TMENT, WESTERN AUSTRALIA

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STAFF NOTES

Later this month Senior Research Officer B.K. Bowen and Research Officer R.J. Slack-Smith will leave Perth to attend a stock assessment workshop at the C.S.I.R.O. Marine Laboratory, Cronulla, N.S.W., during the week commencing November 2. Research Officers from C.S.I.R.O. and the States will participate in the workshop. Under the guidance of Mr. J.A. Gulland, of the Fisheries Laboratory, Lowestoft, England, participants will review the results of Australian stock assessments of fishes currently the subject of research.

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Mr. C.E. Casselton (Head Office) and Supervising Inspector J.E. Bramley commenced two weeks' annual leave on September 21 and 28 respectively. Officers who will enter on leave this month include Inspector D.H. Smith (Dongara) on October 2, and Relieving Inspector R.M. Crawford, Inspector E.I. Forster (p.v. "Vlaming") and Assistant Inspector I.L. Cardon (Albany) on October 5. Mr. P.W. Smith (Head Office) will start his leave on October 19. Inspector R.G. Emery will relieve Assistant Inspector Cardon.

* * *

We welcome to Head Office staff Miss D.E. Patrick, who commenced duty on September 10. Miss Patrick occupies the position of Assistant in the Clerical Branch formerly held by Miss H.M. Gilfellon. The latter resigned from the Service on September 11, after some four years with the Department.

* * *

Inspector G.C. Jeffery, of Mandurah, has resigned from the public service. Inspector A.V. Green has temporarily taken charge of the Mandurah district.

It has been said that in spring a young man's fancy lightly turns to love. There must be some truth in this for just now there is a veritable spate of marrying among the ranks of the younger men of the Department. Cadet Inspector Ron Lindsay, of Perth, set the ball rolling towards the end of September when he married Miss Dora Alman. He will be followed by Assistant Inspector Ian Cardon, who on October 10 will marry Miss Sue Woods. Then on October 24, Mr. Peter Smith, of Head Office staff, will be married to Miss Gail Robbins. Our very best wishes are extended to all three.

* * *

After being delayed from slipping by floodwaters, as a result of heavy late winter rains, the r.v. "Peron" left Fremantle on September 15 for Carnarvon to further the Department's prawn research programme. The "Peron" will be engaged for approximately six weeks in prawn trawling survey work in areas off Carnarvon. Her crew comprises Captain J.W. White, Mate D. Wright, Engineer E.A. Mackenzie, General Survey Hand R. Bray and Cadet Inspector P.W. Harrison. Technical Officer E.H. Barker will be in charge of the sampling programme.

PERSONAL

A recent visitor to Perth was Pearling Officer V. Wells, of the Department of Primary Industry, Canberra, who called on the Director on September 17. Mr. Wells is currently visiting the pearling centres in this State and the Northern Territory.

OBITUARY

On September 14, at "Sunset", Nedlands, Guy Cunliffe Linton passed to his long rest. Mr. Linton, who was born in England, was appointed inspector of fisheries at Albany on April 1, 1913, and remained in charge of the south coast district until his retirement early in 1939. He was 88 at the end.

EFFECTS OF COMMERCIAL FISHING OPERATIONS

The effect or commercial fishing on the biological characteristics of fishes has been studied by a Russian scientist, V.D. Lebedev, according to an interesting note in Sport Fishery Abstracts (U.S. Fish and Wildlife Service) of January, 1964.

Mr. Lebedev reports that an analysis of fossil fishes from archaeological discoveries has permitted a determination of the character of fish fauna before commercial fishing was so intense as it is today. It seems that the maximum size and age of fishes from the earliest human settlements were approximately the same as, or deviated insignificnatly from, comparable values for present-day fishes.

However, the average sizes of some of today's commercial fishes were then larger than they are now. On the other hand, the average size of non-commercial fishes shows little change.

This is observable also, so Mr. Lebedev says, in bodies of water where intense commercial fishing activity is absent. The rate of growth of commercial fishes in waters subject to intensive commercial fishing is greater (and the percentage of the older age groups is smaller) at the present time than in the past.

The commercial value of various species was changed as well. Some species have lost all economic value while the ranges of numerous migratory species has contracted. The number of carnivorous fishes has decreased with fishing and this has led to an increase in fishes of little or no commercial value.

UNDERSIZE SPERM WHALES

The Department of Primary Industry, Canberra, has advised that approval has been given to vary the permit granted on June 12, 1964, for the capture of undersize sperm whales by the Cheynes Beach Whaling Company for scientific purposes.

The permit now provides for the capture of a maximum of 30 undersize sperm whales each month from September to November, 1964, inclusive, and 10 in December, 1964. The company has been instructed that as many as possible of each month's quota should be taken from the same school, and that no carryover of the uncaught protion of any month's quota will be permitted.

W.A. FISH PRODUCTION 1963

The tables on pages 170 and 171 set out the total catch of the main species in 1963 compared with that of 1962, as well as the total production with comparative figures for the past eleven years of the species of greatest economic importance. Prawns have been omitted because of their very recent entry on the production scene.

Overall production is up by over 1,000,000 lb. over last year. This is due mainly to the increased catches of crayfish and, most noticeably, prawns. These increases are, however, to a large extent offset by the substantially smaller catch of Australian salmon.

