78/17

FISHING INDUSTRY RESEARCH TRUST ACCOUNT

FINAL REPORT

1980

ITEM

1. Title of Proposal: Development of small scale invertebrate fisheries in Tasmanian waters.

2. Name of Applicant: Tasmanian Fisheries Development Authority.

3. Division, Department or Section: Fisheries Development Division.

4. Proposal: Several invertebrate stocks known to exist in Tasmanian waters have been little investigated and remain unexploited resources, although similar resources are utilised and form significant fisheries overseas. The importation of products from these fisheries forms a significant segment of Australia's total marine products import bill. It is proposed to explore and develop these fisheries, realising local demand and replacing the imported product. A two year integrated programme for development is required, assessing harvesting, processing and marketing requirements. Stocks under consideration are the molluscs *Eucrasatella kingicola* (clam) and *Fulvia tenuicostata* (cockle) and the crustaceans *Leptomithrax gaimardii* (spider crab), *Ovalipes australiensis* (surf crab) and *Pseudocarcinus gigas* (giant crab).

5. Names of Persons Responsible for Programme:
C. E. Sumner B.Sc.(Hons), Marine Biologist, T.F.D.A.
T. G. Dix, B.Sc.(Hons) Ph.D. Senior Marine Biologist, T.F.D.A.

6. Qualifications of Staff to be Employed on the Programme:
R. S. Bell , B.Sc.(Hons), Marine Biologist, Tasmania.
A. J. McGifford, B.Sc. Technical Officer, Tasmania.
Both "C" class scuba divers.

7. Location of Operations:

Based at the Fisheries Research Station, Crayfish Point, Taroona, 7006. Exploratory fishing in Tasmanian coastal waters with an emphasis on east and far north west coasts.

Giant crab fishing is conducted offshore on the continental shelf and slope whilst the remaining stocks are fished in shallow coastal waters, bays and estuaries.

8. Date Project Commenced:

Staff began employment on 3rd July, 1978. Fishing gear assessment and construction began immediately with the first field trip commencing 24th July.

9. Completion Date:

30th June, 1980.

10 Funds Requested:

	1978/79	1979/80
Salaries and Wages	$19,005.00	$22,431.00
Operating Costs	$12,000.00	$61,500.00
Capital Items	$22,000.00	$3,500.00
	$53,005.00	$87,431.00

11. Funds to be provided by the applicant or sought from other sources:

Salaries and associated expenses of project supervisors have been met by the applicant as with research vessel operating costs. Laboratory and workshop facilities are provided also. Staff of the Industry Division of the T.F.D.A. have been involved, particularly in the second phase of the programme.

12. Variations in Expenditure:

Vessel charter expenditure of 1979/80 have exceeded the allocation by approximately $17,000.00, but savings have been affected in operating and capital expenses during 1978/79. Approval was sought to transfer these funds ($17,314.40) to vessel charter. The original charter period (52 weeks) was reduced to 23 weeks due to increased charter fees.

13(a) Expenditure to 30th June, 1980:

	1978/79	1979/80
Salaries and Pay Roll Tax	$21,419.76	$28,378.16
Operating Expenses:		
Travelling costs	$3,037.75	$5,489.57
Diving gear, clothing $ Footwear	$1,295.45	$115.24
Operating (other, incl vessel charter)	$2,813.23	$72,381.84
Total Operating Expenses:	$7,146.43	$77,986.65
Capital Items:	$7,124.41	$693.80
Vehicle (Holden utility)		
Fishing Gear:		
4 Alaskan king crab traps		
2 Pyramid crab traps		
8 Conical " "		
2 " crab trap frames		
15 Surf crab traps		
3 Spider crab traps		
3 Weed " "		
3 A.R.C. " "		
1 50 m beach seine		
1 5 m beach seine		
Non Perishable Assets:		
3 Flounder lights		
9 Dahn poles		
6 Coils 12 mm rope		
8 60" inflated floats		
45 8" foam buoys		
6 Aluminium floats		
1 Desk calculator		
2 Sea-bee regulators		
2 Taft offshore coats		
2 G96 sheath knives		
2 Lifejackets		
2 Lifejacket lights		
Total Capital Items:	$7,124.41	$ 693.80
Gross Total Cost	$35,690.60	$107,058.61

	1978/79	1979/80
Expected Expenditure to 30.6.80:		
Sundry Operating and Travelling Expenses		300.00
Less		
Grant balance 1978/79 carried forward		$17,314.40
		$90,044.21
Sale of crabs/lobsters		$4,794.30
		$85,249.91

Income to 30.5.80:

Date	$	Sale
5.10.79	15.00	Crayfish
5.10.79	243.00	Crabs, Mures Fish House.
11.10.79	1,194.80	Crayfish, Stanley Fish Pty Ltd.
26.10.79	56.00	" private.
12.11.79	17.00	" "
12.11.79	65.00	" "
16.11.79	183.00	Crabs, Mures.
26.11.79	643.50	Crayfish, Stanley FIsh
26.11.79	200.00	" " "
14.4.80	1,351.50	" " "
14.4.80	759.20	" " "
14.4.80	75.00	Crabs, Mures.
Total Income:	$4,794.30 gross.	

13(b) Final Report:

Stock assessment, harvesting and handling trials have been completed for all five species under study. Pilot processing and marketing trials were conducted on surf crabs, giant crabs and clams.

Small scale fisheries have been developed based on clams and surf crabs. Giant crab resource surveys indicate generally low numbers with areas of local abundance. However, a profitable giant crab by-catch fishery could be developed with further marketing effort.

Current demand for surf crabs exceeds supply leaving room for expansion of this fishery. Demand for Tasmanian clams is growing with increasing public awareness.

Surveys suggest that stocks of cockles are possibly too sparse for commercial harvesting.

Spider crabs are locally abundant but their fishery is considered uneconomical

The project has generated considerable interest among fishermen and retailers in Tasmania. A number of fishermen currently hold exploratory licences for crab fishing. Specialised crab traps built by both commercial fishermen and T.F.D.A. staff are in use in the industry. Thirty field trips have been made aboard T.F.D.A. vessels and seventeen aboard private vessels with project staff supervising.

A. Giant Crab *Pseudocarcinus gigas*

1. Distribution and Abundance

After analysis of catch and area information gathered from professional fishermen during 1978/79, the 16.5 m fishing vessel "Noels Pride" was chartered in September 1979 to conduct giant crab fishing trials in Bass Strait and along the west coast of Tasmania.

The survey aimed to:-

1. Gauge giant crab abundance in north west Tasmanian waters;
2. Investigate the feasibility of a fishery based on crabs alone.
3. Test a variety of pots and traps for fishing efficiency and ease of handling.
4. Determine the most efficient methods of handling and retaining live crabs at sea.
5. Gather biological data on the species including size, migration, habitat preference, depth and aspects of breeding biology.
6. Supply processors with pilot batches of crabs for processing and marketing trials.
7. Initiate a trade link between the ports of landing and the local and Hobart markets.

