

# **Off-Season Trial Of Artificial Rock Lobster Baits**

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**FISHERIES**  
WESTERN AUSTRALIA



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# **PROJECT No. 99/372**

# **Off-Season Trial Of Artificial Rock Lobster Baits**

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**OBJECTIVES:**

1. To conduct statistically valid trials of three artificial rock lobster baits before the start of the 1999/2000 season.
2. To communicate the results of the trials to the industry before the start of the 1999/2000 season.

**NON TECHNICAL SUMMARY:****OUTCOMES ACHIEVED**

These project results have enabled the bait manufacturers and industry to evaluate the catch rates achieved by the artificial baits used alone and in combination with fish compared to the catch rates achieved from pots with the most commonly used baits of fish alone and fish and cowhide.

The two objectives of this project were successfully completed with the statistically valid trials of the three artificial baits having been conducted and the preliminary results being disseminated to industry before the start of the 1999/2000 season on the WA rock lobster coastal tour.

The results indicated that the catch rates for undersize, legal size and combined rock lobsters, for all of the artificial baits alone, were significantly lower than the catch rates for the two control baits of fish alone and the fish plus cowhide bait by at least 26%. Hence the artificial baits do not appear suitable as stand alone baits without further development. However, the catch rates for the artificial baits, particularly the baits provided by Ocean Baits and Aqua Feeds, when combined with fish bait are generally similar to the catch rates for the fish bait alone and the fish plus hide bait. The catch rates of fish with artificial baits generally performed better in Lancelin than in Leeman which indicates that further testing in different areas may be warranted. However, the cost of using the artificial baits as an alternative to hides was generally higher in this experiment as the artificial baits were replaced at each pot lift whereas the hide was replaced after a week.

**KEYWORDS:** western rock lobster, bait, artificial bait.

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## **BACKGROUND**

There has been increasing interest in the use of artificial baits for the capture of western rock lobster. The pressure to reduce the level of imported bait (currently about 15,000MT pa) resulting from the incidents of pilchard deaths in 1995 and 1999, the need to reduce or eliminate the use of cowhide, and the desire to reduce disposal costs of bait cartons have generated an initiative by industry to search for a viable alternative to frozen fish baits and cowhide.

Jones and Gibson (1997) stated that the usage of imported bait was approximately 10,000 t per annum in the early 1990's, which was valued at about \$12 million in 1994-95 and supplied about 65-70% of the rock lobster bait market.

Cowhide has traditionally been used as "holding bait" (a bait not easily consumed or dispersed thereby keeping the lobsters in the pots), and lobsters actively feed on them. Approximately half of the western rock lobster catch is processed in whole form (whole cooked and whole raw) on the day of capture. Consequently, there is a real risk of mammalian material, in the form of indigestible hair, being found in the gut of processed lobster.

Lobster exporters are concerned that such findings could damage markets, especially the relatively new European market, and therefore it is in the industry's interest to be able to assure the market that the risk has been minimized, or obviated.

At a FRDC sponsored workshop held in Perth in May 1999, it was recognized that work on the development and testing of baits should continue. Industry participants were also strongly of the view that a trial of the baits currently on offer would be very desirable. The trials were conducted pre-season so that, if successful, manufacturers could produce such baits in time for the 1999-2000 season, starting on 15<sup>th</sup> November 1999.

## **NEED**

There was a need to conduct trials of commercially available rock lobster baits:

- a) To demonstrate that the industry is cognizant of the desire to reduce the dependence on imported frozen fish for bait.
- b) To determine if a viable alternative to hides could be found.
- c) To undertake trials well in time for the start of the season so that manufacturers of successfully trialled baits could produce bait to meet the expected demand at the start of the season.

## **OBJECTIVES**

1. To conduct statistically valid trials of three artificial rock lobster baits before the start of the 1999/2000 season.
2. To communicate the results of the trials to the industry before the start of the 1999/2000 season.

## METHODS

### Sampling

Two commercial rock lobster vessels and crew were chartered; one vessel in the north coastal zone of the fishery (Leeman) and the other in the south coastal zone of the fishery (Lancelin). Each vessel used the standard commercial three escape gap batten rock lobster pots.

The three different bait replacements on trial were:

- a) a fish bait substitute provided by Ocean Baits Australia (Ocean)
- b) a dry bait provided by Aqua Feeds Australia (Aqua)
- c) a dry, pathogen-free bait from another organization (referred to as Bait X).

