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Trawl Caught Fish and Crustaceans from Cockburn Sound

BY
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PERTH
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Department of Fisheries and Wildlife

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PERTH

R E P O R T

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TRAWL CAUGHT FISH AND CRUSTACEANS FROM COCKBURN SOUND

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I INTRODUCTION

Cockburn Sound is one of the few sheltered embayments near the Perth metropolitan area and as such has been subjected to increasing usage by both the general public and industry. Historically the Sound has been a major commercial fishing area from which much of the fresh fish for the metropolitan area has been caught. More recently, as well as providing a significant commercial catch, a major sport fishery has developed in the area.

The first commercial trawling operations in Cockburn Sound were undertaken in the early part of this century when horses were used to tow small nets on the shallow banks. Later from 1955 to 1962 mechanical trawling was practised over the weed beds in the shallower areas of the Sound. It was during this period that the drop in catches together with political pressure from amateur and non trawling professional fishermen resulted in some inshore parts of the area being closed to trawling. In August 1970, as a conservation measure, and because of increased usage of the major part of the deep Sound by ocean going ships the entire area including Owen Anchorage was finally closed to trawling.

Since 1971 the deep waters of the northern portion of Cockburn Sound have been used by the Fisheries Research Branch of the Department of Fisheries and Wildlife for western king prawn research (Penn, 1975). This deeper water has generally been regarded from diving observations as relatively barren in terms of edible marine life compared with the shallower weed bed areas along the north, east and southern borders of the Sound. However, significant catches of crabs and fish taken from the research area (Figure 1) by R.V. "Flinders" during night trawling operations has indicated that this area is a more important fish and crab habitat than previously thought.

II DESCRIPTION OF THE AREA

Cockburn Sound is a 118 square km marine embayment approximately 30 km south of Perth, Western Australia. The Sound is partially separated from the Indian Ocean by Garden Island to the west and by extensive seagrass covered sand banks to the north and south. The greater portion of the area (71 square km) is an approximately 18m deep basin with a fine mud bottom. A description of the physical characteristics, and a review of biological data on the Sound has been published in the Australian Conservation Foundation Special Publication No. 5 (ed. R.G. Chittleborough, 1970).

III METHODS

A. TRAWLING OPERATIONS

Most trawling by R.V. "Flinders" in Cockburn Sound has been confined to a 17 km² area in the northern portion of the Sound (Figure 1). Starting at dusk each night, up to six 30 minute trawl shots were carried out. The pattern of the hauls was designed to provide a uniform distribution of effort over the area each night. The net used was an 18 metre headrope flat trawl with 51 mm mesh wings and 45 mm mesh cod end. A ground chain set below the ground rope disturbed the bottom sediments but allowed non-swimming animals and debris to pass under the net. The effective width and height of the net while being towed was approximately 12 metres and 1 metre respectively.

B. SAMPLING PROCEDURE

(1) Regular monthly samples.

During prawn research trawling periods (approximately monthly intervals, weather permitting) the abundance, size composition, and some biological observations were recorded for some of the more important sport fish from the area, including the whiting (*Sillago maculata*), snapper (*Chrysophrys unicolor*), samson fish (*Seriola hippos*), mulloway (*Sciaena antarctica*), and the blue manna crab (*Portunus pelagicus*).

(2) Total catch analysis.

On four occasions all fish and crustaceans in five shots were recorded, and some of the more abundant species measured.

C. TEMPERATURE RECORDS

Temperature data for Cockburn Sound during the experimental period, in the form of daily maximum and minimum temperatures, were available from the B.P. oil refinery jetty near the trawling area.

D. MEASUREMENTS

Fish were measured either as (i) "total length", the distance from the tip of the snout to the tip of the tail, or (ii) "caudal fork length", the distance from the tip of the snout to the caudal fork, depending on the tail configuration of the particular species being measured. Maximum carapace width was measured for crabs. All measurements for fish and crabs have been recorded to the nearest centimetre.

.IV RESULTS AND DISCUSSION

A. SPECIES SAMPLED MONTHLY

(1) Whiting (*Sillago maculata*)

Of the popular sport fish captured by trawling, the whiting was noted to be one of the most abundant. The data recorded for this species, i.e. number caught per trawling hour, gonad condition (ripe or spent), and size frequency histograms (length, caudal fork) have been summarised together with temperature data in Figures 2 and 3.

The data presented in Figure 2 show that whiting are abundant in the Sound for most of the year except during late Winter and Spring, the coldest period of the year. A second interesting feature of the catch rate data was that during the periods of low catch rate, e.g. September 1971, the fish appeared to be concentrated into dense schools. This phenomenon was evidenced by occasional catches of the order of 800 fish per shot when the usual catch was less than 50 fish per shot. Although not recorded specifically this schooling behaviour was also noticed during 1972 and 1973 at the coldest time of the year. The implication of this schooling behaviour is that the low catch rate during Spring may only reflect a change in behaviour of the fish, and not a movement of fish out of the Sound.

The stage of gonad development (Figure 2) was determined macroscopically by rating the gonads from the majority of fish as either ripe or spent. The period when most of the whiting examined had mature gonads, began in December or January just prior to the maximum temperature achieved each year. The early March (1972) sample indicated that most gonads were still mature at this time, but by May all animals were in a spent condition.

The data presented in Figure 3 show that the size distribution became bimodal during the Spring of 1971 at which time the catch rate also increased suggesting an influx of recruits to the trawlable population. By the following Autumn the larger mode had all but disappeared probably due to the more rapid growth of the smaller fish (probably 1+ years of age) combined with mortality (both fishing and natural) and possibly emigration of the larger fish.

In the following year 1972 there was also a significant decrease in the modal size in October indicating that recruitment had again occurred during Spring. Although fish smaller than 10 cm (probably 0+ age fish) were not captured by trawling in the Sound, large numbers of small *S. maculata* were caught in the Swan River estuary during Autumn 1975 (R.C.J. Lenanton pers. comm.). This observation suggests that the Swan River may be an important nursery area for the Cockburn Sound whiting population.

The Cockburn Sound population of this generally tropical whiting species is also of interest because the only other known populations on the W.A. coast occur in Shark Bay and Exmouth Gulf.

(2) Snapper (*Chrysophrys unicolor*)

The data collected on juvenile snapper caught during 1971-72 have already been presented by Lenanton (1974).

The following abstract from his paper summarises these data -

"The abundance and size composition of juvenile snapper *Chrysophrys unicolor* trawled from Cockburn Sound W.A., over a 20 month period is presented. 0+ year old snapper were first taken by the gear in April/May at a mean size of between 8 and 9 cm L.C.F. They continued to be caught until the following January/February when they were 1+ yearsold, and a mean size of between 14 and 15 cm L.C.F., after which they disappeared from the catch. The peak months of abundance were April/May. This is the first description of growth of juvenile snapper from Western Australia."

