Aquaculture Extension and Training Support in the U.S.-Affiliated Pacific Islands: Black-Lip Pearl Oyster Spat Production, Year 14

General Information

Reporting Period April 1, 2003–July 31, 2004 (final report)

Funding Level

Year	Amount	Year	Amount
1	$100,000	8	$75,000
2	$82,870	9	$85,000
3	$73,600	10	$85,000
4	$70,000	11	$75,600
5	$75,000	12	$100,520
6	$98,000	13	$114,300
7	$70,000	**14**	**$70,000**
		TOTAL	$1,174,890

Participants

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Black Pearls of Micronesia (BPOM)

Objectives

1. Establish and implement protocols for spawning and rearing sufficient number of pearl oyster spat per year for research, extension, demonstration, and evaluation.
2. Provide training to local people (Marshallese and other Micronesians) on all aspects of the pearl industry from spat production to establishment of farms.
3. Design and conduct practical research on hatchery production of spat and farm grow-out technologies in collaboration with other scientists from local and regional institutions.
4. Assist and advise in hatchery designs and construction.
5. Initiate and maintain algal cultures. Supervise and train at least five local hatchery staff to be able to independently perform all required activities.
6. Perform other related duties determined to be needed and appropriate by the Center for Tropical and Subtropical Aquaculture and the College of the Marshall Islands.

Principal Accomplishments

Objective 1: Establish and implement protocols for spawning and rearing sufficient number of pearl oyster spat per year for research, extension, demonstration, and evaluation.

Two successful hatchery runs were conducted, and both produced enough spat for local industry and research needs.

Project investigators conducted two hatchery runs at the College of the Marshall Islands' Arrak campus Land Grant pearl oyster hatchery. Project investigators produced 1.07 million settled spat during the first hatchery run from June 1 to July 16, 2003. The spat were distributed to two local companies, Robert Reimers Enterprises (RRE) and Black Pearls of Micronesia (BPOM), and each received 357,000 spat ranging in size from 2 to 2.5 mm. This was three times the amount initially requested. It was also the first time in more than two years that spat have been produced and distributed to the farms. The remaining spat were suspended from a submerged long line at the college's Arrak campus demonstration pearl farm to evaluate nursery methods.

On May 15, 2004, project investigators successfully conducted the second pearl oyster spawning trial using broodstock oysters from the Arrak demonstration farm and RRE's farm on Arno atoll. Male oysters began spawning within 15 minutes of the broodstock being placed within tanks with heated seawater. So many males spawned that their sperm turned the seawater milky in color making it difficult to discern spawning female oysters. At least 21 oysters spawned, and tens of millions of fertilized eggs were placed into three 750-L larval tanks. This large number was beyond the carrying capacity of the Arrak hatchery, and the excess larvae were progressively culled while still ensuring that enough settled spat remained by Day 42 (June 30, when the spat had grown to an average size greater than 2 mm). A total of 260,000 spat were produced, and the two commercial farms, RRE and BPOM, picked up 125,000 spat each on June 30, which they took to their farms on Arno atoll. The rest of the spat were maintained for research purposes at the CMI Land Grant pearl farm in Arrak to compare the growth characteristics and growth rates at different areas and to evaluate nursery methods.

Objective 2: Provide training to local people (Marshallese and other Micronesians) on all aspects of the pearl industry from spat production to establishment of farms.

Seven local individuals and one outer-island worker received training in pearl oyster hatchery techniques and farm husbandry.

During the May 2004 hatchery run, neighboring local workers were hired to assist the project investigators because the promised trainees from the stakeholders never materialized. A total of seven outside staff received training in most aspects of pearl oyster hatchery propagation and farm husbandry. Project investigators also trained the first outer-island worker sponsored by the Rongelap Atoll Local Government. He received extension training in both pearl oyster hatchery and farm grow-out husbandry. His training was the result of several requests made by outer-island communities interested in spat grow-out as a way to lessen their dependence on copra as a source of income. These communities could thereby supplement their income by growing out spat to sizes requested and paid for by the larger commercial companies. Subsequent workers would require training prior to receiving spat to reduce grow-out mortality. Training funds are being sought from outside sources for next year's hatchery runs to foster the initial development of four spat grow-out units on four other outer atolls.

Objective 3: Design and conduct practical research on hatchery production of spat and farm grow-out technologies in collaboration with other scientists from local and regional institutions.

Project investigators tested a new settlement substrate,which was based on the design used by a College of Micronesia researcher.