Unseasonal, adverse weather conditions limited the survey to 74 sea days from a total of 166.

Survey observations, reports from professional fishermen and records from holding tanks at the Taroona laboratory have been collated.

Giant crabs have been recorded from most coastal waters of Tasmania, with the highest catch rates from King Island and the west coast. The crab survey involved fishing trials at King Island during the months of September, October and November and on the west coast between Marrawah and Sandy Cape during January, February and early March.

Fishermen have reported catches of up to 50 crabs (0.25 tonnes) per boat, per day from several areas of the west coast. The average catch is reported to be much lower. King Island fishermen may land 5-18 crabs per boat each week, averaged over the summer months. Those fishermen from the ports of Stanley, Smithton and Strahan who work deep waters have the potential to land five times this amount. Apart from the King Island area which has established a crab outlet on the Melbourne market, giant crab abundance can not be guaged from landings as the majority of crabs caught are returned to the sea.

P. gigas is usually caught at depths between 50 and 200 metres although it has been recorded from 495 m (270 fathoms) depth in Tasmanian waters and occasionally occurs in shallow water of 15 to 25 metres.

Crabs caught during the survey were representative in size of the current commercial landings. Weights ranged from 2.9 kg to 10.0 kg with an average of 4.8 kg. Females averaged 3.9 kg., males 5.8 kg. Juvenile giant crabs were not caught during the survey and are only occasionally trapped by rock lobster fishermen.

Catchability of giant crabs appears to fluctuate seasonally, with catch rates increasing from late spring (October) through the summer and decreasing toward early Autumn (April).

Giant crabs are commonly caught from rocky substrates on the deeper edges of recognised rock lobster grounds. 1970/80 survey catches were made on both rock lobster bearing reef and low relief, rockly substrates away from rock lobster grounds. Occasional trawl catches suggest muddy substrates as a possible habitat.

Berried females are rarely caught by rock lobster fishermen but have been observed to spawn during June (1979 and 80) at the T.F.D.A. laboratory. Eggs are carried for four to five months to be released during the early summer. Little is known of the breeding biology, growth rate and suspected seasonal migration of giant crabs.

Mean crab catches are similar to those obtained by Winstanley (1979) in northern Bass Strait.

Giant crabs can best be handled by holding both claws. Mature males of this species characteristically grow an enlarged right hand claw which may weigh over 30% of the total body weight. Female crabs have two claws of equal size

2. Capture and Handling:

Giant crabs are caught incidentally by trawls, longlines and nets.

Trapping in craypots, crab traps and baited fish traps is the most efficient method of capture.

Survey work investigated the fishing potential of 45 pots and traps of ten different designs. These included modified craypots (12), conventional craypots (5), Alaskan king crab traps (2), McKenzie collapsible fish traps (13), steel frame fish trap (1), steel frame pyramid traps (2), steel frame conical traps (4) and square traps built from A.R.C. weld mesh (6). For the purpose of catch analysis traps were grouped into nine categories based on trap size, shape, weight, covering, entrance shape and entrance position.

A large self tipping device complete with hydraulic line hauler was constructed and fitted by A.N. McKenzie, master and owner of the charter vessel "Noel's Pride", to launch and haul the larger traps.

Large crabs are difficult to extract from standard rock lobster pots with a 28 cm neck. Most experimental traps were built with either wider necks (38 cm) or trap doors to allow ready access for large crabs and easier emptying and re-baiting.

Bait supplies were supplemented with caught during the survey. Traps were rebaited daily. Salmon was the best bait for *P. gigas*, but proved to be a poor holding bait.

Soak period, depth, date, position and catch composition were recorded for each trap haul. A statistical analysis of the catch using the student's 't' test for grouped data emphasized the value of using dual purpose traps.

Best crab catches were made using a steel framed fish trap which caught 23 giant crabs per 100 hauls. Alaskan king crab traps failed to trap crabs and caught few crayfish. Steel frame, mesh covered craypots fitted with plastic necks caught significantly more crabs than conventional beehive craypots.

Large fish traps with entrances suitable for crabs and crayfish have a greater holding capacity and better catch retention than conventional craypots, but hauling and handling at sea is more difficult and time consuming.

TABLE 1. Giant crab catches/100 hauls. September 1979-March 1980.

Trap Type	Catch
Steel frame fish trap	23
Mesh covered craypot	17
McKenzie fish traps	10
Pyramid traps	8
ARC pots	7
Conventional craypots	5
Conical pots	5
ARC fish trap	2
Alaskan king crab trap	0

Giant crabs can be kept alive in a boat's well or recirculating tank for considerable periods. Female crabs tend to be more aggressive both on deck and in holding tanks and may cause damage to other crabs or rock lobsters. Claw binding reduces risk of damage but is difficult at sea.

P. gigas can be transported alive in cool, damp bags. Claws must be bound if crabs are not in individual bags or containers. Mortality increases rapidly after 6-8 hours in warm dry conditions but can be reduced by adding ice to the transporting container. Fish bins are suitable if the crabs are packed carefully with the anterior ends uppermost. Crabs remain alive for up to three days in an ice room

3. Processing and Marketing:

The establishment of a stable giant crab fishery in Tasmanian waters essentially depends upon future marketing strategy. Quantities sufficient to satisfy local demand are caught by rock lobster fishermen. However, giant crabs have traditionally been returned to the sea in response to:-

(i) Low prices offered by processors ($0.20/kg 1977/78) due to infrequent, small landings and poor demand.

(ii) Vessel holding space can be better utilised with high value rock lobster catch $5.50-$6.00/kg in 1979/80).

(iii) Crabs causing rock lobster damage and subsequent loss through agitation in holding tanks.

(iv) Fishermen's view that crabs are pests, block pot entrance and reduce rock lobster catches.

Seafood processors at Stanley and Smithton conducted pilot processing and marketing trials. Giant crabs caught during surveys were delivered to them. Cooking, freezing, picking and marketing trials were conducted.

Hand picking produced a high quality product which should realise $12.00-$14.00/kg. This compares favourably with the price of imported products. A sample of frozen, packaged meat picked from 179 kg of giant crabs at Tasmanian Seafood Pty Ltd., Smithton, is currently being sold on the Hobart market. Automated meat extraction is non-viable considering the present low and discontinuous supply.

White meat yield range from 15.1% to 32.9%, with a mean of 22.7% and rose marginally over summer. Meat yields between sexes do not differ significantly. Boiling giant crabs produces brown body meat (about 10% of live weight) which is used as a base in cooking.

