

NEW ZEALAND MARINE DEPARTMENT

FISHERIES TECHNICAL REPORT

No. 3

FISHERIES RESEARCH IN THE EAST CAPE AREA

(Paper presented at the Royal Society of New Zealand
Ninth Science Congress 1960)

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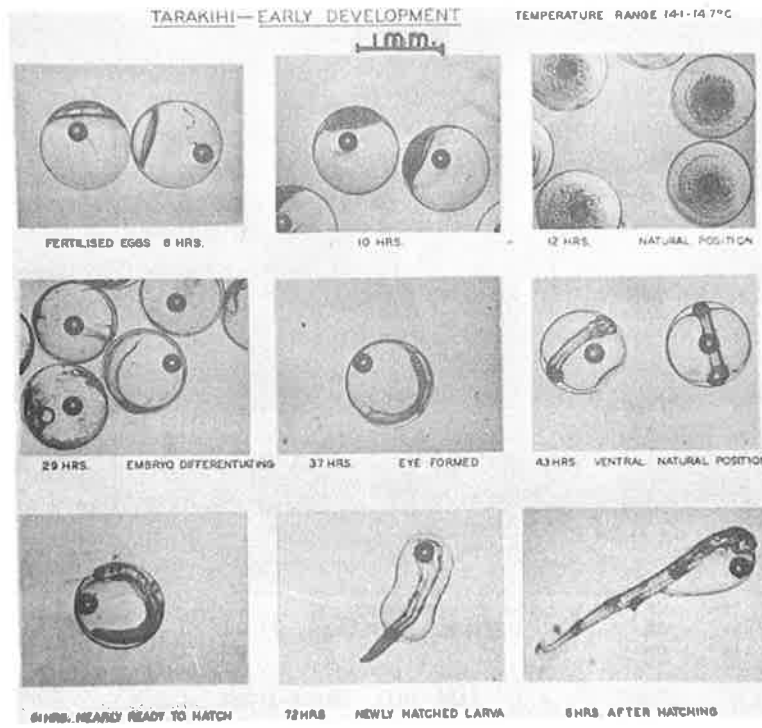


FIG. 1.

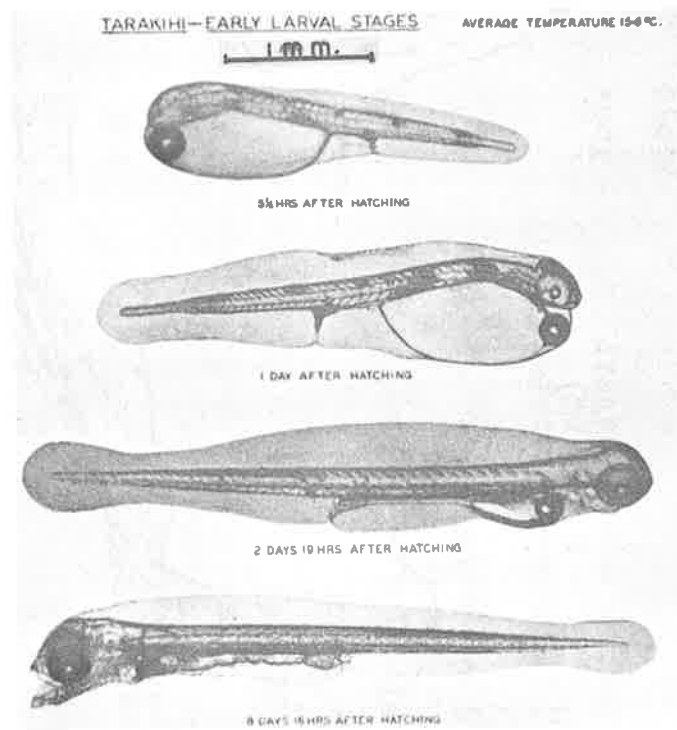


FIG. 2.