W.A. FISHERIES PRODUCTION

Species	Production 1963 (Round Weight, lb)	Production 1962 (Round Weight, lb)
Crayfish	21,250,732	19,275,216
Salmon, Australian	2,871,440	5,392,187
Snapper	1,477,787	1,422,425
Prawns	1,284,833	488,614
Mullet	952,168	824,372
Ruff (Sea Herring)	857,958	813,427
Shark	668,530	603,271
Cobbler	543,178	709,993
Whiting, Sand	543,103	519,957
Mullet, Yellow-eye	376,860	485,094
Jewfish, Westralian	291,234	253,667
Turtles(processed weight)	255,477	48,563
Mackerel, Spanish	207,344	110,181
Tailor	196,615	166,008
Herring, Perth	168,063	74,859
Pilchard	162,274	59,626
Tuna	134,106	42,888
Trevally (Skipjack)	93,283	58,654
Mackerel, School or"Mulie"	83,209	60,720
Samson Fish(Sea Kingfish)	63,580	66,020
Garfish	63,330	45,512
Bream, Yellow Fin	38,514	52,119
Bream, Black	38,081	20,564
Crabs	35,736	56,519
Whiting, King George	34,695	83,484
Bream, Buffalo,	32,904	7,749
Leatherjacket(Silver Flounder)	31,272	30,673
Cod	30,817	16,403
Skate	28,096	9,054
Yellowtail	24,963	10,013
Flathead	23,004	16,975
Whitebait	21,878	9,682
Mulloway	20,640	4,009
Groper	17,028	20,067
Pike	16,634	24,355
Scallops	16,564	105
Others	67,775	43,565
	33,023,705	31,926,490

W.A. FISHERIES PRODUCTION 1953 TO 1963 INCLUSIVE

(Converted to live weight lb.)

YEAR	SPECIES						
	Crayfish	Australian Salmon	Snapper	Mullet		Ruff (Sea Herring)	GRAND TOTAL (all Species)
				River or Sea	Yellow-eye		
1953	7,985,391	3,685,977	791,732	465,419	323,341	1,063,165	16,165,422
1954	10,279,531	6,126,277	1,306,381	395,366	300,762	618,443	21,212,002
1955	11,120,232	4,912,450	1,394,702	453,675	362,907	897,179	21,227,628
1956	10,638,938	4,821,941	1,413,224	548,071	256,903	767,407	20,580,256
1957	12,295,768	4,027,133	852,782	898,823	457,083	956,341	21,944,696
1958	14,500,779	4,091,280	922,824	859,192	476,401	889,083	24,504,518
1959	18,956,297	3,943,679	2,047,003	802,670	435,110	1,338,374	30,328,670
1960	18,376,144	2,550,054	1,681,185	638,682	543,290	1,084,077	28,293,456
1961	18,881,998	2,697,115	1,782,034	993,212	364,323	871,323	28,917,048
1962	19,275,216	5,592,187	1,422,425	824,372	485,094	813,427	31,926,490
1963	21,250,732	2,866,288	1,477,787,	952,168	376,860	857,958	33,023,705

FISH MIGRATIONS AND ITINERARIES

While in Western Australia recently, Dr. G.L. Kesteven, Assistant Chief, Division of Fisheries and Oceanography, C.S.I.R.O., addressed the Rotary Club of Perth. The subject of his talk was the migrations and itineraries of fish.

Dr. Kesteven said that migration routes off the Australian coast were very similar to bus routes. The fish followed more or less well-established routes and, furthermore, travelled along them to a fixed time-table. Like buses, they went from stop to stop.

To illustrate his point, the speaker mentioned the Australian salmon and southern bluefin tuna, both of which provided excellent examples of fish migrations. Both migrate over great distances with fairly regular movement rhythms.

Salmon, for instance, followed two broad paths. The eastern sub-species moved up the east coast from Tasmania to N.S.W. to spawn, and then travelled back again. The western sub-species left Tasmania to spawn somewhere near Bunbury, W.A., the resultant young fish returning to Tasmania by the same route. Here they remained until they came back to W.A., as adult fish, to spawn in the same area.

The tuna travelled both east and west coasts. At times their rate of movement was quite fast; to maintain their schedule they had to keep up an average of at least 12 miles a day.

C.S.I.R.O. in co-operation with some State Fisheries Departments had in recent years been studying fish movements intensively. In three years 15,000 young southern bluefin tuna had been tagged of Albany, and thousands of salmon had been tagged and released.

Sometimes, Dr. Kesteven concluded, seasonal variations in weather, temperature and ocean currents affected the times of arrival and departure of the fish.

ANIMALS DECLARED VERMIN

In the Government Gazette of September 4, 1964, the undermentioned animals have been declared to be vermin under the Vermin Act throughout the whole or in a part or parts of the State as indicated.

With the exception of Argentine ants and grasshoppers it will be noted that all the species declared to be vermin are vertebrates. It will also be seen that most of them are not native to W.A., and have become or threaten to become pests, principally to agriculture. The only indigenous mammal to be declared vermin throughout the State is the dingo.

CLASSES OF ANIMALS	AREA
BIRDS	
(a) Exotics	
Blackbirds (*Turdus merula*)	Whole of State
Bulbuls (*Pycnonotus jocosus*)	" " "
Indian Crows (*Corvus splendens*)	" " "
Finches	" " "
Indian Mynahs (*Acridotheres tristis*)	" " "
Pigeons (*Columba livia*) gone wild	The municipal district of Toodyay.
Californian quails (*Lophortyx californicus*)	Whole of State
Sparrows (*Passer domesticus*)	" " " "
Starlings (*Sturnus vulgaris*)	" " " "
English Thrushes (*Turdus ericetorum*)	" " " "
(b) Indigenous	
Wedgetailed Eagles (*Aquila audax*)	" " "
White Tailed Black Cockatoos (*Calyptorhynchus baudinii*)	The municipal districts of Albany, Plantagenet, Denmark, Donnybrook, Balingup, Collie, Bridgetown, West Arthur, Greenbushes and Manjimup.
Little Corella (*Kakatoe sanguinea*)	West Kimberley, Chapman Valley and Coorow.

