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DEPARTMENT OF PARKS AND WILDLIFE

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DEPARTMENT OF FISHERIES AND FAUNA
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DEPARTMENT OF FISHERIES AND FAUNA

MONTHLY SERVICE BULLETIN

THE A.B.C. PROVIDES RADIO TIME

FOR DEPARTMENTAL OFFICERS

The A.B.C. has agreed to set aside 5 minutes of its "Country Hour" broadcast on the second Tuesday of each month at 12.48 p.m. for talks to be delivered by officers from this Department. A roster of speakers has been prepared for the next twelve months.

The Director, in his broadcast on January 9, spoke on the management of a marine fishery resource. He touched on some of the problems of managing a marine fishery resource which is being exploited by a large number of fishermen.

Herewith is the text of Mr. Bowen's address :-

"Unlike a piece of agricultural land, the sea can not be fenced off into plots with each plot belonging to a fisherman. In other words a marine fishery is a common property resource with all fishermen having an equal right to fish a preferred area of the sea. It follows, that no one fisherman can decide to manage an area of the sea and be sure that he will reap the reward of his own management decision. If, for instance there is no legal minimum length at which a particular fish may be taken, a fisherman's decision to return small fish to the sea, so that they can be harvested at a larger size, will be of little value if the next fisherman who catches that fish decides to retain it in his catch.

Because of this and other similar problems, the Government has to be the sole management agency, and implant on industry regulations which will ensure that the fishery resource is exploited in a rational manner. One of the most common regulations introduced is, of course, the legal minimum length so that a species of fish is harvested at a size which gives the best yield in terms of total body weight. This is what we call rational exploitation.

However, if the fishery resource is very valuable, like our Western Australian crayfishery, the mere fact that a legal minimum length has been introduced does not necessarily mean that the fishery will not be in danger of over-exploitation, or, as it is often called, over-fishing. The crayfishery is an excellent example of a fishery which will always attract a very large number of fishermen. Consider these characteristics of this important resource : It is close to the centres of population - Fremantle and Geraldton; each individual crayfish has a high value; the market in America will absorb every crayfish caught; and the capital cost of entry into the fishery is relatively low.

Given these characteristics, it is not surprising that the fishing pressure on the crayfish resource rose sharply during the 1950's and early 1960's. Because this trend was likely to harm the crayfish stocks, the Government in 1963, decided to stop any further increase in the number of boats. This limitation of effort is another regulation used to ensure rational utilization of a marine fishery resource.

However, at just what point in the development of a fishery the right of entry should be limited is, of course, a very difficult decision and even when right of entry is limited, the skippers of those boats already in the fishery will make every effort to increase their efficiency to take a greater share of the resource. So, the fishing effort is likely to rise even though one set of regulations has been introduced in an attempt to stop this rise. The management agency is then faced with further problems; Should the efficiency of each boat be maintained at a low level to ensure that the total fishing effort of the whole fleet does not increase, or should the efficiency be increased to a maximum and the Government find other ways of overcoming the trend to over-exploitation?

Because of the common property nature of a fishery resource, these decisions can not be made by individual fishermen. In the final analysis the Government has to introduce the required regulatory measures. But, by and large, the measures have to be acceptable to industry and, therefore, Government and industry have to work closely together to produce a set of rules which permits a fishery resource to be exploited but not over-fished.

How do we achieve this contact with industry in Western Australia? There are two ways, both of which are effective. The first is communication with fishermen by members of our staff; for instance, inspectors in the districts seeking the views of individual fishermen, technical officers gathering information from industry, and research officers planning and undertaking research programmes. The second is through industry advisory committees which bring to the notice of the Department of Fisheries and Fauna the views of the fishermen comprising the industry."

The Fauna officer Mr. H.B. Shugg will be the next speaker on February 13, followed by Mr. J.P. Robins, Senior Research Officer (Development) on March 12.

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'Tis not what man does which exalts him, but what man would do.

Browning

DEPARTMENTAL PUBLICATIONS

The Department, in its effort to promote its work, has produced a further two publications.

The first booklet explains what the Fisheries and the Wildlife Management Research Officers do, and why. It indicates the qualities needed to become a successful research officer in the Department of Fisheries and Fauna and sets out details of cadetships which are offered in the Western Australian Public Service. Its main aim is to assist young men and women to gain a clear appreciation of the activities of these research officers before deciding on their future careers.

The other titled "Wealth of the Sea", was produced for the Government of Western Australia and contains a pictorial coverage of the Western Australian fishery. The editorial content deals with the resource, exploitation, the migration journey, boats and gear used, harbour facilities available, the processing of the catch, marketing, and law and the sea, research programmes and a historical background to fishing in Western Australia.