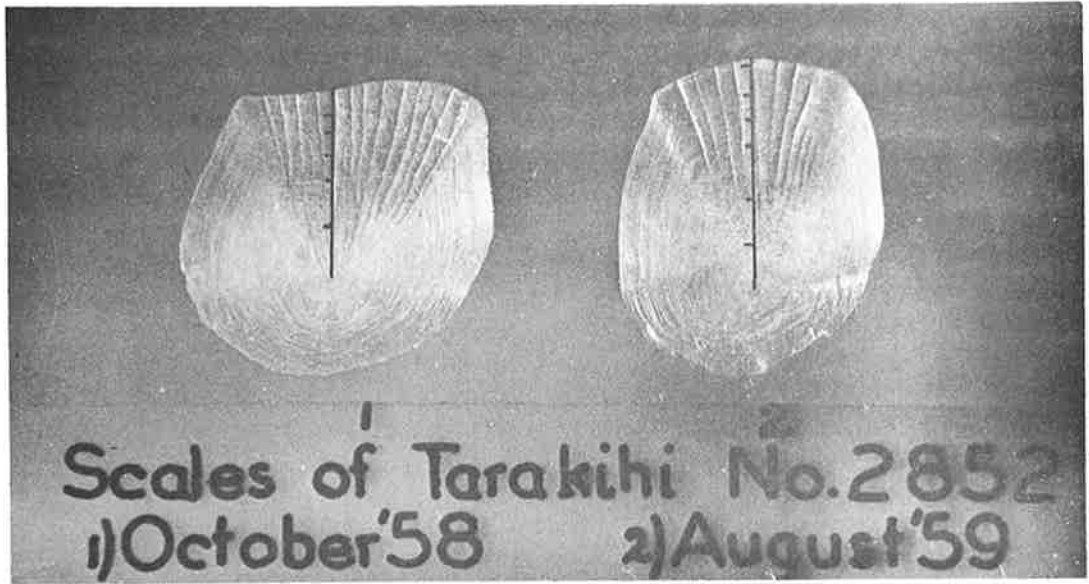


FIG. 3.



FIG. 4.

Table 1.

Commercial Catch from Ports of Gisborne and Napier
Compared with Catch of Ikatere

	Year:-			
	1956	1957	1958	1959
<u>Port of Gisborne</u>				
Tarakihi Landings	cwt. 19,699	cwt. 19,205	cwt. 17,493	cwt. 22,394
Gurnard/Tarakihi Landings	10%	13%	10%	10%
Snapper/Tarakihi Landings	6%	8%	9%	10%
Trevally/Tarakihi Landings	5%	11%	8%	5%
<u>Port of Napier</u>				
Tarakihi Landings	cwt. 12,954	cwt. 11,031	cwt. 11,498	cwt. 15,003
Gurnard/Tarakihi Landings	30%	48%	50%	26%
Snapper/Tarakihi Landings	29%	34%	45%	21%
Trevally/Tarakihi Landings	11%	21%	24%	15%
<u>Ikatere Catch (C.Runaway-Portland Island)</u>				
(Weights estimated approximately)	lbs. 7,050	lbs. 2,100	lbs. 16,250	lbs. 8,775
Tarakihi				
Gurnard/Tarakihi Catch	11%	5%	12%	3%
Snapper/Tarakihi Catch	11%	5%	10%	7%
Trevally/Tarakihi Catch	4%	--	9%	6%

Table 2.

Ikaterere - Catch Analysis (Legal Sizes Only)

