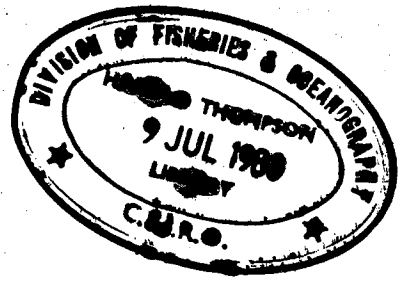
FISHERY SITUATION REPORT 3. PILCHARD AND ANCHOVY

R.H. Winstanley

Fisheries and Wildlife Division
Arthur Rylah Institute for Environmental Research
123 Brown Street, Heidelberg. Vic. 3084



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SITUATION REPORT FOR PILCHARD AND ANCHOVY FISHERY

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Summary

Annual catch weight	-	N.S.W.	140 - 310 tonnes
		Vic.	200 - 500 tonnes
		Tas.	0
		S.A.	0
			(Excludes figures for fish meal production)
Value to fishermen	-	Vic.	over $200,000
Markets	-	N.S.W.	all local as fresh fish, salted bait and anchovies for fish pastes.
		Vic.	all local; most used for fishmeal; some sold for consumption or salted for bait
Numbers of vessels	-	N.S.W.	2 small purse seiners.
		Vic.	18 purse seiners.
Number of men employed	-	N.S.W.	5 - 10
		Vic.	40
Present status of fishery	-		Under-exploited.

1.0 Introduction

Pilchards, anchovies and sprats have been taken commercially in Australian estuary and bay fisheries for many years. The main use of these fishes until recently was in the salted form as bait, hence the common names whitebait and bluebait by which these fish are widely known. During the post-war years anchovies have also been used for flavouring locally-produced fish pastes. Beach and garfish seine nets and bait nets were and still are widely used to take clupeoids in the estuary fisheries.

Blackburn (1950) described the Port Phillip Bay anchovy fishery in the early years. This fishery was centred in the Port Melbourne area, the main season being October to May. Anchovies, pilchards and small quantities of blue sprats were taken by beach seine and hoop-net. The main fishery for blue sprats was in the Sorrento and Corio Bay areas where beach seining was the major fishing method used. Some hoop-net fishing for anchovies was also conducted from the wharves of Geelong.

In 1946 a Melbourne firm began using anchovies as fish-paste flavouring. This increased the demand temporarily but as fishermen on the Bay's eastern shore could take up to 6 tonnes per seine haul, the market was glutted and the advantage was lost. In the winter of 1947, anchovy sales to other fish-paste manufacturers and increased bait demands boosted production.

Occasional shipments of pilchards and anchovies were sent to the Melbourne market from other areas such as Lakes Entrance, Corner Inlet, Western Port and Port Fairy.

The first attempts to catch clupeoids commercially in pelagic fishing gear in south-eastern Australian waters came in 1949 when a purse-lampara net was tried in Port Phillip Bay. Over the following years lampara and purse seine nets were used spasmodically in the Bay and at Lakes Entrance. A Melbourne firm commenced canning pilchards in 1960, but discontinued two years later.

The growth of the Lakes Entrance purse seine fishery during the late 1960's was the greatest advance of the south-eastern Australian clupeoid fishery.

Pilchard and anchovy catches in other south-eastern States appear to be seasonal in the estuaries seine fishery and incidental in other fisheries.

1.1 Species

The following species belonging to the order Clupeiformes are found in south-eastern Australian waters (Scott, 1962):

Family Clupeidae

(i) pilchard, Sardinops neopilchardus (Steindachner), also known as smig in eastern Victoria; the juveniles are properly called sardines;

(ii) sandy sprat, Hyperlophus vittatus (Castelnau);

(iii) sprat, Clupea bassensis McCulloch;

Family Dussumieriidae

(iv) blue sprat, Spratelloides robustus Ogilby, also known in Victoria as blue bait;

Family Engraulidae

(v) southern anchovy, Engraulis australis antipodum Gunther; also known as whitebait.

Pilchards and anchovies are the most common commercial clupeoids. Several other species of no present economic significance, such as the maray, silverside and beaked salmon are also found in these waters.

1.1.1 Distribution

Pilchards are found in the bays, inlets and coastal waters of all Australian States from southern Queensland around the south coast to Western Australia (Munro, 1956), and off New Zealand.