Trial shipments of whole cooked crabs processed at Stanley Fish Pty Ltd., Stanley, have been successfully marketed in Hobart. Great care is required in packaging whole frozen crabs for transport to reduce leg and claw damage. Live crabs delivered to Hobart have brought $3.00/kg retail. The Hobart market could accomodate more than 0.5 tonnes of giant crabs per week.

Prices paid to fishermen vary with the buyer and port of landing; 1978 prices in Hobart were $2.00 to $2.50/kg and reached $3.00/kg in the 1979/80 season, King Island fishermen experienced difficulty selling crabs in 1977, received $1/kg in 1978, $1.50/kg last season (1978/79) and $2.00 to $2.50/kg this season (1979/80).

Whole crab prices on the local market are currently less than 50% that paid for whole rock lobsters. Interstate markets may command higher prices and should be explored. Interest in Tasmanian giant crab exports has been expressed by merchants in Japan and the United States. Local market stimulation over the 1980/81 season may be achieved with a limited amount of government sponsored processing aimed at increasing landings.

B. Spider Crab *Leptomithrax gaimardii*

1. Distribution and Handling

Spider crabs *Leptomithrax gaimardii* are locally abundant in Bass Strait and the east and south eastern waters of Tasmania. This species appears to undergo an annual migration. Crabs have been observed migrating inshore to shallow bays and estuaries during May and June (Winter) and offshore to depths of 60-90 metres during spring. Recently moulted crabs were found during the first weeks of their appearance in shallow waters each year. Most of the inshore migration zones are characterised by strong tidal flows. These include Southport Lagoon, Blackman Bay at Dunalley, Mercury Passage, Georges Bay, Great Oyster Bay and Schouten Passage.

Berried females have been caught in spring and late summer. Early stage egg development was recorded from deep water (90 metres) during spring whilst late stage egg development was recorded from shallow waters during May.

Occasional juvenile spider crabs have been caught at depths greater than 160 metres. However, the majority of juveniles were recorded congregating in large masses in both shallow bays (3-10 m) and offshore (40 m).

2. Capture and Handling:

Crabs have been caught by trapping, beam trawling, Danish seining, scallop dredging, diving and dip netting. Diving has proven to be efficient in shallow waters whilst trapping is suitable for greater depths. Trawling and dredging produce good catch rates when congregations are fished.

Spider crabs can be readily held at sea in a boat's well or in caufs. This species non aggressive and is easily handled at sea. They are a hardy species and will survive in cool moist conditions on land for up to two days.

3. Processing and Marketing:

Although spider crabs are easily caught there is virtually no market demand for them. Their meat yield is poor (3 to 9%) with a heavy weight loss (23 to 35%) during cooking. The meat generally has a coarse flavour.

Whilst the crab appears unsuitable for meat, it may be utilised in seafood stocks.

C. Surf Crab *Ovalipes australienisis*

1. Distribution and Abundance

Surf crabs are widely distributed in Tasmania. They occur in shallow bays on clean sandy bottoms and have been recorded from depths of 80 metres.

Abundance varies with location and seasons and only the north and east coasts appear to offer commercial potential. Large numbers of crabs appear in sheltered bays during late summer and remain for several months.

Commercial quantities occur in Georges Bay, Port Sorell and the Tasman Peninsula and fishermen are using FIRTA traps in the latter area. Fishing trials have been undertaken on the east, south east and north west coasts in areas where quantities of larger crabs are found. Local fishermen established a small scale fishery at Blackman Bay, Dunalley, in 1979 after FIRTA surveys in the area. Catch rates declined over summer and although crabs stocks have since recovered and several fishermen have expressed interest, relatively small quantities have been harvested this year.

2. Capture and Handling

A baited circular trap designed during the project effectively captures surf crabs. Trap fishing is done from small vessels (<6 m) in sheltered waters . Best catches are made at night although daytime fishing is profitable.

Large quantities are caught in beach seines along the north west coast but crabs are often damaged when removing them from a net. Mullet nets have also been used with limited success.

Surf crabs have destructive tendencies which can be minimised by covering the catch with a wet bag immediately upon emptying each trap. The crabs live in caufs and will not fight if kept at moderate densities. They can be packed to survive 12+ hours out of water to reach markets in good condition.

3. Processing and Marketing

Surf crab meat yields of 25% to 31% are encouraging, but due to its small size, this species is not suited to hand picking. However, with an increasing demand for crab meat in Tasmania, future processing may turn towards mechanical meat extraction.

This programme has initiated great interest amongst small scale fishermen. The large volume of enquiries from both amateurs and professionals necessitated updating the 1979 information leaflet.

The present market is based almost entirely on the restaurant and hotel trade which takes delivery of live crabs. These find ready acceptance served whole. However, supply is discontinuous. This situation reduced the impact of promotional efforts to introduce surf crabs to the public through retail outlets.

Although current Hobart demand (about 10 t/year) is not being met, statewide interest from fishermen indicates that this fishery has potential to expand into areas away from the south east.

D. Cockles *Fulvia tenvicostata* (Lamarck 1819)

Limited beds of cockles occur on all Tasmanian coasts except the west.

Cockles were found to live 1-3 cm into the substrate in mud/soft sand in water depths of one metre to 20 metres or more.

These are low density beds (12^{-2}m maximum) in contrast to commercially harvested Britsh beds which have densities of 100 to 1,000 m^{-2}. Because of the low densities, established by diving surveys, investment in an hydraulic clam dredge was not considered justified.

Profitable exploitation of Tasmanian cockle beds is unlikely in the foreseable future. The product is not highly priced or abundant and demand is poor.

E. Clams *Eucrasatella kingicola* (Lamarck 1805)

1. Distribution and Abundance

The distribution and abundance of Tasmanian clams was investigated in the Furneaux Group, the east and the north east coast by dredging from chartered scallop boats. Only the east coast provided beds of commercial significance with catches of >120 kg/day. Museum records indicate a sparce distribution in most other Tasmanian waters.

This species occurs partially burried in gravel or sandy substrates with a high broken shell content in depths of 20-60 metres.

2. Capture and Handling

Historically *E. kingicola* has had no commercial value and was discarded whenever taken in scallop dredges.

Investigations have shown that clams require similar handling techniques to scallops, being sorted and packed into mesh bags on deck. Ideally the catch should be kept cool and damp, in the shade and out of any wind.

Under these conditions clams may survive for 24-36 hours or more and transport with few deaths.

The thick, heavy shells resulting from the clams burrowing habit are easily cracked and require careful handling and to avoid excessive shell damage, scallop bags are only half filled producing 50 kg units of 400-500 cla

Hydraulic dredging would be more efficient than scallop dredging for this species but its high initial cost makes it economically impracticable.

3. Supply

Clams are currently taken as a by-catch during scallop dredging. This by-catch status has led to supply discontinuity and a dependence on the duration of the scallop season in the appropriate areas.

