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DEPARTMENT OF PARKS AND WILDLIFE

DEPARTMENT, WESTERN AUSTRALIA

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STAFF NOTES

Captain H.C.W. Piesse, with Mate R.M. Crawford and Assistant Inspector G.R.C. Haynes, brought the research vessel "Lancelin" to Fremantle last month. They left Geraldton at 5.30 p.m. on August 29 and arrived at Fremantle Harbour at 6 p.m. the next day. Captain Piesse reported that rough conditions were encountered south of Jurien Bay. A heavy sea was shipped over the quarter during a squall and caused some damage. The dinghy filled with water and broke loose but was saved and secured after a great deal of effort. Part of the net rack was broken adrift, the trawling tray, 1 grating, trawling davits, blocks and fittings were washed overboard. Some loose equipment was also lost off the after deck, the running gear suffered some wear and tear and some glass and crockery was smashed, but Captain Piesse said that the sail and standing gear stood up well.

Inspector G.C. Jeffery went on board the "Kooruldhoo" at Geraldton to assist Inspector G. Coombes and Assistant Inspector G.H. Lyon to bring her to Fremantle for refit. They left Geraldton at 9.30 a.m. on Friday, August 26, and arrived at Fremantle, after quite a good run, at 3.30 p.m. on Saturday, August 27.

Inspector W. Davidson will commence annual leave on September 12. Inspector Melsom will relieve.

Assistant Inspector M.J. Simpson will resume duties as assistant in the Mandurah district on September 5. Assistant Inspector R.J. Baird, who is relieving there, will begin his annual leave the same day.

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Assistant Inspector B.A. Carmichael is temporarily in charge in the Geraldton district.

Inspector A.V. Green will commence a month's sick leave on September 5. During part at least of his enforced absence, Inspector H.J. Murray will be in charge of the Albany district.

Technical Officer L.G. Smith will visit southern and south-western centres early in September. Later in the month he will leave by road for Shark Bay. Assisted by Inspector N.E. McLaughlan, Mr. Smith will continue his studies on inshore and estuarine fish species.

Cadet Inspector L.W. Duncan is still on the sick list and off duty. His illness appears to be of a somewhat serious nature, and it is not known when he will be able to resume duty.

Technical Officer J.S. Simpson and Mr. B.K. Bowen, of Head Office, visited Pemberton early in August. Later in the month they inspected dams in which trout had been planted in the Pingelly and Mount Barker districts, and attended the annual meeting of the Albany, Denmark and Plantagenet Trout Acclimatisation Society.

Accompanied by Mr. B.R. Saville and Technical Officer J.S. Simpson, the Superintendent attended the annual meeting of the Trout Acclimatisation Council of W.A. at Dwellingup on Sunday, August 21.

Inspector A.J. Bateman will resume duty after annual leave on September 5; the Supervising Inspector (Mr. J.E. Bramley) and Relieving Inspector (Mr. A.K. Melson) will each resume after annual leave on September 12.

TROUT DISTRIBUTION

The annual distribution of trout fry in Perth will take place this year on Saturday, September 10. Orders for 17,500 have already been placed, but a considerable number in excess will be brought up from

Pemberton to cope with the usual last-minute demands. The distributions will again be made at the rear of the State Housing Commission's buildings. Technical Officer J.S. Simpson will be in charge, assisted by Mr. Ian Bartholomew, of Head Office.

WHALE MARKING

Working in conjunction with Mr. R.G. Chittleborough, research officer of the C.S.I.R.O., the research vessel "Lancelin" spent the last two weeks of July and the first week of August in Shark Bay carrying out an interesting whale marking programme. During this period a total of 86 marks were fired. These marks (see figure overleaf) are metal tubes $10\frac{1}{2}$ inches long, each bearing a serial number and inscription. Some of the marks used were of an earlier type which referred to the Colonial Office, London. The marks are manufactured in England and distributed by the British Institute of Oceanography. Any marks recovered on the Australian coast should, however, be returned to the Fisheries Division of C.S.I.R.O., as they will in all probability be those used in the research programme of that Division. A reward of £1 is paid to the finder of a mark.

Whale marks are fired from the shoulder, using a specially built 12-gauge gun. An extreme range of 70 yards is claimed, but for efficient marking a range of up to 30 yards is preferred. The mark usually lodges in the whale's blubber and is recovered during flensing operations at whaling stations. Some marks do not enter the blubber completely: such protruding marks are less effective as they are likely to work out within a few weeks of marking.

The aims of marking whales are twofold: the discovery of migrations and determination of growth-rate. Marking previously carried out by the Discovery Committee (London) greatly assisted British scientists to outline the main groupings and migration routes of the humpback whale. For example, marks fired into humpback whales in Antarctic waters south (and south-west) of Cape Leeuwin have been recovered along the Western Australian coast (up to 17 years later), but not from the eastern coast of Australia. Humpbacks wintering off the

eastern coast of Australia are a separate group which is concentrated in Antarctic waters south of Tasmania and New Zealand during the summer. It is hoped that the present marking will enable further details of the migration pattern to be elucidated.

If calves (14 to 20 feet long) and yearling humpback whales (about 30 feet long) are marked, the recovery of such marks in later years can yield valuable information upon the growth-rate and age at maturity, for the age of such whales would be accurately known.

One mark from the recent marking in Shark Bay has already been recovered from a humpback killed 20 miles south of the point of marking, 2 days later. However, it is hoped that more marks will be recovered in later years.

