

DEEP-WATER PRAWN PROGRAMME
A DETAILED PLAN OF OPERATION

by

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Status: After about 3 weeks of field work, it has become apparent that the project is progressing well (despite the limitations of the project vessel Kuita Qalo) and in general catches in the deeper areas (300 fm) have approximated those previously considered to be "commercially viable".

It must be stressed that the initial investigations have been directed entirely at determining which of the three trap types (conical, triangular section and square section) is likely to yield the best results.

The fifth set (immediately following the severe storm in early May) was anomalous in that salala was used as bait rather than tuna. The poor catch from this set can probably be attributed to the bait, which, even when the traps were-lifted, was still relatively fresh and odour-free. Data from this set will have to be excluded from analyses of trap efficiency, and it demonstrates the absolute necessity for eliminating extraneous variables when testing a particular factor.

The systematics of the local deep-water prawn community is more complex than originally thought. The genus Heterocarpus, in particular, appears to include a wide range of morphs which may correspond to separable species or sub-species, although it is possible that there may only be a few highly morphologically variable species. We are fortunate to have the close cooperation of Dr. M.King (a prawn-specialist from Australia, currently lecturing at the Tropical Fisheries Unit at USP) in this project. Dr. King is currently investigating the taxonomy, morphometrics and reproductive state of all prawns caught by the project vessel, and will continue to do so until such time as the catch can be sorted, with some degree of confidence, into separate species groups. Specimens have been sent to various crustacean systematists for positive identification, and the remainder of the catch has been sorted and kept frozen at USP. Two Divisional staff (SFA Tikomainiusiladi and SFA) regularly work with USP on the biological and taxonomic

access to all relevant data generated as a result of Dr King's work and, of course, vice versa. Such cooperative ventures between the Division and appropriate USP personnel should be encouraged when practicable, as there has been too little liaison between the two organisations in the past.

Immediate tasks: Studies of comparative trap efficiency (Phase I) are to continue during the week 15-18 May. Two depths (200 and 300 fm) will again be fished, but at a different site (off Suva Point) if the fine weather prevails.

Analysis of the initial data will commence on 21 or 22 May and should be complete by the end of the week (25 May). A progress report incorporating the results and interpretation of those analyses will subsequently be produced for limited circulation.

During the week 21-25 May the project vessel's echo sounder should either be repaired or replaced and the vessel should then run a number of perpendicular offshore transects to chart the bathymetric contours to at least 500 fm in the region bounded by the entrance to Suva Harbour (to the east) and Namuka Is (to the west). The bathymetric data should then be plotted accurately as a permanent record on a large-scale chart, and this used to determine suitable sites for further investigation.

As soon as the initial analyses of trap efficiency have been completed and the implications discussed, more traps of the selected type should be built.

Long term plans:

Having established the optimum trap design as a result of Phase I of the project, there are three additional variables which should be examined before the project commences an extensive survey of potential fishing-grounds. These are:

- i) An analysis (by depth) of species composition and mean individual size.
- ii) An analysis of optimum soak-time
- iii) An examination of the effect of covering the trap with natural or synthetic-fibre materials.

All three investigations are of a short-term nature (except insofar as (i) may vary seasonally) and could conveniently be grouped together as Phase II, to occupy about 4½ weeks of field-sampling time. The suggested approach to Phase II is as follows:

1. Depth analysis

Start: 4th June (first set)
Duration: 5 days (final lift on Sat. 9th June)
No. depths: 7 (at 50 fm intervals from 150 to 450 fm).
No replicates: 1+1
No traps per string: 3
Total no. traps per depth (including replicates):
6 i.e. 2 sets per depth.
Random order of setting: Day 1: 150, 540, 250 fm
Day 2: 400, 300, 200 fm
Day 3: 350, 250, 400 fm
Day 4: 200, 150, 300 fm
Day 5: 450, 350 fm.

Locality: along pre-defined offshore transect
(somewhere between Suva and Namuka Is.).

Bait: S/J or big-eye, but keep it the same
throughout the experiment.

Soak-time: As close as possible to 15 hr throughout.

Catch: to be bagged and labeled (by trap
individually) and returned to the
lab on ice for sorting and weighing.

2. Soak-time analysis

This investigation is designed to answer two main questions: how does the catch rate vary with time, and how much variation in soak-time can be tolerated without substantially affecting the comparative results of trapping experiments? The first question is clearly of interest to the commercial operator, and the second is equally important to the research worker.

A third question, relating to the optimum time in the diel cycle for trapping prawns, could also be examined.

From the results of the depth-distribution analysis, a suitable depth range should be selected at which to conduct these experiments. Depth, locality, bait type and trap design should be kept constant, the only variable being the time between setting and hauling the traps (soak time).

