

## **A joint academic-industrial project to culture the Asian common octopus commercially using land-based aquaria**

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### **Summary**

A collection of determined, like-minded individuals has been assembled in Japan from an unusually broad variety of university, governmental and commercial organizations with one common aim: to successfully culture the common Asian octopus on a commercially sound basis. Experimental open and closed systems at the laboratory level are in use at two universities, and on a semi-commercial level in closed systems at a live-fish-holding facility. Initial culturing of small adults through to spawning individuals has been very successful, and the present focus is on raising paralarvae. Results include demonstration that non-copepod crustaceans dominate the diet of wild paralarvae off Japan.

### **Introduction**

Although the 21st century has seen closing of the life cycle of the common octopus at an experimental level (Iglesias *et al.*, 2004), transferring this success to a commercial scale has continued to be elusive. The history, background and issues facing successful cephalopod aquaculture have been thoroughly reviewed (e.g. Vidal *et al.*, 2014) and a protocol for the first month of paralarval culture has been proposed (Iglesias and Fuentes, 2014). However, placing octopus culture on a commercial footing is still an unfulfilled ambition. Following 2 years of initial discussions (including a 1-week fact-finding visit to octopus rearing facilities in Vigo) and the obtaining of research funding, the project began in April, 2013. None of the current participants has any previous experience in attempting to culture common octopuses through the life cycle.

### **Materials and Methods**

Octopuses for experiments on a pilot industrial scale are transported from Kami-Amakusa (at the East China Sea entrance to the Ariake and Yatsushiro Seas, Kumamoto Pref., Kyushu) in a specially converted truck with two tanks of constantly circulating, aerated seawater. Individual octopuses are enclosed inside their own netting bag weighted with a stone enclosed in a corner pocket. During very hot weather, a stop is made in Osaka Bay to partially replenish the seawater because of heating by the circulating ambient air. On arrival in Ishinomaki, Miyagi Pref. (near Sendai), octopuses are debagged, weighed, sexed and placed in circular holding tanks (separated sexes) containing seawater transported from Onagawa Bay with a variety of octopus pots, PVC pipes and shelving as accommodation. Water temperature is adjusted to that inside the transportation tanks and gradually

brought to a steady 21°C by electrically powered heating and cooling of the circulating, filtered seawater. In winter, local common octopus are transported by road from a local port after capture by traps on the Pacific coast of the Oshika Peninsula, Onagawa.

Experiments in Shimizu are performed on a small scale with octopuses caught locally in unbaited octopus pots or baited traps and maintained in an open system of natural seawater pumped from under ground. Experiments in Sendai are performed in a closed system of artificial seawater with small octopuses and eggs transported from the facilities at Ishinomaki. Some experiments on handling newly settled octopuses are performed using a different, very small species with direct benthic development collected from the intertidal zone off the coast of Amakusa, Kyushu.

## Results and Discussion

Involved in this project, which officially began in April 2013, are scientists from very different fields at three universities; an expert from a company enjoying considerable success with sustainable salmon aquaculture and with transporting live fin-fish and squid; and research staff seconded from the parent company of a snack restaurant chain specializing in octopus dishes. The strategy of this consortium is to pool effort, experience and expertise towards finding solutions to the various problems presently obstructing the transition to a commercially viable business.

To date, octopuses have been raised from young juvenile through to spawning adults in Ishinomaki and Shimizu and initial (but so far unsuccessful) experiments have been carried out on raising paralarvae in Ishinomaki, Sendai and Shimizu. Ongrowing of juveniles from around 250 g to several kg has been dramatically successful, confirming experiences in Europe and Mexico that *Octopus* species are highly suitable for commercial aquaculture. Octopuses readily accept non-live feed including pieces of squid, local trash fish (adult Pacific sand lance, *Ammodytes personatus*) and deshelled and frozen scallops.

Analysis of wild-caught paralarvae has confirmed through molecular sequencing of stomach contents that non-copepod crustaceans are a key component of the diet (cf. Roura *et al.*, 2012). Preparations are under way to ensure a crustacean component in experimental diets, and various strategies towards attacking the problems of raising paralarvae are under way at 4 different locations.

## References

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