Captain Piesse, skipper of the "Lancelin", reports that the area of operations was between lat. 24° 31' S. and lat. 24° 45' S. The first whale was marked on July 16 in Geographe Channel. Humpbacks were plentiful in the whole area, as many as 50 being seen on some days, mainly in pairs and in groups of from 3 to 6. The greatest concentration appeared to be in close proximity to Geographe and Naturaliste Channels.

"Lancelin's" maximum speed is 8 knots, and it was feared she would not be suitable for whale marking. However, very little difficulty was experienced in approaching close enough to the whales to record a most satisfactory percentage of hits. Pairs were easier to mark as they moved more slowly than single whales.

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WHALE MARK - $\frac{2}{3}$ ACTUAL SIZE

To facilitate shooting, it was found necessary after the first few shots to rig a makeshift crow's nest from the stem head forward of the rigging. This gave greater elevation and also a greater range.

FREMANTLE - LANCELIN - CERVANTES - JURIEN BAY

CRAYFISHERY

The table on page 148 records the crayfish production figures for all those areas south of the 30th parallel during the 1951/52, 1952/53, 1953/4 and 1954/5 seasons.

From a statistical point of view the production figures appear to indicate that the fishery continues in a reasonably stable condition. However, the table does not and cannot show intangibles such as weather conditions, working efficiency of boats and fishermen, and so on, or many other factors such as size and range of crayfish, which should also be taken into account when postulating the condition of the industry. The most striking aspect of the table is the similarity of the catch-per-man figures in all areas. The difference between the highest and the lowest catch-per-man is only 4%, suggesting that the whole of the area is being evenly fished, that there is no great variation in efficiency and that the fishermen are likely to remain on their former grounds rather than open up new areas through sheer economic necessity.

As has been the case in previous seasons, the number of men actively engaged in the industry continued to increase. This growth in numbers does not appear to have greatly affected the catch-per-man figures, seeing that any decrease or increase in the various areas was consistent with the fluctuations recorded in past seasons. Another pleasing fact is that the catch-per-man over the whole area differs from that of last year by only 4%. At the same time care must be taken when considering these figures, for they involve the addition of averages which could easily mask variations which may or may not be significant.

FREMANBLE - LANCELIN - CERVANTES AREA

	1951/2 Season (15.11.51 to 31.5.52)			1952/3 Season (24.11.52 to 31.5.53)			1953/4 Season (20.11.53 to 31.5.54)			1954/5 Season (20.11.54 to 31.5.55)		
	Total Catch	Average Catch per of man	No. Men	Total Catch	Average Catch per of man	No. Men	Total Catch	Average Catch per of man	No. Men	Total Catch	Average Catch per of man	No. Men
	lb.	lb.		lb.	lb.		lb.	lb.		lb.	lb.	
Fremantle	1,964,673	19,452	101	2,354,509	16,465	143	2,301,532	15,656	147	2,570,729	18,362	140
Lancelin Is.	2,604,364	23,676	110	1,837,073	17,169	107	2,096,619	20,555	102	2,408,763	18,966	127
Green Islets	501,450	20,894	24	331,645	16,582	20	405,025	23,825	17	495,192	19,045	26
Cervantes Is.	1,107,564	22,151	50	572,995	22,039	26	416,708	18,941	22	1,054,183	19,167	55
Jurien Bay	-	-	-	-	-	-	919,667	15,587	59	748,167	18,704	40
TOTALS .	6,178,051	21,677	285	5,096,222	17,217	296	6,139,551	17,952	342	7,277,034	18,734	388

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The Jurien Bay region, which has now been open to crayfishing for two seasons, has again made a useful contribution to the total catch of the area. Although the catch in this area was not as high as last year, the catch-per-man has risen appreciably. The grounds were fished consistently in the first two months of the season, but then many of the catcher-boats moved south to Cervantes Island due to the loss of the processing boat "Shelley Boy". The catcher-boats then supplied the processing boat "L.F.B. Villaret". This must to a large extent be responsible for the increase in production in the Cervantes Island region.

No decision has yet been made in regard to the date of commencement of the next open season, but it is expected that the Fishermen's Advisory Committee will hear evidence on the subject within the next month.

WILD LIFE SHOWS

The Gould League of Bird Lovers, in conjunction with the Naturalists' Club and Government Departments, is organising another Wild Life Show, which has now become an annual event, in the Perth Town Hall, from Monday, September 12, to Saturday, September 17. This Department is again preparing an exhibit and Senior Inspector J.E. Munro will once more have charge of it.

The Australian Inland Mission will open its show at Kalgoorlie the following week. Mr. Munro will transfer the departmental exhibit from Perth as soon as that show closes.

INTERSTATE FAUNA AUTHORITIES CONFERENCE

Arrangements are now practically finalised for the biennial conference which, for the first time, is to be held in Perth. Delegates will arrive on Friday, September 16, and after viewing the Wild Life Show will leave on a country tour of inspection.

They will visit the Dryandra Forest Reserve,

near Narrogin, which is a sanctuary for a number of rare species of fauna, and the Pemberton forest country, and will be conducted over the Pemberton trout hatchery. They will return to Perth on Monday afternoon and that evening attend a dinner in their honour at the Palace Hotel.

The conference proceedings will commence on Tuesday and carry through to Friday. Breaks in discussions will be made to inspect the South Perth Zoological Gardens and to attend a reception to be tendered them by the Lord Mayor of Perth.

