coolup, a Deputy Member of the Fauna Protection Advisory Committee, seeks

information to assist him in his research into the status of the musk duck.

Mr. Robinson says there seems to have been a big decrease in recent years of musk duck in its normal breeding habitats in the freshwater swamps. He would appreciate any information that inspectors or wardens could forward to the Department under the following headings:-

(1) Have you noticed any decrease in the number of musk ducks in recent years?

(2) Have speed boats had any effect on their feeding habits, i.e., have the ducks been forced away from certain areas?

(3) Accounts of approximate numbers of musk ducks and blue-billed ducks on any of the lakes of the south and west coasts.

SONIC BUOY.

The Western Fisheries Research Committee was established to consider fishery research projects and priorities, and to recommend to the Minister new research programmes necessary for the understanding and development of various fisheries. Presently it has listed the development of a Hydrographic Data Acquisition ("sonic") Buoy as one of two new programmes to aid the expansion of fisheries in this State.

The aim of the sonic buoy project, carried out by Mr. I.G. Nicholls, Computing Centre, University of Western Australia, is to produce a buoy which will efficiently monitor hydrological parameters (salinity, temperature and pressure) and transmit the values (on command) to data recording and processing systems already available at the Computing Centre, University of Western Australia. Limitations have been placed on the engineering of the buoy. Firstly, it should be produced at as low a cost as possible so that the placing of an array of such buoys would be financially feasible in the case of research projects where synoptic monitoring of a particular marine environment or area is required. Secondly the HDA buoy should be capable of extended operation without maintenance; in this regard

a six-months period of unattended operation is considered desirable.

Research so far carried out by Dr. B.W. Logan, of the Geology Department, University of Western Australia, suggests a correlation between prawn abundance and the presence of a steep salinity gradient within the Bay. If this is shown to be so, we will be much further advanced in our endeavours to predict prawn abundances in Shark Bay. This is an exciting thought and one well worth backing.

In discussing technical feasibility of the HDA buoy two subjects must be mentioned. These are:

1. The engineering feasibility of producing a buoy and developing an array of buoys;

2. The technical problems of placing and maintaining buoys in marine waters such as Shark Bay.

There will be engineering problems which will arise in the actual development of the system. However it must be pointed out that during the past twenty years there has been a very great number of developments in data acquisition and processing in all fields of research, particularly in space science, meteorology and oceanography. In oceanography there are already data acquisition systems in existence which are recording environmental information and transmitting the information to recording and processing installations. Thus it must be claimed that the HDA buoy is technically feasible with the present "state of the art". The only question is whether the buoy can be developed and produced at a low enough cost to make the placing of an array of buoys a financial possibility.

The development of a low-cost sonic buoy is the first necessary step towards the use of buoy arrays which can monitor the marine environment on a continuous and synoptic basis. Once this is achieved, then a new and advanced tool will be available for research of all kinds where a knowledge of the marine environment is essential. Such research includes studies of marine sediments, studies of marine communities and studies of populations of commercial fish.

Biological and geological investigations in marine waters are basically an effort to assess what is present and

how it is related to the environment. In studying the environment an attempt is made to define what is normal and relate our sediments on organisms to this form. It is also necessary to know the time and magnitude of major changes in the environment which may affect both sessile and motile organisms. A HDA-buoy array coupled to an appropriate system of data processing represents the most efficient way of assessing both the normal environment and the time and magnitude of environmental changes.

The value of the sonic buoy for fisheries research in Shark Bay, and other shallow coastal areas, is expected to be that it will provide detailed knowledge of the environment at a level of understanding which cannot be attained by conventional sampling with oceanographic vessels.

A grant of $4,000 from the Fisheries Research and Development Fund has been approved by the Minister for this project.

ECOLOGICAL STUDY OF THE ABALONE.

At the seventh meeting of the Western Fisheries Research Committee (February, 1966) it was decided to recommend that research be carried out in relation to the local population of the abalone, Marinauris roei. Research in this area was considered necessary, because of the growing commercial interest in this and other haliotids in Western Australia.

