

A Fishing Research in the Australian Waters

I. Fishing Ground and Species Encountered

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The fishing research ship of the Japan Fisheries Agency, "Suruga-Maru No.1" (chartered from Kyokuyo Hoge Company), navigated in the Australian Waters during the period from 1st September to 20th December 1965 to explore the new fishery resource of bottom fishes. She started from Shimizu and ported Melbourne, Fremantle, Darwin and Thursday Island, and returned to Tokyo. The areas surveyed extended from the Bass Strait, thence the Great Australian Bight, off the coast of Western and Northern Australia to the Gulf of Carpentaria.

Many subjects on species encountered, distributions, fishing grounds and some biological works about various fishes, especially bottom fishes, in the Australian continental shelf and slope were researched in this navigation.

The author obtained the knowledge of fishes in the Australian Waters, from WHITLEY (1962) about the general marine fishes, COWPER & DOWNIE (1957) about the deep water fishes in the southern coast, and from STEAD (1963) about sharks and rays.

He depended on inspectors of the Australian Government for help to identify the species caught and here wishes to thank inspectors, Messers. K. GODFREY and D. TUMER, Division of Fisheries and Oceanography, Commonwealth Scientific and Industrial Organization, and Mr. E. BAKER, Fisheries Office of Western Australian Government. He thanks also Mr. KIYOSHI YOSHIZAKI, Ocean Section II of Japan Fisheries Agency, who was the chief inspector of the ship. The manuscript was read by Dr. YOICHI YABUTA, chief of our laboratory, to whom he extends his sincere appreciation.

I. Materials and Methods

A. Fishing Stations

All stations worked throughout the survey are plotted in Figure 1. These stations were positioned 12 miles or more off the coasts. The total of all stations were 76 and these in the southern coast, from St.1 to St.50, were surveyed most frequently and regularly. The deepest water was 780 meters at St.32 and the shallowest one was 35 meters at St.41.

B. Work at Station

Works at every station were fishing by several kinds of fishing gear, and oceanographical and biological observations. Oceanographical observations were made on the air temperature, water temperature at surface and fishing depth, wind direction and speed, and bottom materials.

Biological observations were the identification of all species, length and weight measurement of almost all species, scale sampling of some fishes, plankton sampling vertically with 70 cm diam. net and sex determination of

sharks caught. Fishing was carried out almost two times a day, early morning and evening with one or sometimes two or three different kinds of fishing gear.

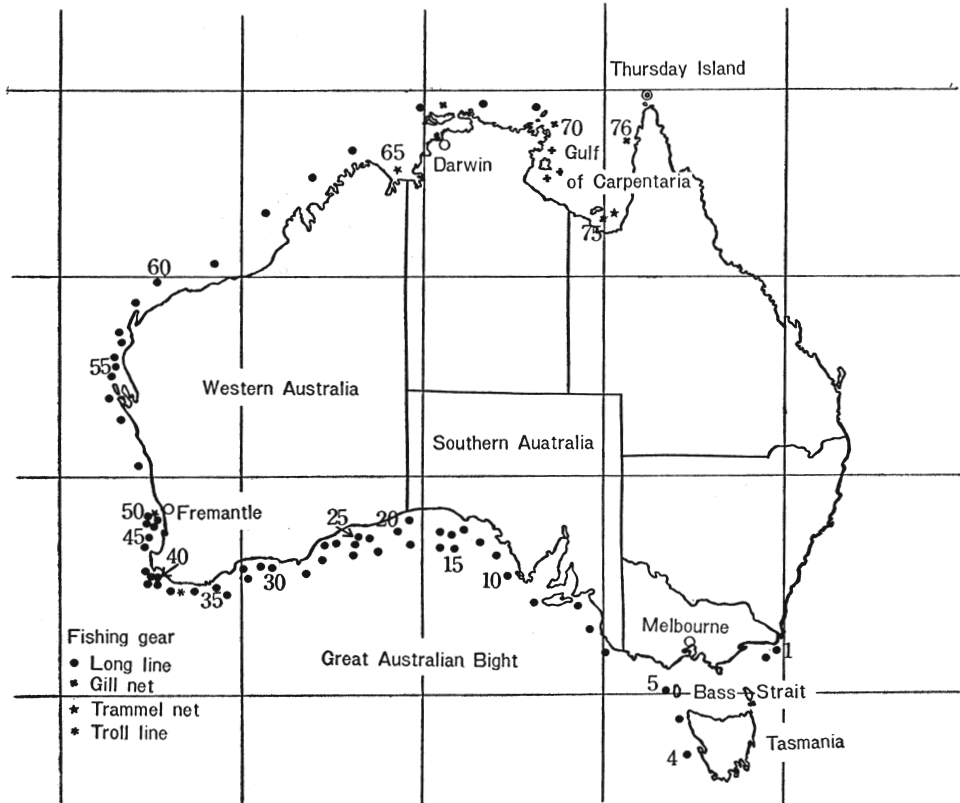


Fig. 1 Area surveyed, positions of stations worked and fishing gear used.

