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Data from Australian east coast shelf waters

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THE GEMFISH, *Rexea solandri* (CUVIER AND
VALENCIENNES): DISTRIBUTION AND LENGTH
DATA FROM AUSTRALIAN EAST COAST SHELF WATERS

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Abstract

Distribution and length data on gemfish, from samples taken over two decades ago by trawling on the east coast continental shelf, are discussed. The present fishery for the species operates on the continental slope and the results from the two areas are complementary. Abundance on the shelf is lowest for the year in winter, when abundance on the slope is highest. The winter decline in abundance of shelf fish is caused by a temporary disappearance of the older age-groups, which evidently migrate down the slope. Gemfish on the shelf approach sexual maturity in winter but do not spawn there, so the downward migration is probably for spawning. The older fish return to the shelf in spring. Abundance of gemfish measured by catch per trawl haul on the shelf increases from 34° to 40°S, but the present slope fishery is confined to the northern part of that belt of latitude. It is therefore possible that the slope fishery could be extended farther south.

INTRODUCTION

The gempylid fish *Rexea solandri* (Cuvier and Valenciennes) has become an important item in the fish catch of New South Wales during the last five years, under the name of gemfish. The latest published annual report of the New South Wales Fisheries Department lists the 1975/76 catch as 739 tonnes, which has certainly been much exceeded since then. Until about 1970 the species was regarded as not very common, and was not sufficiently important to be listed in catch records in Australian waters (Blackburn 1956). The present catches are being made by bottom trawling on the continental slope at depths between 200 and 600 m, from about June to September (Rowling 1976; New South Wales Fisheries Department, unpublished research report).

In the days of the now defunct fleet of steam trawlers that operated from Sydney (1915-1961), the gemfish, then called hake, was a minor part of the trawl catch. Those vessels fished on the east coast continental shelf at depths not exceeding 200 m, from Crowdy Head in New South Wales, to Babel Island in north-east Tasmania (approximately 32° to 40°S latitude). Nothing has been published on the results of that fishing as far as gemfish is concerned, because no records were available. Recently I located some data on catches and samples from steam trawlers that should be useful to those presently active in gemfish research. This paper gives a summary and brief discussion of that information, which applies to the period 1946-1957.

MATERIALS AND METHODS

From 1953 to 1956 Mr John Woore kept records by weight of catches of gemfish (hake) received each month at the Sydney Fish Market. Mr Woore was an employee of the New South Wales Fisheries Department, working in cooperation with the CSIRO Division of Fisheries and Oceanography. Most of the gemfish were caught by steam trawlers, which fished various grounds but landed all catches in Sydney. Their landings were not identifiable by locality. A few vessels fishing by Danish seine also caught gemfish, but their catches were small and infrequent and are not considered here.

The only possible sources of catch data by locality were the logbooks of the trawler captains. CSIRO acquired some of these logbooks after the steam trawl fishery ended. Those of one company, Red Funnel Trawlers Pty Ltd, were complete for the years 1952 to 1957. It was clear from them that gemfish catches had not always been recorded. Some captains always included gemfish with "mixed fish" and others did so at times. There were however enough positive records to be of interest. Catches were reported in baskets, mean basket weight being about 70 lb (31.8 kg). The captains listed their hauls according to the many areas in which they fished (Colefax 1934), but in this paper those areas have been combined into a smaller number.

Samples of gemfish received from steam trawlers at the market were measured by Mr Woore when his other duties permitted. In all he measured 11 263 gemfish at random from 209 samples, which were distributed fairly evenly with time between December 1946 and April 1956. Measurements were made in centimetres to the caudal fin fork. From 1953 to 1956 Mr Woore kept notes on gonad maturity stages of gemfish in a general way, reporting which stages he noted each month.

RESULTS

Distribution and Abundance

The catches of gemfish received from steam trawlers at the Sydney Fish Market are summarised in Table 1 by years (1953-1956) and months. The mean number of trawlers that fished for the whole of each year, obtained from annual reports of the New South Wales Fisheries Department, is also given. Mean annual catches per trawler ranged from 31 300 lb (14 200 kg) to 49 800 lb (22 600 kg). Catches in each year were high in the warmer months and low in the colder months, especially June to August.