Southern anchovies are found in bays, inshore and offshore waters of South Australia, Victoria, Tasmania and southern New South Wales; closely related subspecies are found in Western Australian, northern New South Wales and Queensland waters (Blackburn, 1950a).

Sandy sprats occur in bays, inlets and inshore coastal waters of all mainland States (Munro, 1956).

Sprats occur in the coastal waters and deeper bays and estuaries of Tasmania (Blackburn, 1941) and less frequently in the deeper bays and channels of South Australia (Scott, 1962).

Blue sprats occur in the bays, inlets and coastal waters of all Australian States.

1.2 Biology

Blackburn (1941) investigated the distribution of adult and larval clupeoids in south-eastern Australian waters, their seasonal occurrence and movements, development, size, age, maturity, feeding habits, and chemistry. He also reviewed earlier work relating to these topics.

The age, growth rate and life history of the pilchard in New South Wales waters was described by Blackburn (1949); he also described these aspects of the biology of pilchards in southern and western Australian waters, (Blackburn, 1950b) and in Australian and New Zealand waters (Blackburn, 1960).

The biology of the anchovy in southern Australian waters was described by Blackburn (1950a).

Brief summaries of the biology of the two clupeoids of greatest economic significance in the south eastern region, pilchards and anchovies, are given below.

1.2.1 Biology of the pilchard

In the Australian east coast waters the pilchard is found throughout the year as far north as Sandy Cape (Qld) in offshore waters, at times entering the bays and estuaries off New South Wales. Some surface shoaling of immature fish occurs in spring and summer but the main spawning and associated mass surface shoaling octivities occur through autumn and winter.

In Victorian waters the spawning and surface shoaling season is spring and summer, and in South Australia, summer and autumn. Shoaling is restricted to bay and neritic waters (Blackburn, 1950b).

In Port Phillip Bay pilchard shoals are most abundant during the period August to May, varying in extent and duration from year to year. Spawning occurs over this period. Pilchards are found in deeper water outside the Bay during winter months. Off eastern Victoria pilchards occur in coastal waters throughout the year.

Pilchards occur in eastern Bass Strait, northern and eastern Tasmanian coastal waters from spring to autumn, occasionally entering the bays and estuaries.

In Victorian waters, pilchards reach mean standard lengths of 80, 105, 125, 140 and 155 mm at ages 1, 2, 3, 4 and 5 respectively. The maximum recorded age is six years and the largest recorded size is 197 mm.

Mean size at first maturity is about 80 mm (age 1y) at Lakes Entrance, 100 mm (2y) in Port Phillip Bay and 120 mm (2y) in New South Wales waters (Blackburn 1960).

The oil content of pilchards is highest in immature fish (14.0 per cent) and lowest in mature fish during the spawning season (0.3 per cent) (Blackburn, 1941). This suggests that fish of high oil content should be sought during the non-spawning seasons, i.e. summer in New South Wales and winter further south. This was confirmed by the results of Blackburn and Downie (1955) who found that in New South Wales waters the oil content of pilchards varied from 11 to 17 per cent in January 1954 compared with 5 per cent or less during winter.

The pilchard spawns in the open sea and after several months the post-larvae move inshore to the bays and estuaries where they spend one year before moving out to join the adult stocks. In southern New South Wales waters this offshore movement occurs from September to December and constitutes the first run of shoaling pilchards. Juveniles and adults frequently occur together in Victorian inshore waters.

Pilchards feed on copepods, ostracods, euphausids, mysids and other crustaceans, mollusc larvae, diatoms, larvaceans and chaetognaths.

1.2.2 Biology of the anchovy

Blackburn (1950a) described the results of a biological study of the anchovy in Australian waters. The southern anchovy grows to mean total lengths of 50, 62, 75, 90 and 102 mm at ages 0.5, 1.5, 2.5, 3.5 and 4.5 years respectively; the greatest size is 157 mm. Most of the growth occurs in spring and summer.

Sexual maturity usually occurs at age 1 year.

Spawning occurs mainly in bays, inlets and estuaries in the summer period. The fish inhabit inlet waters and move out to sea in winter as they grow older, returning in spring.