In addition to the juvenile snapper caught by trawling, one adult male of 89 cm(L.C.F.)weighing approximately 10 kg with spent gonads was taken on September 26, 1972. A second large fish was taken about this time but the details were not recorded. These two large fish captured by the trawl were representative of the large fish taken in significant quantities by both professional and amateur fishermen in the Sound. Although the two fish trawled by "Flinders" were unexpected since snapper generally are found in non trawling areas around reefs, jetties, etc., a vessel trawling illegally for prawns in 1975 was reported to have accidentally trawled a school of these large fish resulting in a catch of several hundred fish greater than 10 kg average weight.

The catches of mature and juvenile snapper in Cockburn Sound indicate that the area is probably one of the more important snapper spawning/nursery areas on the south west coast of W.A.

(3) Samson fish (*Seriola hippos*)

Because the samson fish or sea kingfish is one of the major game fish caught in the waters of the south west of W.A., and juveniles of this species are not commonly seen, all specimens of this species were measured and the size histograms (L.C.F.) are presented in Figure 4.

These data indicate that all of the fish caught by the trawl in the deep basin of the Sound are probably from one year class (0+) and that this year class is present principally in Autumn. The virtual absence of these small fish after May is not unexpected since as they grow

larger they would more easily escape the trawl and in addition they are more likely to move to untrawlable parts of the Sound such as reef areas where they are occasionally caught by amateur hand line fishermen.

The presence of these juveniles would suggest that Cockburn Sound is probably a significant nursery area for this species.

(4) Mulloway (*Sciaena antarctica*)

The mulloway was one of the most important amateur angling species caught during the Cockburn Sound programme. As a consequence most fish taken between August 1971 and December 1972 were recorded by sex and length (T.L.) and any individuals approaching spawning condition, i.e. with enlarged gonads were noted (Table 1). Size frequency histograms of all males and females taken are presented in Figure 5.

These data indicate that large adults ranging in size from 90 to 138 cms and weighing between 8 and 31 kg utilize the deep basin of the Sound. Since fish of these sizes could easily avoid the trawl net, the catch rates obtained, although low, indicate the presence of a sizeable population in the Spring of each of the two years.

The few fish recorded with maturing gonads (as indicated by turgid ovaries or testes and obvious eggs or sperm when cut open) occurred in September/October of each year just prior to the summer decrease in catch rate. This drop in catch coincided each year with reports of large fish being caught in the Swan River estuary. These observations suggest that adult fish may migrate into the river possibly to spawn during summer after overwintering in the Sound.

(5) Blue manna crab (*Portunus pelagicus*)

Blue manna crabs were of special interest because (i) they were the dominant species in the trawl catch especially from Autumn to Spring and (ii) the crab population of the Sound supports a large number of professional fishermen and has recently become a major amateur sport fishery.

Carapace width measurements for males and females, together with observations on moulting, spawning condition, and catch rates were collected and are presented in Figures 6 and 7.

The peak of spawning activity occurred in early Summer prior to the maximum water temperature in each year (Figure 6b). Although egg carrying females were most abundant during Summer, some spawning did occur during most months of the year, i.e. at mean monthly temperatures ranging from 15°C to 25°C (Figure 6a).

Towards the end of the spawning season there was an initial peak in the proportion of soft males, followed two months

later by a major peak in moulting of the females (Figure 6b). Since males must be hard shelled and females soft shelled for mating to occur, this separation of moulting periods for the sexes is not unexpected. This also indicates that the mature females must be capable of storing live sperm until the following Spring spawning season.

Although no specific data was available on the larval stages in the Sound, plankton samples examined for prawn larvae were noted to contain numerous *P. pelagicus* larvae especially during the Summer. These observations, together with the large numbers of juveniles from 1-5 cm carapace width caught on the shallows around the shoreline by the author whilst sampling for juvenile prawns, indicates that the entire life cycle of the crab can take place within the Sound. In addition to these juveniles which settle in Cockburn Sound, many larvae spawned by the adult stock in the Sound, settle out along the metropolitan coastline. It is these small juveniles (2-5 cm C.W.) which actively migrate into the Swan River estuary to form the basis of the amateur fishery which takes place during each Summer.

Recruitment of maturing juveniles of modal size 8-10 cm C.W. to the Cockburn stock, occurs during Winter (Figure 7). These recruits probably come from both the shallow banks around the Sound and the Swan River estuary. This influx of recruits usually occurs shortly after the first rains, when many crabs and king prawns leave the river. Both species have been observed and caught by the author migrating to the sea by utilizing the ebb tides at night. This migration into the deep basin of the Sound is also reflected in the rapid increase in catch rate at that time (Figure 6d).

These 8-10 cm C.W. recruits would either be from the preceding Summer spawning, i.e. 0+ years of age, or from a late spawning of the preceding Autumn, giving them an age of 1+ years (Meagher, 1970). During Winter, the recruit mode is relatively stable until the Spring temperature rise when moulting becomes more rapid. By the end of Summer most of the recruits have matured and some of the females have begun to spawn completing the life cycle.

(6) Western king prawn (*Penaeus latisulcatus*)

The data collected on this species in Cockburn Sound have been used in two publications dealing with tagging methods and estimation of population parameters for a penaeid population (Penn, 1975 and 1976) and hence will not be dealt with here, in detail. However, the following general outline of the life cycle of the king prawn has been included to complete the list of important species which use the area.

The deep basin where all trawling was carried out is essentially an adult habitat for the king prawn. Juveniles

are recruited to the area from March to August with a peak in April/May each year. Peak recruitment occurs when juveniles (0+ years of age) arrive from the Swan River estuary and the shallow sand bank nursery areas around the Sound. This influx usually occurs just after the first winter rain reduces the salinity in the Swan River.

By Spring (September) the year's recruits have grown to maturity and begin to spawn. The spawning season lasts until about March with each female spawning a number of times. The eggs are released free into the water with the larvae hatching within 24 hours to drift with the water currents for a period of 2-3 weeks before settling to the bottom. During this period many of the larvae are swept into the Swan River as well as settling out around the shores of Cockburn Sound. These larvae grow rapidly into juveniles during Summer reaching a size of approximately 25mm carapace length by Autumn when they migrate to the adult habitat in the deep basin of Cockburn Sound.

During this migration the prawns from the Swan River estuary are accessible to fishing as they are attracted to bright lights at the surface and can be easily dip netted. A dip-net fishery for king prawns in the lower reaches of the Swan in Autumn has during recent years developed into an important amateur fishery. Although the adult population is not accessible to fishing it does provide the spawning stock and hence recruitment for the Swan River fishery.

B. SPECIES COMPOSITION DATA

On four occasions the entire catch from five shots was recorded. The dates and weather conditions for each survey are as follows:

Survey 1 - 25 September, 1972.

Weather conditions: SSE winds, 11-16 knots. Surface sea water temp: 16.6°C. Moon phase: full moon + 2 days.

Survey 2 - 23 November, 1972.

Weather conditions: SSW winds, 22-33 knots. Surface sea water temp: 21°C. Moon phase: full moon + 2 days.

Survey 3 - 20 December, 1972.

Weather conditions: SSW winds, 4-16 knots. Surface sea water temp: 23.5°C. Moon phase: full moon.

Survey 4 - 23 January, 1973.

Weather conditions: SW winds, 1-17 knots. Surface sea water temp: 23.5°C. Moon phase: full moon + 4 days.