GENERAL FISHERIES ADVISORY COMMITTEEVISITS MANDURAH

In January 1967 the General Fisheries Advisory Committee held its first meeting in Albany and surrounding areas, visiting centres as far east as Bremer Bay. The committee has held previous meetings at Carnarvon, Shark Bay and Perth.

On Monday January 15, 1968 the Committee visited Mandurah, and met with the Mandurah Shire Council and the Mandurah Licensed Fishermen's Association. Items discussed included the marketing of fish, drop nets used by amateurs for catching crabs, sale of fish by amateurs, closure of Golden Bay to net fishing, and that cray-fishermen be confined to the fully protected crayfish industry and boats so engaged be dis-allowed to do long line and net fishing for shark and other fish during the crayfish season.

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I always make the first verse well, but I have trouble making the others.

J.B. Moliere

ADDITIONAL INSPECTION STAFF APPOINTED

The Department recently employed four temporary Assistant Inspectors from outside the Public Service in anticipation of future vacancies. Frequently inspection centres have not been fully manned, due to promotions and resignations, causing a greater burden to be carried by the officers stationed at some centres. In due course when permanent positions become available, these additional appointments could lead to permanent employment of officers already trained in inspectorial duties.

PERMANENT EMPLOYMENT OF MARRIED WOMEN

In a recent circular the Public Service Commissioner advised that the Public Service Act has been amended to provide for the permanent employment of married women in the State Public Service. The Public Service Commissioner has now authority to :-

- (a) approve of an officer continuing to hold office after her marriage,
- (b) appoint a married woman to an office in the Public Service, and
- (c) terminate, at any time, the appointment of an officer who has been continued in office after her marriage.

Should any officer require further details, these are available on application from the Public Service Commissioner's Office.

AERIAL TUNA SURVEYS

The first in a series of aerial tuna surveys conducted by this Department ended with the flight made in January 1968. A report on this flight together with a report on the observations made during December 1967 will be published once the detailed information has been prepared.

* * *

Two Companies, one from America and the other from Australia have formed a partnership to build and operate an abalone canning factory at Maragate, Tasmania. It is planned to export about \$500,000 worth of canned abalone to America and Europe each year.

STAFF NOTES

Our congratulations to Mr. Pat Mahoney who was promoted to the position of Exhibitions Officer, G-11-4, Department of Industrial Development, as a result of a successful appeal, to the Promotions Appeal Board. Some members of the staff will recall that this was the position occupied by Mr. Alan Buchanan, before his recent appointment to a position with the Department of Trade, Melbourne. Mr. Mahoney commenced duties in his new position on January 18.

Mr. Mahoney must also be congratulated on completing his requirements for the Associateship in Public Administration at the Western Australian Institute of Technology during 1967.

* * *

Wetlands Research Officer Mr. T.L. Riggert, in the company of His Excellency the Governor of Western Australia, Sir Douglas Kendrew had no difficulty in obtaining "their bags" on the opening day of the 1968 duck shooting season. Mr. Riggert in accompanying the Governor to the Moora area in above century heat-wave conditions said that a good shoot was had by most sportsmen.

* * *

It is expected that the research vessel "Flinders" will depart early February from Fremantle on its second voyage to northern waters. Mr. C.J. Seabrook will be in command during the six weeks' cruise.

* * *

Mr. Kitch Godfrey, who has been seconded to this Department from the C.S.I.R.O. for the past 14 months has at last decided to join the permanent staff of our Department. It is anticipated that his appointment will be made effective as from mid February.

Congratulations are extended to Mr. Godfrey on the excellent decision made.

* * *

Life is just one damned thing after another.

E. Hubbard

WATERFOWL OBSERVATIONS!

The Department's Supervising Inspector, Mr. J.E. Bramley in the company of Inspector D.H. Smith rowed from Willies Lake to Fulton's Lake passing through the Spectacle Lakes and Hell's Gates on November 29, 1967.

Over 100 adult Black Ducks were counted from Willies Lake to Stake Hill Bridge, a distance of $\frac{1}{2}$ mile. From there to Little Spectacle Lake 140 ducks were counted. These consisted of Grey Teal, Black Duck, Musk Duck, and two other species which could not be identified. In Little Spectacle Lake there were too many ducks to count, including clutches at almost the flying stage.

Mr. Bramley said that when they passed from Little Spectacle Lake to Big Spectacle Lake, he saw a pair of Little Grebes flying very high, something he had not witnessed before in daylight.