The general life history described for the Port Phillip Bay anchovies by Blackburn (1950a) and inferred by him from fragmentary evidence from elsewhere is as follows. Post-larval fish are generally found in the headwaters of bays, inlets, estuaries, etc., separate from older fish. At two years of age (summer) they appear in concentrations near the lower reaches of these inlets, closer to the sea. Three year and older fish are found in the open sea or in smaller numbers with younger fish in the inlets. The seaward migration of 2 to 3 year old fish has not been observed in Port Phillip Bay but does occur at Lakes Entrance, Western Port and elsewhere.

2.0 The fishery

During the last 15 years the use of purse seine and lampara nets has become more and more regular in Port Phillip Bay where at present 16 boats fish for pilchards and anchovies. Small catches continue to be taken with beach seines and hoop-nets.

Pilchards and anchovies are caught in beach seines and bait nets in Western Port, Port Phillip Bay and the Gippsland Lakes regularly; occasional catches are made elsewhere along the Victorian coast, such as Port Fairy and Corner Inlet.

Anchovies make up most of the purse seine catch off Lakes Entrance each year with pilchards and small quantities of sandy sprats and blue sprats. The fishery there extends 1 km seaward from the shore, from Marlo to 65 km west of Lakes Entrance. The fish appear when the water temperature is around 14.5 C and only appear in shoals in smooth conditions. The yield of meal per live weight is uniform at about 20% for pilchards and anchovies. During the summer months when pilchards and anchovies are scarce the purse seiners fish for tuna and Australian salmon.

In other States clupeoids are taken in beach seines in the inlet and estuary fisheries and incidentally in trawl and other catches. No catches of clupeoids have been recorded from Tasmanian waters in the last 20 years; in the same period only one catch, 6 tonnes of pilchards in 1972/73, was recorded from South Australian waters.

2.1 Fishing Localities

The principal south eastern Australian fishing localities for pilchards and anchovies are the open waters off Lakes Entrance, and the waters of Port Phillip Bay and, to a lesser extent, Western Port. These fish are also caught in seines in the Gippsland Lakes.

Considerable quantities of pilchards (about 500 tonnes) are taken annually along the southern N.S.W. coast and off South Australia by tuna pole fishermen for use as live bait.

2.2 Fishing methods

The following methods are used to take commercial catches of pilchards and anchovies:

- purse seining and lampara netting;
- beach seining; and
- hoop netting.

2.2.1 Purse seining

Blackburn and Rayner (1951) described the gear and methods used in the early Port Phillip Bay purse lampara fishery. Lights were used on vessels anchored on calm, dark nights. When fish were massed under the lights a dinghy was used to set the net, of 12 and 18 mm mesh, around the school, then the net was quickly pursed and the catch boarded.

Turbidity and moonlight are inhibiting influences on this type of fishing which has however been used successfully during daylight, on occasions.

Special adaptation of purse seining for shallow water fishing was described in 1960 (Anonymous).

Hughes (1972) described the purse seine method used in the Lakes Entrance clupeoid fishery. Spotter aircraft, sonar and visual sightings from the boats are used to locate schools. The vessel homes in using its sonar and the net, which usually measures 420 m long by 64 m deep of 12 mm nylon mesh. A skiff is used in conjunction with the main boat to set and recover the net. The net is hauled by a power block and a fish pump is used to load the catch directly into the hold.

Lorimer (1967) reviewed the development of purse seining overseas and in Port Phillip Bay, and described fishing gear and methods in some detail.

Details of the vessel, skiff, net and fishing equipment being used in an exploratory purse seining venture were given in Anon. (1973).

Two boats purse seine off Lakes Entrance and sixteen boats purse seine in Port Phillip Bay.

2.2.2 Beach seining

In the shallow waters close to shore in Port Phillip Bay small mesh (12 mm bunt, 18 mm wings) beach seines are used to take pilchards and anchovies. The net is usually set from the shore by a dinghy which follows a crescent from the beach around the shoal and back to the beach.

Similar seine nets are used in estuaries and inlets.

2.2.3 Hoopnetting

This means of fishing is still used from wharves and jetties in Port Phillip Bay, primarily for bait. The operation, which is conducted in daylight, is very simple. The circular hoop-net is lowered horizontally into the water, burley of boiled potato or pollard is scattered on the surface and the net is quickly raised after several minutes to catch the fish attracted to the feed.

Hoop nets are usually 3 m in diameter, with a total depth of about 4 m; the mesh size increases from 12 mm at the bottom to 18 mm at the top. The net is lashed to a circular steel hoop.