The catch rates for each species on each occasion (numbers/hour) are presented in Table 2. In addition each species which uses the area as a nursery is marked with an asterisk in the column marked nursery.

Of the species caught during the species composition survey, two species in addition to those dealt with individually in the previous section were both abundant and important to amateur fishermen, i.e. sand skipjack (banded scad) *Alepes djedaba* (preliminary identification) and butterfish *Pentapodus vittus*.

The sand skipjack were caught at sizes ranging from 6 to 22 cm C.F. (Figure 8) with larger numbers of small fish present only in the December sample. Variability in catch rates was marked in this species, e.g. consecutive 30 minute trawls yielded 16, 8, 25, 402, and 15 indicating that the fish were probably displaying schooling behaviour.

The other abundant species, butterfish, was present at sizes ranging from 7 to 20 cm C.F. (Figure 9). Two modal groups which increased in size during the period September to December were present, possibly representing two year classes. The catch rates for this species were consistent from shot to shot on each survey occasion, but over the four months, the catch rate increased dramatically (Table 2). This would imply that there is a movement of fish into the deep water from September to January.

In addition to the species covered in detail, many of the fish listed in Table 2, e.g. flounders, flatheads, leatherjackets, red mullet, silver bream, yellowtail and tailor, although not individually very abundant in the trawls, together form a major part of the amateur catch from the deep basin of Cockburn Sound.

V CONCLUSIONS

The data on species caught by trawling in the deep basin indicates that this area is of considerable importance to a number of fish, crustaceans, and molluscan stocks. The Sound contains the only major breeding stocks of blue manna crabs, king prawns and trumpeter whiting close to the metropolitan area. In addition the Sound also provides a significant nursery area for juvenile crabs, prawns, snapper, sampson fish, butterfish, sand skipjack, squid, and cuttlefish as well as many other species which are less abundant in the trawl catch.

In addition to the species recorded here, many others (Chittleborough, 1970) which inhabit areas which were not trawled, e.g. the bordering weed beds, shallow sand banks and reef areas, or species which are not effectively caught by a trawl, also utilise the Sound as both an adult habitat and a juvenile nursery area.

There appears to be two major reasons why Cockburn Sound provides an ideal and essential environment for many species of marine life. Firstly, the Sound is the only significantly protected embayment between Cape Naturaliste and Shark Bay, a distance of 1 000 kilometres. Secondly, the area with its associated shallow banks has many of the advantages of the productive coastal estuaries, without being subject to the radical salinity and temperature fluctuations which occur in estuaries during each year.

VI ACKNOWLEDGEMENTS

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TABLE 1 - Number caught, catch rate, mean size, and spawning notes for trawl caught mulloway *Sciaena antarctica* from Cockburn Sound during 1971-72.

YEAR	MONTH	NO. CAUGHT ♂	NO. CAUGHT ♀	MEAN SIZE (CM) ♂	MEAN SIZE (CM) ♀	HOURS TRAWLING	NO./ HOUR	% SPAWNING CONDITION
1971	Aug.	7	2	101	101	21.0	0.43	0
	Sept.	0	4	-	105	22.2	0.18	0
	Oct.	3	1	109	106	10.5	0.38	50
	Nov.	1	0	93	-	12.5	0.08	0
	Dec.	0	0	-	-	15.0	0	-
1972	Jan.	0	0	-	-	11.5	0	-
	Feb.	0	1	-	109	25.0	0.04	0
	Mar.	0	2	-	112	4.5	0.44	0
	Apr.	0	1	-	105	6.0	0.17	0
	May	0	0	-	-	6.0	0	-
	June	0	0	-	-	6.0	0	-
	July	0	0	-	-	6.0	0	-
	Aug.	3	1	NR*	NR*	66.7†	0.06	NR*
	Sept.	8	9	108	108	189.0†	0.09	12
	Oct.	6	4	109	120	125.0†	0.08	40
	Nov.	2	2	106	94	66.7†	0.06	0
	Dec.	0	0	-	-	9.0	0	-

*Not recorded

†Two vessels fishing

TABLE 2 - Species list and catch rate (number/hour) for fish, crustaceans and molluscs taken by trawling during four surveys each of 2.5 hours duration in Cockburn Sound (September 1972 - January 1973).

SCIENTIFIC NAMES	COMMON NAMES	SURVEY NUMBER				NURSERY	
		1	2	3	4		
		No/Hr	No/Hr	No/Hr	No/Hr		
<u>ELASMOBRANCHII</u>							
HETERODONTIDAE	<i>Heterodontus portusjacksoni</i>	Port Jackson shark	2	5.2	4.8	10.0	*
ORECTOLOBIIDAE	* <i>Orectolobus maculatus</i>	Wobbegong shark				0.5	*
MYLIOBATIDAE	<i>Myliobatis australis</i>	Eagle ray		1.2	0.4	2.5	*
RHINOBATIDAE	<i>Trygonorhina fasciata</i>	Fiddler ray			0.4		*
<u>TELEOSTOMI</u>							
CLUPEIDAE	* <i>Sardinops neopilchardus</i>	Pilchard (mulie)	2.4			1.0	
SYNODONTIDAE	<i>Saurida</i> sp.	Lizzard fish		0.8		0.5	
HEMIRAMPHIDAE	* <i>Hyporhamphus melanocheir</i>	Southern sea garfish		0.4			*
PLEURONECTIDAE	<i>Ammotretis elongatus</i>	Elongate flounder	0.4				*
BOTHIDAE	* <i>Pseudorhombus</i> spp.	Flounder	1.6	2.8	4.0	21.5	*
CYNOGLOSSIDAE	<i>Cynoglossus broadhursti</i>	Southern tongue sole	1.0			3.0	*
SPHYRAENIDAE	* <i>Sphyræna obtusata</i>	Striped sea pike		3.2	0.4		*
PLATYCEPHALIDAE	* <i>Thysanophrys cirronasus</i>	Tassel snouted flathead		4.4	2.8		*
	* <i>Platycephalus</i> spp.	Flathead		7.2	5.2	72.5	*
TRIGLIDAE	* <i>Chelidonicichthys kumu</i>	Red gurnard		2.4	0.4	7.5	*
	<i>Paratrigla papilio</i>	Spiny gurnard	3.2	20.0	9.2	15.5	*
SCORPAENIDAE	<i>Gymnapistes marmoratus</i>	Devil fish			1.6	2.5	*
CALLIONYMIDAE	<i>Callionymus goodladi</i>	Dragonet (common)	111.0	286.0	178.0	408.0	*
	<i>Dactylopus dactylopus</i>	Dragonet		6.0	10.0		*
CARANGIDAE	* <i>Seriola hippos</i>	Sampson fish			0.8	1.0	*
	<i>Alepes djedaba</i>	Sand skipjack	153.0	98.0	186.0	196.0	*
	<i>Trachurus maculoochi</i>	Yellowtail scad	13.6	2.0	6.8	4.0	*
POMATOMIDAE	* <i>Pomatomus saltator</i>	Tailor	0.4				*
MULLIDAE	<i>Upeneus tragula</i>	Goatfish		6.8			*
	<i>Upeneichthys porosus</i>	Red mullet		0.4	2.0	2.5	*
SILLAGINDIAE	* <i>Sillago maculata</i>	Trumpeter whiting	13.6	354.0	113.0	484.0	*
APOGONIDAE	<i>Apogon ruppelli</i>	Gobble guts	125.0	154.0	170.0	219.0	*
SPARIDAE	* <i>Rhabdosargus sarba</i>	Silver bream			1.6		*
	* <i>Chrysophrys unicolor</i>	Snapper			10.0		*
GERRIDAE	<i>Gerres australis</i>	Roach	11.0	72.0	52.8	66.0	*
NEMIPTERIDAE	<i>Pentapodus vittus</i>	Butter fish	16.4	102.0	254.0	363.0	*
THERAPONIDAE	<i>Helotes semilineatus</i>	Trumpeter		0.4	4.4	1.5	*
ODACIDAE	<i>Odax semifasciatus</i>	Blue rock whiting		1.6	0.8		*
TETRAODONTIDAE	<i>Torquigener pleurogramma</i>	Banded blowfish	0.4	0.8	4.8	2.0	*
	<i>Spherooides armilla</i>	Ringed blowfish			0.4		*
DIODONTIDAE	Fam. <i>Diodontidae</i>	Porcupine fish			0.8		*
OSTRACIONTIDAE	Fam. <i>Ostraciontidae</i>	Box fish		2.4	6.4	18.0	*
MONACANTHIDAE	* <i>Acanthaluteres</i> spp.)						
	* <i>Acanthaluteres spilome lanurus</i>)	Leatherjackets	35	35	38	115	*
	* <i>Euballochthys mosaicus</i>)						
	* <i>Monacanthus chinensis</i>)						
	No identification available	Angel fish			0.8		
<u>CRUSTACEA</u>							
PORTUNIDAE	* <i>Portunus pelagicus</i>	Blue manna crab	58.6	10.3	27.6	51.0	*
PENAEIDAE	<i>Penaeus latisulcatus</i>	Western king prawn	383.0	402.0	160.0	375	*
<u>CEPHALOPODA</u>							
LOLIGINIDAE	* <i>Sepioteuthis</i> spp.	Squid	2.8			15.5	*
SEPIIDAE	* <i>Sepia</i> spp.	Cuttlefish	13.6			58.0	*
OCTOPODIDAE	* <i>Octopus tetricus</i>	Octopus	0.4			1.0	*