At the end where Big Spectacle Lake enters Hell's Gates there were hundreds of ducks, and never before had he seen so many on this lake. These consisted mainly of Mountain Duck and Black Duck. There were also some Teal and 28 Maned Geese. On passing through Hell's Gates, - a channel approximately $\frac{3}{4}$ mile long and about 30 yards wide - several flocks of Black Duck were put up. The amazing thing was how tame these ducks were. On several occasions Black Duck landed in the channel and did not fly as the two officers rowed past. On one occasion the ends of the oars were not more than six feet from the ducks.

The whole of Fulton's Lake, which is a fairly large lake, was covered from bank to bank with birds, mainly Mountain Duck, Grey Teal, Black and Musk Duck and Maned Goose. It was the biggest concentration of ducks Mr. Bramley had ever seen in this district.

Mr. Bramley said that the concentration of ducks in this lake could have been brought about by the fencing and clearing of large tracks of land along the west side of the lake. Warning signs prohibiting shooting on this property were to be seen at intervals along the fences. The waters of the lakes and rivers as far down as Stake Hill Bridge are fresh.

MANTIS-SHRIMP CAUGHT IN CRAB NETAT THE DERBY JETTY

An unusual type of crustacean caught in a crab net at the Derby Jetty was handed in to Mr. V.T. Nelson, Fauna Warden, for identification.

The crustacean, about 7 inches long was a Mantis-Shrimp, sometimes referred to as a "prawn-killer". It has been forwarded to the Museum for positive identification.

Mantis-Shrimps are a downwardly-flattened group of crustaceans characterised in having a superb pair of toothed raptorial claws which function like the closing blades of a clasp-knife. These claws closely resemble the front legs of the praying mantis, an insect; they are very efficient in holding the small fishes and other animals on which the Mantis-Shrimp feeds, and are to be avoided when handling the live animal. In past, all advantage seems to be with the Mantis-Shrimp when it is being handled, if the spiny forelimbs are avoided, the very strong spines at the outer edge of the tail may be used rather painfully as the creature levers itself clear of restraint.

The common Queensland Mantis-Shrimp (Squilla granti, Stephenson) usually measures about 3 inches in length. Other and longer Mantis-Shrimps taken in trawls include Squilla interrupta (Kemp) which is about 7 inches in length, and the remarkably large Squilla raphides (Fabricius) which measures about 10 inches in length.

INSTRUCTIONS CONCERNING MAGPIES

One of the most frequent birds to be in the news must surely be the magpie. Nearly every day some member of the public reports a bird "making a nuisance of itself".

It has been policy by this Department that no such magpie is to be destroyed, unless it is actually attacking, or you are reasonably sure that it is the bird that has attacked, children under the age of 12. Adults, even the gentle sex, should be able to defend themselves. The fact that a bird attacks an adult, including a fauna warden, is no justification for destroying the bird unless some really special circumstances apply.

This instruction must be adhered to, and all officers should make the public aware that these birds are protected and they are not to be molested.

POWERS OF WARDENS

The attention of all staff is drawn to the comment below which is based on an opinion received from the Crown Law Department on the powers of wardens in relation to the following :-

(a) Authority to detain a Vehicle

As the Fauna Protection Act is worded it seems quite definite that while Section 20 (2) (b) authorizes a warden to stop, detain and search any vehicle, vessel or conveyance, the vehicle, vessel or conveyance could only be detained for as long as was reasonably required to search it. The Senior Assistant Crown Solicitor considers that with one exception there does not appear to be authority to direct a person to drive his vehicle to the nearest police station. The one exception applies when that person has refused to give his name and address or has given a false name and address to the warden, in which case the warden may take that person into custody himself and drive him to the nearest police station. Presumably he could, alternatively, require the person to drive there himself.

(b) Meaning of "Vessel".

In the opinion of the Senior Assistant Crown Solicitor, there is power for a warden to seize any container used in the commission of an offence against the Fauna Protection Act. This would apply to any container used for example to store or hold fauna which had been taken or was held contrary to the provisions of the Act. In other words, a warden may seize not only the skins of say, Johnstone crocodiles, but also any container in which the skins are stored.

The meaning of the word "vessel" as it is used in Sections 20 and 27 of the Act appears to be limited to some kind of conveyance on water and would not include all the other meanings sometimes ascribed to the word such as tin, cask, barrel or other receptacle.

TRENDS IN AUSTRALIAN OVERSEAS TRADEIN MARINE PRODUCEEXPORTSGeneral

The value of marine product exported in July, 1967 was \$2,101,000, a decline of 14.7% on July, 1966. The value of exports of frozen craytails, prawns and pearls, which fell substantially, accounted for most of this decrease. The export values for scallops and abalone increased but this was not sufficient to offset the overall decline in the total value of exports.