The positive records of gemfish in Red Funnel Trawler logbooks are summarised by area and month in Table 2, with data of all vessels and years (1952-1957) totalled. Areas have been combined as follows (latitudes approximate): off Babel Island, 39°00' to 40°00'S; off the north-east part of the Victorian coast, especially Gabo Island to Cape Everard, 37°30' to 38°30'S; off the New South Wales coast south of Sydney, 34°00' to 37°30'S; and off the New South Wales coast from Crowdy Head to Sydney, 32°00' to 34°00'S. In Tables 2 and 3 these areas are called Babel Island, Victoria, New South Wales (south) and New South Wales (north). The first and last areas were not fished in some months. Table 2 shows the same pattern of low catches in winter (June to August) that is evident in Table 1, in each of the three areas south of Sydney. No gemfish were reported north of Sydney.

For further comparisons between areas and months, data on catch per unit of fishing effort were required. It was therefore necessary to identify those trawlers whose captains had kept reasonably complete records of gemfish catches over at least one year. In 1953 four trawlers reported in their logbooks the basket equivalent of the following catches

respectively: 16 590, 15 350, 14 210 and 12 270 kg. These agree fairly well with the mean trawler catch of 1953 from Table 1, namely 14 200 kg, so those four trawlers probably recorded most of the gemfish they caught. The same conclusion was reached in the same way for one trawler in 1954. In 1955 and 1956 no trawler reported any amount approaching the mean in Table 1, and for 1952 and 1957 no estimate of the mean is available.

The records of the abovementioned four trawlers in 1953 and one trawler in 1954 may reasonably be combined. The logbooks showed that they all distributed their fishing effort in the same way by areas and months, and Table 1 shows that mean gemfish catches per trawler were similar in 1953 and 1954. Table 3 summarises the combined records from the selected trawlers, showing total number of hauls and mean gemfish catch per haul for each calendar month in each area of Table 2. Hauls which caught no fish of any kind for technical reasons were not counted. Haul time was generally about four hours.

From Table 3 the trend in apparent abundance from month to month is much the same as found earlier, that is with minima in the colder months, in Victoria and southern New South Wales. The highest values occurred in December and February, although January values were low. Babel Island data suggest the same pattern, since catch per haul was high in January, February, March and November. It may have been fairly high in December and low in May and July, as suggested by means in Table 3, but very few hauls were made at Babel Island in those months. Addition of the scanty information for Babel Island from other trawlers and years would make no difference to this picture. No gemfish were recorded north of Sydney in any year by these selected trawlers or any others, but there was no fishing there in the period December to February when the species would be most likely to occur. Gemfish were

probably less abundant north of Sydney than south of Sydney, but may not have been completely absent to the north. Other aspects of Table 3 are discussed later.

Size Composition of Samples

The gemfish market measurements are given in length frequency polygons for each calendar month on a percent basis (Fig. 1). Measurements of all years (1946-1956) were combined and smoothed by a moving average of three. A few fish between 95 and 105 cm, which was the largest size observed, are omitted in Fig. 1. As explained earlier no grouping of these data by area was possible.

Two distinct modes appear at the left-hand side of each polygon from October to June. It can be seen, from the progression of the extreme left-hand mode, that these two modes represent separate age-groups one year apart. If the spawning season of gemfish is winter, which seems likely, as mentioned in the next section, the left-hand mode at 28-29 cm in the October polygon is probably just over one year or just over two years old. The former age seems more probable and I assume it for convenience, although it makes no difference to the conclusions of this paper. The extreme left-hand mode and the next one are referred to as the I+ and II+ groups respectively in the following interpretation.