* Commercial important species.

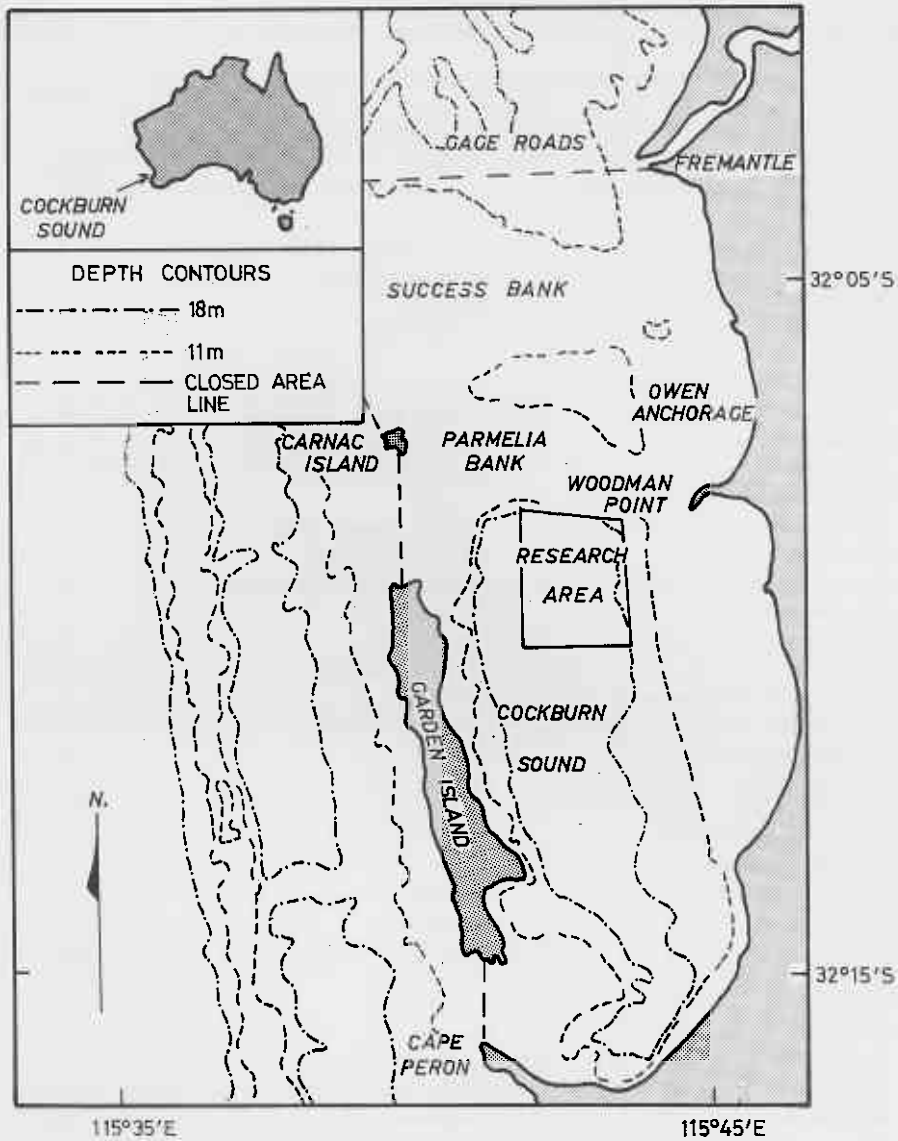


FIGURE 1 - Cockburn Sound, W.A., showing the trawling research area and the closed trawling area.