White Bellied Sea Eagle (Haliaeetus leucogaster)	Roebourne and Tableland
Emus (Dromaius novae-hollandiae)	Whole of State except Albany Armadale-Kelmscott, Augusta-Margaret River, Balingup, Beverley, Boddington, Boyup Brook, Bridgetown, Brookton, Broomehill, Bunbury, Busselton, Capel, Cockburn, Collie, Cranbrook, Cuballing, Dardanup, Darkan, Denmark, Donnybrook, Gosnells, Greenbushes, Harvey, Kalamunda, Katanning, Kojonup, Manjimup, Mt. Barker, Mundaring, Mundijong, Nannup, Narrogin, Pingelly, Pinjarra, Rockingham, Serpentine, Jarrahdale, Tambellup, Wagin, William Woodanilling and York.
Galahs (Kakatoe roseicapilla)	Mukinbudin, Koorda, Victoria Plains, Morawa, Dalwallinu, Chapman Valley, Goomalling, Wongan-Ballidu, Moora, Quairading, Mount Marshall, Gingin, Westonia, Corrigin, Wickepin, Kununoppin-Trayning, Bruce Rock, Coorow and Mullewa.
28 Parrots or Port Lincoln (Barnardius zonarius)	Dalwallinu, Armadale-Kelmscott and Greenbushes.
W.A. Rosella (Platycercus icterotis)	Armadale-Kelmscott and Greenbushes
Smokers or Regent Parrots (Purpureicephalus spurius)	Victoria Plains, Wickepin, Narrogin, Gingin, Morawa and Broomehill.
W.A. King Parrots (Purpureicephalus spurius)	Collie and West Arthur

MAMMALS

(a) Exotics

Cats (Felis cattus)	Whole of State
Camels (Camelus spp)	" " "
Dogs (Canis spp)	" " "
Donkeys (Equus asinus)	" " "
Foxes (Vulpes vulpes)	" " "
Goats (Capra hircus L)	" " "
Hares (Lepus spp)	" " "
Pigs (Sus scrofa)	" " "
Rabbits (Order Lagomoraha)	" " "

(b) Indigenous

(i) Marsupials

Red, Blue Marloo Kangaroo (Macropus rufus) and Hill Euro, Biggada (Macropus robustus)	Ashburton, Sandstone, Cue, Gascoyne-Minilya, Meekatharra, Mt. Magnet, Murchison, Roebourne, Tableland, Upper Gascoyne, West Kimberley, Wiluna, Halls Creek, Kalgoorlie, Laverton, Broome, Leonora, Wyndham, Menzies, Marble Bar, Yalgoo, Nullagine, Port Hedland and Mount Marshall.
Jungle Kangaroo , River Wallaby or Scimitar-tailed Wallaby (Macropus agilis)	Broome, West Kimberley and Wyndham.
Grey kangaroo (Macropus ocydromus)	Wagin, Dumbleyung, Moora, Lake Grace, Wongan-Ballidu, Mingenew, Mount Marshall and Kondinin.
Wombats (Volbatus spp)	Whole of State except the portion east of Meridan 123 deg. East and South of 29 deg. South.

(ii) Other

Dingoes (Canis spp)	Whole of State

AMPHIBIANS

Giant Toads (Bufo marinus)	Whole of State
African Toads (Xenopus laevis)	" " "

INSECTS

Argentine Ants (Iridomyrmex humilis Mayr)	" " "
Grasshoppers	" " "

The keeping of any species declared to be vermin is controlled by the Chief Vermin Control Officer, Department of Agriculture, Jarrah Road, South Perth.

FISHERMEN'S ADVISORY COMMITTEE

The Minister for Fisheries (Mr. Ross Hutchinson) has re-appointed Messrs. G. Travia, of Geraldton (representing crayfishermen), Roland Smith, of Perth (representing persons not commercially engaged in fishing) and W. Matthei, of Yunderup (representing beach and estuarine fishermen), members of the Fishermen's Advisory Committee.

The other appointed member of the Committee is Mr. N.H. Wright, of Quindalup, who represents deep-sea fishermen other than crayfishermen.

The Committee is scheduled to hold a number of meetings this month. These will be at Bunbury (October 13), Busselton (October 14), Manjimup (October 15), Fremantle (October 21 and 22), Geraldton (October 27 and 28) and Dongara (October 29).

NO SECOND LICENSE TO PRAWN IN SHARK BAY

The Minister for Fisheries has ruled that no individual fisherman may have more than one authorization for prawning in the Shark Bay-Carnarvon area, nor have an interest in more than one.

The determination was the result of recent inquiries to the Department on behalf of a person already authorized in respect of one boat seeking to purchase a second vessel similarly endowed with such an authorization. There is, of course, no objection to his buying the second boat, but if he does so its authorization to trawl in Shark Bay will be cancelled.