Blackburn (1950) recorded that on occasions a hoop-net could take up to 35 kg of fish in one lift; the average catch is 2 to 5 kg.

2.3 Production

The increase in clupeoid production from south-eastern Australian waters, shown in Table 1, has resulted largely from increasing pilchard landings in New South Wales. In fact a further and substantial increase in anchovy and pilchard production has occurred since 1969 when a purse seine and fish meal industry was established at Lakes Entrance, Victoria. In most years, annual production by this industry far exceeds the totals shown in Table 1 but details are not shown in this report at the request of Lakes Entrance Processor's Pty Ltd.

Apart from the Lakes Entrance purse seine fishery the biggest clupeoid fishery in south-eastern Australia is in Port Phillip Bay (see Table 2). Pilchards usually constitutes 70-90% of the catch; most of the balance are anchovies.

Most of the New South Wales clupeoid catch comes from oceanic waters. The greatest pilchard production is at Tweed River, Jervis Bay and Ulladulla and the greatest anchovy production is at Port Jackson. Pilchards usually constitute 70-90% of the clupeoid catch.

No commercial catches of clupeoids have been recorded from Tasmanian waters and the only records for South Australian waters was 6 tonnes of pilchards landed in 1972/73.

The quantity of clupeoids caught for live bait in the tuna pole fishery is not recorded.

TABLE 1 Annual catches (tonnes) of pilchards (P), anchovies (A), blue sprats (B), and sandy sprats (S) from south-eastern Australian waters since 1964/65.

Year	N.S.W.		VICTORIA				S.E. AUSTRALIA				Total cluepoids
	P	A	P	A	B	S	P	A	B	S	
1964/65	46	0	220	125	3	0	266	125	3	0	394
1965/66	73	0	228	170	4	0	301	170	4	0	475
1966/67	78	0	51	197	5	2	128	197	5	2	331
1967/68	133	0	44	156	19	5	178	156	19	2	357
1968/69	75	0	41	162	26	0	116	162	26	0	304
1969/70	141	26	256	31	8	0	397	57	8	0	462
1970/71	125	54	123	36	2	9	248	90	2	9	349
1971/72	147	30	192	101	-	0	339	131	-	0	470
1972/73	112	31	389	85	-	0	507*	116	-	0	623
1973/74	210	97	205	112	0	3	415	209	0	3	627
1974/75	132	59	118+	267+	n.a.		250+	326+	n.a.		576+
1975/76	219	32	65+	133+	n.a.		284+	165+	n.a.		449+
1976/77	236	8	235+	46+	n.a.		471+	54+	n.a.		525+

- non-zero catch less than 1 tonne; *includes 6 tonnes landed in SA;
+ incomplete totals.

Sources: Australian Bureau of Statistics; NSW State Fisheries; Fisheries and Wildlife Division, Victoria.

TABLE 2 Annual catches (tonnes) of pilchards (P), anchovies (A), blue sprats (B) and sandy sprats (S) from Port Phillip Bay and other Victorian waters since 1964/65 (excluding production from Lakes Entrance purse seine fishery since 1969).

Year	PORT PHILLIP BAY				OTHER WATERS				TOTAL VIC. WATERS				TOTAL CLUPEOID
	P	A	B	S	P	A	B	S	P	A	B	S	
1964/65	220	66	2	0	-	59	-	0	220	125	3	0	348
1965/66	217	89	3	0	11	81	1	0	228	170	4	0	402
1966/67	51	103	1	-	-	94	4	2	51	197	5	2	255
1967/68	44	117	11	2	-	39	8	3	44	156	19	5	224
1968/69	41	162	25	0	0	-	1	0	41	162	26	0	229
1969/70	255	42	8	0	1	9	0	0	256	31	8	0	295
1970/71	123	31	2	0	0	5	0	9	123	36	2	9	170
1971/72	187	94	0	0	5	7	-	0	192	101	-	0	293
1972/73	388	83	-	0	1	2	0	0	389	85	-	0	474
1973/74	205	107	0	3	0	5	0	0	205	112	0	3	317
1974/75	118	267											
1975/76	65	133			NOT AVAILABLE								
1976/77	235	46											
1977/78	140	162											

- non-zero catch less than one tonne.

Sources: Australian Bureau of Statistics; Fisheries & Wildlife Division, Victoria.