Crayfish

The quantity of Australian crayfish imported by the U.S. during the six months period ended June 1967, was 7,644,000lb., a slight decline of 1.3% on the corresponding period in 1966.

During the same period, the quantity of Canadian live lobsters imported by the U.S. fell 16.6%. This decline reflects the poor catches made by the Canadian fishermen so far this season rather than a weakening in demand conditions.

U.S. stocks of spiny lobster tails held in store at the end of June, 1967 were considerably lower than those held in store during June, 1966 and May, 1967, indicating a likely continuation of price increases during the next two months.

U.S. prices for craytails during July, 1967 maintained an upward movement. Notable increases were recorded in all of the lower grades in both the New York and the Los Angeles markets. The highest increase, 12 cents per lb., was recorded in New York in the 6-8 oz. grade.

Prawns

The volume of frozen prawns exported from Australia in July, 1967 declined compared with July, 1966. The quantity exported to Japan fell approximately 46.0%. The reason for this fall was the drop in the quantity of prawns made available for export from Western Australia.

Scallops

Scallop exports rose significantly in July, 1967 compared with July, 1966. A rise of 53.0% occurred in the quantity shipped to France.

Abalone

Exports of abalone continued to increase during July, 1967. The main reason for this situation is the increasing quantities of frozen and canned abalone becoming available for export from Victoria, N.S.W. and to a lesser extent Tasmania.

IMPORTS

General

Marine produce worth \$2,071,00 was imported in July, 1967, an increase of 21.4% on July, 1966. The value of imports of packaged fish, which increased substantially, accounted for most of this increase. Also import values increased for frozen whole fish, canned herrings and crustaceans and molluscs both canned and otherwise prepared or preserved.

Packaged Fish

The total quantity and value of packaged fish imported by Australia increased substantially during July, 1967 compared with July 1966.

Although there was a significant increase in the quantity and value of fish fingers imported in packs not exceeding 1 lb., packaged fish in packs exceeding 1 lb. showed an ever larger increase. All States received supplies from abroad with the most notable increases occurring in N.S.W., Queensland and Western Australia.

Source of information

Fisheries Branch,
Department of Primary Industry,
CANBERRA. A.C.T.

STATE PUBLIC SERVICE V COMMONWEALTH PUBLIC SERVICE
ANNUAL BOWLING MATCH, 1968

The Bowling Match between State and Commonwealth officers is to be held at the FLOREAT PARK BOWLING CLUB on Friday, 15th March 1968, commencing at 7.30 p.m.

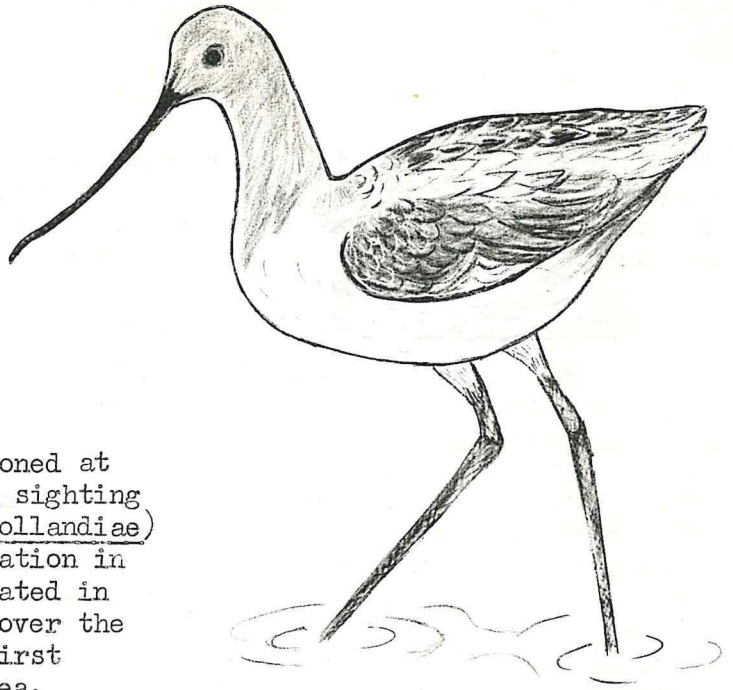
It may be necessary to limit the teams to 56 players, however, if a larger nomination is received, the Commonwealth will be able to match the increase, so all interested bowlers are requested to submit their names. Catering arrangements for players and visitors are to be organized by the Floreat Ladies' Bowling Club.

In order to meet incidental costs and make a donation for the use of the greens a charge of 75c. per player and 50c. per visitor will be made.

Intending players should submit their names in writing, not later than Friday, 1st March 1968, and state Department, Pennant Club, the division and normal position in which he plays. To assist the ladies it is requested that each player indicate whether he will be accompanied by any non players.