Two fishermen land clams on a regular basis with other supplying only occasional catches.

Frozen storage keeps clams in good condition and allows supplies to be marketed year round. The valves of this species are tightly closed when caught but are easily opened when the clam has thawed after being frozen. Microwaves have been used to facilitate shucking of a similar species overseas but has not been used in Tasmania to date.

4. Marketing

Tasmanian clams are also known as blood clams as the dark brown meat contains a red blood pigment.

The strong, rich flavour of these clams makes them an excellent chowder base but one restaurant also serves them in the half shell.

Live weights of clams average 122.6 g and meat yields varied from 11-25%.

Catches from the initial surveys were used to introduce the product to the public and the clams were distributed to restaurants and retail outlets to gauge consumer reaction.

Restaurant sales of fresh clams were encouraging and seem likely to improve. Retail sales of fresh and frozen clams have been poor to date but are expected to increase with greater public awareness.

Present sales of 1.5 - 2.0 tonnes/year are increasing.

This fishery currently has a small but expanding market despite its poor supply situation.

The current price of $11.25/50 kg bag (½ scallop bag) approaches the current market price for scallops although numbers of individuals and weight differ. (150-400 scallops/half bag and 400-500 clams/half bag).

An effective marketing strategy would increase demand leading to higher prices to the fisherman and an improvement in commercial and public acceptance of the product.

Overall comment

Of the species studied, giant and surf crabs together with clams present opportunity for development of lucrative small scale fisheries. Giant crabs and clams are likely to be caught as a by-catch, surf crabs as an inshore fishery possibility combined with gill netting.

Cockles represent non-commercial resource due to their scarsity, difficulty of handling and price. No further research with this species is proposed.

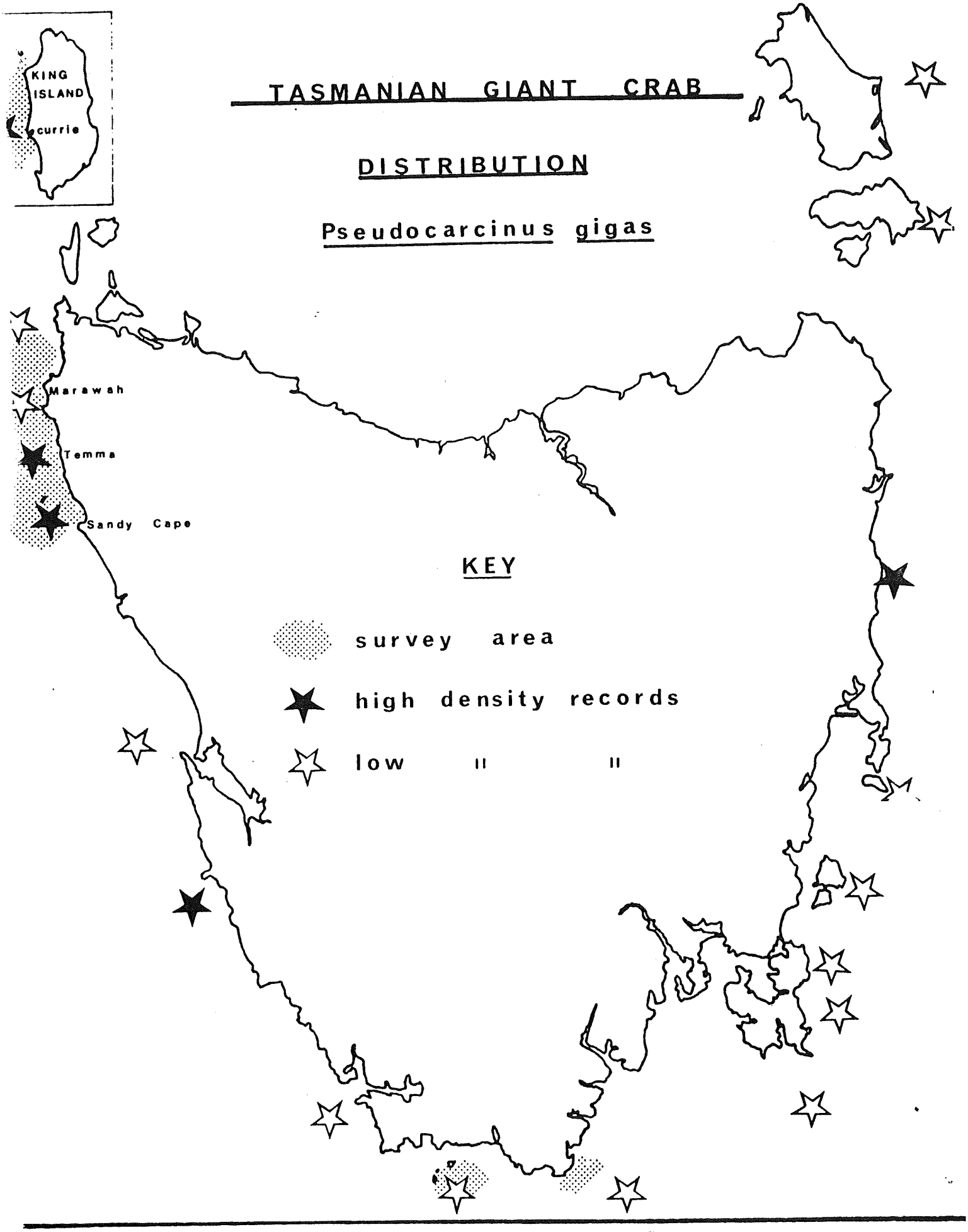
Spider,crabs, although readily harvestable, have poor meat yields and are not considered to be a commercial proposition.

Presently estimated potentials are summarised in Table 1 although estimates must be regarded as preliminary.

The study has shown good local demand for giant and surf crabs and also clams. Whether fishermen fulfil this demand remains unanswered. Information, summarised in this report will serve to guide judgements on the resources and their potentials a need which is evident from the many enquiries and interest to date.