The most interesting feature of Fig. 1 is the declining representation of the II+ and older groups from spring and summer to winter. The polygons for October to February show appreciable percentages at sizes up to 80 cm. After February the percentages of fish between 50 and 80 cm gradually decline. In the July, August and September polygons most of the fish between 40 and 50 cm (the original II+ group, now three years old) have also disappeared. Only the original I+ group, now just two years old, remains abundant. Then in October the older age-groups, and the

new 1+ group, at modal size 28-29 cm, reappear.

Sexual Maturity

In all months from October through March only small gonads were found in the market samples with no discrete ova perceptible with the naked eye. From April to September the same stages occurred, together with a later one, in which the gonads were larger with discrete ova clearly visible. Very large gonads with large yolked ova or running gametes were not observed. Locality information was again not available.

DISCUSSION

It is clear from the records of the trawl fishery that gemfish are much scarcer on the continental shelf in winter than during the rest of the year, between Sydney and Babel Island (Tables 1 to 3). The winter decline is most obvious for fish over 40 cm, which practically disappear (Fig. 1).

The modern fishery takes gemfish mainly in winter on the continental slope. It is highly probable that the larger fish leave the shelf and travel down the continental slope in winter. They must be much more abundant per unit area on parts of the slope than they normally are anywhere on the shelf, or the slope fishery would not be profitable. Some or all of the surviving gemfish over 40 cm return to the continental shelf in spring and summer (Fig. 1). It is possible that some of those between 30 and 40 cm make similar movements, and that fish of modal size less than 28 cm occur only on the slope. Length frequency data from slope samples could resolve these points.

Observations on gonads are consistent with a conclusion reached by others that gemfish spawn on the slope in winter (New South Wales Fisheries Department, unpublished research report). Our samples from the

continental shelf suggest a more advanced sexual maturity from late autumn to early spring than at any other season, but give no evidence of spawning on the shelf at any time. Probably the descent of large gemfish down the slope in winter is a spawning migration, causing the fish to become aggregated and particularly vulnerable to fishing, as others have indicated.

Table 3 shows that mean catch per trawl haul was higher in Victoria than in New South Wales in most months. It was also higher at Babel Island, in months when 20 or more hauls were made there, than in Victoria. Thus abundance on the shelf tends to increase towards the south. The only important exception to this trend in Table 3 is the high February mean for New South Wales, which reflects some exceptionally large catches in 1954 at Disaster Bay. That locality is at the extreme south of New South Wales, a few miles from the first of the Victorian grounds.

The present slope fishery operates only along part of the New South Wales coast. It is not known if the gemfish in that area are derived entirely from New South Wales shelf waters, or from Victorian and Tasmanian shelf waters as well. In the former case there could be similar winter occurrences of gemfish on the slope east of the old trawling grounds off Victoria and Babel Island, composed of individuals that migrate down from the shelf in those particular areas. If that were so the abundance on the slope might be as high off Victoria and Babel Island as it is off New South Wales or even higher, in view of the conclusion of the previous paragraph. Then a much larger catch of gemfish than at present might be taken in Australian east coast waters on the slope, assuming the slope off Victoria and Babel Island to be fishable with trawls. Experimental winter trawling on the slope between the present fishing area and Babel Island could resolve this point.

Such experimental trawling probably should extend along the slope to the east of the Tasmanian mainland, since gemfish occur there (Cowper and Downie 1957). It is possible however that distribution and abundance of the species are different off eastern Tasmania, especially the southern part, than elsewhere. Gemfish, under the name of kingfish or Tasmanian kingfish, were once very common on the continental shelf off southern Tasmania (Johnston 1883, 1891). The main season of occurrence was December to June, especially May and June. The fish were caught by hand-lining at night. McCulloch (1915) noted that the species had become very rare in that area. These authors gave no quantitative information. I participated in many fishing cruises off southern Tasmania, but no gemfish were seen or heard of except on the slope.