It was agreed that a project of this kind currently being undertaken by Mrs. S. Slack-Smith, Department of Zoology, University of Western Australia, could well be supported from Fisheries Research and Development Fund.

Research on abalone is not considered departmentally to fall easily into the category of an important potential fishery. Consideration will need to be given as to whether the populations of Marinauris roei should be exploited by professionals or semi-professionals. This mollusc is sedentary and thus probably incapable of withstanding a high exploitation rate.

Alternatively, because of its sedentary nature, the mollusc is easily studied and an assessment of the stocks could be made with very little cost. The potential may, therefore, be quite high relative to the cost of obtaining the information required for development and may, therefore, be quite high relative to the cost of obtaining the information required for development and management.

An initial grant of $400 has been approved by the Minister towards the cost of Mrs. Slack-Smith's programme.

FAUNA PROTECTION ACT.

Frequently enquiries are received from students undertaking studies concerning fauna, and from the general public in relation to the application of the Fauna Protection Act. The following has been prepared as a general guide and should be used by officers when answering enquiries.

Under Section 14 of this State's Fauna Protection Act 1950-54 all fauna is protected until declared otherwise. By fauna is meant all the vertebrate animals that occur in this State, either naturally or as a result of migration or from introduction by man, and which are wild by nature. These include mammals, birds and reptiles - in fact, all animals with backbones except fishes.

When speaking of "protected" fauna we mean that it is protected from being taken by any means, that it is prohibited to kill or capture, to poison or hunt, to disturb or injure any fauna not declared to be protected. Only a few species have been declared to be not protected (eg., saltwater crocodile) so the great majority of them are protected.

What Protection Means.

Protected fauna may not lawfully be taken by any person, anywhere or at any time, unless by the authority of a license which he holds under section 17 of the Fauna Protection Act. Fauna on private property is protected too because the Act declares that all fauna is the property of the Crown until lawfully taken.

Fauna in Captivity and for Study.

No fauna, with the exception of up to nine unprotected birds, may lawfully be kept in captivity by any private individual except under license.

While unprotected fauna may be taken without a license, it may be kept in captivity only by licensed persons, or in an official school holding area. Unprotected fauna and frogs may be used for dissection and study in official school courses.

Protected fauna may be taken only under license and the licensemay set down conditions under which the fauna may be kept.

If a protected bird or other animal is rescued from

a hostile situation, it may be taken to a school or elsewhere for identification but it must be released as soon as possible in a favourable situation. Protected fauna (except specimens found dead) must not be taken for dissection purposes except under a special license.

REPLACEMENT OF LICENSED FISHING BOAT.

Attention is drawn to regulation 4 of the Fisheries Act and Regulations which reads -

> "Any person issued with a fishing boat license or a renewal thereof pursuant to regulation 2 of these regulations, if that boat is lost or destroyed, or because of unseaworthiness is not licensed as required under subregulation (3a) of that regulation, may with the approval of the Director replace that boat with another boat owned by him, but no such license shall be transferred to another person."

All applications for permission to replace boats which are licensed to engage in crayfishing, with the exception of boats which are lost or destroyed shall be accompanied by a certificate under the W.A. Marine Act and regulations administered by the Harbour and Light Department, stating that the boat concerned is either unseaworthy or that it will not be granted a renewal of its existing certificate of seaworthiness.

Replacement of boats of a length less than 25 feet will receive consideration if the application is accompanied by a certificate that the boat is unsafe or does not comply with the requirements of the Harbour and Light Department.

Replacement Length.

When a crayfishing boat is replaced, the surveyed length of the new boat as shown on the certificate of the Harbour and Light Department shall be accepted as the length of the vessel and shall be recorded on the boat license. However, no license shall be granted for any boat when the surveyed length exceeds the replacement length as approved by the Department. For example, if the replacement of a 30 feet vessel is approved, the surveyed length of that vessel must not exceed 30 feet.

Every licensed fishing boat, whether there is a change of ownership or it is just a renewal of the license, must be relicensed for the length as shown on the existing

license, irrespective of whether the length is the overall measurement or is the waterline measurement.