A symposium on fauna conservation will be held in the Assembly Room of the Institute of Engineers, 7th Floor, Gladden Building, Perth, at 8 p.m. on Friday, September 23. The symposium will be open to the public and any members of the staff able to attend will be most welcome.

Papers will be presented by Messrs L. Glauert, Director of the W.A. Museum; A. Main, of the Zoology Department of the University of W.A.; V.M. Serventy, on behalf of the Royal Society of W.A.; and Dr. G. Dunnet, of the Wildlife Survey Section, C.S.I.R.O.

WILD DUCK SCORECARDS

There was a very disappointing response from duck shooters to the Department's plea for completion and return of scorecards. The cards, which sought to obtain the number, species and locality where wild ducks were shot, were widely distributed prior to the last open season.

A letter has been sent to all gun clubs in the State requesting them to urge members to complete and forward scorecards, as the information is vitally necessary for the preparation of statistics in conjunction with our wild duck conservation programme. Inspectors are requested to do all in their power to persuade shooters to submit the details of their take during the last open season.

IMPORTANT BAND RECOVERED

An aluminium band inscribed "ANARE AUSTRALIA 2209" was handed in to departmental officers at Houtman's Abrolhos by Mr. Reg. Thomson, a crayfisherman, last July. Mr. Thomson had taken the band from a dead bird washed up on North Island on July 11. With the details of its recovery, it was forwarded to the Wildlife Survey Section, C.S.I.R.O., who passed it on to the Antarctic Division, Department of External Affairs in Melbourne. The director, Mr. P.G. Law, has now advised that the band was placed on a giant petrel, Macronectes giganteus, on February 14, 1954, on West Cape, Heard Island. This band was the first of the giant petrel bands recovered during a bird's second year of flying, and the record was therefore a particularly valuable one. Birds of the same species, ringed on the same day, have been recovered from Possession Island (South-West Africa), Calbuco and Valparaiso (Chile), Tahiti (Society Islands), Portland (Victoria) and Auckland (N.Z.). Mr. Law added that the extraordinary migration of the giant petrel was unsuspected until the present ringing programme was started. He says there is still much to learn about the full extent and nature of its wanderings, and consequently his Division is very interested to hear of recoveries.

TWO NEW SANCTUARIES

In the "Government Gazette" of July 8, 1955, a new sanctuary for fauna was gazetted. It comprises islands and rocks between Penguin Island and Cape Peron in Shoalwater Bay, about 16 miles south of Fremantle. Numbered 24204, this reserve is the first to be vested in the Fauna Protection Advisory Committee of Western Australia, who thereby have been granted complete control of it. The area is an important breeding ground for many sea birds and is the northernmost nesting site of the fairy penguin.

Following representations from this Department, the Under Secretary for Lands has agreed to reserve 15556 being made a sanctuary for fauna. This reserve embraces the whole of Thompson Lake (south-east of Fremantle) and also a good slice of surrounding land. Originally reserved for drainage purposes, it has sheltered a wealth of fauna. As many as 78 species of birds have been recorded there as recently as last

year, and brush wallabies and grey kangaroos are known to exist there.

The credit for the initial representations to have these two areas gazetted as sanctuaries, goes to one of our most active honorary wardens, Mr. W.C. Ford, of Hamilton Hill.

CONTROL OF SPEAR-GUNS

Last month the Minister for Police, Mr. Styants, introduced into Parliament a Bill designed to control the use of spear-guns. One of its important provisions is for the creation of areas wherein the use of spear-guns may be prohibited by proclamation. Emphasis has been placed on safety requirements, in the construction and use of spear-guns, by providing severe penalties for any disregard of these factors. Spear-fishermen will not be permitted to discharge a gun within 50 yards of a person swimming or of anyone fishing with a fishing line. Persons under 14 years of age will not be allowed to use a spear-gun unless they are directly supervised by a person over 21.

The Bill requires police officers and fisheries inspectors to police its provisions.

WHENCE IT CAME

by J.E. Munro.

Twenty years or so ago a young man came to Tom Rann, the well-known boat-builder of Mill Street, Perth, and showed him the drawings and plans of a dinghy.

Tom was most impressed.

The young chap then placed an order and, in due course, the dinghy was completed and lay in the boat-shed ready for delivery. Time went by, but there was no sign of the customer. Tom became worried. The boat represented money and money was what he needed.

Eventually he rang the lad's father, telling him of the boat and suggesting that he remind his son that the craft was ready. Next day an indignant son blew into Rann's boat shed cursing Tom for his stupidity. The boat had been ordered by the son as a surprise birthday present, and now that the cat was out of the bag, the surprise was no surprise. Tom, being the man that he is, told the young chap to go and jump into the river or lake, or something, and, of course, found himself still stuck with the dinghy.

Then Mr. Furniss came on the scene. He wanted a dinghy for Mandurah, "one just like that boat there in the corner of the shed." A deal was made and the boat at last began to see some action. It was then taken to Mandurah where Mr. Furniss had opened up a property along the river, and named it Furnissdale.

Later the little dinghy was sold and resold until finally it was acquired by this Department. That is the history of the Furnissdale; the fleetest, trimmest and bestest dinghy ever to honour the Fisheries Department with its help.

ALLOWANCES

Notification was received from the Public Service Commissioner's Office last month that the following allowances had been increased from July 1, 1955 :-

Eastern States Travelling: Increased by 20/-d a day to 70/-d.

City Hotels: Increased by 6/-d a day to 46/-d.

Relieving Officers: After the first 21 days at 33/-d a day, officers will now be reimbursed 20/-d a day if married or 12/-d a day if single.