TABLE 1. Tasmanian landings of crabs, clams and cockles

Species	Catch 1977	Catch 1979/1980	Catch Value First sale	Potential Catch	Potential Catch Value - First Sale
Giant Crab	Unknown < 2 tonne	6-8 tonne	$14,000	100 tonne	$200,000
Surf Crab	Nil	2 tonne	$5,000	10 tonne	$25,000
Spider Crab	Nil	0.1 tonne	-?	100 tonne	-
Clam	Nil	2 tonne	$400	> 50 tonne	$10,000
Cockles	Nil	0	-	-	-



GURE 1. TASMANIAN GIANT CRAB DISTRIBUTI

Alaskan King Crab Trap

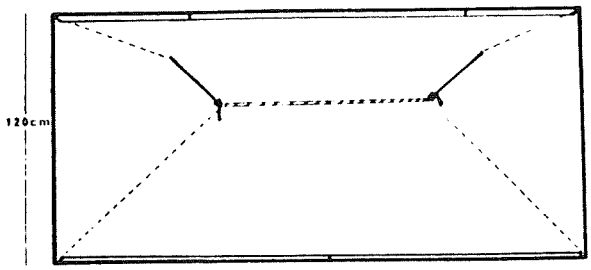


fig 2

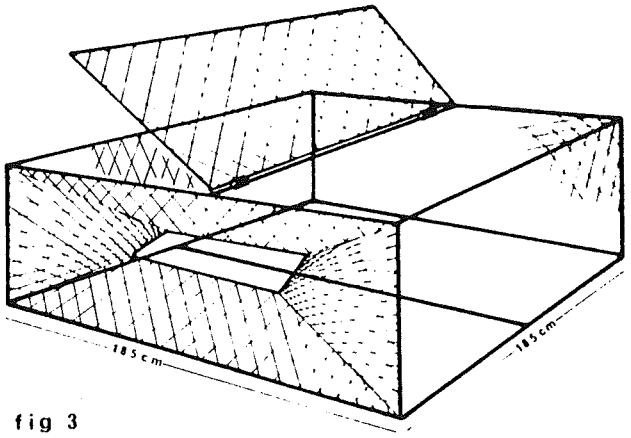


fig 3

Steel Frame Fish Trap

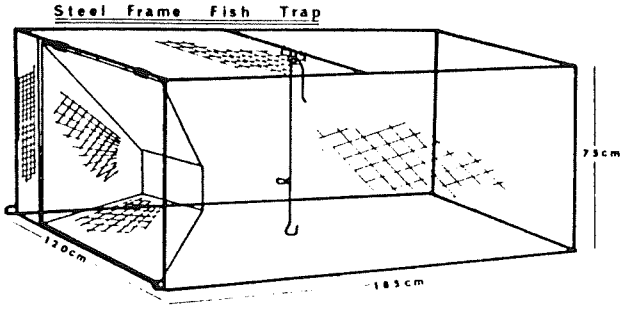


fig 4

McKenzie Fish Trap

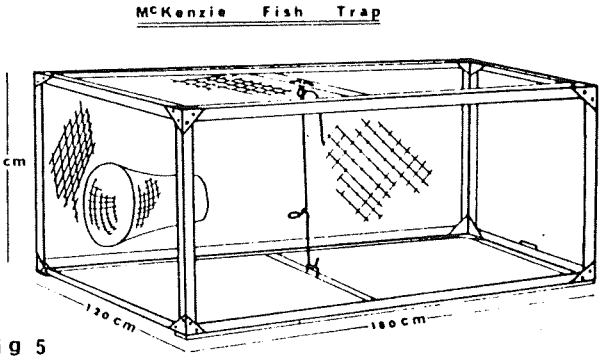
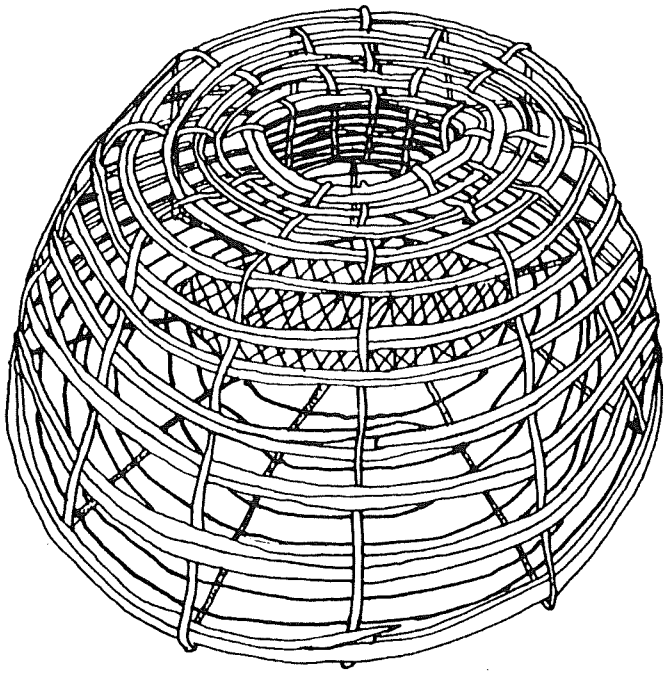


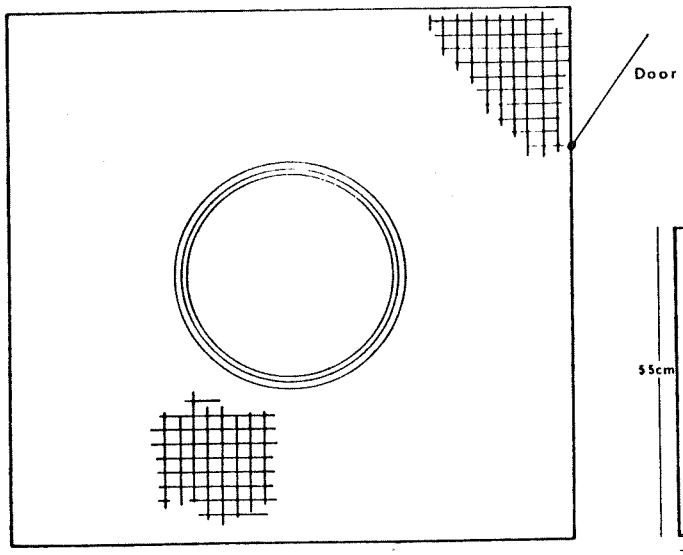
fig 5

Conventional Bee-hive Cray Pot



Base Ø 140 cm Neck Ø 28 cm

fig 6



Plan View

fig 7

ARC Pot Side View

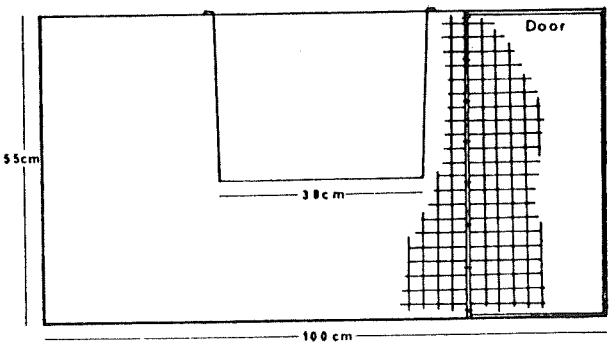
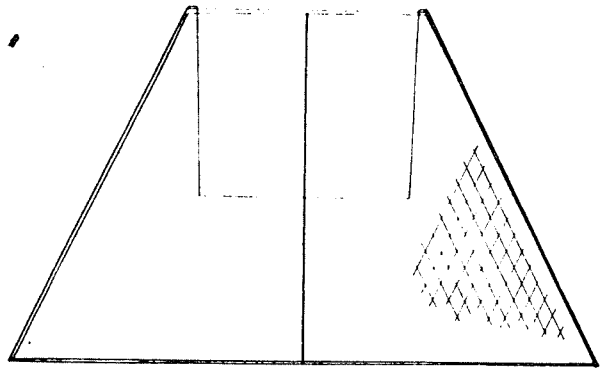