When a boat is replaced by a boat of a less length the craypot license shall not authorise the use of a greater number of pots than 3 for each foot of the new boat. Likewise the number of pots licensed for any crayfishing boat shall not be increased without reference to, and the approval of, the Director.

PRESERVATION OF THE NOISY SCRUB-BIRD.

The Governor in Executive Council recently approved the cancellation of the proposed townsite of Casuarina at Two People Bay. The area concerned has now been made a reserve for conservation of fauna and vested in the Fauna Protection Advisory Committee. This undoubtedly will help to preserve Atrichornis clamosus, more commonly known as the Noisy Scrub-bird, as well as the Western Whipbird and the Bristle Bird, all rare birds found in the Two People Bay area.

Action such as this will bring the Government world-wide acclaim in conservation circles. In particular the executive officers of World Wildlife Fund, with which Prince Philip of Edinburgh and the Prince of the Netherlands are actively associated, will no doubt publicise the matter as a guide and stimulus to the emerging nations in Africa and Asia. There are matters of animal conservation in these regions which are arousing disquiet, now that European supervision has passed, and the Western Australian model could well be held up as an example to be followed.

The Noisy Scrub-bird was first discovered by John Gilbert at Drakesbrook, some 70 miles south of Perth, and at King George's Sound (Albany) in 1843. It was recorded again in 1889 by A.J. Campbell near Cape Leeuwin, and at Torbay, 15 miles west of Albany.

It was on December 23, 1961, some 70 years since the bird was last officially seen or heard, that Mr. H.O. Webster heard its call and re-discovered the bird. The call has been described as "once heard, never to be forgotten."

FREMANTLE FISHING BOAT HARBOUR - EXTENSION.

The Minister for Works has advised that work was started towards the end of June on the construction of a 600 - foot addition to the north breakwater at the Fremantle Fishing Boat Harbour.

The new spur will extend south-west from the existing breakwater, shield the entrance and improve conditions inside the boat harbour. A contract has been let for $87,760 for the supplying and placing of the stone, and the work is expected to be completed in about four months.

Prior to the construction of the south breakwater, anchorage for fishing vessels in the boat harbour was very limited. With the additional facilities now provided and about to be provided, a protected anchorage will be available for most licensed fishing boats outside the river area.

The new entrance, marked with suitable navigation aids, will lead into a harbour that will offer the fishing fleet based at Fremantle a safe, all-weather, roomy anchorage.

NOTES ON PUBLIC RELATIONS.

At the Annual Staff Conference in 1964, Staff expressed the opinion that the Department lacks in Public relation training.

The value of good public relations does not depend entirely on one officer, who is appointed in this capacity. Each one of us, from the lowest to the highest, has a public relations responsibility. We are all public servants and we are paid to give service to the public. In many ways each can carry out a really worthwhile programme. Probably the best means of establishing good public relations is by creating an image which will cause all men to look up to the Department. We must not, in either our public or private behaviour, do anything which will cause the community to look down on us or on the Department.

So you can see, training begins with each one of us. Furthermore suitable material will be published in this bulletin as it becomes available.

CLEARING HOUSE

CURRENT MEASUREMENTS IN THE SEAS AROUND BRITAIN.

Fisheries scientists are investigating the currents in the sea in relation to their studies of fish migration and of the drift of fish eggs and larvae from the spawning areas to the nursery grounds where the fry grow up. A knowledge of the current system is also essential in studies of marine pollution.

Until recently ocean currents were measured in a general way by finding out the drift of bottles or plastic markers from a known release point, or by anchoring a research ship for at least 12½ hours at each of a series of stations and, at say hourly intervals, lowering current meters that measure the speed and direction of water flow past the ship.

The first method does not give all that much information about the currents in an area, and the second is expensive in ship-time and very dependent on good weather conditions. Now, however, we have a new family of instruments for measuring currents, instruments which not only measure the current speed and direction but also store the information on magnetic tape or cine film for later analysis by a computer.