The three baits were tested as an attractant in their own right and also as “holding baits” replacing the use of cowhide as a complement to the fish bait. The baits were tested against the industry standards (controls) of fish only and fish plus cowhide bait combinations. The Bait X formula was altered for pot lifts after the 15<sup>th</sup> August due to problems with the original formula.

A review of the commercial logbook voluntary programme data was undertaken for the years 1991/92 to 1997/98 to verify the proposed control baits as the industry standards. The review showed fishermen used fish or the combination of fish with hides and in the past, fish with hocks. Kahawai or Australian Salmon *Arripis truttaceus* were used as the control fish bait and frozen cowhide used as the control holding bait. The Australian salmon was obtained frozen whole and cut in half and two pieces were used as the control fish bait and one piece used if with a holding bait.

Combinations of the attractants and holding baits were tested over 1, 2, and 3 day soak times (Table 1). The use of the artificial baits as an attractant only was not tested for the three day soak time as multiple day pulls are generally baited with combinations of attractant and holding baits i.e. fish plus hide.

After consultation with the fishermen it was agreed that the multiple day pull trials should be conducted in deeper waters. During the season, 2 and 3 day pulls mainly occur in deeper water (>15 fathoms) with fishermen believing that in the shallow depths lobsters tend to escape from pots. Therefore 1 day pulls were conducted in shallow waters (<10 fathoms) at both sites and multiple day pulls were conducted in deeper waters (10-20 fathoms) at both sites.

In the event of serious disruption due to weather, the trials were to be suspended, and restarted when the weather allowed.

Table 1: Combination of bait types and soak times that were tested.

<b>Bait Type</b>	<b>1 Day Pull</b>	<b>2 Day Pull</b>	<b>3 Day Pull</b>
<b>Experimental Treatments</b>	<b>(&lt; 10 fm)</b>	<b>(10 - 20 fm)</b>	<b>(10 - 20 fm)</b>
<b>Salmon (Fish)</b>	X	X	
<b>Ocean Baits Australia (Ocean)</b>	X	X	
<b>Aqua Feeds Australia (Aqua)</b>	X	X	
<b>Bait X</b>	X	X	
<b>Fish + Hide</b>	X	X	X
<b>Fish + Ocean</b>	X	X	X
<b>Fish + Aqua</b>	X	X	X
<b>Fish + Bait X</b>	X	X	X

The trials were conducted for 14 days over the new moon period (6<sup>th</sup> - 19<sup>th</sup> August 1999) in addition to the pot soaking period which were 6 days prior to the first baiting day. The sampling involved dividing 128 pots into 3 sets of gear. There were 32 pots scheduled for 1 day pulls i.e. 4 replicates of the 8 treatments; 56 pots scheduled for 2 day pulls; and 40 pots scheduled for 3 day pulls. The 2 day pull pots represented 7 replicates of the 8 treatments and the 3 day pull pots consisted of 10 replicates of each of the 4 treatments (Table 1). The bait treatments within each set of replicate pots were randomized prior to the commencement of the trial and the format repeated on each baiting. This represented 48, 42 and 40 replicates of each bait type for the 1, 2 and 3 day pulls at each site (Table 2).

Pots were moved to new ground within the same depth category after each day. The precise location of each pot was left to the discretion of the skipper so that the trial would reflect normal commercial fishing operations.

Quantities for each of the bait types were chosen to be cost-consistent with commercial rock lobster operations at approximately \$2.00/potlift. Australian salmon is about \$1.50/kg and cowhide is about \$0.70/kg. The fish only control pots contained about 1-1.5kg/pot (\$1.50-\$2.25). The fish and hide control pots used approx. 0.75-1kg of fish (\$1.12-\$1.50) and 0.5-1kg of hide (\$0.35-\$0.70) per pot. In order to test baits as a complement to the fish bait as well as a stand alone bait, all experimental baits were manufactured and supplied for the trial in quantities equal to half the average commercial pot lift cost, i.e. \$1.00. For the stand-alone treatments, artificial bait to the value of \$2.00 was used in each pot. In the fish plus artificial bait treatments, artificial bait to the value of \$1.00 was added to the pots together with 0.75-1kg fish.

As commercial fishermen keep hides in pots for up to several weeks dependent upon catch rates, the hide was soaked for conditioning prior to the survey's commencement on 30 July 1999 and was topped up with additional hide on 11 August 1999. The artificial baits were changed at each pot lift.



Table 2: Quantities of baits used in the trial.