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REFERENCES

- Blackburn, M. (1956). Real and apparent changes in size of marine animal populations during the Australian fisheries investigations. *J. Cons. Perm. Int. Explor. Mer* 21, 284-295.
- Colefax, A.N. (1934). A preliminary investigation of the natural history of the tiger flathead (*Neoplatycephalus macrodon*) on the south-eastern Australian coast. I. Distribution and supply; length statistics. *Proc. Linn. Soc. N.S.W.* 59, 71-91.
- Cowper, T.R. and R.J. Downie (1957). A line-fishing survey of the fishes of the south-eastern Australian continental slope. CSIRO Aust. Div. Fish. Oceanogr. Rep. 6.
- Johnston, R.M. (1883). General and critical observations on the fishes of Tasmania, with a classified catalogue of all the known species. *Pap. Proc. R. Soc. Tasmania* 1882, 51-144.
- Johnston, R.M. (1891). Further observations upon the fishes and fishing industry of Tasmania, together with a revised list of indigenous species. *Pap. Proc. R. Soc. Tasmania* 1890, 22-46.
- McCulloch, A.R. (1915). Report on some fishes obtained by the F.I.S. *Endeavour* on the coasts of Queensland, New South Wales, Victoria, Tasmania, South and South-Western Australia. In 'Biological Results of the Fishing Experiments carried on by F.I.S. *Endeavour*, 1909-14'. Vol. 3 pp 97-170. (Australia Dep. Trade and Customs: Sydney).
- Rowling, K. (1976). Future of NSW trawl fishery looks good. *Aust. Fish.* 35(10), 11-12.

Table 1. Catches of gemfish (1000 lb = 454 kg) received from steam trawlers at the Sydney Fish Market. Number of boats means the average number of trawlers that fished for the whole year

Year	No. boats	Jan	Feb	Mar	Apr	May	June ('000 lb)	July	Aug	Sept	Oct	Nov	Dec	Total	Total/boat
1953	10	31	42	55	7	6	4	6	5	12	16	27	102	313	31.3
1954	9	22	35	32	29	45	25	11	13	31	39	25	35	342	38.0
1955	5	7	19	45	50	15	12	7	3	30	9	17	35	249	49.8
1956	4	22	19	21	9	4	7	9	10	14	15	22	41	193	48.2
Total		82	115	153	95	70	48	33	31	87	79	91	213	1,097	

Table 2. Baskets (70 lb = 31.8 kg) of gemfish reported by all Red Funnel Trawler captains in the years 1952-1957, by areas and months; * means no fishing

Area	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Babel I.	464	461	363	44	0	*	0	0	27	121	91	29	1,600
Victoria	151	136	100	131	75	7	52	56	275	353	233	1,027	2,596
NSW (S)	33	120	42	202	196	93	16	56	69	176	175	258	1,436
NSW (N)	*	*	0	*	0	0	0	0	0	0	0	*	0
Total	648	717	505	377	271	100	68	112	371	650	499	1,314	5,632

Table 3. Mean catch of gemfish per trawl haul by selected trawlers in 1953 and 1954 by area and month, with number of hauls in parentheses. Units are baskets (70 lb = 31.8 kg), * means no fishing

Area	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Oct- Mar	Apr- Sept
Babel I.	1.4 (217)	1.5 (112)	2.3 (113)	*	0.0 (7)	*	0.0 (4)	*	*	*	3.1 (23)	1.0 (5)	1.7 (470)	0.0 (11)
Victoria	0.3 (76)	0.4 (144)	0.2 (131)	0.1 (103)	0.7 (107)	0.0 (121)	<0.1 (124)	0.5 (78)	1.5 (90)	1.1 (186)	1.1 (79)	3.2 (175)	1.2 (791)	0.4 (623)
N.S.W.(S)	<0.1 (37)	2.4 (36)	0.2 (67)	0.1 (267)	0.4 (233)	0.3 (247)	<0.1 (220)	0.2 (255)	<0.1 (178)	0.1 (172)	0.5 (185)	1.3 (98)	0.6 (595)	0.2 (1400)
N.S.W.(N)	*	*	0.0 (17)	*	0.0 (58)	0.0 (15)	0.0 (8)	0.0 (62)	0.0 (127)	0.0 (92)	0.0 (40)	*	0.0 (149)	0.0 (270)