C. Fishing Gear

Several kinds of fishing gear were used in this survey.

a) Two types of bottom longline: A square basket type of longline called Tai-Nawa (Bream Line) was used in the shallow water, mainly less than 150 meters. This is commonly used for the Bream fishing in the New Zealand Waters by Japanese fishing boats. The main length of one basket line was 200 meters with 125 hooks and that of the branch line was from 45 to 60 cm. It was lowered from the stern of the ship and hauled by a small dory.

A round basket type of longline called Tara-Nawa (Cod Line) was used in the water deeper than 150 meters. Along northern coast, however, this gear was used even in the water shallower than 100 meters. This is the same type gear used generally for the Cod fishing in the Northern Pacific Ocean. The length of the main line was 70 meters with 30 hooks and that of the branch line 1.5 meters. It was hauled by linehauler of the ship.

An average number of 1,250 hooks was set at each station, the maximum number being 3,100 and the minimum 180 hooks in one station of the Bream Line. In Cod Line, an average number of 1,500 hooks was set in each station, the maximum of 4,000 and the minimum of 600 in one station.

b) Drift net : This is the same gear used in the North Pacific Salmon Fishing and the length was 60 meters and the depth 5 meters. This gear was mainly used in the Gulf of Carpentaria.

c. Trammel net : This is called Sammai-Ami in Japan, which was used for survey of prawn fishing along the western coast and the Gulf of Carpentaria.

II. Results

A. Species Encountered

From 76 stations in total, 112 species of fishes with a few prawn were encountered. The list of the species are as follows:

Family	Scientific name	Australian common name
Heterodontidae	<i>Heterodontus portusjacksoni</i> (MEYER)	Portjackson shark
Cyliorhinidae	<i>Halaelurus</i> sp.	Cat shark
Orectolobidae	<i>Brachaelurus waddi</i> (BLOCH & SCHNEIDER)	Blind cat shark
	<i>Orectolobus maculatus</i> (BONNATERRE)	Common wobbegong
	<i>Nebrus concolor</i> RÜPPEL	Tawny shark
Galeorhinidae	<i>Eulamia macrura</i> (RAMSAY & OGILBY)	Whaler shark
	<i>E. coatesi</i> (WHITLEY)	Coates shark
	<i>E. spallanzani</i> (LE SUEUR)	Black tip shark
	<i>E. ahenea</i> STEAD	Bronze whaler shark
	<i>E.</i> sp.	Inky tail shark
	<i>Galeolamna grayi</i> OWEN	South australian whaler shark
	<i>Galeocerdo cuvier</i> (LE SUEUR)	Tiger shark
	<i>Galeorhinus australis</i> (MACLEAY)	School shark
	<i>Hemigaleus microstoma</i> BLEEKER	Weasel shark
	<i>Triakis ventralis</i> (WHITLEY)	Whiskery shark
	<i>Mustelus antarcticus</i> GÜNTHER	Gummy shark
	<i>M.</i> sp.	White spotted gummy shark
Sphyrnidae	<i>Sphyrna lewini</i> (GRIFFITH)	Hammerheaded shark
Squalidae	<i>Squalus fernandus</i> MOLINA	Spiny dogfish
	<i>S. kirki</i> PHILIPS	White spotted spiny dogfish
	<i>Deaniopus quadrispinosa</i> (MCCULLOCH)	Long-snouted dogfish
	<i>Etomopterus lucifer</i> JORDAN & SCHNEIDER	Mollers dog shark
Pristiophoridae	<i>Pristiophorus nudipinnus</i> GÜNTHER	Southern sawshark
Dalatiidae	<i>Dalatias licha</i> (BONNATERRE)	Black shark
Rhinobatidae	<i>Rhinobatus</i> sp.	Shovel-nosed ray
	<i>Trygonorhina fasciata</i> MÜLLER & HENLE	Fiddle ray
Torpedinidae	<i>Hypnaree subnigro</i> (DUMERIL)	Numb fish