<b>Bait Type</b>	<b>1 Day Pull</b>	<b>2 Day Pull</b>	<b>3 Day Pull</b>	<b>Total Baits</b>
<b>Experimental Treatments</b>	<b>Replicates</b>	<b>Replicates</b>	<b>Replicates</b>	
<b>Salmon (Fish)~1-1.5kg/pot</b>	96	84		180 x 1.5kg of FISH
<b>Ocean Baits Australia (Ocean)</b>	96	84		180 x 2kg brick of Ocean (Attracting)
<b>Aqua Feeds Australia (Aqua)</b>	96	84		180 x 3 (450gm) blocks of Aqua
<b>Bait X</b>	96	84		180 x 3 type I + 3 type II discs ~\$2 worth of discs of Bait X
<b>Fish + Hide</b>	96	84	80	260 x 1kg FISH + 260 x 1kg HIDE
<b>Fish + Ocean</b>	96	84	80	260 x 1kg FISH + 260 x 1kg brick of Ocean (Holding)
<b>Fish + Aqua</b>	96	84	80	260 x 1kg FISH + 260 x 2 (450gm) blocks of Aqua
<b>Fish + Bait X</b>	96	84	80	260 x 1kg FISH + 260 x 3 type II discs ~\$1 worth of discs of Bait X

The bait manufacturers agreed that on rebaiting if there is still bait remaining then it should be left in the pot when the new bait was added. Bait X was provided as two types of baits, an attractant (type 1) and a holding bait (type 2). It was agreed that the holding baits would be used in the treatments containing fish. In the stand alone trial, half the bait was to be attractant (type 1) and half holding (type 2). Bait X was used in the trial with three 100-150 gm “discs” at a \$1 bait cost. In the holding treatments there were three type 2 “discs” along with the fish and in the stand alone trial there were three type 1 “discs” and three type 2 “discs”.

All lobsters captured were measured (to nearest mm) and sexed from each individual pot. Environmental details including bottom water temperature and swell height were recorded on a daily basis. Presence of lobster predators including octopus, cuttlefish and fish or evidence of their presence, e.g. dead or predated lobsters, was recorded for each pot pull as well as any damage to the pot which may have affected the catch rate.

#### Data Analysis

A validation of the data from the trial was conducted. Pots with structural damage that may have influenced the catch rates for that day were omitted from the analysis.

An ANOVA was undertaken on the catch rate of rock lobster by the different bait types and the actual day pulls in both Lancelin and Leeman for one, two and three planned day pulls. The planned day pulls were not always the same as the actual day pulls as the schedule was affected by the weather. The catch rates were log transformed to take into account the skewness in the distribution of catch rates.

The catch rates of undersize, legal-size and all rock lobsters were examined. There were insufficient numbers of mature females caught to enable a valid comparison of the bait types for this category of rock lobsters.

The calculation of the catch rates for Bait X baits was later divided into two different time periods to test the effect of the change in the formula. The change over to the new formula

occurred on the 15<sup>th</sup> August for the one and two day pulls and then on the 16<sup>th</sup> August for three day pulls.

Where the ANOVA showed a significant difference in bait types, paired comparisons of the catch rates of each pair of baits in the two locations and day pulls was undertaken using Tukey's Test to determine the significant difference between the catch rates (Walpole & Myers, 1993).

## Results and Discussion

The ANOVA on the log transformed catch rates of all rock lobsters per pot for the different bait types showed a very significant difference between the 8 bait types for 1 and 2 day pull types in both Lancelin and Leeman (Tables 3 and 4). However there was no significant difference between the four bait types (fish plus treatment bait) used in the three day pull (Table 3 and 4). As some days of fishing were missed there were some day pulls which were different from those planned, however, these did not generally show a significant difference in catch rates (Tables 3 and 4).

Table 3: ANOVA of catch rate of all rock lobsters for Lancelin by day pull type (DP Type).

DP Type	Source	DF	Sum of Squares	Mean Square	Pr>F
1	Bait	7	117.3585	16.7655	0.0001
	Actual day pull	1	0.0481	0.0481	0.7840
	Error	368	235.1137	0.6389	
2	Bait	7	51.0557	7.2937	0.0001
	Actual day pull	1	4.4339	4.4339	0.0166
	Error	318	243.2013	0.7648	
3	Bait	3	1.0734	0.3578	0.6935
	Actual day pull	1	1.4356	1.4356	0.1639
	Error	153	112.2616	0.7337	

Table 4: ANOVA of catch rate of all rock lobsters for Leeman by day pull type (DP Type).