Camp Allowance: Where no cook is provided in a departmental camp, an extra 1/6d a day will be paid, increasing the rate for married men to 11/6d a day and for single men to 7/6d a day.

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Boat Subsistence Allowance : Following the increase in the camp allowance as shown in the preceding paragraph, representations were made to the Public Service Commissioner for an increase in the special subsistence allowance payable to inspectors on departmental vessels. Hitherto it had been a margin over the camp allowance of 2/-d a day for married officers and 1/-d a day for single officers.

The Commissioner has pointed out that the existing boat allowance included an additional amount to cover the lack of a cook on our boats. He has refused to approve any general increase in the rates. He has, however, directed that the same margin over the camp allowance (2/-d) should be paid both to married and to single men. As from July 1, 1955, therefore, boat subsistence allowances payable are :-

Married men - 12/-d a day;
Single men - 8/-d a day.

Single officers who have served on a departmental vessel since last July should claim any arrears on their next PSC Form 10.

MARSUPIAL RESEARCH

From Mr. E.H.M. Ealey, research officer of the Wildlife Survey Section of C.S.I.R.O., we have received a report of the progress made in the kangaroo investigations being carried out at Woodstock Field Station in the Port Hedland district. Mr. Ealey's report, which sets out the problems encountered and the work done so far, appears here verbatim -

KANGAROO INVESTIGATIONS

Woodstock Station is situated south of Port Hedland, in an area of rough hill country. The most common kangaroo in our area is the Euro or "hill" kangaroo, Osphranter antilopinus cervinus. The work on this animal has had to be planned to fit in with its seasonal behaviour. The summer rains allow it to be independent of artificial waters, and appear to

cause a dispersal. Although some artificial waters are visited in hot spells during late summer and autumn, sand soaks and water holes are kept well supplied by occasional rain until the winter rains, which occur in a good season, fall. It is not until September that euros begin using artificial waters regularly, so that much of the work must be limited to an intensive period between September and December.

As it was decided to give toxicological experiments priority, pens were built and euros were easily caught in a funnel trap built around a water trough. However these animals died in captivity as fast as they were captured, and so this work has been postponed until we have sufficient hand-reared animals for key experiments.

Before the rains, early in January, techniques were tested for use in the coming summer. Chloral hydrate, administered in drinking water, was shown to be an effective narcotic and a number of animals were examined, measured, ear-tagged and marked with Durafur (a black dye) while narcotised in this manner. Ear tags were observed to be a source of constant irritation, but a heavy plastic collar was unnoticed by a hand-reared animal, and with the addition of Scotchlite can be seen at a distance of 400 yards at night. A programme based on these techniques will be carried out this summer to investigate movements and growth of marked animals.

Emphasis has been on the control aspect of our work, but our main difficulty is in assessing the effectiveness of techniques. Stations that have poisoned thousands of euros regularly each year still have thousands left. Therefore any method must give a very high kill to be any more useful than existing methods. The problem is to estimate the percentage kill. Visual census methods, such as transects at dawn and dusk, are being tested and automatic counters on watering points and salt licks have been devised. A modified type is being tested at present before being used in the poison trials next season, when, with salt as a bait, sodium fluoracetate (1080), and possibly arsenic, will be used.

One of the main features of this year's work has been the sending out of 300 questionnaires to

Pastoralists. We have found pastoralists to take an intelligent interest in vermin problems and are hopeful of obtaining a great deal of information from them on the kangaroo problem.

The water relations of euros are being studied in detail, as the summer watering points are the main places of concentration. All watering places on a study area, some 16 miles in circumference, are being mapped, and as natural waters dry up the expected increase in numbers visiting artificial waters will be noted by automatic counters.

Before we can advise on a control problem, we must have some idea of the breeding rate of euros. A reproductive study, based on monthly samples, is proving interesting. Data has been accumulated from over 200 specimens of euros, and some idea of size at birth, changes during pouch life, size at which juveniles leave the pouch and mature, has been gained. Judging from a hand reared specimen, males may attain the weight of 20 lb. before they are a year old, but are not mature at that age. Because of the peculiar tooth succession, the dental characteristics of these animals are proving a useful guide for age grouping them. The age distribution in a population gives a valuable guide to the efficiency of a control method. A population that is being effectively controlled should be composed mainly of young animals.

It is a simple matter to kill some kangaroos by any one of a variety of methods, but to control them properly presents a complicated problem. However we are hopeful that a period of intensive study will produce practical methods that will hit the euro where it hurts.

TECHNICAL INSTRUCTION FOR STAFF

Arrangements have been made with the Plant Engineer's Branch of the Public Works Department for crews of patrol vessels to be taken over their workshops and receive instruction in the care and maintenance of fuel pumps and atomisers.

Additionally, this month, classes will commence to train patrol vessel crews in navigation, seamanship and cordage.

THE CLEARING HOUSE

How F.A.O. Help Fishermen in their Search for Fish

The contribution of oceanographic research to the fisheries of the world as it affects the distribution, abundance and behaviour of fish, fishing operations and fisheries science is explained in an article in the F.A.O. Fisheries Bulletin (April - June, 1955) by G.L. Kesteven, Chief Biologist, Fisheries Division F.A.O., Rome, and G.E.R. Deacon, Director, National Institute of Oceanography, Wormley, (Surrey).

The fisheries biologist must determine the general characteristics of an area and its fishery stocks, say the authors. This includes the composition of the stocks, identification of species, the general life history of the fish (including feeding, reproduction and migratory habits) and the measurement of potentialities for growth, reproduction and viability.