Rajidae	<i>Psammobatis waitii</i> (MCCULLOCH)	Round skate
	<i>Raja</i> sp.	Bight skate
Dasyatidae	<i>Urolophus testaceus</i> (MÜLLER & HENLE)	Stingaree
	<i>U. cruciatus</i> (LACÉPÈDE)	Cross-back stingaree
	<i>U.</i> sp.	Western stingaree
Myliobatidae	<i>Myliobatis</i> sp.	Eagle ray
Chimaeridae	<i>Phasmichthys lemures</i> (WHITLEY)	Bight ghost shark
	<i>P. waitei</i> (FOWLER)	Waites ghost shark
Callorhynchidae	<i>Callorhynchus milli</i> BORY	Elephant shark
Clupeoidea	<i>Megalops cyprinoides</i> (BROUSSONET)	Tarpon
	<i>Harengula koningsbergeri</i> WEBER & DE BEAUFORT	Spotted herring
	<i>Nematolosa come</i> (RICHARDSON)	Haiback herring
	<i>Pellona ditchela</i> CUVIER & VALENCIENNES	Ditchelee herring
Polynemidae	<i>Eleutheronema tetradactylum</i> (SHAW)	Giant threadfin
Pomatomidae	<i>Pomatomus saltorix</i> (LINNÉ)	Tailer
Synodontidae	<i>Saurida undosquamis</i> (RICHARDSON)	Large scaled saury
Bothidae	<i>Thyrsites atum</i> CUVIER & VALENCIENNES	Barracuda
	<i>Rexea solandri</i> (CUVIER)	King barracuda
	<i>Agrioposphraena barracuda</i> WALBAUM	Akerstoromes seapike
Theraponidae	<i>Therapon theraps</i> CUVIER & VALENCIENNES	Striped perch
Pomadasyidae	<i>Pomadasyus hasta</i> (BLOCH)	Lined silver grunter
	<i>P. maculatus</i> (BLEAKER)	Saddle berch
Tachysauridae	<i>Tachysurus thalassinus</i> (RÜPPELL)	Giant salmon catfish
Aulopidae	<i>Aulops purpurisatus</i> RICHARDSON	Sergant baker
Cheilodactylidae	<i>Nemadactylus morwong</i> (RAMSAY & OGILBY)	Morwong
	<i>Dactylopagrus</i> sp.	Blue morwong
Congridae	<i>Conger</i> sp.	Conger eel
Muraenidae	<i>Alabes</i> sp.	Reef eel
Enoplosidae	<i>Enoplosus armatus</i> (WHITLEY)	Old wife
Sillaginidae	<i>Sillaginodes</i> sp.	King george whiting
Priachanthidae	<i>Liopempheris multiradiata</i> KLUNZIGER	Bulls-eye
Mullidae	<i>Upeneus porosus</i> CUVIER & VALENCIENNES	Red mullet
Scorpinidae	<i>Scorpius lineolatus</i> KNER	Sweep
Serranidae	<i>Cephalopis miniatus</i> (FORSKÅL)	Coral trout
	<i>Mora mora</i> (RISSO)	Deep sea cod
	<i>Epinephelus amblycephalus</i> (BLEEKER)	Bluntheaded rockcod
	<i>E. chlorostigma</i> (CUVIER & VALENCIENNES)	Bird-wire rockcod
	<i>E. tauvina</i> (FORSKÅL)	Slimy cod
	<i>E.</i> sp.	Chainaman rockcod

	<i>E.</i> sp.	Break seacod
Lutjanidae	<i>Lutjanus sebae</i> (CUVIER & VALENCIENNES)	Emperor
	<i>L. Malabalius</i> (BLOCH & SCHNEIDER)	Ladyfish
	<i>L.</i> sp.	Crescent snapper
Lethrinidae	<i>Lethrinus nebulosus</i> (FORSKÅL)	Starry pigfaced bream
	<i>L.</i> sp.	N.W. snapper
Sparidae	<i>Chrisophrys aurtus</i> (BLOCH & SCHNEICER)	Snapper
	<i>C. unicolor</i> QUOY & GAIMARI	Westralian jewfish
Ostorhinchidae	<i>Ostorhinchus conwaii</i> RICHARDSON	Knifejaw
Trachichthodae	<i>Trachichthodes lineatus</i> (CUVIER)	Swallow tail
	<i>T. affinis</i> GÜNTHER	Nannygai
	<i>T.</i> sp.	Redfish
Menidae	<i>Mene maculata</i> (BLOCH & SCHNEIDER)	Doller fish
Carangidae	<i>Caranx sexfasciatus</i> QUOY & GAIMARD	Great trevally
	<i>C. fulvoguttatus</i> FORSKÅL	Golden spotted trevally
	<i>C. georgianus</i> (CUVIER & VALENCIENNES)	White trevally
	<i>C. speciosus</i> (FORSKÅL)	Golden trevally
	<i>C. oblongus</i> (CUVIER & VALENCIENNES)	Oblong trevally
Seriolidae	<i>Elagatis bippinulatus</i> (QUOY & GAIMARD)	Runner
	<i>Seriola grandis</i> CASTOLNOU	King amberjack
	<i>Rachycentron canadum</i> (LINNÉ)	Cobia or Black kingfish
	<i>Parastromateus niger</i> BLOCH	Black pomfret
Scombridae	<i>Pneumatophorus australasicus</i> CUVIER & VALENCIENNES	Mackerel
	<i>Scombermorus commersoni</i> (LACÉPÈDE)	Narrow barred spanish mackerel
	<i>S. semifasciatus</i> (MACLEAY)	Broad barred spanish mackerel
	<i>Rastrelliger kanagurta</i> (CUVIER)	Rake-gilled mackerel
	<i>Euthynus aletteratus</i> (CONTOR)	Mackerel tuna
	<i>Makaira martina</i> JORDAN & HILL	Black marlin
Scorpaenidae	<i>Neosebastes pandus</i> RICHARDSON	Gurnard perch
	<i>Hericolenus papillosus</i> (BLOCH & SCHNEIDER)	Red gurnard perch
	<i>Scorpaena cruenta</i> RICHARSON	Red rockcod
Triglidae	<i>Pterygotrigla</i> sp.	Red gurnard
	<i>P.</i> sp.	Lachet
Platycephalidae	<i>Neoplatycephalus conatus</i> WAITE & MCCULLOCH	Deep water flathead
	<i>Platycephalus bassensis</i> CUVIER & VALENCIENNES	Sand flathead
Aleuteridae	<i>Canthrinus ayraudi</i> QUOY & GAIMADO	Yellow leather jacket