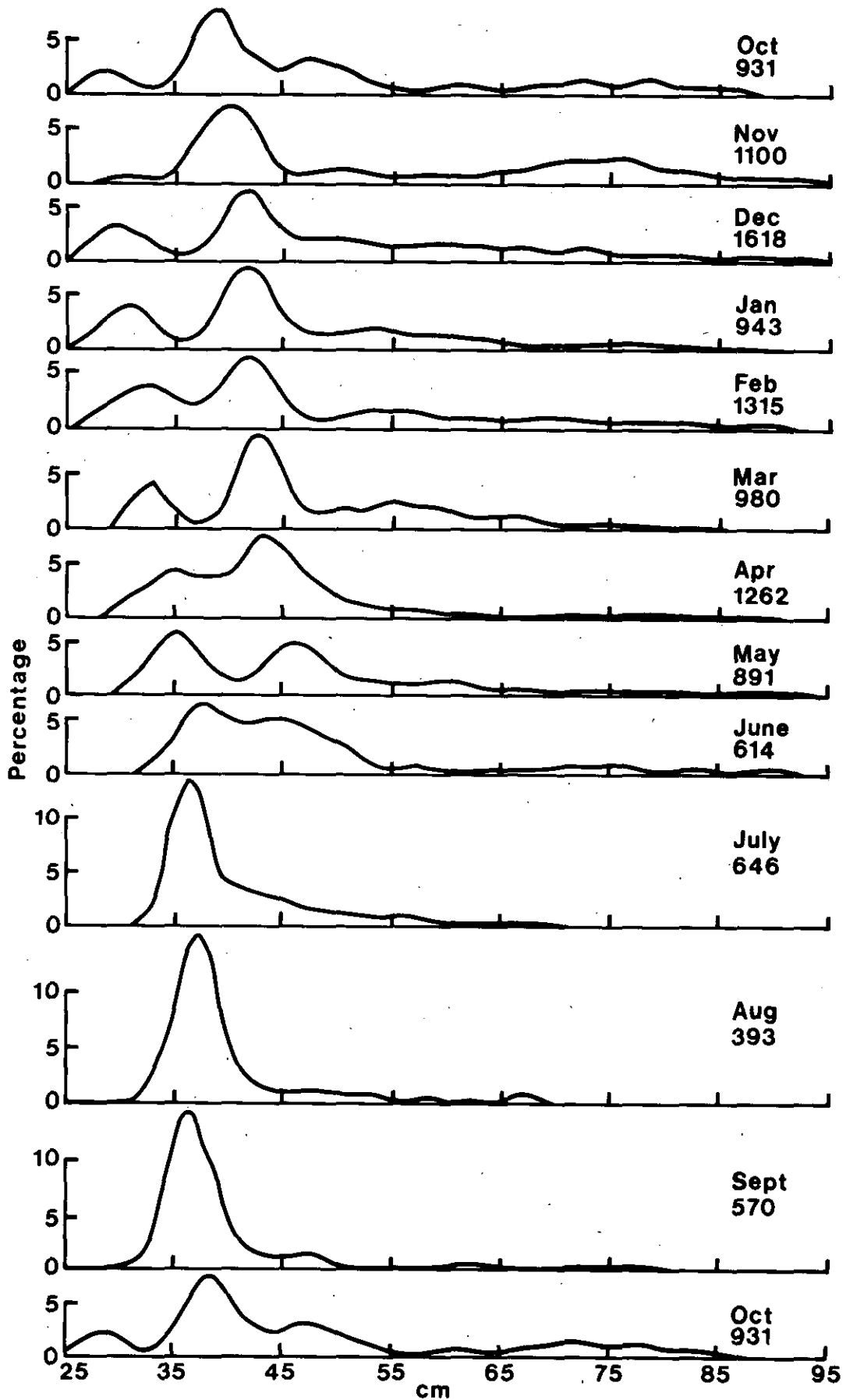


Fig. 1. Percentage length frequency polygons for gemfish trawled on the shelf, 1946-1956.

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