Unlike the first hatchery run, the spat produced in 2004 were settled on a newly designed settlement substrate. The design was a modified version of the substrate used successfully by Mr. Masahiro Ito in Pohnpei for his College of Micronesia Land Grant Program pearl project. The substrate was made of shade cloth attached to a PVC pipe frame, which was constructed to fit inside the spat bag. A settlement slat was also placed inside the bag to catch and resettle any spat that were dislodged from the frames during transport. Spat bags containing the frames were then suspended from longlines at the farm sites for grow-out of the spat.

Project investigators advised industry members on grow-out techniques. In addition to detailed instructions sent via e-mail, the pearl oyster hatchery specialist also explained everything at two stakeholders' meetings using an actual settlement frame as a visual aid. The specialist told them that farm divers needed to inspect the bags at least weekly to remove any predators and to change spat bags when fouling had occurred. As the spat grew in size, the frame should be placed in spat bags with progressively larger mesh so that adequate water circulation with the entrained phytoplankton food was maintained. When the spat reached a size greater than 13 mm dorso-ventral shell length (thumbnail size), the spat should be carefully removed from the shade cloth by cutting through the spat's attaching byssal threads (i.e., not pulled off) and placed into the appropriate size mesh of the farm's pocket panel nets for further grow-out to a size into which pearl nuclei could be inserted by a technician to produce cultured pearls.

Objective 4: Assist and advise in hatchery designs and construction.

Project investigators remodeled a hatchery at the College of the Marshall Islands' Arrak campus to accommodate pearl oysters.

The College of the Marshall Islands' Arrak hatchery was successfully renovated for propagation of pearl oyster spat during 2003, and both runs were conducted at this hatchery, which required fewer modifications than the larger, formerly commercial hatchery at Woja. For example, the Arrak hatchery already had electric power and working seawater intake pumps. In April 2003, project investigators submitted a preliminary list of equipment needed to make the Woja hatchery operational to its owner, MIMRA. As of July 2004, the equipment had not yet been ordered. Therefore, project investigators continued to use the facilities at Arrak. Additional improvements to the Arrak hatchery were also made prior to the second hatchery run. This included the installation of submersible pumps to move seawater between tanks.

Objective 5: Initiate and maintain algal cultures. Supervise and train at least five local hatchery staff to be able to independently perform all required activities.

Four microalgal species were acquired and maintained, and seven local individuals were trained.

For the first improvised hatchery run, three microalgal species were acquired from the Woja hatchery, and a fourth species was brought in from Hawaii. These starter cultures were then used to initiate food production for the pearl oyster larvae and settled spat during the hatchery run. However, food production was limited by the lack of available glassware and culture flasks on site as well as by the lack of promised trainees who would have been able to take over some of the workload during the hatchery run.

More glassware was acquired from the Woja hatchery before the second hatchery run so that the propagation of pearl oyster spat was no longer constrained by food production. As mentioned under Objective 1, neighboring local workers were hired to assist in the hatchery run, and seven outside staff received training in most aspects of pearl oyster hatchery propagation and farm husbandry.

Objective 6: Perform other related duties determined to be needed and appropriate by the Center for Tropical and Subtropical Aquaculture and the College of the Marshall Islands.

The project's top priority was the hatchery propagation of pearl oyster spat. However, at the behest of CMI and MIMRA, the project's pearl oyster hatchery specialist also participated in workshops on aquaculture and resource development on RMI's outer-island atolls.

Impacts

Pearl oyster hatchery specialist Mr. Rand Dybdahl, in collaboration with Dr. Manoj Nair R., succeeded in producing 1.07 million settled spat at the CMI's Arrak Campus research hatchery after modifying it to propagate pearl oysters during the project's first hatchery run. Another successful spat production was achieved at the same location in June 2004, when 260,000 settled spat were produced and 125,000 spat were distributed to each of the two commercial companies. Thus, local hatchery production of spat was demonstrated conclusively, making pearl farming on RMI's islands again possible.

For next year's project, the continued hatchery propagation of black-lip pearl oysters will ensure a stable supply of spat for the fledgling industry in the RMI. Larval rearing experiments done concurrently during the run will help to identify site-specific hatchery protocols that should be adopted for optimal propagation.

Other deliverables from a continuation of this project include the development of guidelines for the successful grow-out of spat, a hatchery production cost model, publication of a site-specific hatchery manual, and the continuation of extension training and technology transfer through local and regional workshops.

Publications in Print, Manuscripts, and Papers Presented

Nair R., M. and R.E. Dybdahl. 2004. Status of black-lip pearl oyster farming in the Republic of the Marshall Islands. Proceedings of the World Aquaculture Society, Honolulu, Hawaii, March 1–5, 2004. Journal of Shellfish Research 23(1):304.