	<i>Paramoacanthus</i> sp.	Leather jacket
Psettodidae	<i>Psettodes erumei</i> (BLOCH & GAIMARD)	Halibut
Bothidae	<i>Pseudorhombus jenynsii</i> (BLEEKER)	Small-toothed flounder
	<i>P.</i> sp.	Three spot flounder
Diodontidae	<i>Tragulichthys jaculiferus</i> (CUVIER)	Porcupine
Tetraodontidae	<i>Pleurachansus scleratus</i> (FORSTER)	Silver puffer
Moridae	<i>Physiculus</i> sp.	Australian rockcod
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Penaeidae	<i>Penaeus</i> sp.	Tiger prawn
	<i>P.</i> sp.	King prawn
	<i>P.</i> sp.	Endeavour prawn

B. Fishing Ground and Fishes

The stations were divided into several parts. And the species caught, type of bottom substance, water depth and water temperature in each part are described. Table 1 shows the water temperature at all the stations.

Table 1. Temperature at surface(A) and fishing depth(B)

	A	B		A	B		A	B		A	B
St. 1	13.8	13.7	St. 21	15.7	14.3	St. 41	18.6	18.4	St. 61	25.7	24.5
2	15.2	12.6	22	16.3	16.2	42	18.8	...	62	27.0	26.8
3	13.2	13.0	23	16.2	16.1	43	18.7	18.1	63	28.0	28.0
4	12.6	12.2	24	16.1	...	44	19.2	18.4	64	28.1	27.5
5	12.5	12.4	25	16.7	...	45	19.0	18.8	65
6	14.2	14.3	26	16.5	...	46	18.9	18.8	66	29.1	28.6
7	14.4	14.0	27	16.5	16.3	47	19.0	...	67	29.1	28.5
8	14.9	14.2	28	16.7	16.5	48	19.0	...	68	29.6	29.5
9	15.3	16.2	29	16.5	15.3	49	19.2	...	69	28.7	28.5
10	15.2	...	30	16.7	16.5	50	19.3	...	70	28.1	28.1
11	15.5	15.4	31	17.3	17.0	51	19.9	...	71	28.4	26.3
12	16.1	15.3	32	17.0	...	52	20.2	...	72	27.7	25.7
13	16.4	16.5	33	17.5	16.9	53	20.8	...	73	28.9	27.9
14	16.4	15.6	34	17.8	...	54	20.7	20.6	74	28.4	...
15	15.4	15.0	35	18.3	17.3	55	22.0	20.8	75
16	15.6	14.6	36	18.4	18.2	56	21.7	20.8	76	28.7	28.0
17	15.8	15.7	37	18.2	18.6	57	22.5	20.8			
18	16.3	16.1	38	18.5	17.8	58	22.5	...			
19	15.1	14.1	39	18.8	18.1	59	23.4	...			
20	16.2	16.1	40	18.2	...	60	23.7	...			

a) Sts. 1—9. From the Bass Strait to the off shore of Port Lincoln

The water depth was from 70 to 175 meters and the area had a sandy bottom with shells. Plankton sampled consisted mainly of Copepoda and Appendicularia. Fishes caught were Morwong (*Nemadactylus morwong*), Red gurnard (*Pterigo-*

trigra sp.), Australian rockcod (*Physiculus* sp.), Knife jaw (*Ostrhincus conwaii*) and Flathead (*Platycephalus bassensis*). The spiny dogfish, *Squalus fernandus*, 50 cm in average length was the most abundant species. The western coast of Tasmania was not so good a fishing ground compared with the Bass Strait.

b) Sts. 10—29. Great Australian Bight

The Bight fishing ground was divided into two parts according to depth. One part included shallow water of the continental shelf of less than 100 meters depth. The bottom sediments was almost "White Fine Sand", showing low productivity of the water in this area. The Australian inspector said that the currents from Indian Ocean cease to pour into the Bight in summer and fresh water from the land runs little down through all seasons, therefore there are not many fishes and only the Leather jacket (*Aluteridae* sp.) was found, therefore they generally call the Bight in summer "Dead Sea".

Another part included the continental slope, from 300 to 800 meters depth. The bottom was sandy and muddy with corals and sponges in this area. The Deep sea cod (*Mora mora*), Red gurnard perch (*Helicolenus papillosus*), Long snouted dogfish (*Deania quadrispinosa*) and Mollers dog shark (*Etomopterus lucifer*) were the deep water fishes at depths exceeding 500 meters. The Spiny dogfish was always a dominant species in the middle water from 400 to 500 meters depth.

c) Sts 30—50 Southern Coast of Western Australia

The fishing area was less than 300 meters in depth and the bottom was sandy and rocky with corals. The Snapper, *Chrysophrys aurtus*, with a bulging head (especially the old fish had big bulges on the forehead and snout) was caught in abundance from the rocky bottom. It was 70 cm in length and 6 kg in weight in average. The Westralian jewfish, *Chrysophrys unicolor*, and Snapper are the magnificent food fish of Western Australian people. The Portjackson shark (*Heterodontus portusjacksoni*), Whiskery shark (*Triakis ventralis*), Bronze whaler shark (*Eulamia ahenea*) and some other species of shark were caught. The Spiny dogfish was caught in depths of more than 100 metres. The Mackerel, *Pneumatophorus australasicus*, was caught by trolling at the surface of St.35.