Please address your replies to :-

K.T. Cadee,
Public Service Commissioner's Office,
184 St. George's Terrace,
PERTH.



AVOCET

The Department's Warden stationed at Wyndham, Mr. V.T. Nelson, reported sighting two Avocets (Recurvirostra novae-hollandiae) at Point Spring on Carlton Hill Station in November 1967. As Mr. Nelson indicated in his report, these birds occur all over the State, but this was actually his first sighting of them in the Wyndham area.

Serventy and Whittell in their handbook record that this species occurs all over the State, but is rare in the north and rare or absent in the extreme South-west. It visits the coastal plain estuaries in the summer months as far south as Busselton.

The Avocet's (Recurvirostra novae-hollandiae) body plumage is mainly white with a chestnut head and a broad white band across the middle of the brownish - black wings. The mantle is white with two black stripes along it. The long, delicate black beak has a pronounced up-curve, and the very long legs are a light grey-blue. There is no hind toe, and the toes are fully webbed. It stands 18 inches high. The flight is rather laboured, and when flying the Avocet carries its legs stretched out straight behind. Its food is mainly aquatic animals and plants.

A MARK OF DISTINCTION

How can you tell one fish from another, or one shrimp, one lobster, or even one whale, from all the others just like it? One way, of course, is to put a mark or tag on the individuals you are interested in.

Tagged fishes can "tell" biologists some very interesting things about themselves: where they go, how many there are, how long they live, or how many die each year.

The expanding interest in, and research on our fishery resources, and an increase in the tagging of fishes have resulted in some new and sophisticated tag materials to help the researchers. Electronics and new plastics enable us now to carry on experiments not possible even a few years ago.

Russians Tag Sturgeon with Radio

A tagging experiment recently reported from the U.S.S.R. may even help increase the supply of the gourmet's favorite delicacy, caviar. Russian biologists wanted to learn more about the daily cycle of movements of the sturgeon whose eggs, when salted and cured, become caviar. The researchers especially wanted to know how the water depth, the currents, and the temperature influenced the movements of the fish. Radio transmitters, "no bigger than a matchbox", according to the report, were attached to the backs of a certain number of the fish to keep track of them. The marked sturgeon then were released to join the others in the school. Signals from the transmitters were picked up by receivers in small boats from which the biologists followed the sturgeons. Data about the conditions of the water through which the fish swam gave some indication of the environment they preferred.

This rather sophisticated electronic-age tagging experiment is a far cry from the first relatively crude experiments performed nearly 100 years ago. Then, wealthy landowners in Scotland tied bits of colored silk to the tails of salmon and trout and put the fishes back into the streams on their estates. There was no plan; the men simply were curious about what happened to the fish and where they went.

Tagging Studies Planned In Detail

The practice of marking fishes merely to find out what happens to them is pretty much a thing of the past now. Today, thousands of fishes of many species are marked by biologists who set up well-planned experiments designed to yield definite information. Marking and tagging fishes and other aquatic animals are recognized as powerful research tools in fishery science. The knowledge gained from such experiments is a first step toward helping conserve our fishery resources.

Researchers have tried many different ways to make one fish look different from all of its mates. (See "Fingerprinting Fish," Sea Frontiers, Vol. 2, No. 3, November, 1956) Fish have been branded, tattooed, dyed all the colors of the rainbow, fin-clipped and, of course, tagged. Branding and tattooing have been only slightly successful with most species but the other kinds of marks have been used over and over with varying degrees of success.

Marking fish with dyes has worked best with freshwater species.

In New York State, anglers were surprised by their catches of blue, red, and orange carp (Cyprinus carpio) in some lakes and ponds. The carp had eaten dye pellets mixed with bait as part of a carp control experiment. Dyes do not mark salt-water fishes as well but have worked with some invertebrates. Starfish that were damaging the oyster crop in Long Island Sound were dyed in one experiment and released to measure their rate of dispersal over the shellfish beds. The researchers got the information they wanted and quite a number of amateur beachcombers collected exotic specimens when some of the experimental starfish drifted onto the shore.

Dyes Track Shrimp

Shrimp (Penaeus spp.) injected with various biological stains have provided biologists with valuable information about their movements and growth. In earlier studies, shrimp had been marked with tags but too many of the smaller individuals died from the shock of being handled and tagged. Now, stains are injected into the abdomens of the shrimp with hypodermic syringes to mark the experimental animals and make them stand out from the others in the net when they are caught again. Biologists from the Bureau of Commercial Fisheries (BCF) at Galveston, Texas, and Miami, have tagged many thousands of these tasty crustaceans. Co-operating with the government scientists are researchers at the Institute of Marine Sciences who are actively working to unravel some of the mysteries of shrimp life history.