CONVICTIONS

JULY - SEPTEMBER, 1964

Date	Defendant	Court	Charge	Result
		FISHERIES ACT		Fined
6.7.64	Iannello, Cologero	Fremantle	Brushed Female Crayfish	£25.0.0. and license suspended for three months.
6.7.64	Caputi, Guiseppe	"	"	£25.0.0. and license suspended for three months.
3.8.64	Scardingo, Leo	"	U/S Crayfish	£23. 0.0.
3.8.64	Miragliotta, Alphonse	"	U/W Craytails	£13.15.0.
3.8.64	Miragliotta, Alphonse	"	"	£18.15.0.
10.8.64	Iannello, Frank	"	Excessive Number of Craypots	£10. 0.0.
24.8.64	Francisco, Manuel	"	U/S Crayfish	£26.15.0.
21.9.64	Scobie, Clive E.	"	U/W Craytails	£73.15.0.
28.9.64	Parker, Raymond A.	"	U/S Crayfish	£42.15.0.
28.9.64	Pittorino, Bert	"	"	£23.10.0.
28.9.64	Pittorino, Bert	"	"	£18. 5.0.
28.9.64	Paparella, Angelo	"	U/W Craytails	£483.15.0.
20.8.64	Hughes, Frank	Geraldton	U/S Crayfish	£10.18.0.
20.8.64	Nielsen, Richard	"	"	£10.15.0.
20.8.64	King, Alex N.	"	"	£30. 4.0.
20.8.64	May, Kenneth George	"	"	£10. 6.0.
20.8.64	May, Kenneth George	"	Breach condition of license - taking fish for gain using unlicensed boat.	£35. 0.0.

CONVICTIONS (Cont'd)

Date	Defendant	Court	Charge	Result
				Fined
2.7.64	Meagher, Thomas	Perth	U/W Crayfish	£15. 0.0.
2.7.64	Dillon, Kevin Francis	"	U/S Crayfish	£12. 2.0.
2.7.64	Dillon, Kevin Francis	"	"	£12.13.0.
9.7.64	Ulinovich, Ricardo	"	Obstructing inspector	£10. 0.0.
9.7.64	Walkerden, Allan Charles	"	Fishing Closed Waters	£ 5. 0.0.
9.7.64	Kelvin, John R.	"	"	£ 5. 0.0.
9.7.64	Covino, AAntonio	"	U/S Crayfish	£10.11.0.
9.7.64	Butler, Leslie W.J.	"	Obstructing inspector	£10. 0.0.
9.7.64	Butler, Leslie W.J.	"	U/S Crayfish	£20. 3.0.
9.7.64	Butler, James Henry	"	"	£35. 3.0.
9.7.64	Butler, James Henry	"	Obstructing inspector	£10. 0.0.
29.7.64	Morck, John	Childrens	U/S Crayfish	£10. 0.0.
29.7.64	Carter, Denis John	"	"	£20.18.0.
31.7.64	Walkerden, Brian C.	Perth	"	£15. 9.0.
31.7.64	Stacey, Adrian F.	"	"	£27. 6.0.
7.8.64	Ulinovich, Ricardo	"	"	£26. 0.0.
7.8.64	Wade, Stanley	"	"	£108.16.0.
7.8.64	Chapman, Peter	"	"	£21. 9.0;
14.8.64	McGrath, William	"	U/W Craytails	£15.14.0.
14.8.64	McGrath, William	"	"	£18. 8.0.
21.8.64	Isbister, Milton L.	"	"	£12. 1.0.
28.8.64	Van-Gelder, Johannes	"	U/S Crayfish	£26. 7.6.
28.8.64	Walkerden, Alan C.	"	"	£16. 5.0.
28.8.64	Walkerden, Alan C.	"	"	£10. 9.0.
11.9.64	Ulinovich, Ricardo	"	Obstructing inspector	£20. 0.0.
11.9.64	Parkin, Edward	"	Fishing Closed Waters	£ 5. 0.0.
11.9.64	Ellis, Donald W.	"	U/S Crayfish	£121.13.0.
23.9.64	O'Dea, Francis John	"	"	£28. 2.6.

CONVICTIONS (Cont'd)

Date	Defendant	Court	Charge	Result
	FAUNA PROTECTION ACT			Fined
14.8.64	Loveridge, Frederick C.	Perth	Taking protected fauna	£ 5. 0.0.
24.8.64	Mundy, Ernest John	Fremantle	"	£10.0.0..
24.8.64	Pavlovich, Aleksander	"	"	£10. 0.0.
11.9.64	Tate, Douglas	Perth)	Taking kangaroos for gain without license	
11.9.64	Tate, Bruce Cameron	")		£10. 0.0.

"WHITE" CRAYFISH RESEARCH

Where do the "white" crayfish come from and where do they go? Fishermen have been asking these questions for years. Past research has shown that the "whites" are newly moulted "red" crayfish but it has not been shown whether or not the "pre-whites" move into the shallow waters or are a portion of the resident population of small "reds". The current research programme being presented by Dr. Chittleborough, Division of Fisheries and Oceanography, C.S.I.R.O., and Mr. Bowen of this Department will assist in answering these questions.

Last month approximately 4,000 crayfish were either tagged or marked in the shallow waters of Jurien Bay. The tags used were single-barb plastic darts with a numbered streamer. The dart is inserted into the tail between the second and third segment on the dorsal surface. The marks are circular holes punched into the tail fan. The actual positioning of the marks on the fan records the carapace length of the crayfish at the time of punching.

When will the tagged and marked crayfish be caught? It is possible, and indeed quite probable, that many of the crayfish will be caught as " whites" during the November - December season. It this is so, it will mean that there is nothing mysterious about the "whites", they will have originated from the normal population of small "red" crayfish living on the reefs. On the other hand, some of the crayfish may be caught as "whites" and some as " reds" in the same areas as those in which they were tagged or they may

all be caught as "reds". Whatever the results, our knowledge of the part played by the "whites" will be increased.