Use of these recording current meters will vastly increase our knowledge of water movements in the seas and oceans, and will do this relatively cheaply. One vessel can moor perhaps 40 of these meters in two days at various points in a sea area and then get on with other work while the machines measure and record water movements at 10 minute intervals for as long as 80 days at a time.

Over the last year the Fisheries Laboratory, Lowestoft, has been using in the North Sea and Irish Sea recording current meters of German manufacture which record the data on film.

The Lowestoft scientists are now to start using a British instrument and the Ministry of Agriculture, Fisheries and Food has placed a contract with Plessey-UK Ltd. for 40 recording current meters based on an instrument developed by the Christians Michelsen Institute, Bergen,

Norway under a NATO contract.

The first of these meters, together with the German meters were used on April 21 when R.V. Clione anchored four recording current meter stations in that part of the Irish Sea lying between Great Ormes Head, the Calf of Man and Anglesey.

The position of each current meter will be marked by a red and yellow striped, tyre-shaped buoy, 6 ft. in diameter, which has the words "MAFF, Fisheries Laboratory, Lowestoft" written on it in black. The steel tower of the buoy carried a radar reflector and a light which gives "Group flash 5 every 20 seconds" during the hours of darkness. On this occasion the instruments and their marker buoys will be out until about May 17 and the scientists would be pleased if fishermen in the area would stay at least $\frac{1}{4}$ mile from each buoy.

(Fishing News April, 1966)

INVESTIGATIONS OFF AFRICA.

Some of the world's most productive fisheries take place in areas of "upwelling," that is along coasts where the prevailing winds blow from the land and transport the surface waters off-shore, so allowing the cool, deep water below to ascend to the surface.

This upwelled water is rich in the nutrients essential to the plants which form the base of the food chain in the sea, and so these areas are extremely fertile. Four are located on the eastern sides of the Atlantic and Pacific Oceans, two in each of the two tropical zones, i.e., off California, Peru, south-west Africa, and north-west Africa (Morocco-Spanish Sahara).

In the Indian Ocean the position is more complex, because the wind system is monsoonal and changes with the season.

The locations of the upwelling regions accordingly change with the direction of the monsoon; the more important areas are off Somalia, in the northern part of the Arabian Sea, and off north-western Australia. Winds that blow from the land are characteristic of desert areas, so

that some of the most fertile parts of the sea are found close to the most infertile parts of the land masses.

The oceanography of the upwelling areas off California, Peru and south-west Africa has been explored to a fair extent and the International Indian Ocean Expedition, carried out recently under the direction of the Intergovernmental Oceanographic Commission, has yielded much information about upwelling in the Indian Ocean.

British scientists from the National Institute of Oceanography, Wormley, Surrey, aboard RRS Discovery, played a major part in the investigations off Somalia and Arabia.

During the period February 8 to February 26 this year further work on the upwelling area off south-west Africa was carried out from HMS Hecla (Captain G. P. D. Hall, RN) by a team from the Fisheries Laboratory, Lowestoft, and the University of Cape Town, under Dr. D. H. Cushing.

The oceanography of the area off north-west Africa, the nearest major upwelling area to Europe, remains the least known, judging by the literature published to date. To remedy this situation, the Fisheries Laboratory, Lowestoft, has started a study of the physical and chemical oceanography of this region.

A cruise there was made by the Laboratory's Research Vessel Clione in June last year. This has now been followed by investigations from HMS Hecate (Commander J. D. Winstanley, R.N.) during the maiden voyage of this, a sister ship of HMS Hecla. The scientific team from Lowestoft was led by Mr. A.R. Folkard, and the area between the Canary Islands and Mauretania was surveyed during the period February 28 to March 9.

(Fishing News April, 1966)

CONSERVATION IN MALAYSIA.

A total of 26 birds and mammals have been declared protected in the three Malayan States of Selangor, Negri Sembilan, and Malacca. The measure took effect from the beginning of December 1965. The penalty for shooting or trapping any of the protected mammals is six months' imprisonment, or a fine of $1,000, or both; the penalty for hunting any of the birds is a fine of $100.