DP Type	Source	DF	Sum of Squares	Mean Square	Pr>F
1	Bait	7	80.4675	11.4954	0.0001
	Actual day pull	1	0.2418	0.2418	0.5441
	Error	369	241.9518	0.6557	
2	Bait	7	40.6432	5.8062	0.0001
	Actual day pull	1	0.8100	0.8100	0.2375
	Error	321	185.6283	0.5783	
3	Bait	3	2.8938	0.9646	0.2428
	Actual day pull	1	5.1224	5.1224	0.0070
	Error	150	102.7805	0.6852	

The significant difference in catch rates for Lancelin in the 1 day pull trial for the different bait types was due to the artificial baits used alone having a lower catch rate than the fish alone and the fish with other baits (Figure 1). The lowest catch rate for Lancelin in the one day pulls was the Bait X only bait. The *a posteriori* tests confirmed that there was no significant difference between the Fish plus artificial baits and the control baits, fish plus hide and fish alone.

For the 2 day pull trial in Lancelin the catch rates associated with fish plus either hide, Aquafeed or Ocean baits performed better than the artificial baits used alone (Figure 2). Bait

X again performed poorly. The 3 day pull trial resulted in similar catch rates between the fish plus hide and the fish and three proposed holding bait types (Figure 3).

The Leeman 1 day pull trial showed a similar result to the Lancelin trial, with the three artificial baits having a lower catch rate than the fish only bait (Figure 4) and this was confirmed by the *a posteriori* tests. The fish plus holding bait had a similar catch rate to the fish only bait for the 1 day pull (Figure 4).

The three artificial baits used alone again performed poorly in the Leeman 2 day pull trial with no significant difference between the other baits (Figure 5). While there was no significant difference in the baits used in the 3 day pull trial in Leeman, the fish plus hide baited pots had a much higher catch rate than pots baited with fish and artificial baits (Figure 6). Due to bad weather, this 3 day pull trial also included some 4 day pulls and the catch rate was low for this day compared to the catch rates of the 3 day pulls (Table 4), particularly for pots with artificial baits. This result differed from the 3 day pull trial at Lancelin which showed similar catch rates amongst all the bait types.

The ANOVA for catch rates of undersize and legal size rock lobsters showed a similar result and this is reflected in the Figures 1 to 6.

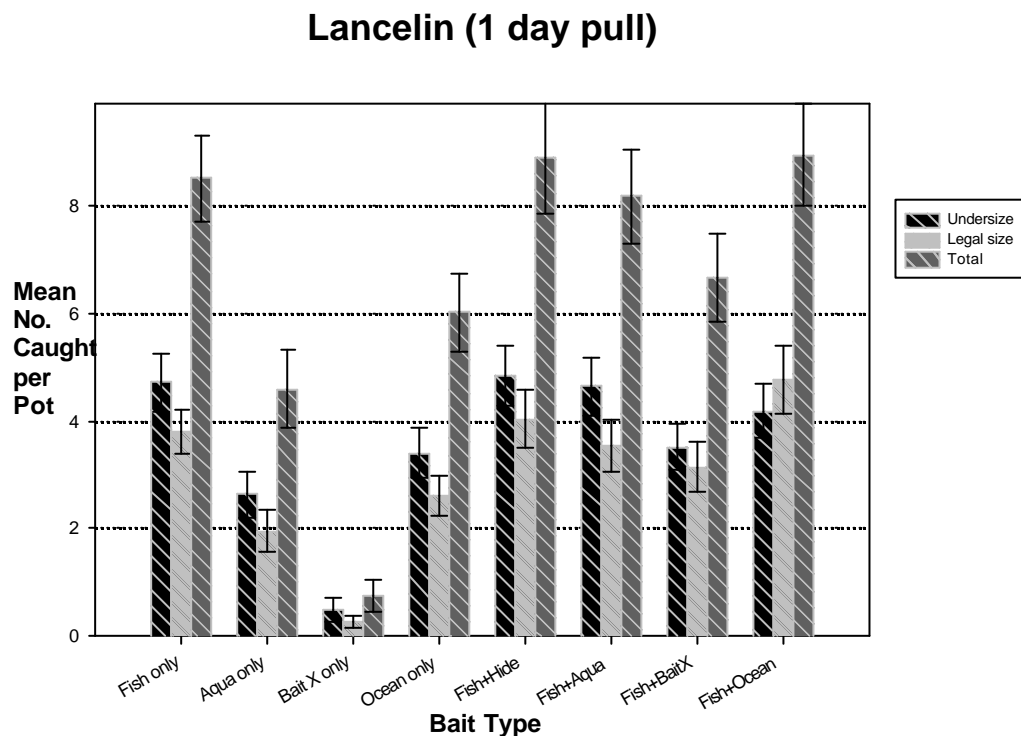


Figure 1: Catch rate (with 1 standard error shown) of undersize, legal size and combined per bait type.