In November and December "white" crayfish will be tagged with an antennal tag consisting of a piece of plastic-coated wire wound around the base of the antenna. The recoveries from this programme will provide additional information on the seaward movement of "whites" and their entry into the "red" population.

As with all tagging programmes, a large part of the success depends on the co-operation of the fishermen in returning tagged and marked crayfish caught during their fishing operations. In an endeavour to increase the fishermen's interest in the programme the Department is offering a reward of 5/- a pound for all tagged or marked crayfish handed to a departmental officer.

RESTRICTIONS ENFORCED IN EXMOUTH GULF

Between August 19 and 21, Inspector B.A. Carmichael visited Learmonth to police the restrictions recently imposed on prawn trawling in Exmouth Gulf, and to follow up reports of unauthorised vessels fishing there. However, on arrival at Learmonth, Mr. Carmichael was informed that the boats which had caused concern had moved out of the area.

In an endeavour to arrange a meeting with skippers of trawlers who are not permitted to operate on the Exmouth trawling grounds, an attempt was made from the processing works of M.G. Kailis to establish touch by radio. Contact was made with the skippers of l.f.bs. "Bluefin" and "Kiaora III", which were both in the vicinity of Onslow, some 70 miles up the coast. So that he might interview these men personally, Inspector Carmichael arranged with the skipper of l.f.b. "St. Amaro" to take him to where these vessels were working.

"St. Amaro" left her anchorage at 4 a.m. on August 20, to commence the trip up the coast. The early start had been arranged so that prawn trawling could be carried out en route. Six trawls were made with disappointing results. After the last shot, at approximately 2 p.m., the vessel continued on her journey arriving off the Ashburton River at 8 p.m. Inspector Carmichael was able to board "Bluefin" and discuss the new restrictions with her skipper. He also

made contact with the l.f.b. "Eckero". Unfortunately, "Kia-ora III" could not be contacted and "St. Amaro" commenced the return journey at 10 p.m., arriving at the Learmonth anchorage at 9 a.m. the following morning. Further efforts to contact "Kia-ora III" by radio were unsuccessful.

Inspector Carmichael was informed that approximately 150,000 lb. of prawns had been caught in Exmouth Gulf this season. Banana prawns were the predominant species, followed by tiger prawns and king prawns in that order.

WHAT CAN FISH HEAR ?

An article appearing in the August publication of "World Fishing" concerns the ability of fish to hear sounds and the question of whether or not the sounds made by trawls or from the fishing vessel itself have an effect on the fish causing them to disperse. It says that experiments suggested that most fish can only hear sounds of quite low frequency from about 50 to 1,000 cycles a second and that their ears are not very sensitive and they do not seem to be able to tell the direction sounds are coming from.

The article then continued:-

"There is some evidence that herring dive down into deeper water when disturbed and it is thought that this is due to the noise of nets and ships. This would certainly help them to avoid being caught by midwater trawls.

"So the sounds made by nets and vessels may temporarily disturb fish such as herring, but not in a directional way and often they do not respond at all. One of the reasons for this is the poor hearing ability of fish; another, the fact that strange noises have no meaning for fish, which live in an environment constantly changing in background noise.

"Some sounds do have a meaning to them and these are, of course, the sounds which they produce themselves. Since the last war there has been

much research in underwater acoustics and it has been found that many species of fish produce sounds. For example the 'grunting' sound of the cod is produced by the contraction of special muscles attached to the swim bladder, which cause the enclosed gases to vibrate. These sounds are important during the spawning period the males produce the sound in the presence of other competing males and in courtship with the female. Many other species of fish produce sounds and locating fish by the sounds they make is already practised in some Far East coastal fisheries which employ a well-trained 'fish listener'."

SICK AND ACCIDENT REPORTS

We are happy to report that Technical Officer J.S. Simpson has left hospital after his recent appendectomy and is now convalescing at home. Mr. Simpson, it will be recalled, became ill while travelling to Geraldton in r.v. "Lancelin" some weeks ago and was taken to hospital immediately upon arrival in port. He later returned to Perth, but forthwith entered St. John of God Hospital at Belmont. His progress was at first slow, but latterly he has improved considerably and he expects to be back at work by the end of October.

While in Sydney at the fisheries field officers' training school, Technical Officer N.E. McLaughlan had the misfortune, on the first day, to break a small bone in his foot. This necessitated a brief visit to hospital as well as the use of crutches during the whole period of the school. The fracture is now coming along nicely.

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CLEARING HOUSE

CAN THE WORLD'S SEAS PRODUCE 20 TIMES AS MUCH AS THEY DO TODAY?

A Big Question For The Scientists

*How to feed the world's growing population in 40 years (by which time it is expected to double today's figure) is the big question worrying scientists and statesmen.

*To do it, more and more attention is being turned to the sea.

*And the factors bearing on its increasing importance were adequately and interestingly summarised by Dr. D.B. Finn in a recent address to a Canadian audience.

"Various authorities," he said, "have placed the seas' capacities at about double or treble their present production." Dr. W.M. Chapman on the other hand, in a speech in Los Angeles in January, said, "Recent competent studies by scientists at the Scripps Institution of Oceanography and the Institute of Marine Resources of the University of California, supported by similar studies elsewhere, indicate that under present conditions of production, and the state of the art, the production of animal protein from the sea can be increased by a factor of ten, and that the theoretical capacity of the sea to produce animal protein is adequate to satisfy the protein dietary requirements of a world population of 30 billion people (about ten times the present world population).