fig 8

Side View - Conical Trap



Base-100cm ø Neck 41cm ø

fig 9

Conical Trap Plan View

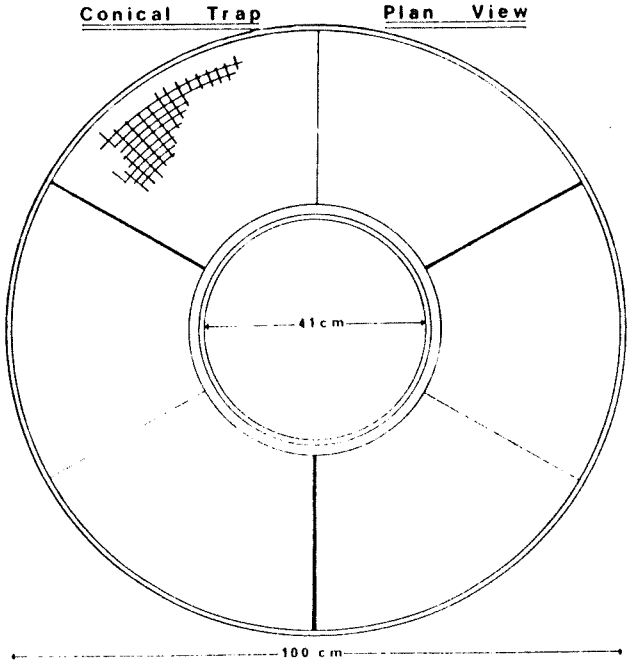


fig 10

Pyramid Pot Plan View