The five mammals on the list are the smooth, hairy-nosed, and small clawed otters, the Malayan wild dog, and the linsang.

The 21 birds are; peafowl, argus pheasant, mountain argus pheasant, peacock pheasant, mountain peacock pheasant, rufous-tailed fireback pheasant, long-billed tree partridge, black wood partridge, crested green wood partridge, ferruginous wood partridge, Malayan chestnut-breasted tree partridge, Campbell's tree partridge, blue-breasted button quail, bustard quail, cotton tea, white-winged wood duck, common teal, gargany teal, whistling teal, shoveller, and Malayan jungle fowl.

(The International Wildlife Magazine London May, 1966)

A helicopter is being used in New Zealand waters to lay nets, lines and crayfish pots and to carry harpoons for shark shooting. This is believed to be the first instance where a helicopter has been used for commercial fishing. A small aluminium boat has been slung under the helicopter and is used in conjunction with it. Lines laid close inshore are winched in by a four-wheel-drive vehicle. It is hoped eventually to lay each day 50 miles of line and 50,000 hooks.

(The Fisherman Autumn, 1966)

STUDY SHEDS NEW LIGHT ON GULF STREAM:

A study of the Gulf Stream now under way by U. S. oceanographers is shedding new light on this mysterious "ocean river." Data obtained during the first quarter of a scheduled year-long investigation, the most intensive of its kind ever attempted, are providing scientists with material upon which more definite conclusions regarding the nature of the Gulf Stream may ultimately be reached.

The undertaking, in which 15 governmental and private groups are participating, is being coordinated by the Institute for Oceanography, a component of the U. S. Department of Commerce's Environmental Science Services Administration (ESSA).

Participants include ships, planes, and scientists of ESSA's Institute for Oceanography, Coast & Geodetic Survey, and Weather Bureau; Naval Oceanographic Office; Office of Naval Research; Coast Guard; Interior Department's Bureau of Sport Fisheries and Wildlife; University of Miami; Duke University; Columbia University's Lamont Geological Observatory; University of Rhode Island; Massachusetts Institution; New York University; and Lerner Marine Laboratory, Bimini, Bahamas.

Although no formal reports have yet been made, preliminary findings disclosed the following:

1. The Gulf Stream expands and contracts like a living thing, but with an apparent irregularity that so far defies prediction.

2. The stream fluctuates like an undulating body. During the initial three-month period of the study (September through November), the position of the stream fluctuated as much as 250 miles, changing at times 15 to 20 miles a day. From September, to October, a fluctuation of 200 miles was measured; from October to November, about 100 miles. The studies revealed that the stream's course varied more and more the farther it went from the North American coast.

This extensive fluctuation was observed about 800 miles out to sea from Cape Hatteras, N.C., where the giant stream veers north-east toward Europe after flowing up the U.S. coast from the Straits of Florida.

3. In that area, the stream was found to migrate in northerly and southerly directions. After leaving Cape Hatteras, the stream proceeded north to about the same latitude as New York City, then veered south about 150 miles to the latitude of Washington, D. C., then north again some 210 miles to the

latitude of Boston, then south once more approximately 150 miles to the latitude of Philadelphia.

4. These sharp fluctuations in the stream's course are known as meanders. The meander which fluctuated between Washington and Boston was observed in October. By November, the stream had apparently straightened out considerably, for the October meander was no longer so pronounced.

5. From time to time, part of a meander will break off, forming an eddy. The eddies remain unconnected with the stream until they disappear. One eddy 60 miles in diameter was discovered in September south of the stream (none has yet been found to the north). It whirled counterclockwise around its 180 mile circumference at a speed of about one-third revolution per day.

6. The stream is detected most readily after it leaves Cape Hatteras at a depth of about 600 feet, where the temperature changes rapidly across the stream. The maximum surface current appears to lie above the region where the temperature at this depth is 15°C. (59°F.). Oceanographers call it the 15-degree isotherm and regard it as the main velocity axis of the stream. The 15-degree isotherm indicates the location of the "cold wall" forming the edge of the stream.