2.4 Market

Approximately 70% of the clupeoids purse seined in Port Phillip Bay are sold locally for consumption; the remainder are sold for bait. In most years the magnitude of the fishery is regulated by the capacity of these bait and fresh fish markets.

In the year ended 30 September 1978, the New South Wales Fish Marketing Authority handled 24 tonnes of anchovies and 265 tonnes of pilchards worth an average of $0.86 and $0.52 per kg, respectively.

3.0 Management

The only restrictions affecting the Lakes Entrance and Port Phillip Bay fisheries relate to navigation channels, boat moorings and harbour facilities, and protection of other species. Regulations define the gear, permitted areas and manner of use applicable to holders of Master Fishermen's Amateur Fishing and Bait Licences within the bays and inlets.

4.0 Research and Development

The clupeoid stocks of south eastern Australian waters have been the subject of a great deal of biological research, resource survey and experimental fishing over a relatively long period of time. This is remarkable considering the limited extent of the exploitation of the clupeoid resource in the region.

These studies are briefly mentioned below in chronological order.

Dakin (1937) described the spawning season and occurrence of pilchards and larval stages in New South Wales waters.

Blackburn (1941) reported the results of a detailed survey for clupeoid fish, eggs and larval stages in eastern and south eastern waters, and summarised the knowledge of these species up to that time. In 1943, Blackburn described the capture of sprats in a purse seine in eastern Tasmanian waters. The findings of the continuation of the east coast clupeoid survey were recorded by Blackburn and Olsen (1947).

The results of biological studies of the southern anchovy in Australian waters and a summary of prior knowledge of the species were described by Blackburn (1950a). In the same year he summarised the results of studies of the pilchard in southern Australian waters. Blackburn (1951) proposed three distinct races of pilchards in eastern, south eastern and south western Australian waters, on the basis of observed differences in growth rates.

In 1950, Blackburn and Tubb discussed measures of the abundance of clupeoids and other pelagic species as given in previous survey reports, fishermens observations, departmental records, aerial sightings, etc.

Blackburn and Rayner (1951) reviewed experimental pelagic fishing methods used in earlier surveys and fishing operations. The earliest attempt to take pilchards commercially in south eastern waters using pelagic gear was in 1949 in Port Phillip Bay when two fishermen used purse lampara under electric lights at night. A lampara was used in the D'Entrecasteau Channel, Tasmania, to catch quantities of sprats during 1949. The research survey vessel Warreen used gill nets, purse seine and lampara nets as well as other sampling devices during the extensive clupeoid survey conducted between 1938 and 1942.

In the summer of 1954 Blackburn and Downie (1955) surveyed waters off New South Wales for subsurface pilchards and investigated the oil content of the fish caught. Pilchards detected by echo sounding were readily sampled in a drift net and oil contents, ranging from 11 to 17 per cent raw weight.

Experimental canning of pilchards in Melbourne in 1960 held some promise of stability and growth of the local industry but difficulties in handling and sorting the mixed species catches prevented this. Nevertheless the developing local market for fresh pilchards, and salted and frozen pilchards for bait has achieved stability in the Port Phillip Bay fishery.

Purse seining for clupeoids off Lakes Entrance was conducted irregularly from the early 1950's and really expanded as a fishery in 1968 when the fish meal plant commenced operations at the port.

The fishing boat Laurus, its purse seine net and other gear, were described (Anonymous, 1950. 23.5) as an Australian Government financed exploratory fishing project. Catches of skipjack and mackerel from Eden waters have since been published (Anonymous, 1974).

Gorman and Graham (1973, 1974) have reported catches of blue sprats, pilchards and anchovies in experimental midwater trawl cruises off New South Wales. The fish-finding and catching equipment and the manner of fishing used is also described.

Gorman and Graham (1976) have described experimental catches and midwater trawling prospects for pilchards and anchovies off New South Wales and commented that although anchovies can be caught in commercial quantities, catch rates are inconsistent.

Clupeoids have been reported in demersal and midwater trawl catches by the F.R.V. Courageous at various locations off south-eastern Australia.

5.0 Prospects

There is potential for a far greater degree of exploitation of clupeoid fish in south eastern Australian waters. Kesteven's (1967) estimate of 100,000 tonnes for the prospective catch off south-eastern and southern Australia remains unsubstantiated and both observations (Blackburn and Tubb 1950) and fishery experience show that the abundance of clupeoids is very variable from year to year.

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Revised by R.H. Winstanley

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