d) Sts.51—64. Western and Northern Coast of Western Australia

The fishing area was from 40 to 160 meters in depth and the bottom consisted of sand with shells between St. 51 and 57, after St. 58, it was almost sand with corals. From St. 51 to 55 the Snapper, Giant salmon catfish (*Tachysurus thalassinus*) and Lined silver grunter (*Pomadasyus hasta*) and then from St. 57 to 59 the Silver puffer (*Pleurachansus scleratus*) were the dominant species. The Snapper in this area was smaller than the ones from the southern coast of Western Australia, being 40 cm in length and 2 kg in weight in average. After St. 60, the N.W. snapper (*Lethrinus* sp.), Emperor (*Lutjanus sebae*), Coral trout (*Cephalopis miniatus*), Coral cod (*Plectropomus maculatus*), Slimy cod (*Epinephelus tawina*) and other subtropical species were caught, and above all, the Whaler shark (*Eulamia macrura*) was the most dominant species at every station of this area.

e) Sts.65—76. Gulf of Carpentaria

The water depth was 76 meters in maximum and the bottom was almost occupied with gray mud. All fishes caught were tropical species. By longline the Black tip shark (*Eulamia spallanzani*), Coates shark (*Eulamia caotesi*),

Table 2. Number of fishes of all species per 100 hooks of longline in each station.

St. 1	12.4	St. 11	0	St. 21	11.4	St. 31	0.5	St. 41	1.1	St. 51	2.0	St. 61	5.1	St. 71	—
2	7.8	12	0.7	22	0.5	32	4.6	42	0	52	3.2	62	1.3	72	—
3	4.3	13	0	23	0.8	33	0.8	43	1.7	53	3.5	63	1.7	73	—
4	0.5	14	0.2	24	8.1	34	12.8	44	1.8	54	8.3	64	4.0	74	—
5	2.2	15	10.5	25	0	35	1.9	45	1.5	55	1.4	65	—	75	—
6	15.0	16	7.5	26	0.7	36	11.4	46	2.1	56	7.4	66	7.8	76	—
7	0.8	17	0.1	27	0.5	37	—	47	0.2	57	6.3	67	—		
8	0.3	18	1.0	28	1.1	38	4.4	48	—	58	4.2	68	4.4		
9	1.9	19	13.4	29	0	39	1.2	49	0.5	59	0.8	69	7.6		
10	0.7	20	0.2	30	0.9	40	3.3	50	8.4	60	5.1	70	—		

Bar shows the stations where other fishing gear except longline was used.

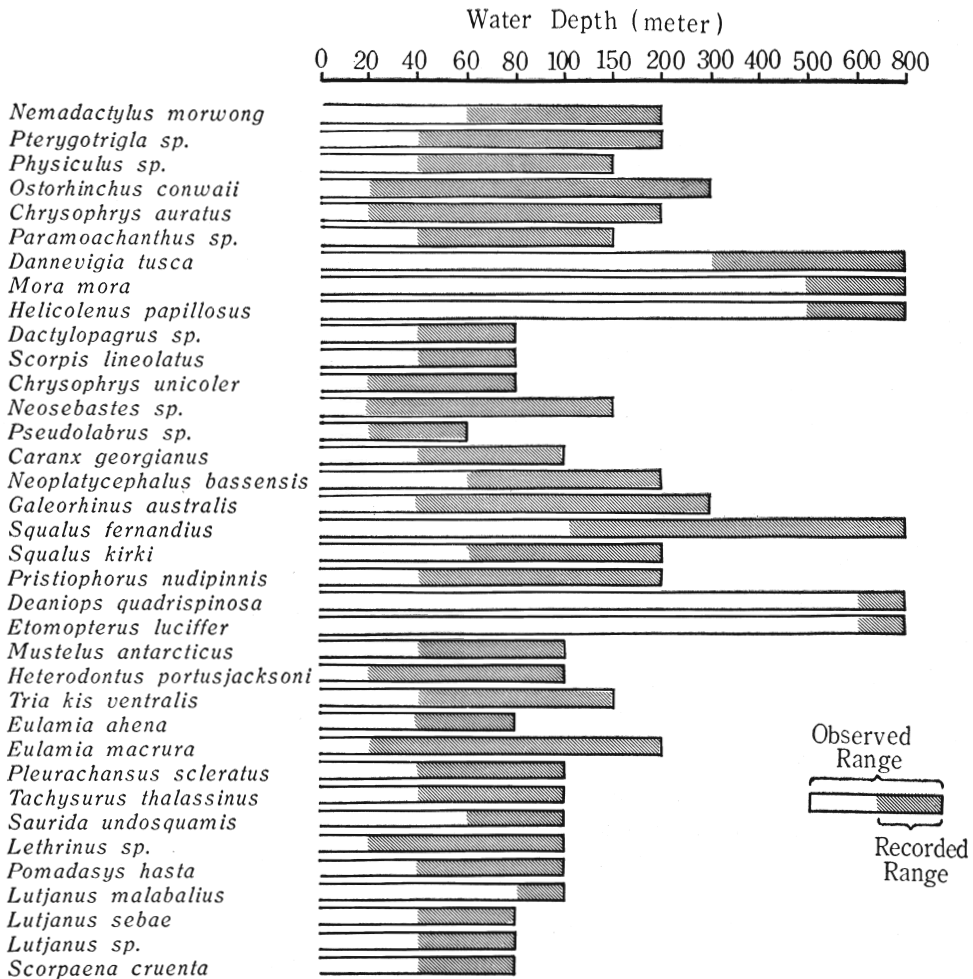


Fig. 2 Depth range of main species caught.