### Lancelin (2 day pull)

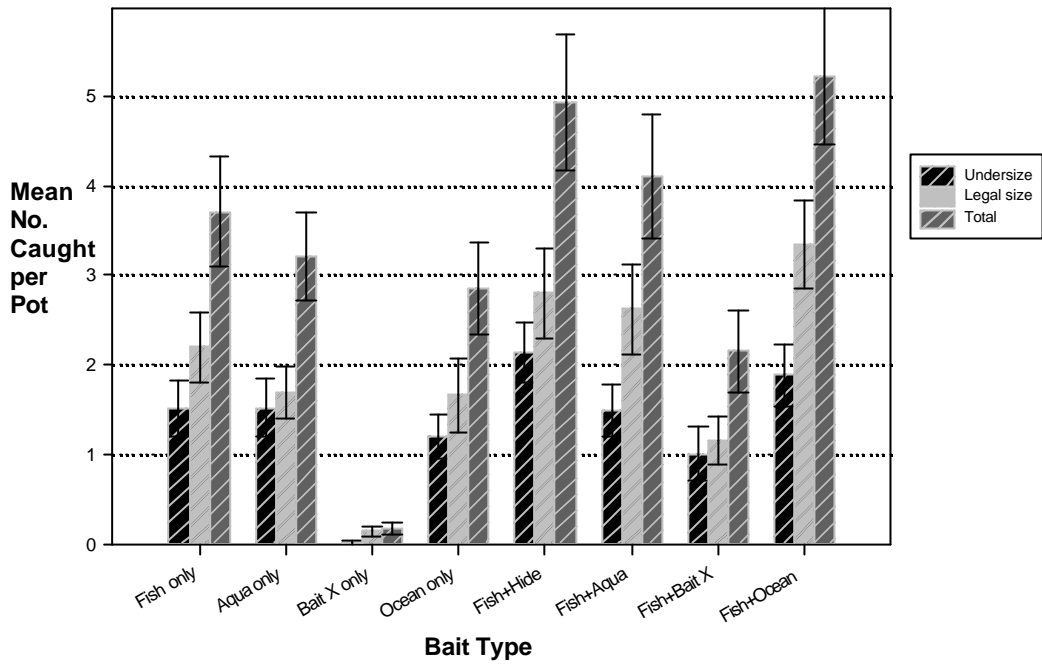


Figure 2: Catch rate (with 1 standard error shown) of undersize, legal size and combined per bait type.