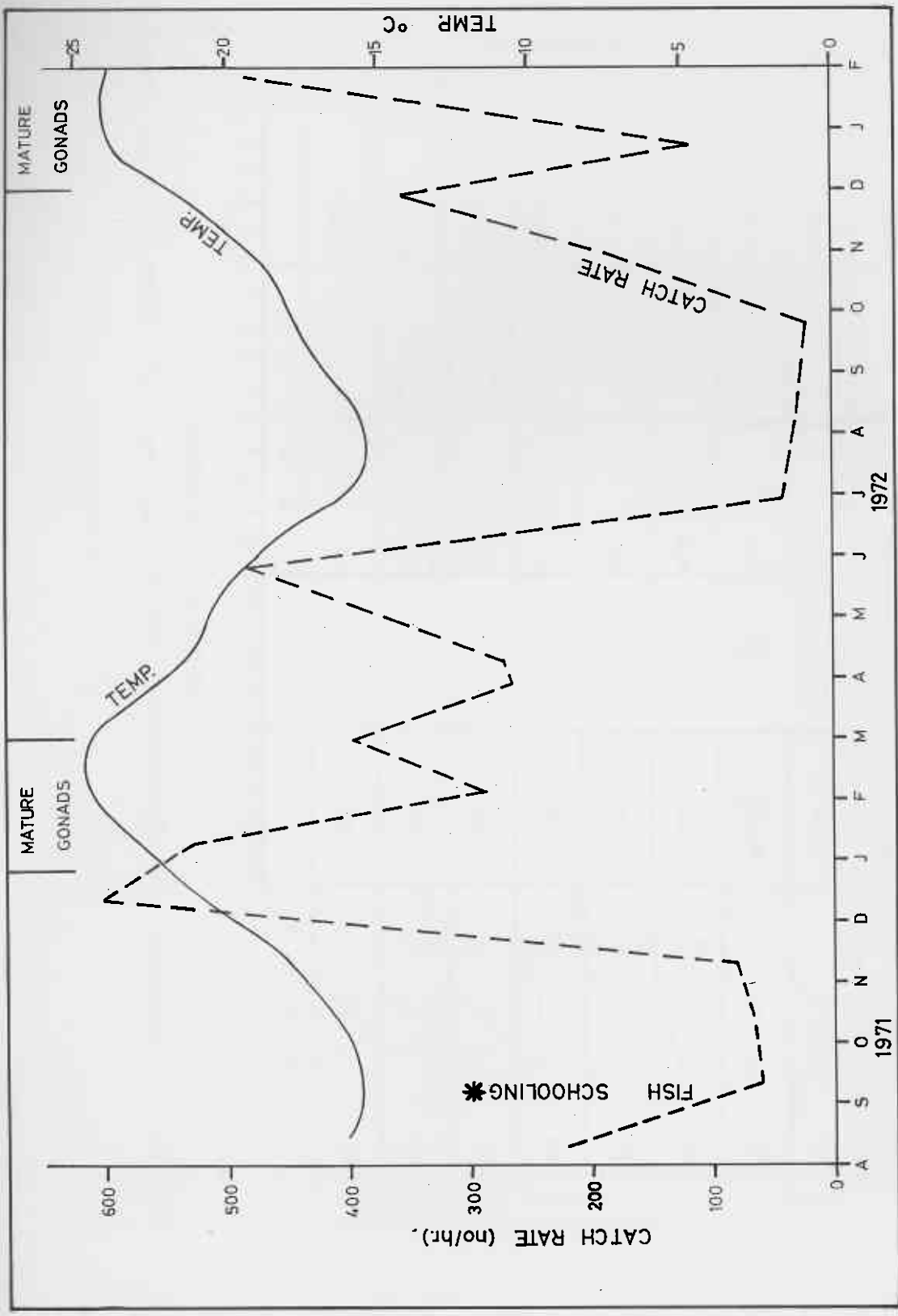


FIGURE 2 - *Sillago maculata* - catch rates, gonad condition and the annual temperature cycle in Cockburn Sound.

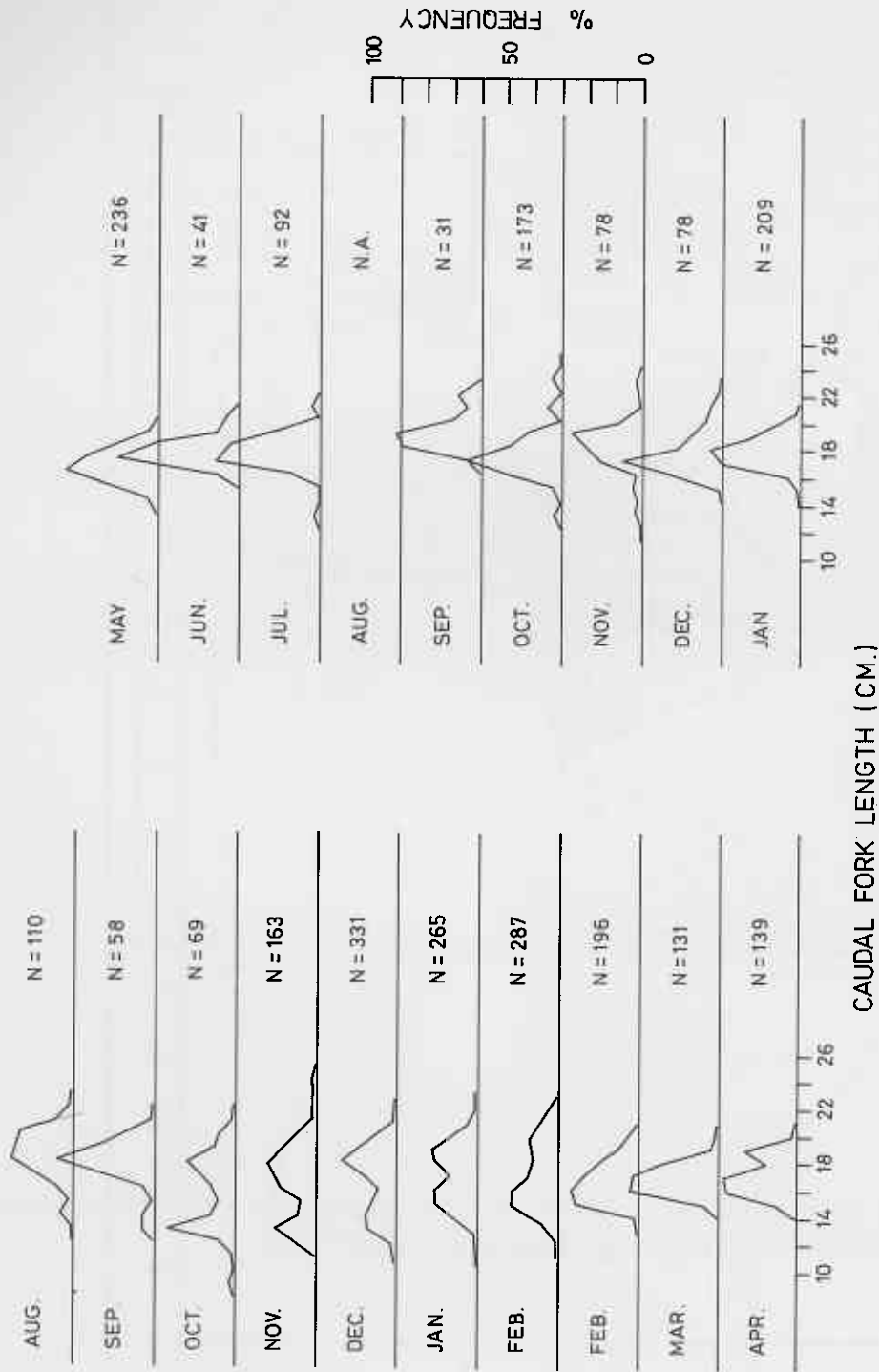


Figure 3. Monthly size frequencies for *Sillago maculata* from Cockburn Sound.