	<u>1956</u>	<u>1957</u>	<u>1958</u>	<u>1959</u>
<u>Tarakihi</u>				
<u>Number</u>	<u>4,026</u>	<u>1,226</u>	<u>10,111</u>	<u>4,910</u>
Minimum Size Range of Half the Catch (Lengths)	<u>12.7"-14.4"</u>	<u>12.5"-14.4"</u>	<u>12.1"-14.2"</u>	<u>12.7"-14.7"</u>
Minimum Size Range of Half the Catch (Weights)	<u>13.0"-14.8"</u>	<u>13.0"-14.9"</u>	<u>12.7"-14.7"</u>	<u>13.2"-15.1"</u>
Most important Modal Lengths	<u>13", 14"</u>	<u>12½", 14"</u>	<u>13½"</u>	<u>13½", 14½"</u>
<u>Gurnard</u>				
<u>Number</u>	<u>444</u>	<u>55</u>	<u>1,129</u>	<u>147</u>
Minimum Size Range of Half the Catch (Lengths)	<u>11.5"-15.2"</u>	<u>13.1"-16.2"</u>	<u>12.1"-15.2"</u>	<u>13.6"-16.5"</u>
Minimum Size Range of Half the Catch (Weights)	--	--	--	--
Most important Modal Lengths	<u>13½", 15", 16"</u>	<u>12½", 15", 17"</u>	<u>13", 14", 15"</u>	<u>11", 14½", 16½"</u>
<u>Snapper</u>				
<u>Number</u>	<u>425</u>	<u>49</u>	<u>1,082</u>	<u>383</u>
Minimum Size Range of Half the Catch (Lengths)	<u>12.6"-17.5"</u>	<u>15.3"-18.1"</u>	<u>12.3"-16.7"</u>	<u>11.4"-15.9"</u>
Minimum Size Range of Half the Catch (Weights)	--	--	--	--
Most important Modal Lengths	<u>12", 13", 14½"</u>	<u>16½", 18", 20"</u>	<u>10½", 14", 15"</u>	<u>11", 12½", 13½", 14½"</u>
<u>Trevally</u>				
<u>Number</u>	<u>145</u>	<u>6</u>	<u>1,010</u>	<u>291</u>
Minimum Size Range of Half the Catch (Lengths)	<u>13.2"-15.5"</u>	--	<u>12.2"-13.9"</u>	<u>12.0"-15.0"</u>
Minimum Size Range of Half the Catch (Weights)	--	--	--	--
Most important Modal Lengths	<u>13½", 14½", 16"</u>	--	<u>11½", 13½", 14½"</u>	<u>11½", 13", 14"</u>

(Most abundant modal length doubly underlined)
(2nd " " singly)

FISHERIES RESEARCH IN THE EAST CAPE AREA.

(Paper presented at the Royal Society of New Zealand Ninth Science Congress, 1960).

For some considerable time, snapper and tarakihi have been the two most important commercial species in New Zealand and together account for over half the total weight landed in this country. Research on snapper has been conducted at intervals over the last 30 years, mainly in Auckland waters. Tarakihi has received attention only during the last few years, and most of the work has been centred on East Cape and the waters south of this to Gisborne. For this paper, I have extended the East Cape area to embrace the waters between Cape Runaway and the Mahia Peninsula with some remarks including Hawke Bay. Greater detail of the various aspects of the research concerning the tarakihi will be published elsewhere in the near future.

The Commercial Catch

Since 1953 (when work was commenced on the tarakihi), the species has accounted for 23.15% of the total landings of fish in New Zealand. From Cape Runaway southwards to Lyttelton, tarakihi is the most important commercial species and snapper becomes progressively less significant the further south the landing port. Tarakihi is also important in the trawl catches as far south as Port Chalmers. It is also abundant in the Bay of Plenty and northwards, but snapper is the more popular commercial species there. Very small quantities of tarakihi are taken on the west coast of both islands.

Tarakihi, as a rule, are caught in deeper waters than snapper, although the areas overlap considerably. Very few tarakihi are found in waters shallower than 40 fathoms, and it is possibly because of this fact that they do not figure in the west coast catches where commercial fishing is confined to fairly shallow water.

In the East Cape area, the commercial species of importance are tarakihi, gurnard, snapper and trevally, in that order - as

shown for the Gisborne, and Napier fishing returns, (the boats from these ports taking their catch almost exclusively from these waters). Trawlers from Auckland and Tauranga also fish the northern half fairly extensively but by no means exclusively, and the relative importance of the various species cannot be assessed for the different areas. Records of the Marine Department's research trawler, Ikatere, translated roughly into weights place the order of abundance as tarakihi well in the lead with gurnard and snapper about equal for second place and trevally fourth. A summary of results over the last four years is shown in Table 1.

Table 2 shows the catch in more detail of these four species, and the size range which contributes most commercially. Our records are more detailed for tarakihi than for the other fish, and it is interesting to note that the size range of the central half of the catch for this species differs by about $\frac{1}{2}$ inch according to whether the catch is measured for length or weight. Commercially, the weight is all-important. From the population angle, the most abundant size is about 14" and this is about half-way in the size range of the central half of the catch by weight. Similar details are not available for the other species.