### Lancelin (3 day pull)

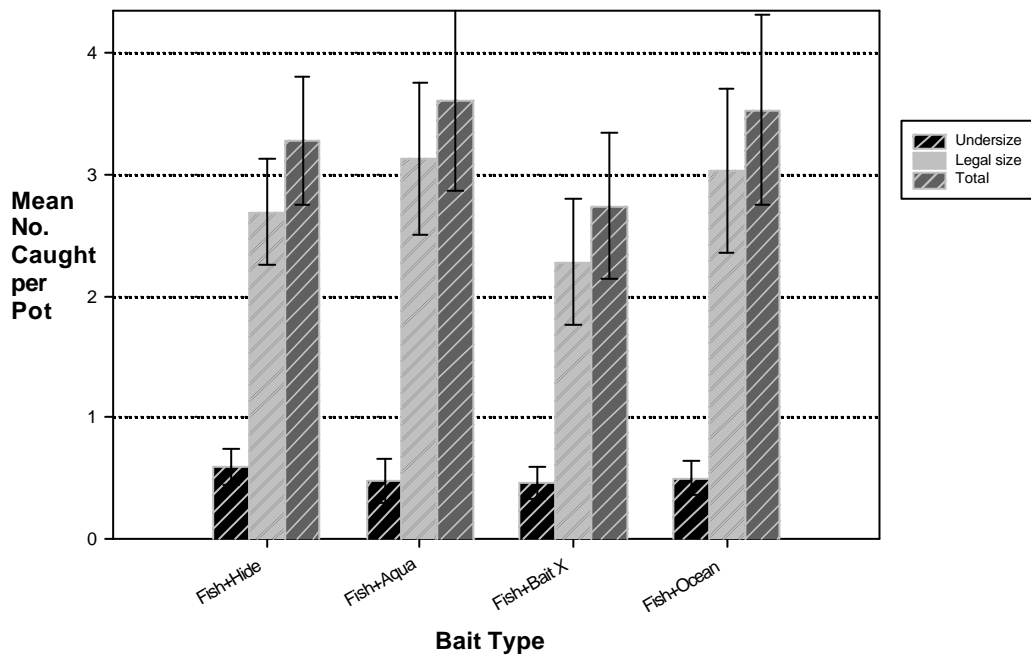


Figure 3: Catch rate (with 1 standard error shown) of undersize, legal size and combined per bait type.

### Leeman (1 day pull)

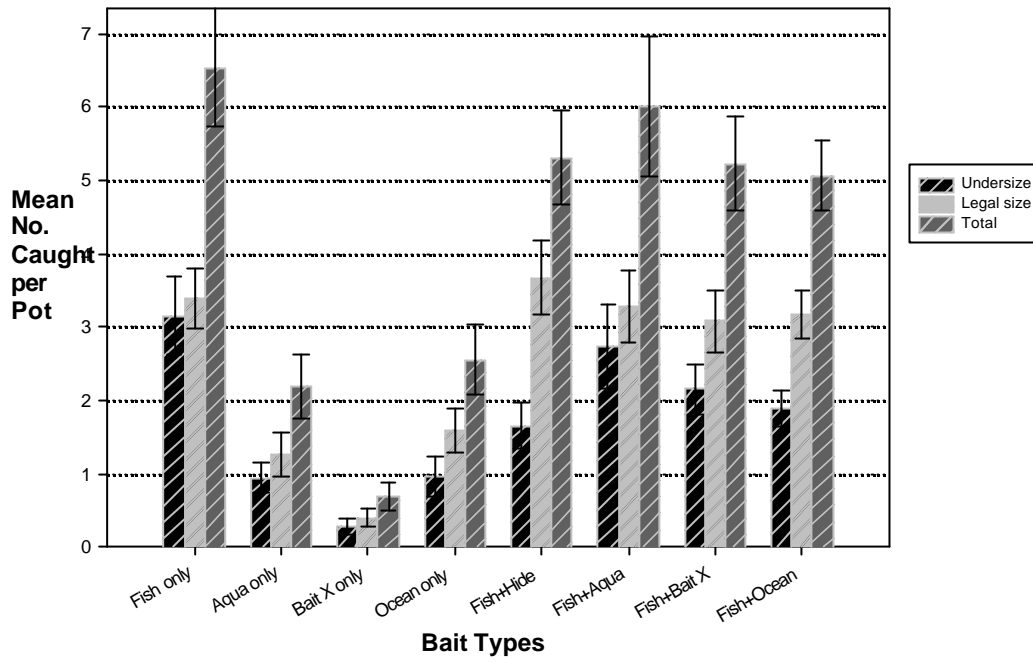


Figure 4: Catch rate (with 1 standard error shown) of undersize, legal size and combined per bait type.