More Surveys Necessary

Great oceanographic cruises made by Challenger and other vessels have established the major features of present knowledge of marine zoogeography, but "there remains much to be done to enable us to evaluate unexploited areas in a way that will give fishermen the information they need to plan the development of fishing operations."

There is an urgent need to assess the natural abundance of stocks. The authors quote as a practical example of this problem the situation existing in the Arabian Sea east of Somalia. Somali fishermen have caught tuna there for many years and small canneries have processed the catch for the export market. Now the canneries would like to extend their operations and the question arises as to whether there are sufficient and accessible stocks of tuna living in the Somali coastal waters.

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The authors point out that it is not sufficient merely to establish that there are more fish available. Cannery operators need to have some indication of the actual numbers likely to be available so that they can provide sufficient fishing boats and the extra gear as well as instal more processing equipment to handle the catch.

Preparing for a Storm

It has been stated that fish move away from shoal water before the approach of storms and heavy swell, and that they feed voraciously just before storms; it is even asserted that fish are aware of impending earthquakes. But evidence is meagre and the phenomena provide a challenge to oceanographers and fishery research workers, says the article.

"As oceanography and fisheries science advance it will always be wise to consider whether more knowledge of the behaviour of the fish, or of the craft and gear, in different weather conditions, can be used to reduce loss or damage, as well as the time spent on unproductive effort.

"Methods of predicting waves and swell, and of obtaining warning of their approach, have probably arrived at a stage where they might be used to prevent journeys to offshore banks at a time when the swell found there is too high for fishing; they might also help to prevent damage to moored or beached craft. There is also much to be learnt about the actual operation of underwater gear and the reactions of the fish under different conditions, and fresh opportunities are offered by the new methods of underwater observation, photography, cinephotography and television.

("The Fishing News" London, July 15, 1955.)

Let's Farm the Sea NOW!

A farmer's view on fishing

Enormous sums of money are being spent on research in an attempt to revolutionise commercial fishing, and various experiments are being carried

out to find ways and means of simplifying large scale fishing operations.

In spite of all that has been and is being done in this direction, it seems to me, as a mere farmer, that the job is being taskled in the wrong way. The most modern fisherman, using the most up-to-date equipment, is on a par with the bow and arrow hunters of a bygone age on land.

A wastage

A farmer can protect his herds and flocks from natural predatory animals that would otherwise prey upon them, and without such protection, modern animal husbandry would be impossible.

Can you imagine a farmer breeding sheep to feed wolves? Or a poultry farmer raising chickens to feed foxes? But what goes on in the sea? Out of the 16,000 known species of fish that live in the sea, about 200 are useful, and a mere seven or eight species have any real commercial value. The seas are much too vast for man to have any hope of killing off the useless species in order to give the others a better change of survival.

Experts have estimated that a pair of mature Dover soles will spawn 2,500 baby fish in a single breeding season under natural conditions in the ocean, but only about 4 per cent of these survive, the remainder being gobbled up by fish with cannibal habits. What a shocking wastage!

Try the Dover sole

Experiments have been carried out in some of the land-locked sea lochs in Scotland in the breeding and rearing of plaice, but success was limited due to the presence in those lochs of cannibal fish that gobbled up the fry. But one important fact emerged. Marking of the fish proved that a fish that did not need to search for its food made as much growth in one year as it would have made in 4 years under natural conditions in the ocean.

Now here we are, living on an island completely surrounded by sea water, with large tracts of

land in coastal areas unsuitable for the cultivation of land crops.

Would it not be possible to use this land for the development of gigantic sea fish farms? Obviously, such fish farms would be suitable only for the kinds of fish that like shallow water, and much would have to be discovered about the breeding habits of such fish. The water would have to be filtered to remove the ova of unwanted cannibal fish. The expense of concreting large basins for this purpose would not be prohibitive when it is considered that the bulk shingle required is lying on the beach waiting to be used. The advantages of breeding and rearing delectable fish like Dover soles should be obvious. If the conservation rate could be increased from 4 per cent to 40 or 50 per cent, taken together with the increased growth and weight that feeding could produce, then experiments along these lines should be started without delay. A pilot plant could be built for the cost of a couple of modern trawlers. The hazards of fishing would be reduced to the normal occupational risk of any job on shore, and orderly marketing of fish would ensue, without wide price fluctuations and bad weather shortages.

It's done overseas

Fish rearing of fresh water varieties has proved a success in China and South-East Asia. Carp rearing has been in progress on the continent for many years, and recently thousands of fish farms have started up in North America. In fact about one-fifth of all edible fish sold are taken from fresh water, and yet the sea covers about three-quarters of the surface of the globe. Those enterprising people who have made a success of breeding and rearing fresh water fish had to start from the beginning.

We are constantly being reminded of the fact that we cannot feed our island population from our own agricultural resources. Why don't we attempt to breed and rear Dover soles?

Donald MacDonald

("World Fishing"

London

July, 1955.)

YES - A Pilot Scheme is Justified

A fisherman replies to Mr. MacDonald

As a fisherman my first reaction to a suggested scheme for the commercial breeding of sea fish was, not unnaturally, somewhat sceptical. After spending some years and a good deal of money in finding and catching an uncertain quantity of fish, it comes as somewhat of a shock to find a landsman proposing to ensure a regular supply without having to do either!