7. There is evidence that the stream extends to the bottom of the sea, even after it leaves the relatively shallow water (about 2,400 feet) over the Blake Plateau and proceeds northeastward over the deep sea. The Blake Plateau is a flat underwater shelf off the South Carolina coast.

One oceanographer theorized that the stream assumes a champagne-glass shape (Minus the bottom) as it leaves the Blake Plateau. It is broader on the top and then narrows towards the bottom. He based this hypothesis on bottom current measurements and mathematical computations.

The study, which will continue into next summer, is being concentrated in these areas: Off Miami, Fla.; between the Straits of Florida and Cape Hatteras off Charleston, S. C.; and in the North Atlantic from Cape Hatteras out into the ocean to the area south of Nova Scotia.

When the study is completed, scientists will have a much better understanding of the great stream which, when it leaves the Straits of Florida, is like a mighty river discharging one hundred billion tons of water each hour. It has been calculated that the Gulf Stream flow is 22 times as large as all the rivers of the world.

(Commercial Fisheries Review April, 1966)

OCEANOGRAPHY - ANTARCTIC OCEAN BIOLOGICAL STUDY.

Three marine scientists from the Institute of Marine Science, University of Miami, are participating in the first phase of a new intensive study of the Antarctic Ocean. They left Miami on January 12 for Punta Arenas, Chile, where they boarded the U. S. Coast Guard icebreaker Eastwind for the expedition into the south polar seas.

Sponsored by the National Science Foundation (NFS), the work of the scientists consists largely of collecting and studying yeasts and other fungi and phytoplankton (planktonic plants.) These microscopic organisms play a vital role in the cycling of nutrients in the ocean. The Antarctic Sea is an area of great productivity. Its nutrient-rich waters support a prodigious quantity of animal life ranging from the tiny creatures of the plankton to the penguins, seals, and whales. The role of microscopic fungi in the great chain of life in the sea will be studied.

The Eastwind left Chile on January 16. After crossing the Drake Passage, the ship will stop at Palmer Station on Anvers Island, near the Antarctic Circle. One of the scientists will leave the ship there and remain at Palmer Station for five weeks making collections of terrestrial and inshore fungi. He will utilize the laboratory facilities recently set up by the U. S. Antarctic Research Program.

In the meantime, the other two scientists will collect fungi and phytoplankton from the waters off the Palmer Peninsula, which juts out from the continent of Antarctica in the direction of South America, 700 miles away. They will be accompanied by scientists from NSF, the Smithsonian Institution, Florida State University, and the University of Hawaii, who will study deep-water corals, birds, insects, bacteria, and bottom sediments.

The cruise was scheduled to end in early March. Later that month, 2 of the scientists were to join the NSF's research vessel the USNS Eltanin for a second cruise in Antarctic waters from Chile to New Zealand.

(Commercial Fisheries Reveiw Arlington April, 1966)

FISHING FLEET EXPANSION PLANNED FOR 1966-1970.

The Soviet Union plans to add 1,500 vessels to her fishing fleet during the 5-Year Plan (1966-1970). Most of those will be built in domestic shipyards, but foreign purchases (especially from Eastern Europe) will also be numerous. The additions will consist of 13 different classes. Among the larger types of vessels, the following planned additions are known: 150 large stern freezer trawlers (Maiakovskii class from U.S.S.R. and Kosmos class from Poland), 100 large tropical stern trawlers (Tropik class from East Germany), a 40,000-gross-ton giant fishing mothership (Vostok class, now being built at Leningrad), 145 refrigerated fish carriers (many purchased in Western Europe), undetermined number of floating fish factories (U.S.S.R., West German, and Japanese construction), and others. Soviets admit that "there is not enough room" on existing fishing grounds for all of these vessels, and say the only way to successfully use the new additions is for them "to conquer new, unexploited fishing grounds." Most of these would be in the South Atlantic, South Pacific, and Indian Ocean. During the next 5 years, there probably will be increased Soviet fishery research effort, increased pressure on world fishery resources, and more joint Soviet enterprises with other nations.