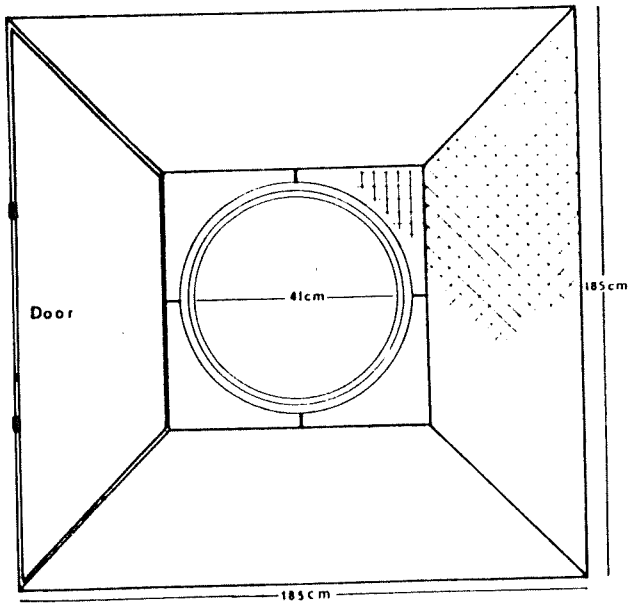


fig 11

Pyramid Pot Side View

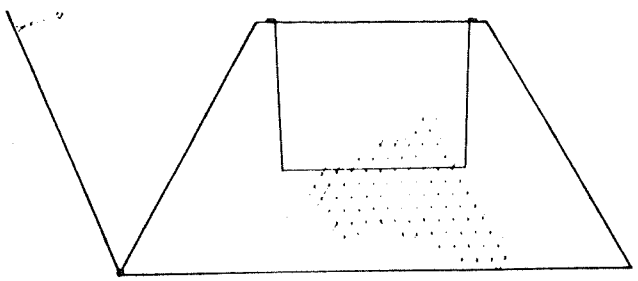
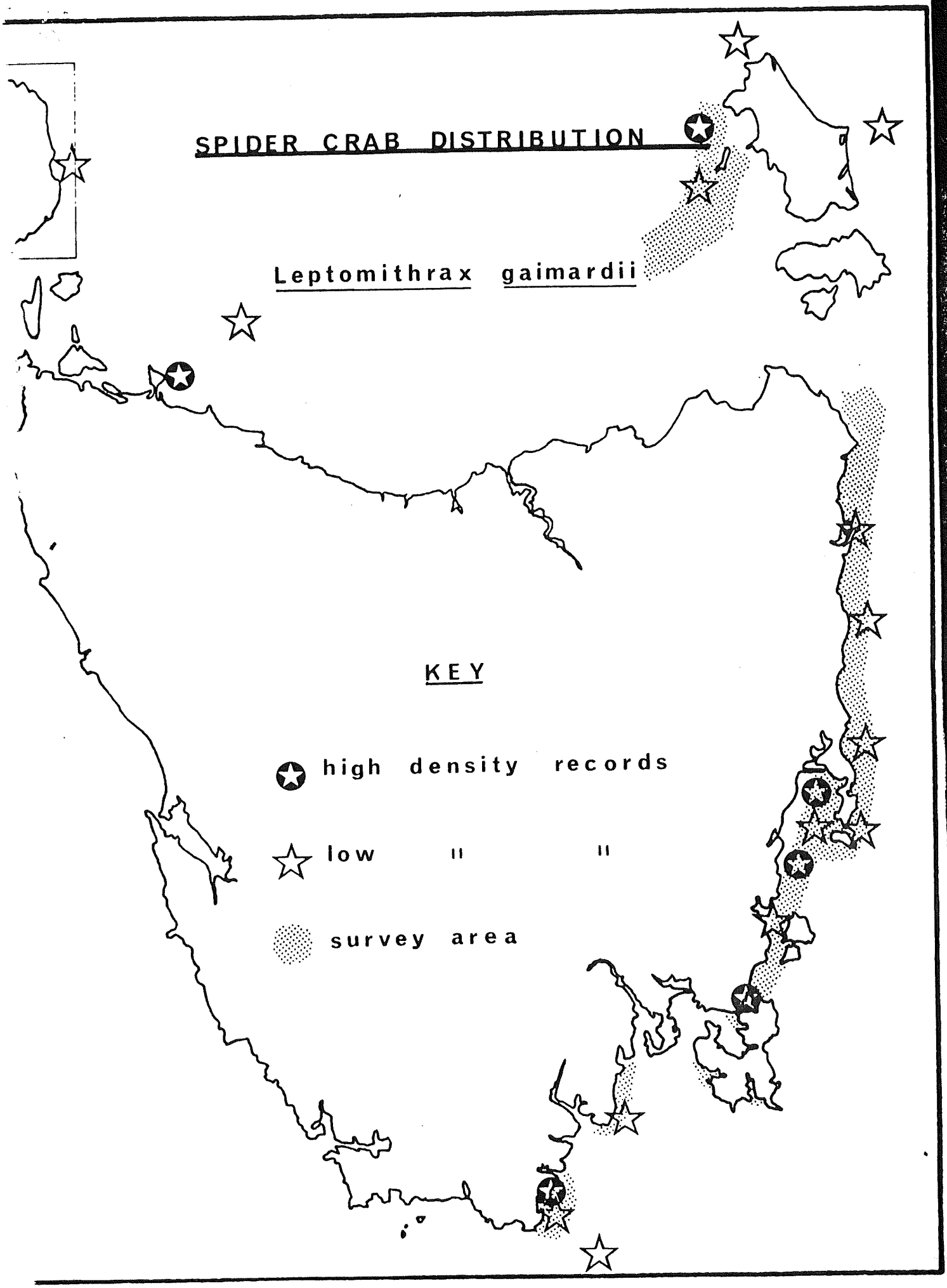
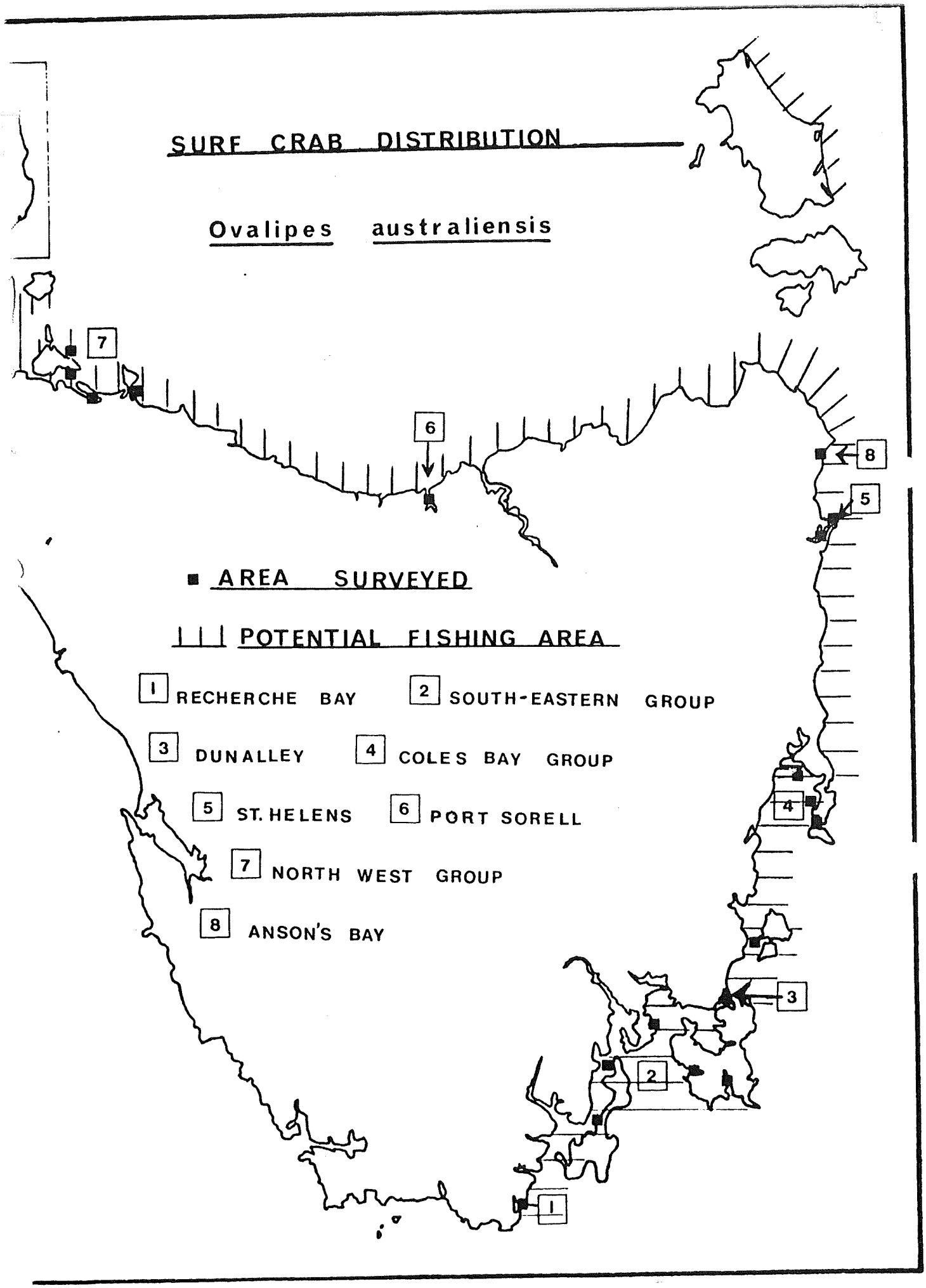