Inky tail shark (*Eulamia* sp.), by the drift net two species of Spanish mackerel (*Scomcermorus commersoni* and *S. semifasciatus*), Mackerel tuna (*Euthynnus aletteratus*), and by the trammel net the Striped perch (*Therapon theraps*), Saddle perch (*Pomadasys maculatus*) and prawns (*Penaeus* spp.) were caught in this area.

C. The Depth Range

The depth range of the various species caught are plotted in Figure 2.

D. Catch per 100 Hooks of Longline

Total catch per 100 hooks of longline in all stations are shown in Table 2. In this case, "catch" was represented with number of fishes of all species. Two types of longline, Cod line and Bream Line, were estimated to have the same fishing efficiency. Considering the variation of catch per 100 hooks, the higher rate was found in the Bass Strait, the continental slope of the Great Australian Bight and off the coast of Western Australia. The lowest rate was found in the shallow water of the Great Australian Bight. The rate having more than 10.0 per 100 hooks depended in a great measure on the number of Spiny dogfish. The maximum rate was 15.0 per 100 hooks at St. 6.

Catch per 100 hooks by species was respectively shown in Appendix Figure 1—3 on 11 species. The Spiny dogfish had the highest rate of all species caught, the maximum rate being 1.33 per 100 hooks in St.6.

The maximum catch per 100 hooks by species were 3.1 of Morwong and 5.4 of Red gurnard in the Bass Strait, 3.7 of Deep sea cod in the continental slope of the Great Australian Bight, 2.9 of Snapper, 3.5 of Silver puffer and 5.9 of Whaler shark in the western coast, and 3.7 of Coates shark, 7.5 of Black tip shark and 6.8 of Whaler shark in the northern coast.

Summary

1. The species encountered, the relation between fish and fishing ground, and catch per 100 hooks of the bottom longline in the Australian Waters were described.
2. The number of species encountered was 112.
3. The main species caught were Spiny dogfish, Whaler shark, Black tip shark, Coates shark, Snapper, Knife jaw, Deep sea cod, Silver puffer and Giant salmon catfish.
4. The maximum total catch in all stations was 15.0 per 100 hooks of St. 6 and the maximum catch by species in all species was 13.3 per 100 hooks of Spiny dogfish.