Life History of the Tarakihi.

In this region, spawning generally takes place in April, the main ground being between Hicks Bay and Lottin Point to the west of East Cape. Other grounds have been located south of East Cape, usually over rocky sea-bottom. Average temperatures over the spawning areas last year were as follows:-

sea surface	18.3°C
thermocline (13-33 fathoms)	18.2°C
sea bottom (32-80 fathoms)	14.6°C

All over this region, sea conditions are generally fairly turbulent, and as a result, the eggs which will float near the surface in calm waters, have been found dispersed throughout the depth of the sea. In contrast to this, eggs in the Bay of Plenty were found only above the thermocline.

Figures 1 and 2 show photographs of embryos and larvae at various stages of development.

The eggs vary in size from about 0.9 to 1.05 mm. in diameter, averaging 0.956 mm. (eggs taken from some 20 running-ripe fish). Artificially fertilised eggs developed as follows (average temperature during embryonic development 14.5°C) -

Embryo:- 29 hours - embryo first seen differentiating from the cellular mass.

43 hours - Eyes and somites seen.

60 hours - auditory capsule; anteriorly-placed heart beating once every second; distinctive pigment pattern forming and embryonic fin.

72-84 hours - almost all of the embryos hatched.

Larvae:- 0 - 1 day- larva floats upside down near the surface for the first 12 hours, then begins to sink.
2 days - eyes started to pigment; dorsal pigment patches behind the head region moved towards the ventral surface; active swimming.

- 3 days - heart takes up normal thoracic position; typical pigment bands formed; pectoral fin lobes visible.
- 4 days - small mouth opened; eyes fully pigmented.
- 5 days - mouth larger and jaws moving; filamentous part of pectoral lobes formed; yolk sac and oil globule very small.
- 6 days - larva starting to shrink in length.
- 7 days - gill cover opened; mouth with wide gape; rectal portion of gut constricted off.

Larvae were kept alive for 9½ days after hatching, and although still lively, had then to be preserved.

Effect of Temperature on rate of Development.

Average temperature of 13.1°C,	hatching time 5 days;
14.5°C,	3 days;
17.6°C,	2 days.

Under natural conditions with sea temperatures as for April in 1959, hatching times above the thermocline should be a little short of 2 days, but at sea bottom temperatures it is increased to 3 days.

Attempts have been made to study the development of the larvae under natural conditions, but the difficulty in locating suitable concentrations of them is very great. However, some progress is being made.

Growth.

The tarakihi has proved to be an elusive species for growth determinations. Length-frequency modes of the catch give a lead, but the most fruitful source lies in the annual rings formed in the scales. Unfortunately, the position of

the first ring is problematical, so that the present results may be a year short of the actual facts. Checks have been made of commercial-sized stocks through recaptured tagged fish, but this is not possible for the small sizes. More work is necessary in this field, but the following is an indication of the probable growth rate.

From back calculations of ring positions on the most clearly-marked scales, the following growth rate emerges:-

1st complete year 3.3", 2nd 5.6", 3rd 8.0", 4th 10.1",
5th 11.8", 6th 13.0", 7th 13.9",
8th, 14.9".

Corresponding weights:- 1 oz., 1.9 oz. 4.8 oz. 10.2 oz.
15.5 oz. 22.2 oz. 25 oz. 30.7 oz.

Tarakihi thus reach the minimum legal retainable size of 10" by the end of the 4th year, and the main catch is made up of fish between 7 and 9 years of age. Most of the fish mature in their 4th or 5th year and after that, the growth rate appears to be relatively slower than for immature fish.

Scales taken from fish at the time of tagging and again after recapture, show that only one ring is generally formed annually, and it is formed either during the spawning season or during the winter. Back calculations of the two sets of scales from such fish agree closely.

Overall measurements of fish taken at tagging and again after recapture show the annual growth rate for the larger fish to be rather slower than the figures given above. This may be explained by the fact that the more reliable length

measurements are made several days, or sometimes weeks, after the recapture, whereas at the time of tagging, the fish is measured under optimum conditions.

Figure 3 shows two scales taken from one fish - one at the time of tagging and the second after its recapture, 10 months later, when it had developed a further ring.