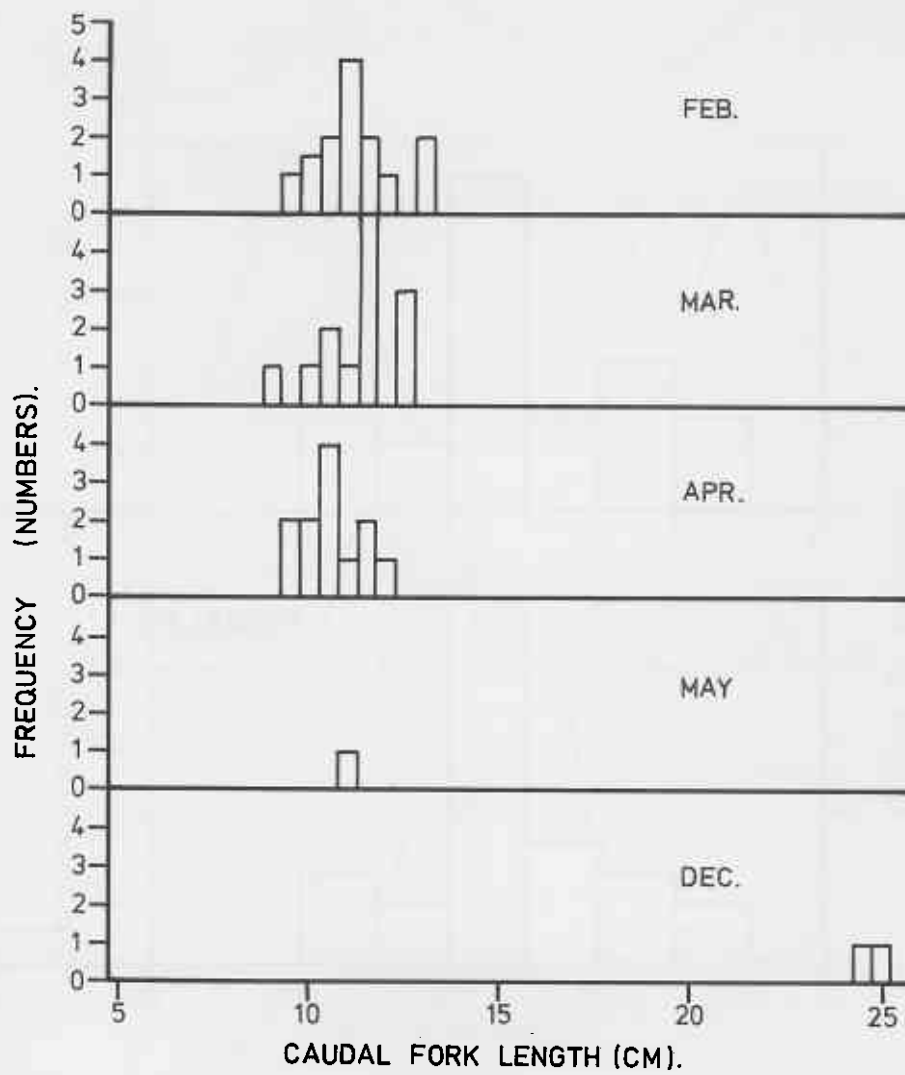


FIGURE 4 - Length frequency histograms of juvenile samson fish (*Seriola hippos*) from Cockburn Sound during 1972.

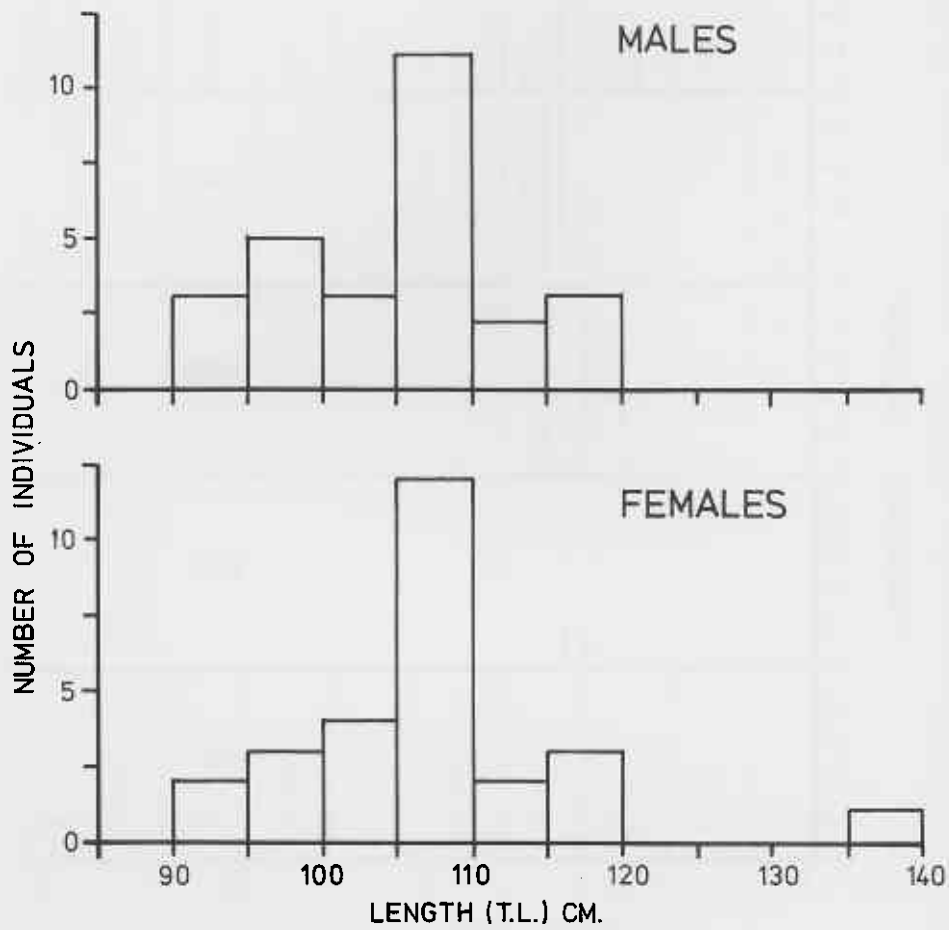


FIGURE 5 - Length frequency histograms for male and female mullet *Sciaena antarctica* trawled in Cockburn Sound.

