

No 1971/9
COMPLETING

FISHING INDUSTRY RESEARCH TRUST ACCOUNT

APPLICATION FOR GRANT

TITLE OF PROPOSAL: HIGH DENSITY OYSTER CULTURE AND OYSTER HUSBANDRY
APPLICANTS NAME: NEW SOUTH WALES STATE FISHERIES
ORGANISATION: SCIENTIFIC SECTION
FINANCES SOUGHT BY APPLICANT: 1976/77 \$ N/A 1977/78 \$ 1978/79 \$
RELATED APPLICATIONS: N/A

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G. TUNKS
SECRETARY
FISHING INDUSTRY RESEARCH COMMITTEE

FISHING INDUSTRY RESEARCH TRUST ACCOUNT

REPORT ON PROJECT - 1975/76

1. Title of Proposal: High density oyster culture and oyster husbandry.
2. Name of Applicant: New South Wales State Fisheries.
3. Division: Scientific Section.
4. Proposal: Establishment of the economic feasibility of oyster culture under pond conditions, development of reliable techniques to produce under controlled hatchery conditions improved strains of seed oysters for subsequent cultivation in estuarine or pond waters, and development of techniques to improve the efficiency of existing estuarine culture practices.
5. Name of Person Responsible for the Programme: Dr. D.D. Francois, Director of Fisheries
6. Qualifications of Staff Employed on the Programme:
 - (i) Senior Research Scientist: H.B. Wisely, M.Sc., D.Sc.
 - (ii) Technical Officer: J.E. Holliday, H.D.A.
 - (iii) Technical Assistant: Mrs. B. Reid
7. Location of Operations: Research operations are centred chiefly at the Brackish Water Fish Culture Research Station, Port Stephens, with selected field studies in all major New South Wales estuaries.
8. Date Proposal Commenced: Major segments of the project were initiated in 1972.
9. Completion Date: 1976
10. Report on Project:

(i) Culture of Oysters Under Pond Conditions

A series of experiments were carried out to determine the feasibility of cultivating oysters under pond conditions. Standard trays, carrying known high numbers of oysters, were set out in two ponds. One pond was retained as a control whilst the second was enriched with nutrients.

The enriched pond developed high densities of a variety of algae but no significant increase in the growth of the oysters in this pond compared with the controls was recorded. On the basis of these preliminary field experiments, cultivation of high density stocks under pond conditions would appear to have little chance of success.

stimuli including temperature shock and gonad additives, all experiments conducted towards the end of the 1974/75 spawning season proved successful in inducing spawning. The natural stocks are currently coming into spawning condition and laboratory spawning induction experiments are to be continued.

Laboratory produced progeny were reared through the major part of the larval life. However, it was not possible to maintain the larval cultures to the settlement stage and this is attributed to a lack of suitable food. As mentioned above laboratory feeding experiments showed that the majority of the algae cultured in the laboratory were above the optimum particle size for ingestion by the adults and this also holds true for the larvae.

Laboratory cultured algae have been homogenised to provide optimum particle size and are being held under refrigeration. The homogenised algae will be fed to the progeny resulting from the spawning induction experiments to be carried out during the next few months and it is anticipated that success will be achieved in maintaining the larvae through to the settlement stage. If this is the case the programme can then be expanded to include development of techniques for hatchery production of spat and selection of improved strains of the Sydney rock oyster.

(iii) Improvement of Cultivation Practices

In this segment studies have been concentrated on preliminary evaluation of Japanese and Korean longline and raft culture methods as a means of developing deep water oyster cultivation in New South Wales and elsewhere in Australia.

The stick and tray method of cultivation, although highly successful in shallow estuarine water, is not suitable for deep water because of the cost of the posts required to fence the leases

and support the racks needed to carry the sticks and trays.

The basic unit of an Asian longline consists of a float which supports a rope or wire extending to a depth of approximately two thirds of the water column. Scallop shells carrying young oysters (spat) are pierced and strung on the rope or wire; the shells are spaced at selected growing distances by means of bamboo or plastic tube spacers. The floats are arranged in a grid system approximately one metre apart and supplementary strings of scallop shells are suspended from the ropes used to hold the floats in position. In this way extremely dense, three-dimensional oyster units are built up in the water column with a resultant high production of oysters per surface area.

Evaluation of the Asian longline method for use in New South Wales was commenced in 1972, and the study comprised three main phases. In 1973 suitability of scallop shells for collecting Sydney rock oyster spat was determined. Upon completion of this work a series of simple longlines was tested in Port Stephens, and then growth and mortality were studied at 22 longline stations in selected estuaries throughout the entire coastal area of New South Wales.

The studies to determine the suitability of scallop shells for collecting Sydney rock oyster spat showed the use of these shells to be highly satisfactory. During the 1973 season from 20 - 30,000 scallop shells were suspended from a raft in Salamander Bay, Port Stephens, and acceptable settlement densities of between 5 - 20 spat per shell were obtained. To avoid heavy barnacle settlement on the scallop shells, the cultch was not submerged until after spawning of the natural stocks had occurred.

In order to obtain spat for subsequent longline experiments, from 20 - 30,000 scallop shells were also suspended from a raft in Salamander Bay during both the 1974 and 1975 spawning seasons.

A highly acceptable settlement density was obtained and the consistent results over three seasons clearly demonstrate the suitability of scallop shells as cultch for longline cultivation.

Results from the initial simple longline experiment conducted in Port Stephens indicated good growth and low mortality. The project was therefore expanded to cover 22 selected estuaries throughout New South Wales.

The 22 longlines were examined quarterly, particular attention being paid to growth and mortality. Although there was some individual variation between longlines, the general conclusions reached after a study period of approximately 18 months are as follows:

- (a) Mortality was negligible. Surprisingly predation by fish and crabs was exceedingly low as were also the effects of mudworm and "winter mortality".
- (b) No problems were experienced with "overspawning", the settlement of young oysters on the stocks suspended from the longlines.
- (c) No major problems were experienced in the smothering of the oysters by algae, sponges and seaquirts. Seasonally, in some areas, settlement of barnacles occurred. This would incur problems in culling before marketing.
- (d) Growth was high approximating 10% per month which markedly exceeds that attained using the stick and tray method. Average longline weight increases for northern and southern New South Wales are shown in the following table.

Period	% Increase in Weight	
	Northern N.S.W.	Southern N.S.W.
May - Aug	8.5	6.1
Aug - Dec	11.5	11.6
Dec - Mar	12.3	11.5
Mar - June	7.4	8.8

(iv) General Conclusions. The longline experiments carried out conclusively show that oysters survive and grow when continually submerged, and the preliminary data obtained indicate that mortality is low and growth exceeds that of tray and stick cultivated oysters. However, there are grave doubts as to whether the Asian longline method would prove economical in Australia because of the labour involved in the use of scallop shells and similar sized cultch material. Preparation of the shells, their handling during assembly of the longlines, and final culling of the oysters grown on the shells all involve considerable labour and present labour costs in Australia may well preclude current use of this method in Australia. However, there is little doubt that a more suitable deepwater culture unit can be developed and a proposal relating to such development has been submitted to the Fishing Industry Research Trust Account Committee for consideration.

The longline experiments presently being conducted are now to be terminated and the results prepared for publication. Further work is to be carried out during the remainder of this financial year in relation to feeding and laboratory rearing and the results of this work will then also be prepared for publication.

11. Expenditure: 1st July, 1975, to 31st December, 1975

Salaries and wages	\$13,380.00
Operating expenses	1,009.59
Capital expenses	1,428.47