However, there is little doubt that certain types of demersal, or bottom feeding, fish would lend themselves admirably to such a scheme, and of these fish the sole would seem to be best suited, both by virtue of its high market value, its feeding habits, and its ability to thrive in varying water salinity, temperature or depth.

Such a fish is not dependent on water borne plankton for its food, but lives on marine worms, shrimps or crabs, so that the question of the number of fish per cubic unit of water is one only of "domestic comfort", as artificial feeding could be employed. The fact that the fish would receive a regular balanced diet, without expending a great deal of energy in hunting and catching its food, should result in far more rapid growth, and improved quality of flesh. It is conceivable too, that once in operation, the scheme would provide its own fish meal from waste products of filleting, which could form a basis for such a diet.

It is upon this rapid growth, plus the immense increase of reproductivity brought about by controlled fertilisation, hatching and protection of brood, that the success of such a scheme may well depend, while the advantages on the marketing side are obvious.

The effect on the inshore and near water fishermen may, I think, be discounted. The rapid growth in popularity of the frozen fillet should greatly increase the demand for fresh flat fish, and the produce of a "fish farm" could well be handled on the spot by a deep-freeze plant facilitating

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despatch and packing, and ensuring some return from bones and skins in the form of by-products.

As regards the economies of such a "farm" that is a matter for the marine biologist and mathematician, though much could be ascertained by controlled tests on a small scale. There is no doubt that a considerable tank area would be necessary to support the number of fish required to maintain adequate stocks throughout the year, and the initial cost of building these tanks would be far from small. Added to this the cost of pumping, and filtering sea water, fish food, and the processing of the fish must be taken into consideration. A formidable capital outlay, but should tests and figures show promise, a pilot scheme even on a national basis may well be justified. There is considerable Government concern over the conservation of fish stocks. Perhaps here is a tailor-made solution to more problems than are immediately apparent.

("World Fishing"

London

July, 1955.)

How Refrigeration at Sea Best Protects Tuna Quality

by Lionel Farber

For raw tuna the preservation procedure leading to the least changes in the appearance and physical state is refrigeration. The changes which can occur during the improper refrigeration of tuna and some practical recommendations to prevent these deleterious changes in the raw fish are briefly outlined in the present paper.

In order to avoid or minimize the adverse changes which may occur during improper refrigeration, and which are given in a later section, the following operating procedures during freezing and storage are recommended. These have been developed from experiments in the laboratory and from trials on commercial tuna boats.

Freezing

1. A rapid removal (within 8-10 hours) of the heat of the tuna with a reduction in the temperature

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of the inside flesh to about 28° F. by immersion in prechilled sea water constantly kept at this temperature.

2. Possible storage at this temperature for a maximum of 7 days, provided the temperature is maintained with no fluctuations.

3. The chilled seawater is removed and a dense sodium chloride brine of 20-23% salt at about 0° to -5° F. is put on the tuna and kept re-circulated with no temperature rise until the tuna have been frozen and their temperature is close to that of the brine.

Storage

1. The tuna should be stored at a temperature no higher than 10° F., preferably around 0° F. Then storage temperature must be kept constant at whatever value is chosen, otherwise most of the advantages obtained from the rapid chilling and freezing will be lost.

2. The storage medium can be either the cold dense brine or cold air. On prolonged storage in air there is a possibility of fatty changes leading to rancidity and off-odors and off-flavours and an opportunity for drying out of the outer layers of the tuna to occur. Brine storage may facilitate the removal of the tuna from the wells with a reduction in loss from broken fish.

The various steps of the recommended procedure were devised and suggested in order to prevent the following changes which may result from improper freezing and storage of tuna.

Possible de-grade

Improper freezing and storage of tuna aboard the fishing vessel may result in down-grading the catch as result of the following conditions :

1. Mechanical rupture of muscle cells by large sharp-pointed ice crystals, allowing water with dissolved cell constituents to escape.

2. Breaking up of the semi-gelatinous structure

of the muscle cell contents, with a separation of part of the protein as discrete insoluble clumps and the formation of a liquid containing such substances as salts and flavor-contributing substances.

3. Loss of this liquid containing the various nutritive and flavoring substances from the broken muscle cells on thawing.

4. Changes in fat resulting in the production of rancid odors and off-flavours.

5. Penetration of salt into the flesh resulting in a toughening of the meat and a decrease in its palatability and the possible formation of off-colours by the release of and changes in the red blood pigment, particularly around the larger blood vessels. The addition of salt to a warm brine-tuna mixture followed by a slow lowering of the temperature is a practice that must be avoided to prevent or minimise the changes mentioned.

6. Dehydration of the tuna flesh by the loss of free liquids and during exposure to fluctuating storage temperatures.

7. Shrinkage of the meat and loss in total weight as a result of salt penetration and other effects.

The above changes all add up to a detrimental change in the physical state of the flesh, a decrease in palatability through a toughening of the texture and a loss of the savory flavouring substances, leaving a dry, flat-tasting, woody material, and under certain adverse conditions, resulting in the formation of off-odours, and off-flavours, through such changes as fat breakdown and rancidification.

Thawing

The above recommended procedures are designed to eliminate the possibilities of :

1. Spoilage during the initial chilling of tuna to about 28° F.

2. The formation of large jagged ice crystals within and without the muscle cells.

3. The disintegration of the semi-gelatinous structure of the muscle cell contents with the formation of insoluble denatured protein and a free fluid portion.

4. The loss of nutrients and flavour-contributing substances by the escape of this free liquid portion of the broken cell jelly on thawing (drip).