A metal tag inserted between the plates on the tail of the spiny lobster (Panulirus argus) was used in research on the species carried on by scientists from the Institute of Marine Sciences. The tag was designed to help explain some of the life history of this succulent crustacean. As with most tags used on lobster, crabs, and other marine animals that periodically shed their outer skeleton, the tag is lost when the animal moults.

Marking fishes or other aquatic animals with dyes, stains or clipped fins has one great disadvantage - individual fish cannot be identified when they are caught again. This is critical in age and growth studies, for example, where the fish are measured when they are marked, and measured again when they are recaptured. To make each fish truly an individual, researchers must use tags.

More than twenty different kinds of tags are used by fishery biologists. Some tags have as many as eight variations of design because, although one kind of tag may work well on several species, other tags work well on only one species. Thus, the biologist must first try out a number of tags on the animals he is interested in before he begins his full-scale experiment. All fish tags have one thing in common, however. Each is stamped or printed with a serial number and the name of the laboratory or agency that is conducting the experiment.

Petersen Tag Widely Used

One of the most widely used and generally, successful of all tags is the Petersen tag, named for the Danish biologist who invented it in 1894. It consists of two plastic discs, usually about one-half inch in diameter. The tag can be attached with a pin or wire to the gill covers, through the back muscles, or through the fleshy part of the tail of the fish.

Fishery biologists at the Woods Hole Biological Laboratory of the Bureau of Commercial Fisheries, working 150 to 200 miles at sea aboard the R.V. Albatross III, put Petersen tags on some 10,000 haddock (Melano-grammus aeglefinus) in the Northwest Atlantic and found that the haddock is pretty much of a homebody. The tagged fish stayed more or less on the same fishing bank where they had been tagged, with very few of them migrating from one bank to another.

Widespread use of modern, non-toxic plastics for fish tags resulted in some of the most revealing findings about the movements of tunas, sailfish, and other large gamefish. Earlier gamefish tagging experiments had not worked out well, mostly because of tag failures. (See "Trailing Ocean Gamesters," Sea Frontiers, Vol. 1 No. 1, November, 1954). For example; in an early tuna tagging study at the Institute of Marine Sciences, bluefin tuna were tagged with nickel-plated, monel metal fish hooks stamped, "Return to U. of M. Marine Lab.". When a tuna was hooked with the marked hook, a "break-away" leader released the fish with the hook firmly in the flesh. There were reports that some of the hooks corroded in the tuna, however, and a later modification was to coat the hook with a thin film of plastic to increase the success of the tuna tagging programme.

Sailfish were tagged by researchers from the Institute of Marine Sciences by slipping a rubber ring over the fish's bill. The ring was provided with a stainless steel message tag. A metal dart tag inserted in the flesh was later substituted for the rubber ring when a number of sailfish with damaged bills were caught by anglers. The ring apparently caused an injury to the bill and, thus, its use was discontinued.

Tuna and "Spaghetti".

"Spaghetti" tags, made from lengths of vinyl tubing gave good results on tuna because they could be quickly applied to the fish, were not injurious, and were not affected by long immersion in seawater. They were drawn through the back muscles of the fish with a needle and tied in a simple overhand knot. The spaghetti tags were used very successfully on tuna off the west coast of the United States. Biologists from the State of California and the Bureau of Commercial Fisheries tagged 960 bluefin tuna (Thunnus thynnus) in 1962 near the coast of Southern California and Baja California.

Most of the recaptures were made by American fishermen, but two long-distance migrants turned up in the experiments. One tagged bluefin was caught in the Sea of Japan after two years. The biologists calculated it had travelled a minimum of 4,820 miles and had averaged 7 miles per day. The fish must have spent some time eating as well as swimming, they thought, because it grew from 23 pounds to 53 pounds while it was travelling.

Two months after this tuna was caught, another from the same tagging experiment was caught 300 miles north of Tokyo. This fish was reckoned to have travelled at an average rate of 16 miles per day. It had weighed 22 pounds when it was tagged and in the intervening two years tripled its weight.

Another tag used successfully on large game fish is the dart tag largely developed by Frank J. Mather, III, of the Woods Hole Oceanographic Institution. It is a modification of the spaghetti tag and is simply a length of plastic tubing about 5 inches long attached to either a stainless steel or plastic barbed point. The point is jabbed into the back muscles of the giant fish leaving the plastic with its imprinted message and number on the outside where it can be seen when the fish is caught again. Use of the dart tag on 22,000 tunas, white marlin (Makaira albidus), and other species in the Atlantic Ocean--and the co-operation of some 3,000 sport fishermen - have turned up some very interesting information on these fishes.