"I have not had a chance to examine the data that produced this conclusion." commented Dr. Finn, "but if the world ever contains 30 billion people whose requirement of animal protein is about 40 gms. per day (on the wet basis), i.e. about 32 K per year, it would mean that the sea would have to supply about 960 million metric tons of fish or its equivalent per year, on a theoretical basis. That is about 20 times as much as it does now."

Six things We don't Know

Discussing the possibilities of enlarging production, Dr. Finn listed six things of importance that we didn't know, and required to know before we could really begin to plan increased supplies from the seas.

These six things were:

1. We do not know, or cannot foretell, whether nations will effectively co-operate to make possible the maximum sustained yield, even though scientists can prescribe the necessary measures.

2. We do not know whether the stocks presently exploited will stand up to the more intensive fishery. (There are signs that some of them will not.) Nor do we as yet know what the standing crop may be, that is, how many fish there are in the sea.

3. We do not know what new fisheries will be discovered, and by new fisheries I mean those that would yield the kind of fish we are used to consuming, though there are many possibilities.

4. We know even less about the demand which might spring up for species of fish which we at present do not consume.

5. We do not know whether scientists will be permitted to give effect to existing knowledge on the augmentation of the existing resources, or how much encouragement they will get to search for new knowledge of this kind.

6. We cannot predict whether earning power will be raised for the creation of extra demands for fish, which woul sustain new production.

Much is Being Done

In spite of the ignorance of those factors, a great amoun of interest and work was being devoted to the question of adequately developing and using the potential nutritional values of the seas.

Governments, national and international scientific institutions, universities, as well as international bodies such as FAO, are giving a great deal of thought and action to these matters.

"But the point is that the field of inquiry is so complicated and diverse, and the answers are so urgently important to the lives of men, that it should be made possible to do much more.

"We spend many billions of dollars on outer space, but pitifully little on inner space - the oceans. I venture the opinion that the conquest of the inner space is much more important to man's existence than exploration of outer space, and sending a man to the moon."

Traversing his six points, Dr. Finn made these comments on them.

Existing stocks: "Some stocks might be more easily exhaused than others. Salmon is one of them. It would be theoretically possible to exterminate the Pacific salmon by trapping and netting every fish that seeks to enter its native river. Luckily, this problem is being looked after by the International Pacific Salmon Fisheries Commission. The halibut of the North Pacific is another of these fish. The International Pacific Halibut Commission provides an example of how yields can be increased by intelligent managing of the cropping. Further, two world wars virtually closed the North Sea to fishing. The fish almost immediately increased in numbers and the yields at end of the wars were tremendous. But the intensity of fishing succeeding the war was so great as to reduce the yield once again to a point where only relatively small vessels could make it pay. Larger more modern vessels were forced to fish farther afield.

"Many went to waters adjacent to Newfoundland. And the number of trawlers there from countries all over the world has been increasing yearly. FAO estimates that this area produced 3.14 million metric tons in 1962. How will it stand up to the rapidly increasing fishing effort? One cannot say. Fortunately the International Commission for the North Atlantic Fisheries is actively working on this problem, and is trying to find out.

"As for herring, sardines, anchovy, tuna and the pelagic fish, there is still scant information of the effect of man as a predator. The excellent work of the International Tropical Tuna Commission has shown that one particular race of yellow fin tuna off the west coast of Latin and Central America is being fished to its limit or beyond it.

Co-operation of Nations: "Secondly we do not know how successful we will be in getting nations to co-operate in controlling the harvesting of fish so that the maximum sustainable yield can be taken. Fishing is a hunting operation conducted under fierce competition. First come, first served, and devil take the hindmost has been the rule. To reduce this anarchical way to one of order, even though the total benefit to mankind would be increased, is not something that appeals to nations who are in competition for existence. Much educational effort, enormous amounts of patience and persistence of purpose must be expended before the long term interest of humanity can be served in this way.

"The problem is made much more difficult because the ocean fisheries scientists, faced with so many unknowns, cannot as yet say what degree of protection is required.

Nations won't agree to restrictions on their fishing industry unless scientists acting objectively can forecast the results. That is why the accumulation of such knowledge is so urgent.

"However, excellent work is under way to secure this information. Canada's Fisheries Research Board is outstanding. The United States, Japan, Great Britain and practically all the European countries are active, but perhaps the most searching and comprehensive efforts are being made by Russia. The trouble is that, with the possible exception of Russia, this excellent work is not being supported well enough - not in proportion to the vastness of the problem.

"Ocean research, including its biological phases, is essentially an international problem. It requires inter-governmental planning and co-operation. It is beyond the powers and scope of any one nation.

New Fisheries? - "Thirdly, we do not know what new fisheries will be discovered - those yielding the kind of fish we are used to eating. There are many indications that there are unfished stocks in the ocean. For instance, in the Arabian Sea, the Patagonian Shelf, the Persian Gulf and others.

"Then there is the interesting point of our consumption pattern. By and large, the Northern Hemisphere is frightfully conservative. We catch the same fish as we caught hundreds of years ago and resist any innovation.

"This is a challenge to the food technologist. Japan has probably gone farthest in this field. They are almost entirely dependent on the products of the sea for their intake of animal protein and prepare many products from fish that otherwise might not be consumed. I have eaten bologna sausage which one would never guess contained fish.