5. The occurrence of changes in colour of the tuna meat and of changes in the fats leading to off-flavours and off-odours, and

6. Shrinkage and loss in weight of the tuna as a result of all these changes.

The thawing process can be regarded as the reverse of the freezing one. Harmful effects, similar to those occurring during the freezing operation, can occur in tuna flesh as its temperature is raised and the thawed state is reached. Accordingly as far as is known at present, the thawing operation should be as rapid as possible, particularly through the temperature zone of maximum change, from just below the freezing point of the flesh to just above 20° F.

Quality Protected

The above information summarises the current knowledge regarding the freezing, and to a lesser extent the thawing, processes and its practical application. As newer refrigeration media and practices become available, the above operating suggestions can then be modified to take advantage of them.

The prevention of the deleterious changes outlined above will lead to a product which, after undergoing the proper thawing operation and canning procedures, will be as nutritious as the original unfrozen tuna, and which will have an attractive texture and a satisfying savoury taste. In other words, the product will be one which can be said to have quality in every respect. This is the ideal towards which everyone in the tuna industry should strive.

("Pacific Fisherman" Portland, Oregon. July, 1955.)

Echo Sounders and New Rods Bring Success
to Durban Boats

In one of the most encouraging developments in the recent history of South Africa's fishing industry, the use of echo fish finders and of special deep sea fishing rods has brought new prosperity to Durban-based boats engaged in line fishing off the Natal and Zululand coasts.

About six months ago, the first of the local boats were fitted with "fish finders". This corresponded closely with the substitution of the familiar handlines by heavy duty glass fibre rods, heavy nylon line and special 9-inch diameter reels.

The first half year's use of echo sounding equipment for the location of fish, has confirmed most graphically the richness of grounds off the coast. For many years it has been held - but up to now not really proved - that fish abounded between the Portuguese border and down to East London.

But it has taken the "fish finders" to prove it not only pictorially (the records left by the equipment of shoals of fish) but practically through substantially improved catches.

In addition, new "banks" have been found at various points on the 300 miles and more between East London and Cape Vidal and the "picking up" of known banks is a matter of ease as there is no longer need to get a "fix" from landmarks, often hard to pick up in poor visibility.

A further development that has come about since the use of this equipment is that 74's formerly regarded as "seasonal" fish, have been caught regularly and in appreciable quantities "out of season". In the "warm" months from January to March in the past, soldiers and slingers have formed the bulk of local fishing craft's hauls.

Now it is possible to fish the deep banks on which 74's are freely found with the result that this high class fish is now being taken almost to the exclusion of other fish. Barracouda, too, are being caught in increasing quantities.

Deep Sea Rods

By using heavy deep sea rods, fishermen have not only more control but the nylon lines (nothing less than 100 lb. breaking strain is used) do not offer the same resistance to strong flowing currents as the former cotton lines.

Using only 1½lb. sinkers (5 lb. was the weight needed to take the cotton lines to the bottom), it is possible now to fish in conditions which, with the older type of line, would have made fishing impossible.

It is believed that the use of these rods, and the equipment employed generally, is considered unique for commercial fishermen.

Rods have proved especially valuable when barracouda have "run". An experienced fisherman told the South African Shipping News that, with rods, more fish were taken more quickly than would have been possible with the old handlines in use.

Proof of this was supplied early in May when the fishing vessel Heathfield took 3,500 lb. of barracouda on the one day and more than 4,000 lb. on the second. With handlines nothing like this total could have been brought aboard.

The same vessel when operating off the Zululand Coast "located" what to date is the largest single shoal of fish yet "picked up". With the fish finder operating a large shoal (thought most likely to be 74's) was registered on the graph.

A start was made to fish but the fish were not biting so the Heathfield moved on. The shoal was still recorded and after a while a further effort was made to fish but they again would not feed.

One of her crew said: "We caught a few 74's as we stopped to fish but not in sufficient numbers to continue fishing. But for ten miles, we still had this huge shoal under us. I'm sure that they were not moving with us for they are not fast travellers.

"At times they were shown in a solid "bank"

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of fish up to 30 feet thick lying in about 300 feet of water. The fish finder may locate them all right, but it does not make them bite if they are not so inclined. That is one of the things that has to be considered when people hear of this tremendous shoal. They are there but still have to be caught."

Note: Soldiers, 74's and slingers are all very closely related to the snapper and bream of Western Australia. The barracouda is very close to our pike.

("South African Shipping News" Cape Town. June, 1955.)

Fishing Rights and Limits Discussed

The International Law Commission has been engaged in discussions aimed at ending the old dispute over the extent of territorial sea limits.

Britain and the United States want a three-mile limit, the Scandinavian countries want at least four miles, and Yugoslavia is pressing for six miles.

Russia in practice applies a 12-mile limit, and Chile, Peru and Ecuador claim that their territorial waters extend 200 miles out to sea.

On June 14 the Commission adopted a provisional ruling that, without taking any decision as to the question of the proper extension of the territorial sea, it "considers that in any case, international law does not justify the extension of the territorial sea beyond 12 miles."

On June 22 the Commission adopted an article aimed at protecting the territorial waters of countries whose coastline is deeply indented, by providing that in special circumstances these waters be calculated from a straight base line between appropriate points on the coast, disregarding the low-water mark from which the boundary is usually measured.

Britain, the United States and France voted against the proposal.

In view of their importance to world fishing interests we give in full the clauses on fishing included in the International Law Commission's draft on "the regime of the high seas."