Literature

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豪州海域における漁業調査

I. 漁場ならびに出現魚種

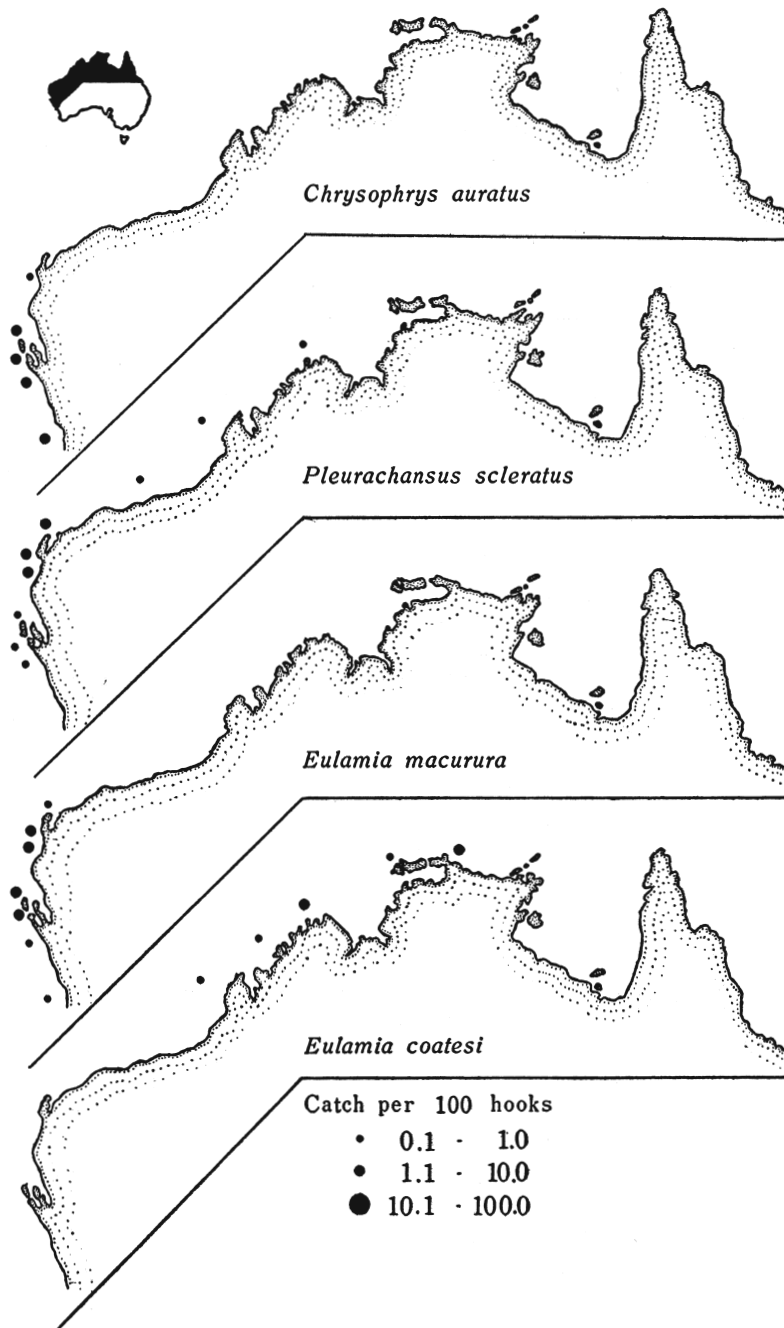
加 藤 守

水産庁生産部は海外新漁場開発の初年度のものとして、1965年9月1日から12月20日にかけて、豪州海域における主な底魚類の分布、資源等について調査した。著者は調査官として、特に生物調査を担当する機会をえたので、その結果の一部を報告する。

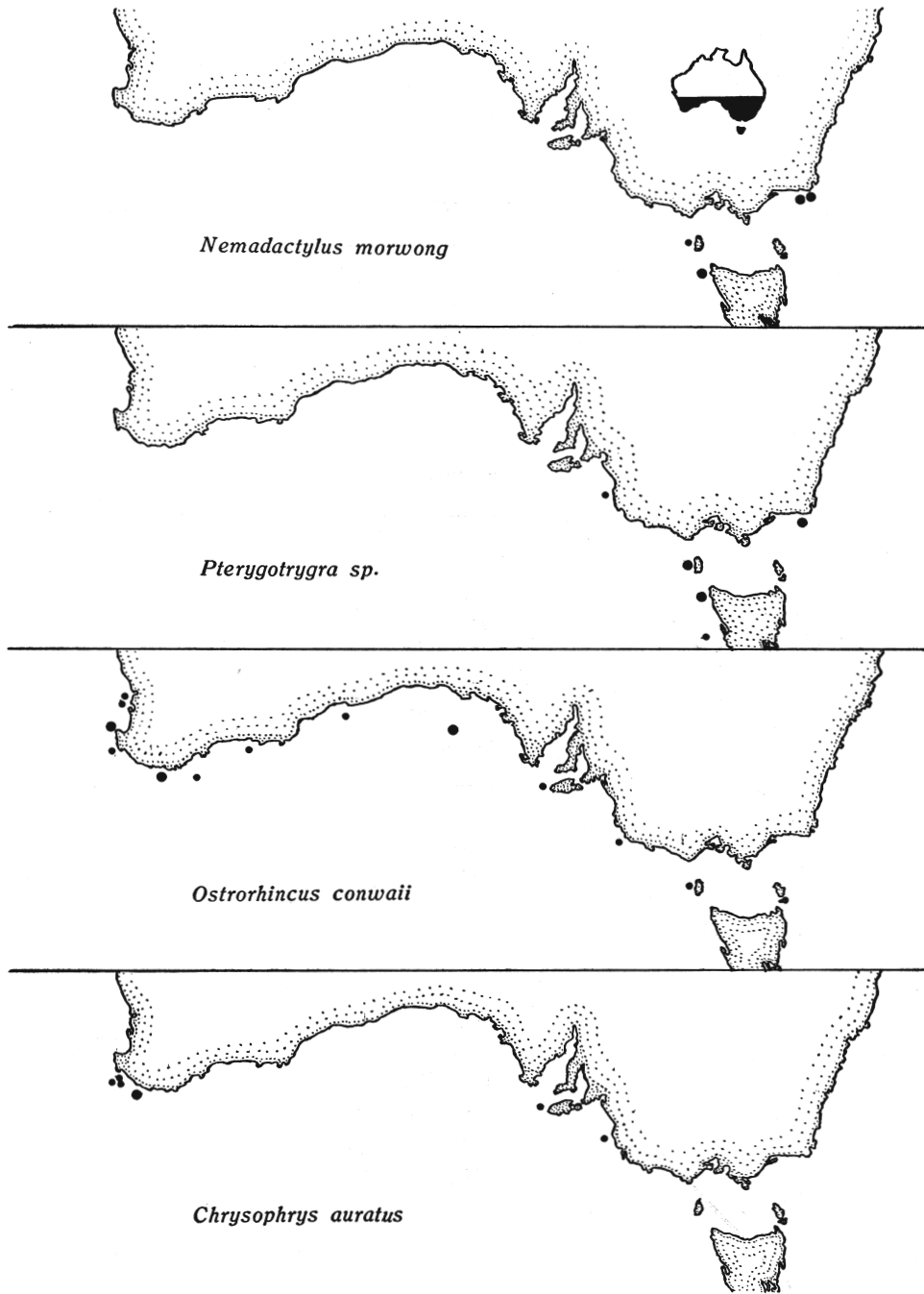
調査水域は豪州南、西、北岸にわたり、沿岸から12マイル以遠の大陸棚上の76地点について調査を行なった。調査漁具は底延縄（タイ縄およびタラ縄の2種）を主体として、刺網、三枚網等を用いた。海洋観測は、各地点における表面および底層の水温の測定、底質の採集等について、また生物調査は漁獲魚種の査定、体長・体重の測定、プランクトン採集等について行なった。