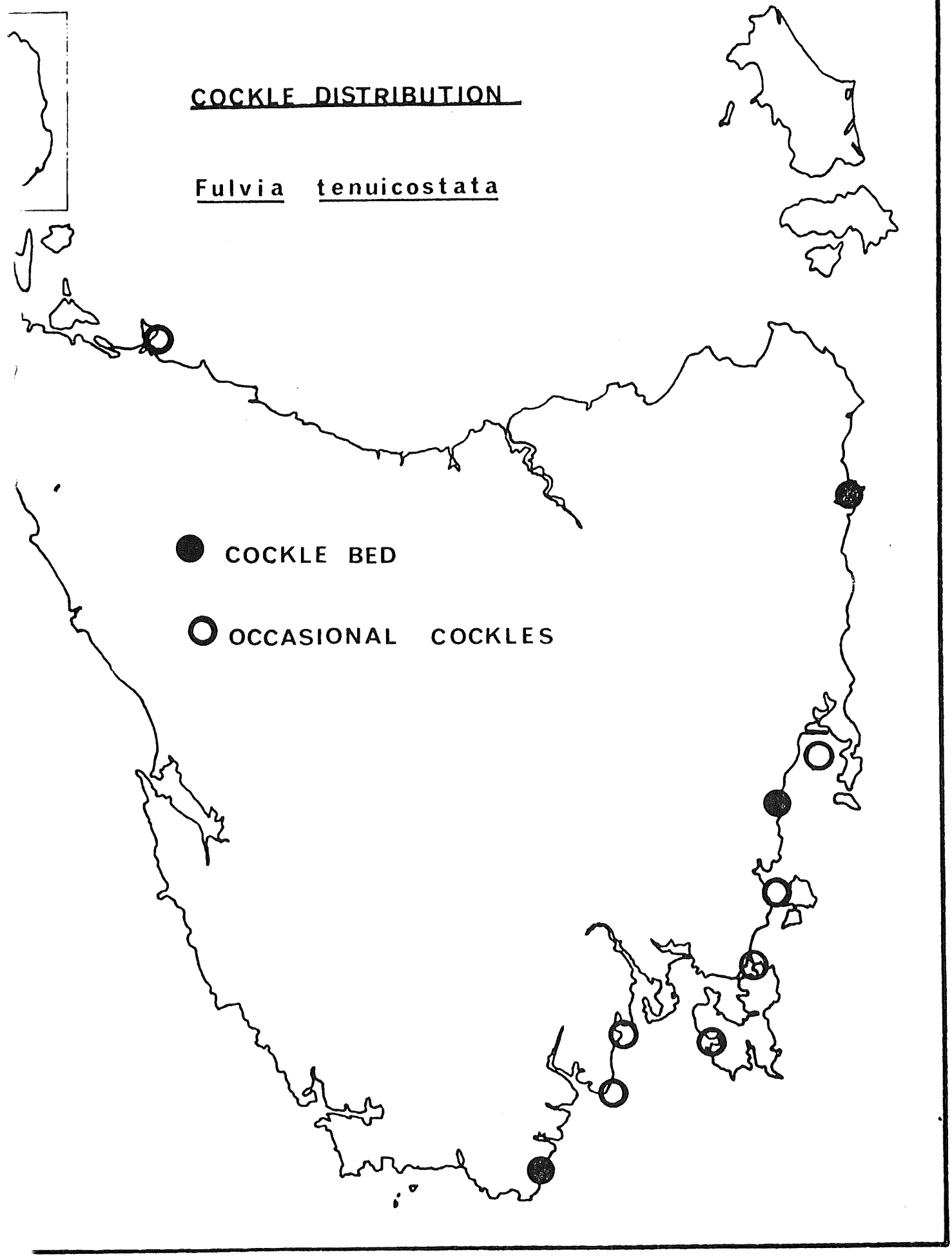
fig 12



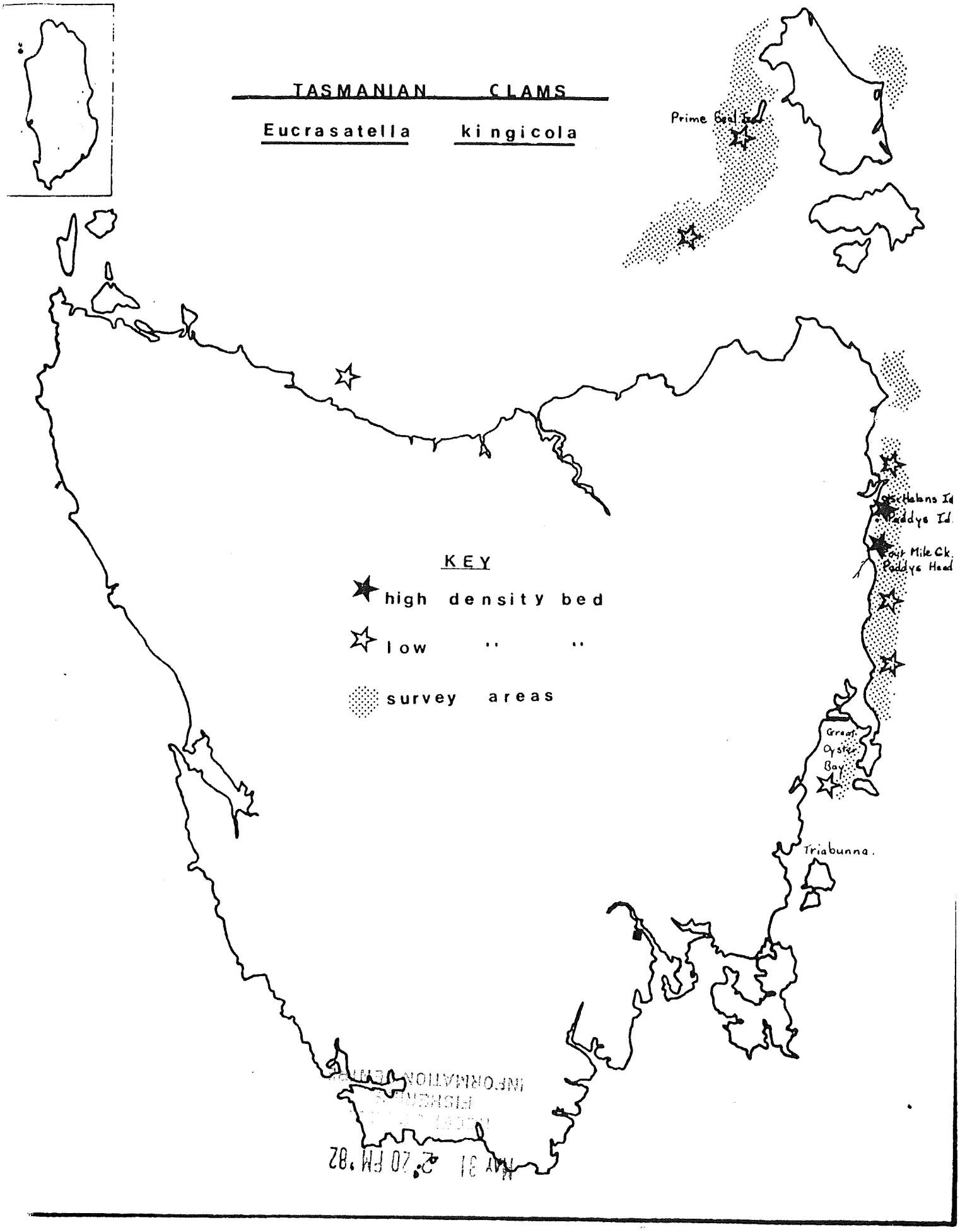
13. SPIDER CRAB DISTRIBUTION.



E 14. SURF CRAB DISTRIBUTION.



15. COCKLE DISTRIBUTION.



URE 16. TASMANIAN CLAM DISTRIBUTION.

Briefing Notes for Mr Curtin

78/17
Completed

Title: Development of small scale invertebrate fisheries in Tasmania - TFIA

Funds expended: $85,249.91

Assessment: Clear report should be made available to industry.

Background: TFIA surveyed five invertebrates for development possibilities and concluded

- Giant crabs show potential as a by catch with rock lobster fishery,
- Surf crabs show possibilities as an inshore fishery combined with gillnetting,
- Clams show potential as a by catch with scalloping,
- Spider crabs are not economical because of poor meat yields,
- Cockles are not commercial because of low density, handling difficulties and price.
- Paper estimates that the three promising species could add $235,000 to the landed value of Tasmanian fisheries.
- Considerable development of gear for catching the crabs was done.
- Was a project of direct use to industry.