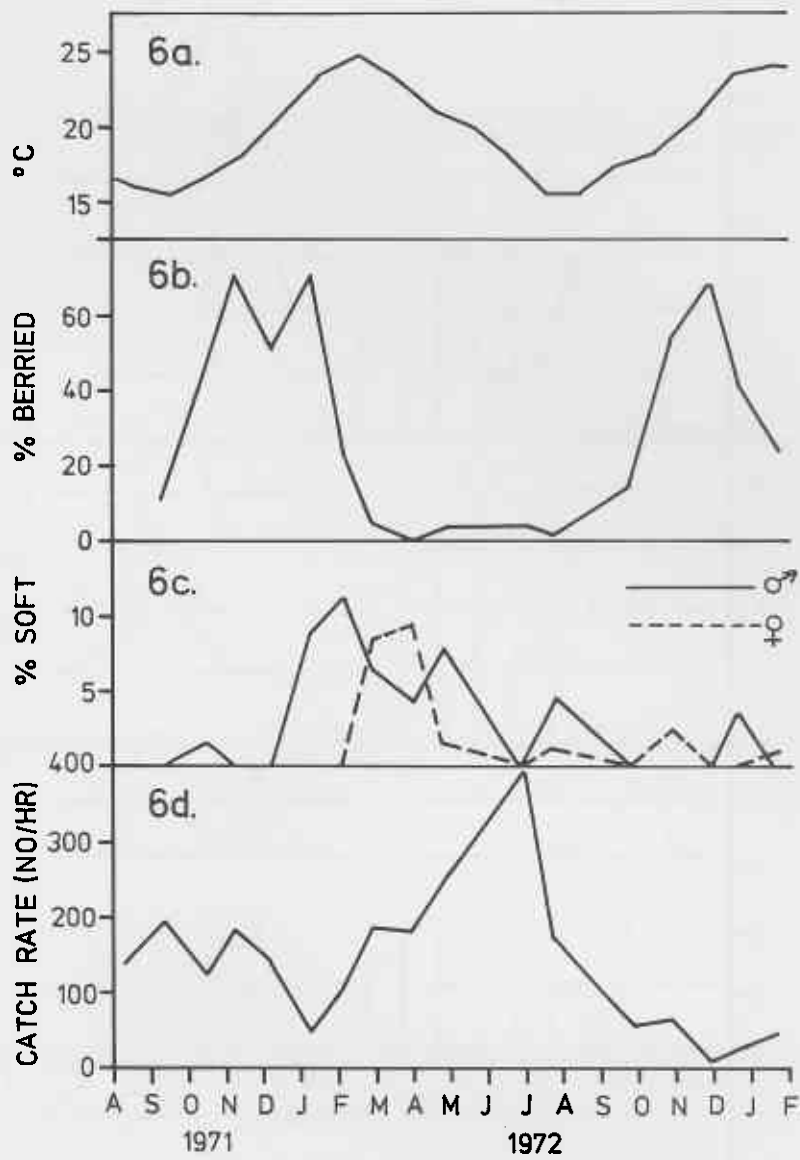


FIGURE 6 - Data relating to the blue manna crab *Portunus pelagicus* population in Cockburn Sound:
 6(a) Annual temperature cycle;
 6(b) Percentage berried females;
 6(c) Percentage soft shelled;
 6(d) Catch rate (combined males and females).

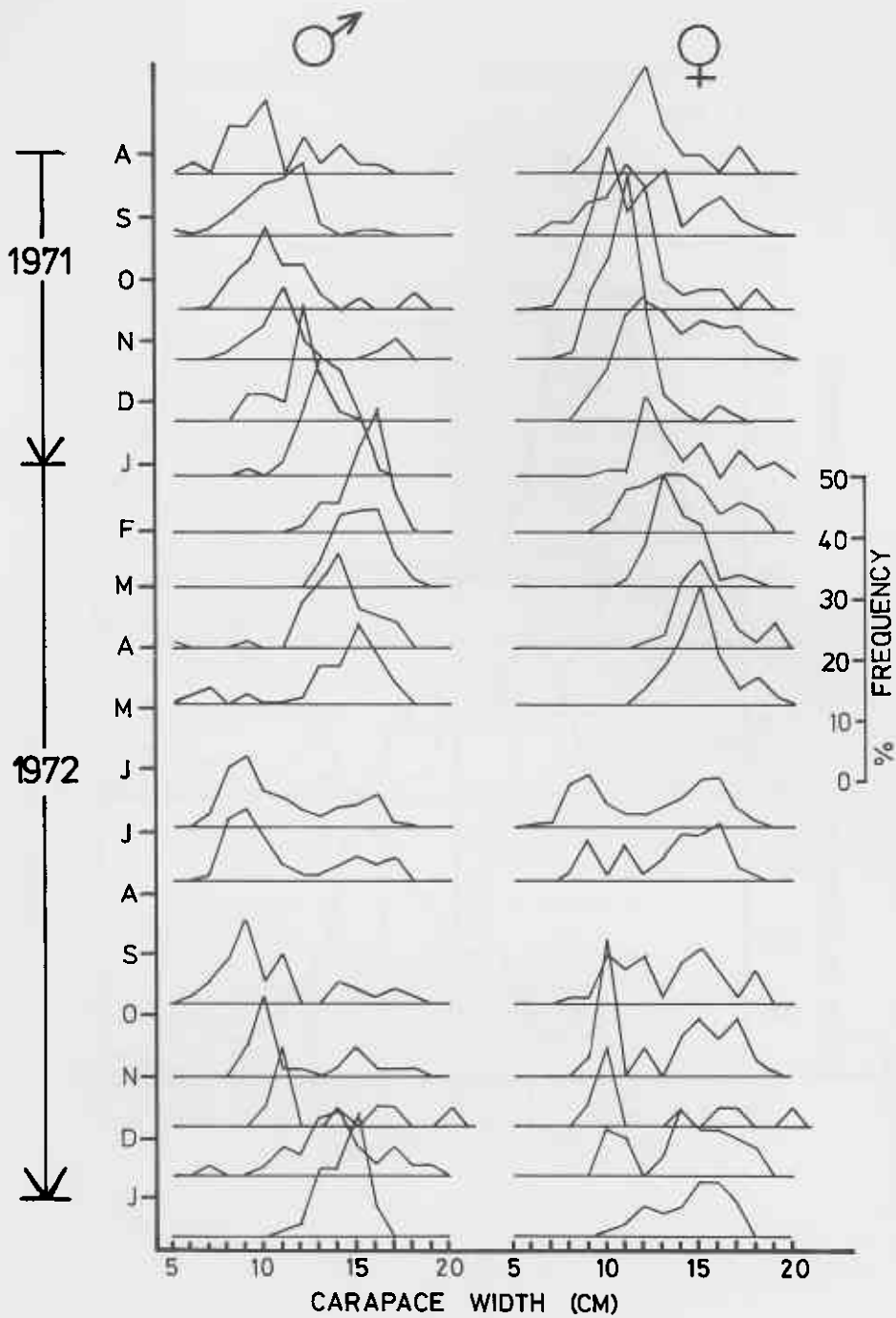


FIGURE 7 - Size frequency distributions for trawl caught male and female *Portunus pelagicus* from Cockburn Sound.

