Exploring the world of the seahorse

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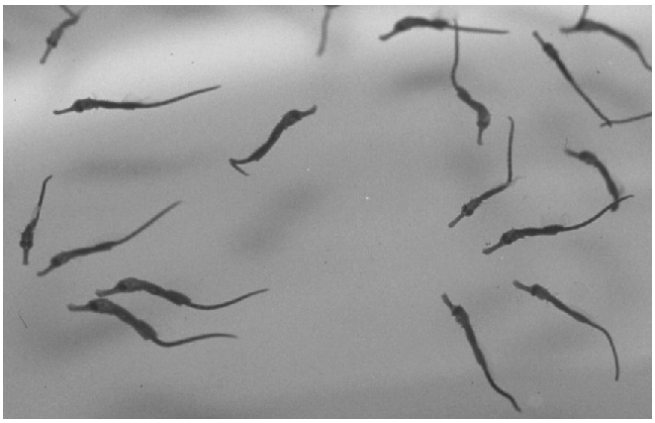
Thanks to AWIS member Stephanie Thompson for submitting this article describing her experiences researching a fascinating marine animal, the seahorse.

In February 2000, I began my Masters research with the University of Otago Marine Science Department on the large-bellied seahorse, *Hippocampus abdominalis*. Prior to moving to Dunedin, I had never even seen a seahorse, so I was pleased that my research was going to involve such an intriguing and unusual animal. Seahorses are fish, although they do not look like fish, do not swim like fish and do not live like fish! They belong to the family Syngnathidae, along with pipefish, pipehorses and seadragons. The large-bellied seahorse is one of the largest species of seahorse, reaching up to 35 cm in length, and is found around the coast of New Zealand and the south eastern coast of Australia and Tasmania.

Perhaps the most unusual feature of the seahorse is their way of reproducing - the male has the babies! The male has a highly vascularised brood pouch on his lower abdomen into which the female deposits her eggs after an intricate courtship. The male nurtures the developing young (about one month for *H. abdominalis*), and then gives birth to between 300-700 fully formed, independent seahorse juveniles.

My Masters research aimed to develop a beneficial live diet for seahorse juveniles, particularly focusing on dietary essential fatty acid requirements, for the purposes of aquaculture. "Why would you want to farm seahorses?" you may ask. Well, the main demand for seahorses is from the Traditional Chinese Medicine (TCM) trade. In TCM, seahorses are purported to be an effective treatment for a huge array of ailments, such as fatigue, respiratory problems, sexual dysfunction, skin disease, and mental disorders. This legal trade consumes an estimated 40 million seahorses from the wild each year, placing unsustainable pressure on some species, particularly in Southeast Asia. Aquaculture has been proposed as a tool that could alleviate some of the pressure on wild populations while taking advantage of the increasing demand for seahorses and seahorse products.

Stephanie taking samples on a mussel barge in the Marlborough Sounds. Photo: C.Hopkins (Cawthron).



Awwwhh… ain't they cute? A brood of baby sea horses produced at the Portobello Marine Laboratory as part of Stephanie's research. The newborn seahorses (species Hippocampus abdominalis) are on average about 15 mm long. Photo: Stephanie Thompson.

The aquaculture of seahorses is a relatively new industry in New Zealand. NIWA have been undertaking research and experimental culture of *H. abdominalis* since 1997. There are a couple of pilot ventures trialing seahorse aquaculture in New Zealand, including at least one facility in the initial stages of commercial operation. The culture technology is established; however, there are still many aspects that need attention, and research is investigating techniques to make seahorse aquaculture economically feasible. A common hurdle to the successful culture of fish is inadequate nutrition of larvae and juveniles, and early attempts at seahorse culture also encountered high juvenile mortality. This is where my research came in.

I was lucky enough to undertake my research at the Portobello Marine Laboratory, University of Otago. The daily drive around the Otago Peninsula was one of the highlights. David Tung (who was undertaking PhD research on seahorse aquaculture) and I maintained adult breeding pairs in the lab and each pregnancy was awaited with crossed fingers, so that I could get my research subjects. I used each brood of seahorse juveniles to trial experimental live diets, measuring the seahorses' growth and survival over 4-6 weeks. The live diets I used were based on *Artemia* (brine shrimp), which I enriched with various fish oil emulsions, commercial enrichment media or microalgae. I was amazed by the difference a beneficial diet made, as I achieved more than 80% seahorse survival with some diets, compared to less than 20% survival with unenriched *Artemia* after 6 weeks of experimental culture.

The other component of my research was investigating the fatty acid composition of the diets and seahorses, in order to establish which fatty acids were important for seahorse growth and survival. Omega-3 fatty acids are currently a hot topic in nutritional circles, as the benefits of an omega-3 rich diet for humans become apparent. Well, juvenile fish have essential fatty acid requirements too. I spent several months learning fatty acid sample preparation (grinding up seahorses was not the most pleasant task) and the principles of gas chromatography. I discovered that juvenile seahorses do have essential fatty acid requirements that must be met by a suitable diet. By comparing their body composition and egg composition with that of the diets I was feeding them, I could predict the levels of essential fatty acids that juvenile seahorses needed to be healthy.

I wrote up most of my thesis in Nelson, as my partner Grant works as a marine scientist at the Cawthron Institute. The timing of the completion of my thesis was great, as I was fortunate enough to hand in my thesis and step into a job as a coastal scientist at the Cawthron Institute too. I certainly could not imagine myself as a full-time seahorse farmer! I am lucky that my role in the Coastal and Estuarine group of Cawthron is very diverse. I assist with the group's consulting and research work, report writing and editing, and in the quality assurance programme and the promotion and communication of science, a role which I would like to develop a lot further in the future. I really enjoy working after years of being a poor student, and appreciate the practical applications of the science that I am doing. But I do miss my research subjects now and then!