漁獲魚種の総計はエビをふくめて112種で、主な魚種は *Squalus fernandius*, *Eulamia macrura*, *Eulamia spallanzani*, *Chrysophrys aurtus*, *Mora mora*, *Tachysurus thalasinus*, *Nemadactylus morwong*, *Pterygotrygla* sp., *Pleurachansus scleratus*. 等であつた。

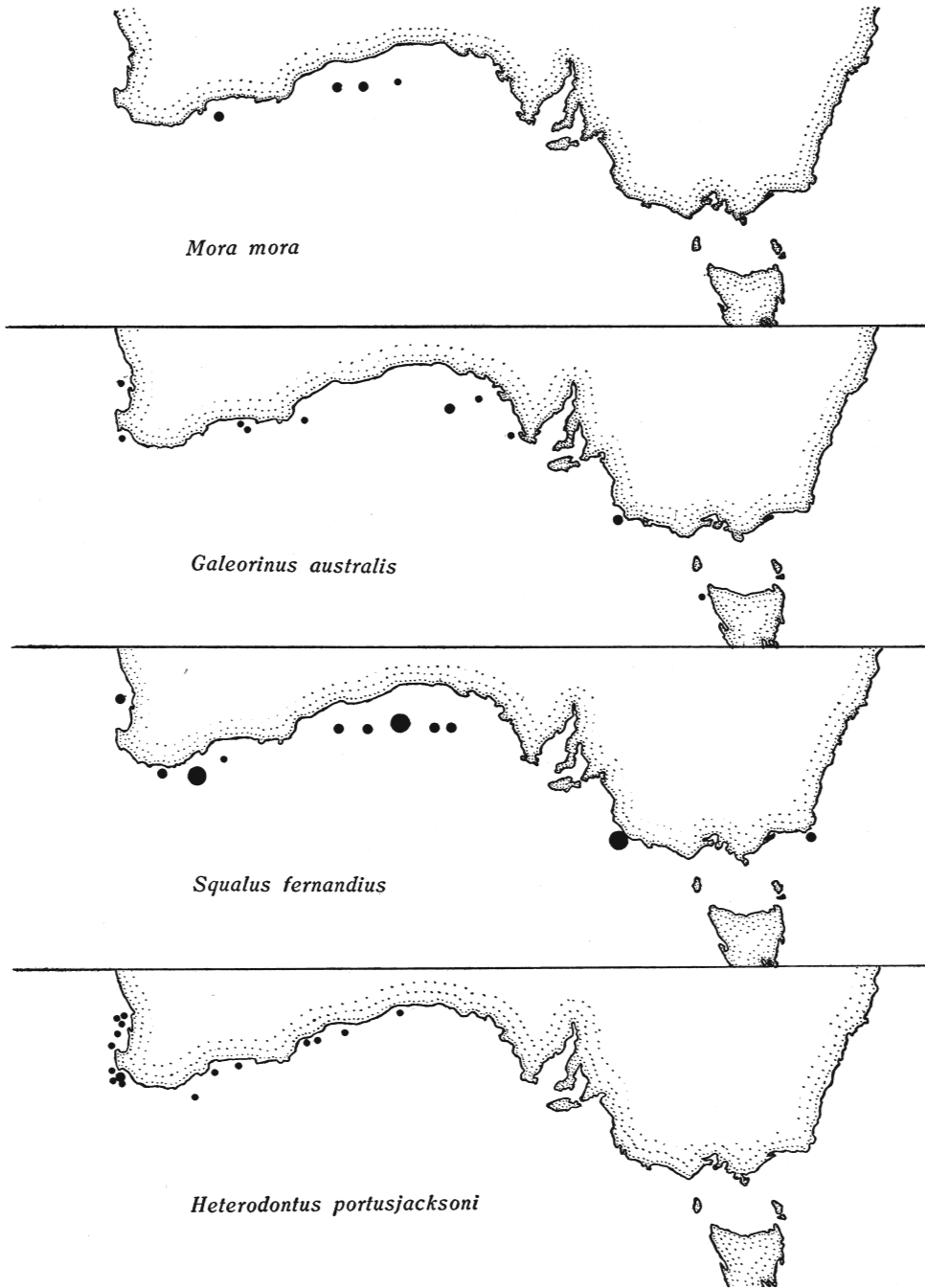
延縄による漁獲状態をみると、バス海峡、西オーストラリア沿岸のほか、オーストラリア大湾の500m以深の地点等で割合よい漁獲を示したが、オーストラリア大湾内奥においては全くの不漁であつた。100鈎あたりの漁獲尾数をみると、各地点で平均2～4尾を示し、最高はSt. 6における15.5尾であつた。



Appendix Fig. 1



Appendix Fig. 2



Appendix Fig. 3