"I have also eaten bread containing fish flour to the extent of 10 per cent without even detecting it. The flour was made from anchovetta and hake which are not ordinarily consumed by people. There must be many products that could be prepared appetisingly from sea material, but here again no one can tell if and when this will occur.

Farming the sea? - "There is growing knowledge by biological scientists on how to augment the existing resources of the sea. Cushing, of Lowestoft, has described artificial rearing techniques, and transplantation and exploitation of fertility, and he believes that yields can be increased by such methods.

Enclosed areas such as lagoons and perhaps fjords might be used to rear stocks of young fish in the absence of predators British scientists have succeeded with plaice in this manner. In nature, of the 300 or 400 thousand eggs which each female plaice lays, only about 10 or 15 young ones survive to enter the fishery. Under the new British methods these eggs are hatched in captivity, protected during the critical first eight weeks when most of the mortality occurs, and then planted on natural feeding grounds. In this way a survival rate of from 20 to 30 per cent is secured.

"The Russians have transplanted pink salmon to the Baltic and given rise to a new fishery. They have also transplanted Baltic herring to the Aral Sea where survival is much greater.

"Northern Hemisphere trout have been transferred to New Zealand, where they grow tremendously and have become as well as an increased source of food, one of the main tourist attractions.

"Wimpeny introduced the mullet to Egypt, where it thrives Many other possibilities of this sort exist, particularly in transferring species from the Northern Hemisphere across the equator to places of similar environment in the Southern Hemisphere.

"The use of applied genetics, selective breeding for desired qualities such as have revolutionised the beef and broiler industry are possible also with fish.

Will progress be made? - "But will men of science be given the opportunity to do this? The answers lie beyond science or logic. They lie in the realm of social behaviour between nations. Nations, struggling for self preservation, face problems of mutual competition and different ideologies. The success of one may depend upon the failure of another. This has been the lesson of history. We are only on the verge of emerging into the stage of 'live and let live.' We are still very far from regarding this world as one complex community, the failure of any part of which is a threat to the whole.

"Most of the examples I have cited concern the possibilities of increasing an abundance which nobody owns. What nation is going to give effect to these discoveries when there is no guarantee, under the hunting operation which prevails on the high seas, of reaping even a share of the reward?

"Will scientists be allowed to proceed with their researches, conducted at great cost to their respective countries, unless some understanding can be arrived at between nations, as to the sharing of the rewards? The discovery is one thing (and it would be difficult to stop it under a regime of freedom of inquiry) but putting it into effect is quite another.

"The achievement of the immense possibilities that such a branch of endeavour holds will depend upon getting nations to agree to some system of sharing in the costs and the rewards. This will take education and time.

Consuming the product: "Finally, there is the problem of securing an effective demand for new production. This principally concerns the newer countries where the problem of under-nutrition and malnutrition is gravest. Fundamentally it is due to poverty and ignorance.

"The preamble of the constitution of FAO has as its object the raising of the standard of living of peoples. To that we are devoting our work. As we and others are successful so we shall create conditions which will enable needy people to take advantage of the world's resources. The fisheries resource is high among these.

"The problem really is not so much what the seas can produce as what they will be allowed to produce."

(The Fishing News London 31 July, 1964.)

FISH FRESHNESS COMPUTED ELECTRONICALLY

A German machine which assesses the freshness of fish electronically is undergoing a series of comprehensive tests at Torry Research Station, Aberdeen, Scotland, the Fish Trades Gazette has reported.

The machine was developed by an electronics firm of Hamburg. The performance of the instrument on whole fish stored in ice will be compared with results obtained by taste panel and chemical tests.

The fish tester consists of a measuring apparatus contained in a metal case and measuring forceps which are connected to the apparatus by a cable and special plug.

The measuring apparatus contains a fully transistorised circuit using 24 semiconductor elements (transistors, etc.) which produce the measuring current and evaluates it electronically in such a way that the measured value can be read directly and immediately on the scale of an instrument on the front panel of the metal case.

The indicator has a circular scale for each of five commercially important kinds of fish divided into "degrees of freshness". The degrees of freshness give the "freshness" of the measured fish in "reserve ice storage days", that is they indicate how many days the fish - being stored in ice immediately after the measurement - can be kept in usable condition.

The scale on top, calibrated linearly from 0 to 100, is to facilitiate setting up calibration curves for types of fish other than the five selected, whose loss of freshness during storage in ice is found to be different and must first be determined empirically.

The metal case also contains two six-volt batteries which will last for about six months with daily use and can be exchanged by lifting off the front panel.

The measuring forceps carry a graphite electrode on each end, guided in a metal sleeve and fixed by clamping screw. For ease in use a carrying case is supplied so that the bearer has both hands free and can also read the indicated values on the instrument's scale.

Tests carried out earlier with the fish tester by the West German Federal Research Institute for Fisheries, Hamburg, are reported to have proved that the indications of the degree of freshness were in accordance with chemical and organoleptic statements, and that even when by means of certain alterations of storage conditions the proceedings of decay were delayed or accelerated, these factors had no influence on the indicated degree of freshness.

The tests carried out with a fish tester by veterinary surgeons and market commissioners at the daily fish auctions at Cuxhaven, Hamburg and Kiel have shown that the instrument indicates exactly the freshness of the fish quite subjectively according to quality.

The measuring principle on which the fish tester is based makes use of the fact that a.c. resistance of fish tissue contains capacitive components which are conditioned by the properties of the cellular skins.