At least five giant bluefins tagged in the Straits of Florida were recaptured by commercial fishermen in Norway. Two bluefins tagged off Maryland were recaptured by commercial fishermen in Spain. These cross-ocean migrants were very large fish; medium and small tuna (less than 270 pounds) seem to prefer to remain in American waters.

Marlin and Sailfish Travels Charted

Tag returns from marlin indicate the fish migrate from the Caribbean area in the spring to feeding grounds in the coastal waters off the South Atlantic and Middle Atlantic states where they spend the summer.

The recapture of tagged sailfish (Istiophorus albicans), also marked with the dart tag, suggests to the biologists that there is an interchange of the species between the east coast of Florida and the Gulf of Mexico. So far, however, too few of the tagged fish have been recaptured to yield more definite information.

The migrations of some fishes are not so easily learned through tagging experiments. For many years, some biologists argued that the spiny dogfish (Squalus acanthias), a small shark, swam out to deep water in the winter. Other biologists argued that the dogfish swam south in the winter. Tagging experiments by U.S. and Canadian biologists indicated that the dogfish did both.

Now, to get some clear ideas about the migrations of the dogfish, more of them will have to be tagged.

Research with tagged fishes depends on the tag being seen and the finder returning it with the necessary information about when and where it was found (or caught), a length measurement, and other data to help the researchers. A well-designed, visible tag usually will be seen when the fish is first caught. Sometimes, however, tagged specimens may pass through several hands before the tag is noticed. Take the case of the shrimp that travelled 2,000 miles (See *Sea Frontiers*, Vol 5, No. 3, August, 1959). It had been tagged and released in the waters off the Dry Tortugas by scientists from the Institute of Marine Sciences and was found by a Bronx, New York, housewife, but not until she had cooked it for her family's supper. A silver hake (*Merluccius bilinearis*) tagged in Cape Cod Bay, Massachusetts, was found by another sharp-eyed housewife, 1,500 miles inland in South Dakota.

Whales and Sardines Shot with Markers

Some fish tags are designed to be detected mechanically. In the fishery for the Pacific sardine (*Sardinops caerulea*), California Department of Fish and Game personnel tagged many thousands of the fish with small, numbered nickel-plated metal plates. The plates were inserted by hand in the body cavity of the fish or were shot in with a small pneumatic pistol. This species is used mainly for fish meal and oil and is handled in bulk. Electro-magnets installed in the conveyor system of the fishmeal plants detect the tags so that they can be recovered and identified with the date and area fished for the ships then being unloaded. About 5,200 tags (4 per cent of the total used) have been recovered. Analysis of the returns show that the sardines moved inshore from their spawning grounds some 50 miles off San Diego and travelled up the coast to Vancouver Island. Some sardines tagged by Canadian biologists moved south to California.

A similar metal tag, but built with king-size proportions, is used to mark whales. Harmless, metal projectiles are shot into the whales by research personnel. Later, when the whale is being processed on a factory ship, recovery of the tag from the carcass helps to add a bit more information to what we know about the migrations and other aspects of the life history of these large mammals.

Radioactive Tagging

The increasing use of radioisotopes in biological research suggested the use of radioactive tags in fishes.

Biologists and their engineer colleagues knew that sensitive radiological detection devices would make it possible to identify individual fishes with such tags, especially in species going into meal and oil plants. Early stumbling blocks to the development of the tag was the understandable reluctance of several Federal agencies to approve the use of radioactive materials in a potential food substance, and the abhorrence of the public to what might seem like indiscriminate use of radio-active materials. Today, however, Bureau of Commercial Fisheries scientists have developed and are testing a modified sardine tag that utilizes a low-level radioactive source. The level poses no danger to the fish or to man. Use of the tag may help biologists learn, for example, what factors led to the disastrous collapse a few years ago of the California sardine fishery when the fish, suddenly, were no longer available.

The success of the various tags and techniques for marking marine animals inspired programs to mark other oceanic "inhabitants" for easy identification. The U.S. Coast Guard now is using color to trace the routes of large icebergs. Vermillion dye bombs are dropped on the dangerous ice masses to help track them through the North Atlantic shipping lanes. The color "tags" are used in conjunction with radiometric and satellite photo reconnaissance methods already in use to make for safer ship navigation.

"Sea Frontiers" (Albert C. Jensen)

July, -August 1967

SOUTH ARABIA: GREEN TURTLE STUDY

Over the past eight months Professor Harold F. Hirth has been studying the biology of the green turtle (Chelonia mydas) on the beaches of South Arabia. His work is for F.A.O. under the U.N. Development Programme.