(Commercial Fisheries Review Arlington April, 1966)

GROUNDFISH EXPORTS TO AUSTRALIA.

Three Nova Scotia firms have begun shipping groundfish to Australia. One hopes to sell a million pounds of fish to Australia in 1966. Another one exports to Australia all flounder in excess of its needs for the domestic market, and the third firm has been selling groundfish, mostly sole, to Australia since 1964. A representative of one of the firms said cod, flounder, and ocean perch are very well received in Australia. He explained that the Australian preference for those species may result from the large number of European immigrants who are used to eating Atlantic fish.

Canadian sales success in Australia could be at the expense of frozen fish products now shipped to Australia from Europe. The Canadians have comparatively low shipping costs via the Panama Canal and consider

themselves competitive with European producers.

A Nova Scotia firm said it was cheaper to ship to Australia than to France because of routing problems to France. Monthly refrigerated vessel service is available between Halifax and Australia. (United States Consulate General, Halifax, January 6, 1966.)

(Commercial Fisheries Review Washington March, 1966)

ANTARCTIC WHALING OPERATIONS 1965/66.

Japan, U.S.S.R., and Norway are operating 10 whaling fleets in the 20th (1965/1966) Antarctic Whaling Expedition. This is a reduction of 5 fleets from the 19th (1964/1965) Expedition. Of the 10 fleets, 3 Japanese fishing companies have 5 fleets on the grounds instead of the 7 operated last year. The fleet reductions followed the action taken by the International Whaling Commission in reducing the international Antarctic whale catch from 8,000 blue-whale units (informally set by Antarctic whaling countries) for 1964/1965 to 4,500 blue-whale units for the 1965.1966 season.

Japan's quota for the current year is 2,340 blue-whale units, 52 percent of the international quota. From the beginning of the baleen whaling season on December 15, 1965, to January 8, 1966, Japanese fleets landed 646 blue-whale units producing 11,376 tons of oil. The combined catch of the Antarctic whaling countries (Japan, U.S.S.R., Norway) during that period was 1,006 blue-whale units.

Current season hauls by the Japanese are significantly lower than during the same period in 1964/1965. On January 9, 1965, the catch by 7 Japanese fleets amounted to 1,307 blue-whale units. On a per-fleet basis, the average Japanese catch this year is 129 blue-whale units as compared with 186 last year. The average catch per fleet of the combined fleet (all countries) this year is 100.6 blue-whale units against 136.7 last year. (U.S. Embassy, Tokyo, Japan, January 25, 1966.)

(Commercial Fisheries Review Washington March, 1966)

THE BOUNTY OF THE SEA

Oil polluted waters cause the death of thousands, possibly millions, of sea-birds each year, not to mention death of fish. When birds land on polluted waters, the oil saturates their feathers - destroying buoyancy and insulation, dooming the birds to a lingering death from exposure or drowning.

A great deal of oil pollution comes from regular shipping practices. When returning to refinery ports, tankers pump seawater into about one-third of their tanks to provide ballast and with it goes 60 to 70 tons of oily residue from the tanks.

One American oil company has spent more than a million dollars developing equipment that will separate the oil from the ballast water. This company's tankers no longer dump oil with their ballast water.

This suggests that there is no longer any reason to allow any tanker to dump oily water near shore. The necessary demulsifying equipment costs money, but if one company has developed and installed it voluntarily, why not the others?

- - - - -

More than a million tons of seaweed is harvested each year throughout the world, and Australia too is taking her share. The Australian alginate-extracting company is located at Louisville, near Orford, in Tasmania, and has now reached full scale production. This will cut imports of alginates, which have doubled over the past three to four years. Alginates are used in the food and pharmaceutical, textile printing, and paper industries.

Egyptian crabs, whose eyes revolve through an angle of 360 degrees - and that's not a bad trick either, are helping biologists in their studies of the human nervous system. Eyes of the crabs are balanced at the end of long stalks. Their particularly long optic nerves are ideally suited for the research, which is being carried out in West Germany.

(The Fisherman, New South Wales, 1965.66)