This aspect of the programme could be dealt within a week (possibly 11th-15th June) given good weather. A tentative field schedule is as follows:

Day 1. Set 3 strings of 3 traps at 1830 hr (6.30 pm)
Day 2. Haul at (12 hr soak)
Day 3. Haul at 0800 (16 hr soak), re-set at 1600 hr.
Day 4. Haul at 1000 (18 hr soak), re-set at 1700 hr.
Day 5. Haul at 0700 (14 hr soak)

This scheme gives 9 replicate samples at each of 4 soak times (12, 14, 16 and 18 hours). By

plotting the results it should be obvious whether or not the catch/time curve tends towards the asymptote. If so, an economically optimum soak-time may be derived.

The relatively simple analysis of this data could be effected within a day of the final field-operation, but the results should be discussed in case the shape of the catch curve indicates the desirability of further investigation at one or other end of the arbitrarily-selected 6-hour soak-time range (12-18 hr). The week of 18th - 22nd June should be reserved for such contingencies. If the results indicate an uncomplicated interpretation, this week could be used to test the relative efficiency of day and night sets (12-hour soak time), assuming that problems of locating, hauling and setting traps, as well as general navigation at dusk and dawn, are not insurmountable.

3. Effect of trap coverings.

The data on deep-water prawn trap covers are equivocal; it may be profitable to spend a few days testing the relative efficiency of uncovered, hessian-covered and synthetic fibre-covered traps. With one of each on a string, and setting 3 strings per day, it should be possible to get some idea of whether covering significantly improves the catch rate in a short time. Two field operations, involving 6 replicates of each 'cover type' should suffice. Once again, of course, the depth, locality and bait type would remain the same. This final experimental stage of Phase II would (hopefully) be completed during the last week of June at which time the Phase II Progress Report will be produced.

By early July we should have a basic understanding of the following:

- i) which of the three tested trap designs is the most effective.
- ii) whether covering this type of trap with hessian or synthetic material has an appreciable effect on the catch-rate.
- iii) the depths at which the prawns are most abundant and of the largest average size (at this particular time of the year).
- iv) the distribution of each species (or at least genus) in terms of depth
- v) the optimum (economic) soak-time
- vi) the effect of slight variations in soak-time on experimental results (i.e. whether or not it is necessary to convert catches to

- vii) the identity of at least the major species.
- viii) the size distribution of the population of the major species, and possibly an indication of reproductive strategies and growth characteristics.

A discussion of all the above points should be included in the Phase II progress report, together with a list, if necessary, of those areas of the project which may require some further experimentation in order to provide conclusive results.

The final component of the project (Phase III) will consist of exploratory fishing in a number of widely distributed geographical areas, and should commence around mid-July. By this time both the FC-2 (Mata-in-Civa) and FC-3 should be in commission, and equipped with a standard set of ropes and traps. These vessels will be able to contribute to the project (on a part-time basis) by supplying information on the distribution and abundance of prawns in the Northern and Western Divisions. There must be very close liaison between SFO (Research) and the FC vessel operators to ensure that all gear and techniques are standardised, and that the vessels are utilised as efficiently as possible. Phase III should be continued for at least 12 months so that seasonal effects on species composition, geographical distribution and depth distribution can be elucidated. A simple index of the reproductive state of populations of the main species should be recorded regularly (perhaps the percentage of berried females in a specific carapace-length range would be sufficient).

Throughout Phase III it will be necessary to plan individual cruises, which will mean a certain amount of chart-work and bathymetric contouring by those vessels equipped with suitable echo-sounding equipment.

It would be very interesting, provided we can obtain the appropriate equipment, to make some record of temperature and current strength at the Trapping depths. I am about to request quotations for a mechanical bathythermograph capable of operating to a depth of 800 m and a 'Pisa' - type gel-set current speed and direction indicator, from the Kahlorics range of oceanographic instruments.

The fine details of Phase III operations will depend to some extent on the findings of Phase II, and there will need to be some considerable discussion beforehand to decide on specific fishing strategies. The need for very careful planning cannot be over-stressed. It is recommended that a progress report be produced at the end of every three months during Phase III, with significant input from Dr. King's biological/morphometric work.

In addition, potential local and overseas markets should be sounded out and tested with trial shipments of prawns during this period. Serious consideration should be given to determining the best method of storing the catch on board (e.g. green or cooked?, ice or iced brine? etc). Finally, a complete economic analysis of a typical prawn trapping vessel's operation should be undertaken.

At the termination of the project (e.g. September 1980) a full report, synthesising the results of all three phases of the project, should be compiled. This report should, if possible, contain all the raw data (at least the raw catch data) and multiple copies should be made for general distribution. A condensed version should also be prepared for publication. It is quite possible that by the time the project has finished, there will be one or more commercial operators fishing the deep water prawn stocks. The research section will, of course, have to establish a system for collecting commercial trapping data, and an analysis of the commercial catch should also be included in the final report.

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