### Leeman (2 day pull)

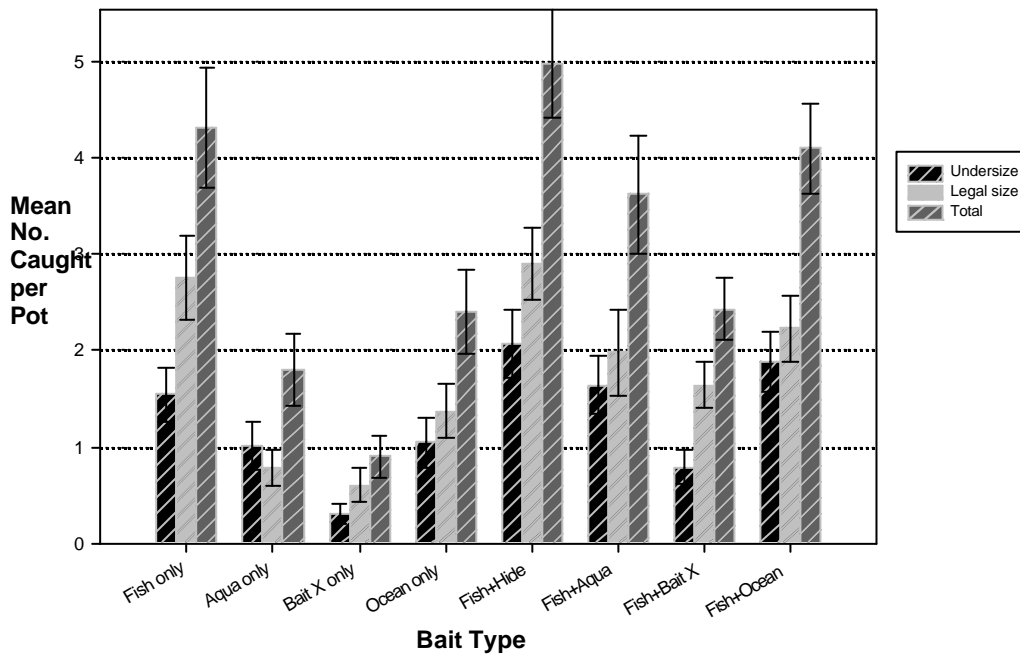


Figure 5: Catch rate (with 1 standard error shown) of undersize, legal size and combined per bait type.

### Leeman (3 day pull)

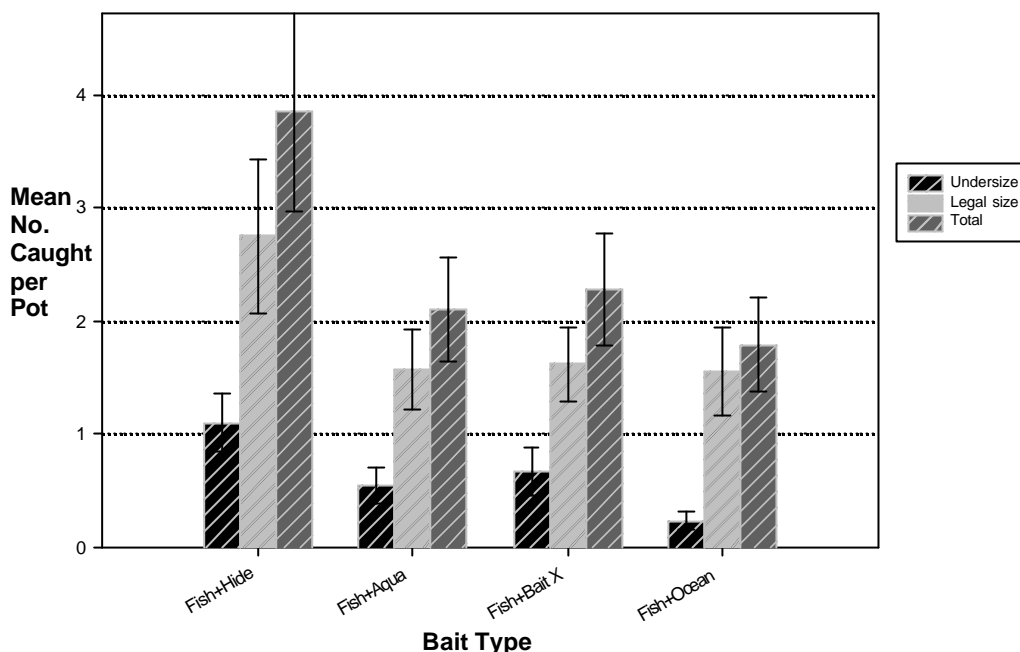


Figure 6: Catch rate (with 1 standard error shown) of undersize, legal size and combined per bait type.

Table 5: Mean number of total rock lobster caught per pot in the period before the Bait X formula was changed (period one) and the period after (period two).

		Period One		Period Two	
		Bait X Only	Fish Only	Bait X Only	Fish Only
Lancelin	1 day pull	0.19	8.34	1.81	8.00
	2 day pulls	0.11	4.64	0.29	1.57
Leeman	1 day pull	0.31	6.47	1.44	6.27
	2 day pulls	0.89	4.86	1.07	3.21

Table 6: Mean number of total western rock lobster caught per pot in the period before the Bait X formula was changed (period one) and the period after (period two).