An average turtle is about 40 inches long and weighs between 300 and 400 pounds, of which 50% is edible flesh. The flesh is not eaten by the local people, perhaps for religious reasons, but it can bring high prices elsewhere, notably in London, New York and Hamburg. Turtle fishing could therefore become a valuable export industry if properly regulated.

Professor Hirth has initiated a tagging programme to acquire additional data on the life history and movements of the green turtle. Metal clips showing the date and place of tagging are attached to the foreflipper. Already three returned tags have revealed that within a few months one turtle had travelled 480 miles to the west and the other two had reached a place on the east coast of Africa some 1,500 miles from their starting point.

As well as providing interesting data on migratory movements, this information indicates that the rational exploitation of the green turtle will require agreement between all the nations concerned.

It will be necessary for management to involve limitation of the catch as well as protection of the nesting grounds, particularly against predatory dogs. Huge numbers of eggs are destroyed by dogs which roam the beaches in packs, killing female turtles and digging up the eggs. Native fishermen also will have to be taught not to kill the female turtles before they have laid their eggs. Professor Hirth believes that at a later stage turtle culture might be contemplated in fenced areas along the coast.

I U C N Bulletin

July-September 1967

MORE TRAINING NEEDED

The development of the fishing industry will be very low unless there is an extensive plan provided for teaching potential young fishermen in new ways of developing fishing. This was stated by Mr. K. Mitchelson, of Lakes Entrance, Victoria, at the recent Australian Fisheries Development Conference in Canberra.

In Japan, and Russia, boys interested in becoming fishermen can learn the approved course as a subject along with the rest of their subjects. In Scotland, too, training is more intensive. After the boys leave school, they study all aspects of boats and nets for an approved period and then spend the equivalent time at sea on different types of fishing boats acquiring first hand knowledge of fishing.

Mr. Mitchelson asked why cannot a similar scheme be available for boys here? Perhaps there could be arranged an exchange system with other countries. He said that we must get overseas ideas into our fishing industry to open up new methods of developing our fishing areas. At present there is no incentive whatsoever for a lad who has a good education to go fishing.

The types of boys who are coming into the fishing industry as deck-hands are those boys who could not attain a professional career. We can not look to them to give the industry the boost it needs, Mr. Mitchelson stated.

Commercial Fishing & Marketing

March-April 1967

ENFORCEMENT ACTIVITIES

Prosecutions October - December, 1967

Name	Offence	Place of Hearing	Date of Hearing	Fine
Westerberg, G.C.& N.E.	Boat Un-numbered	Albany	8.12.67	\$10 each
Benson, J.F.& O.J.	"	"	"	\$10 each
O'Sullivan, D.	U/S Marron	Collie	12.12.67	\$20
Humphreys, M.	" "	"	"	\$20
Fenn, B.R.	Selling grey kangaroo skins without license	Fremantle	23.10.67	\$10

U/S = Undersize.

LIBRARY ACCESSIONS

for

January, 1968Books

- COGGER, Harold. Australian Reptiles in Colour. Sydney A.H.& A.W. Reed. 1967 112p. pls.
- HILL, Robin. Australian Birds. Melb./Sydney. Thos Nelson. Ltd. 1967 287p. original paintings bibl.

JOSKE, Percy Ernest. The Law and Procedure at Meetings in Australia and New Zealand. A concise guide to assist persons taking part in or who may be called upon to advise in connexion with meetings 4th ed. Australia. The Law Book Society of Australia Pty Ltd. 1963 22p. refs.

OXFORD UNIVERSITY PRESS.

Oxford Dictionary of Quotations. 2nd ed. rev. London. O.U.P. 1966 1002p.

WEATHERLY, A.H. Ed. Australian Inland Waters and their Fauna. Eleven Studies. Canberra. Australian National University Press. 1967 287p. figs. maps. pls. refs. tabs.

Ph. D. THESIS

Burbidge, A.A. The Biology of South-western Tortoises. 1967 161p. figs. pls. refs. tabs. (presented by Author)

PUBLICATIONS

Australian Agricultural Extension Conference. Hobart, Tasmania. May, 1967 Vol 2. Collators' Reports, together with guidelines and the specific questions that stimulated group discussions.

Central Marine Fisheries Research Institute (Madras, India) 26th Anniversary SOUVENIR (Contains papers on various topics relevant to fish and fisheries - reports of progress, etc.)

The Otago Acclimatisation Society (Dunedin, New Zealand) ANNUAL REPORT for year ending August 31st, 1967.

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NEWS FOR THE ANGLER!

Good sized mulloway have been caught in recent weeks in the Canning River by the more experienced anglers.