SAND SKIPJACK / BANDED SCAD (*Alepes djedaba*)

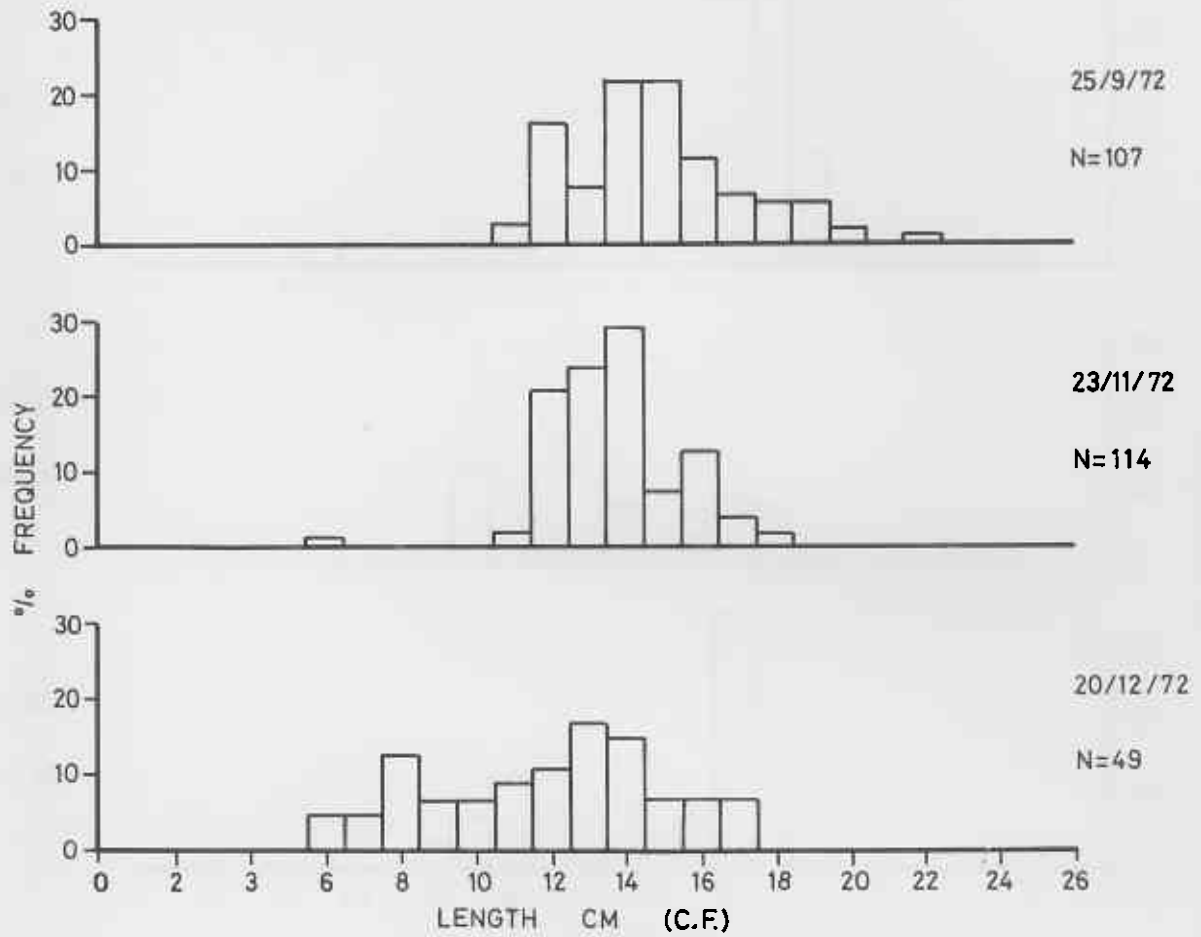


FIGURE 8 - Size composition of sand skipjack (banded scad) *Alepes djedaba*, in the trawl catch from Cockburn Sound during Spring 1972.

BUTTERFISH (Pentapodus vittus)

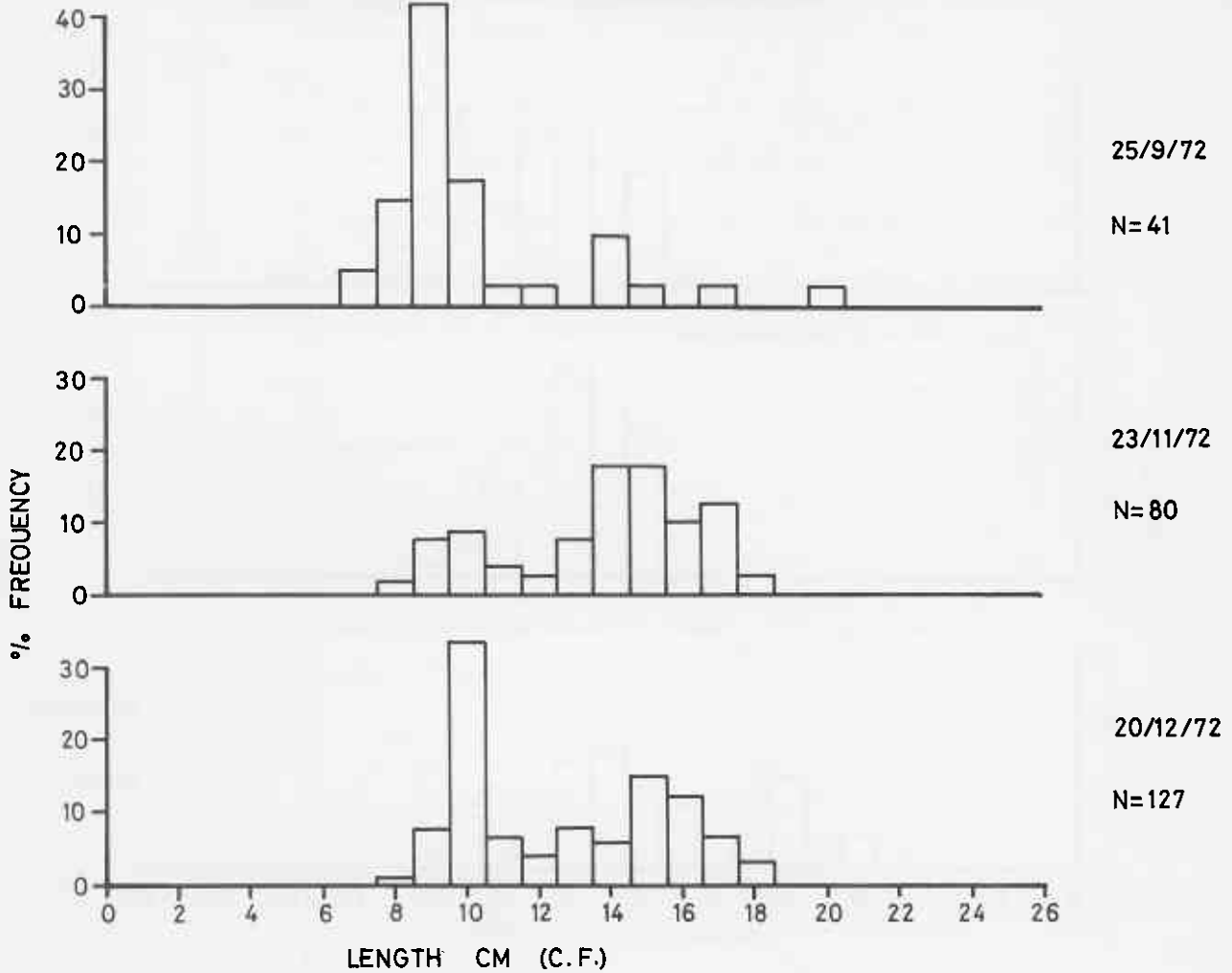


FIGURE 9 - Size composition of butterfish, *Pentapodus vittus* in the trawl catch from Cockburn Sound during Spring 1972.