		Period One		Period Two	
		Fish + Bait X	Fish + Hide	Fish + Bait X	Fish + Hide
Lancelin	1 day pull	6.78	9.19	6.44	7.75
	2 day pulls	2.46	4.96	1.43	4.29
	3 day pulls	3.17	3.50	1.20	2.30
Leeman	1 day pull	5.97	4.22	3.75	7.50
	2 day pulls	2.75	4.71	1.79	5.50
	3 day pulls	1.97	2.57	3.00	7.70

The formula of Bait X was changed during the trial and a comparison of the catch rates shows that it improved after the change over for the trials when used alone but was still well below the catch rate of the control bait of fish only (Table 5). However the comparison of the catch rate of the Bait X used as a holding bait with fish showed a decline in catch rate after the changeover and was generally lower than the control bait of Fish plus Hide (Table 6).

It was observed that there were no remnants of Bait X remaining when the pots were pulled, especially for the 2 or 3 day pulls. There was only a slight improvement after this bait was changed during the experiment. The Aquafeed and Ocean bait often had remnants after 1 day pulls with the Aquafeed bait often having some remnants after three days.

This experiment was conducted in August and the environmental conditions were typical of winter conditions and what would be expected towards the end of the rock lobster season in June. The weather pattern during the experiment consisted of cold fronts with strong westerly winds and swells with light winds for the days between the fronts. The water temperature range was 16.7 to 19.1°C in Leeman and 17.5 to 20.0°C in Lancelin.

A total of 3-4% of pots contained evidence of octopus when pulled (Table 7). Evidence of octopus comprises of one or more octopus found in the pot, one or more dead rock lobster found in the pot or a combination of these. There is not sufficient data of evidence of octopus to assess if there is a major difference in the attraction of octopus by the bait types.

Table 7: Percentage of pots pulled that contained octopus, or evidence of octopus, by bait type.

Bait	No. Pots	No. Pots With Octopus	%
Fish Only	175	3	1.71%
Aqua Only	178	5	2.81%
Bait X Only	176	0	0.00%
Ocean Only	176	7	3.98%
Fish & Hide	256	9	3.52%
Fish & Aqua	253	15	5.93%
Fish & Bait X	257	12	4.67%
Fish & Ocean	254	9	3.54%

Preliminary results were provided to rock lobster fishermen in WA during the annual series of meetings at five locations throughout the fishery, viz. Geraldton, Dongara, Jurien, Ledge Point and Fremantle, during September 1999 before the start of the 1999/2000 season.

## Benefits

The direct beneficiaries will be the western rock lobster fishermen in Western Australia. If frozen bait is eventually replaced as a result of this project, there is a quantifiable saving of \$4 million in storage costs. If imported bait is likewise replaced, there is a quantifiable foreign exchange saving of about \$15 million. Intangible benefits include the reduction in packaging disposal costs, and the positive impact of reducing the risk of bovine material in rock lobster sold overseas.

## Further Development

The artificial baits, when used as an alternative to hide, generally had similar catch rates and is worthy of further testing by industry in order to move away from the use of hides. There were some differences in the catch rates of the bait types between the two areas examined, indicating that further testing in different regions is warranted. There would also need to be further testing to be done at different times of the year. Further refinement of the artificial baits

are required if they are to successfully replace fish as a stand-alone attractant for rock lobsters.

## **Conclusions**

The two objectives of this project were successfully completed with the statistically valid trials of the three artificial baits having been conducted and the results being disseminated to industry before the start of the 1999/2000 season.

The research survey approach adopted to test baits appears to be the most appropriate method with the pots with different baits being set next to each other. This enabled a comparison of the effectiveness of baits as other factors affecting catch rates such as environmental conditions and location were similar.

The results indicate that the catch rates for undersize, legal size and combined rock lobsters, for all of the artificial baits alone, are generally lower than the catch rates for the two control baits of fish alone and the fish plus cowhide bait. Hence the artificial baits do not appear suitable as stand alone baits without further development. However, the catch rates for the artificial baits, particularly Ocean Bait and Aqua Feed, when combined with fish bait are generally similar to the catch rates for the Fish bait alone and the Fish plus Hide bait. The catch rates of fish with artificial baits generally performed better in Lancelin than in Leeman indicating that further testing in different areas may be warranted. However, the cost of using the artificial baits as an alternative to hides was generally higher in this experiment as the artificial baits were replaced at each pot lift whereas the hide was replaced after a week.

## **Acknowledgements**

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## **Appendix 1: Intellectual Property**

The IP associated with the artificial baits remains with the three companies involved. This project facilitated the testing of the baits at sea.

## **Appendix 2: Staff**

Dr Nick Caputi	Supervising Scientist (Invertebrates)
Mr Richard Stevens	R&D Manager, WA Fishing Industry Council
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