These clauses on fishing really constitute new legislation rather than a summary of established rule as is the case with much of the other sections now codified.

The preamble to the section on fishing, has still to be exactly worded, according to the correspondent of The Times but it will proclaim the obligations of the States to respect the right to fish. That right is subject to treaty commitments and to the provisions in the draft articles hereafter recorded relating to the conservation of the living resources of the high seas.

Proposed Articles

The articles, which will now be referred to the Governments concerned, are as follows :-

Article 29 - A State whose nationals are engaged in fishing in any area of the high seas where the nationals of other States are not thus engaged, may adopt measures for regulating and controlling fishing activities in such areas for the purpose of the conservation of the living resources of the high seas.

Article 30 - If the nationals of two or more States are engaged in fishing in any area of the high seas, these States shall, at the request of any of them, enter into negotiations in order to prescribe by agreement the measures necessary for the conservation of the living resources of the high seas.

2. If the States concerned do not reach agreement within a reasonable period of time, any of the parties may initiate the procedure contemplated in Article 35.

Article 31 - 1. If, subsequent to the adoption of the measures referred to in Articles 29 and 30 nationals of other States engage in fishing in the same area, the measures adopted shall be applicable to them.

2. If the State whose nationals take part in the fisheries do not accept the measures so adopted, and if no agreement can be reached within a reasonable period of time, any of the interested parties may initiate the procedure contemplated in Article 35. Subject to paragraph 2 of Article 36 the measures adopted shall remain obligatory pending the arbitral decision.

Article 32 - A coastal State having a special interest in the maintenance of the productivity of the living resources in any area of the high seas contiguous to its coasts, is entitled to stage any system of research and regulation in that area, even though its nationals do not carry on fishing there.

Article 33 - 1. A coastal State having a special interest in the maintenance of the productivity of the living resources in any area of the high seas contiguous to its coasts, may adopt unilaterally whatever measures of conservation are appropriate in the area where this interest lies, provided that negotiations with the other States concerned have not led to an agreement within a reasonable period of time.

2. The measures which the coastal State adopts under the first paragraph of this article shall be valid as to other States only if the following requirements are fulfilled :

- a) that scientific evidence shows that there is an imperative and urgent need for measures of conservation;
- b) that the measures adopted are based on appropriate scientific findings; and
- c) that such measures do not discriminate against foreign fishermen.

3. If these measures are not accepted by the other States concerned, any of the parties may initiate the procedure envisaged in Article 35. Subject to paragraph 2 of Article 36, the measures contemplated shall remain obligatory pending the arbitral decision.

Article 34 - 1. Any State even if its nationals are not engaged in fishing in an area of the high seas not contiguous to its coasts, but which has a special interest in the conservation of the living resources in that area, may request the State whose nationals are engaged in fishing there, to take the necessary measures of conservation.

2. If no agreement is reached within a reasonable period, such State may initiate the procedure contemplated in Article 35.

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Proposed Arbitration

Article 35 - 1. The differences between States contemplated in Articles 30, 31, 33, and 34 shall, at the request of any of the parties, be settled by arbitration, unless the parties agree to seek a solution by another method of peaceful settlement.

2. The arbitration shall be entrusted to an arbitral commission, whose members shall be chosen by agreement between the parties. Failing such an agreement within a period of three months from the date of the original request, the Commission shall, at the request of any of the parties, be appointed by the Secretary-General of the United Nations in consultation with the Director-General of the Food and Agricultural Organisation. In that case, the commission shall consist of four or six qualified experts in the matter of conservation of the living resources of the sea, and one expert in international law, and any casual vacancies arising after the appointment shall equally be filled by the Secretary-General. The commission shall settle its own procedure and shall determine how the costs and expenses shall be divided between the parties.

3. The commission shall, in all cases, be constituted within five months from the date of the original request for settlement, and shall render its decision within a further period of three months, unless it decides to extend that time limit.

Article 36 - 1. In arriving at its decisions, the Arbitral Commission shall, in the case of measures not unilaterally adopted by coastal States, apply the criteria listed in Article 33, paragraph 2, according to the circumstances of each case.

2. The commission may decide that pending its award the measures in dispute shall not be applied.

Article 37 - The decisions of the commission shall be binding on the States concerned. If the decision is accompanied by any recommendations, they shall receive the greatest possible consideration.

In commenting on the proposals, The Times correspondent added :

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"It is strongly hoped that those Latin American countries which have claimed a territorial sea up to 200 miles will be persuaded to moderate their pretensions now that their demand for the conservation of the fisheries off their coasts has been met. The organisations that were represented at the Rome conference on fisheries will be invited to comment on the provisions."

("The Fishing News" London July 8, 1955.)

New Use for Wet Fish Scrap

Canada's pigs and chickens may soon be growing fat on rations fortified by a product under test by the Atlantic Fisheries Experimental Station of the Fisheries Research Board of Canada at Halifax, in conjunction with the Experimental Farm of the Department of Agriculture at Nappan, N.S.

One of the Board's functions is to help prevent the waste of any fishery product. Fish meals and fish oils, of course, are long established by-products, but during the past year the feeding of wet fish scrap has been tested in Nova Scotia. Several large batches of ensilage were prepared from cod and haddock offal, preserved by means of sulphuric acid.

This silage was fed, in varying amounts, with the regular grains to young growing pigs and chicks at the experimental farm. The results of these feeding tests were considered successful, but further experiments are being carried out to determine just how the new product can best be utilised by pig and chicken farmers.

("Fishing Gazette" New York June, 1955)