When during storage of fish, the fish albumen is removed or decomposed by enzymes of the fish and by bacterial activity (loss of freshness, advance of decay), the cellular skins consisting mainly of albumen are affected to the same extent, and correspondingly lose the properties which contribute the capacitive components to the a.c. resistance of the tissue.

The same applies if the cellular skins of the tissue are more or less damaged by mechanical effects (knocks, heavy pressure, etc.) or by ice crystal formation in the tissue on freezing. Thus the tissue changes which occur with decreasing freshness and mechanical damage are measured by electrical means through the reduction of the capacitive component of the a.c. resistance.

Since with normal storage the mechanical effects are only of subsidiary importance, the tissue changes bear an empirically determined, direct and reproducible relation to the freshness of the fish.

(The Fisherman Sydney. Winter, 1964.)

THE DIATOMIC SOUP

In his book, "You and the Universe", N.J. Berrill states: "A hump-back whale, which is far from being the largest of its kind, needs a ton of herring in its stomach to feel comfortably full - as many as 5,000 individual fish. Each herring in turn, may well have six or seven thousand small crustaceans in its own stomach, each of which contains as many as 130,000 diatoms. In other words, some 400 billion yellow-green diatoms sustain a single medium-sized whale for a few hours at the most."

When it is considered that men take from the sea around 40 million tons of fish annually for food, the immense importance of the microscopic single-celled algae, known as diatoms, may be grasped, although their rate of proliferation and death in countless thousands of digestive tracts are so great that they may only be comprehended as shadowy abstractions.

There may be as many as several million diatoms in a single quart of surface water. A single diatom reproduces so rapidly that in a month it may have a thousand million descendants.

Planktonic life, of which diatoms constitute six-tenths inhabit the surface waters down to a depth of some 100 feet, and along the coastal shelves where the sunlight can extend to the sea floor.

On the continental shelves the diatomic soup is so thick, the only problem is to find living space on the sea bed. Once this is accomplished it is merely a matter of opening the mouth and eating to capacity.

(The Fisherman Sydney. Winter, 1964.)

FISH TO FLAVOUR

It may be as easy as salting food
says Japanese scientist

In the future it may be possible to flavour fish as easily as we salt our food today.

This interesting disclosure was made recently by Dr. Y. Hashimoto of the University of Tokyo. He was outlining Japanese research into the palatibility of fish, at an international symposium on the significance of fundamental research in the utilization of fish, held in Husum, West Germany, by the FAO.

"Most investigations have been on substances responsible for taste, especially the complicated taste described as 'meaty' or 'palate-satisfying'," said Dr. Hashimoto.

He began experiments some years ago by producing extracts of marine products for laboratory study, He chose three of Japan's tastiest and most popular fish products - katsuwobushi, a dried bonito preparation; uni, the unripe gonad of sea urchin; and abalone meat.

After many experiments Dr. Hashimoto and his colleagues could tell with accuracy which chemicals determined the taste qualities of each of these products.

The taste of uni, for example, is mainly due to its amino acids and nucleotides. Dr. Hashimoto suggested, indeed, that the principal taste factors in marine products are glycine, alanine, valine, glutamic acid, methonine, IMP and GMP.

"It is quite within the bounds of possibility," stated Dr. Hashimoto, "to influence the taste characteristics of marine products with a few compounds, once the overall taste picture becomes evident.

Fishmerchant and Processor London July/August, 1964.

CORROSION CHALLENGE

Preventing the corrosion of metal hulls and machinery seems to present constant challenge to those called on to deal with the problem. No sooner are methods evolved to combat corrosion in one set of circumstances than new ones are called for to deal with it in another.

Recently M.G. Duff and Partners were asked to investigate the causes of corrosion in diesel engine heat-exchange equipment in Peruvian fishing vessels, and, after prolonged investigations, discovered that the severe pitting of the cupro-nickel cooler pipes was due to pollution of Peruvian coastal waters by hydrogen sulphide.

They found that warm ocean currents move in towards the Peruvian coast and mix with the local waters for several months every year, and that the resulting changes in water temperature causes wholesale destruction of the planktonic life on which the fish feed. Enormous numbers of fish consequently die, and so do enormous numbers of guano birds accustomed to feeding on the fish and as a result a wide band of coastal water is polluted by hydrogen sulphide - a product of their decomposition.

No pipe alloys normally used in ships will withstand the corrosive influences of this water, and trials are being made with new materials likely to last considerably longer than four months - the period in which some of the cupro-nickel pipes have corroded through. This case reminds me of a similar one which occurred some years ago in North Australia. Fishermen there, who moored their boats in a certain estuary, could not understand why unusually rapid corrosion should take place in the water intakes and cooling systems of their engines, and not until after a thorough investigation of the problem had been made, was it established that it was due to water polluted by mangrove swamps adjacent to their moorings.

(The Fishing News London 17 July, 1964.)

WHAT MAKES SALMON RUN?

Salmon periodically migrate from fresh to salt water and back again during their life cycle. Evidence strongly suggests that this migration is a result of changing preference for water of varying salinity. This, in turn, seems to be caused by a change in the rate of thyroid activity.

When coho salmon, Onchorhyncus kisutch, thyroids were stimulated by a hormone, they sought sea water. When hormone injections were stopped they sought fresh water. Pink salmon, Onchorhyncus gorbuscha showed the opposite effect when their thyroids were artificially inhibited, seeking fresh water in preference to sea water.

There are probably many additional factors involved as well, such as the action of the pituitary gland, diet and length of day.

(Sea Frontiers Miami, Florida July, 1964)