Food.

Much of the sea bottom in this region is composed of soft bluish-grey mud, and the bottom-dwelling fauna is restricted to shallow burrowing and tube-forming worms, echiurids, brittle stars and holothurians, various bottom-dwelling crustaceans and shellfish. Tarakihi feed on all these forms, but usually of a size too small for identification by the unaided eye. The nature of the gut contents suggests that the fish gulp at the sea bottom rather than select their food items. However, they are also known to feed extensively on pelagic fauna at certain times. I have seen stomachs of a whole catch of fish fully distended with the Euphausiid, Nyctiphanes, during April, and other obvious mid-water forms are sometimes found.

It is not yet known whether or not there is a general pattern of feeding behaviour involving mid-water and bottom-dwelling food items. The present orthodox trawling methods catch only the fish feeding or resting on the bottom, and therefore the recorded food items are mainly from this source.

Tagging and its Results.

Tagging was initiated in order to obtain facts about the movements of tarakihi, their growth rate, and to gain some elementary knowledge of the exploitation rate of the

species. Reference has already been made to their growth records.

Since 1953, some 4,500 fish have been tagged, with an overall recovery rate of 2.1%. 1958 was the most successful year, resulting in 3.6% recoveries to date. However, a small proportion of these 1958 fish (163 in all), released at Tokomaru Wharf, have given the extraordinary recovery rate of 12.3%. A similar high recovery rate of 13.8% was obtained from a total of 29 fish released from the same wharf in 1956. The significance of this is unknown, but could lead to difficult problems in the management of the fishery.

Movements. (see Figure 4)

The first year's returns gave the impression that most of the fish were restricted in their wanderings, the distances usually being only a few miles along the coast or in an off-shore - on-shore direction. However, two returns came from 50 and 80 miles from their respective tagging sites, but these were considered to be non-typical wanderers. Results of later years however have confirmed the fact that extensive coastal movement is quite common. Two fish were caught over 200 miles from their points of release - one, tagged near Cape Kidnappers, was caught off Te Kaha Pt. in the Bay of Plenty; the other, tagged near Portland Island, was recovered in Cook Strait - and they were both caught 10 months after tagging. Four others were found over 100 miles distant, two of them within 5 months and the other two, a year and 5 months after their release; five others had moved over 40 miles. On the other hand, it is fairly common to find fish taken within a mile or so of their tagging sites near the

anniversary dates of their release - had they been there all the time (2 years in some cases), or had they returned, thus suggesting a seasonal rotation over definite feeding grounds?

The great majority of the recoveries have been made north of their points of release, many of them on, near or beyond the spawning grounds west of East Cape near the spawning season. It is this trend which has prompted us to tag spawning fish on these grounds this year, to try to discover their later movements - whether there is a subsequent southward surge back to previous grounds, or whether the fish commonly continue westwards into the Bay of Plenty and perhaps beyond.

Species of Fish mentioned in the Text

Tarakihi	-	<u>Cheilodactylus macropterus</u>
Snapper	-	<u>Chrysophrys auratus</u>
Trevally	-	<u>Caranx lutescens</u>
Gurnard	-	<u>Trigla kumu</u>

SUMMARY.

The tarakihi (Cheilodactylus macropterus) accounts for one-fifth of the total weight of fish landed in New Zealand. Over the last few years, a study has been made of its life-history, growth, feeding habits, migrations, abundance, and general ecology - all important aspects involved in the good management of the fishery. A short account of these findings is presented, together with the relative abundance of this species with the other commercial species of the area.

Acknowledgments

I wish to thank Mr. A. C. Kaberry, Chief Inspector of Fisheries, for his advice in the general planning of the various projects concerning the research into the biology of the tarakihi in this area; also for his and Mr. K. R. Allen's helpful criticism of the analysis of results and text. My thanks are also extended to the skippers (Mr. A. Duthie, the late Mr. G. Baker and Mr. W. G. Sampson) and crew members of the Marine Department's fisheries research vessel, Ikatere, without whom this report would never have materialised. I am also very grateful to all those fishermen who reported their recaptures of tagged tarakihi.

References

Marine Department Annual Reports - Catch Statistics for the years 1953 - 1959.