South Pacific Sabbatical Leave: *Bruce Smith and Kit Muma*

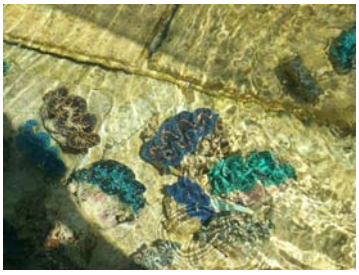
Imagine a tropical paradise. Add two biologists with digital video and still cameras equipped with underwater housings and you end up with over 2000 images and 12 hours of video recordings of the fauna and flora of the region. You can almost smell the frangipani flowers (above) and feel the warm tropical breeze as dawn breaks at Muri beach on Rarotonga (right). We spent 7 weeks during the Fall term traveling in the South Pacific (Cook Islands and Fiji) and the north and south island of New Zealand. The images we took will be used extensively in Bruce's teaching in Animal Behavior and Invertebrate Zoology.

Our primary reason for visiting the Pacific islands was to broaden our experience in marine ecosystems. The bulk of our time was spent snorkeling on coral reefs. While in the Cook Islands, we also collaborated with Gerald McCormick of the Cook Isl. Natural Heritage Project, Biodiversity Inventory, surveying freshwater aquatic organisms (http://cookislands.bishopsmuseum.org). Our reasons were twofold: first, no one had attempted to collect water mites (the organisms on which Bruce's research is focused) in the Cook Islands. Such surveys had found a decreasing diversity of water mites proceeding away from Australia, with 2 species found in American Samoa, none in Tahiti; the Cook Islands are located midway between American Samoa and Tahiti. In terms of understanding island biogeography and distribution patterns of these organisms, this was an interesting gap in knowledge. Second, we knew that stream organisms in general showed this pattern of decreased diversity with increasing distance from mainland, with major groups of organisms dropping out of the food web. Meanwhile, there was the same nutrient and energy input into the streams, the question was what (if any) organisms filled the vacant niches in the food web.

To summarize briefly, we did not find any mites in our survey of the Cook Islands, and the major groups of aquatic insects (mayflies, stoneflies, caddisflies) were also absent. These insect groups serve as the major plant feeders and processors of detritis in stream ecosystems - in a typical Ithaca stream, the community would include about 10-15 species from each of these insect groups, each filling a fairly specific role in the food web. In the Cook Islands, several shrimp and prawn species have adapted to freshwater, migrating up streams from the ocean and filling the vacancies in the food web left by the lack of aquatic insects. Only four species of shrimp and prawns are involved, and they have taken generalist roles in completing the foodweb. The picture at the left shows Bruce in the Avarua stream on Rarotonga retrieving one of his (empty) light traps.

While on Rarotonga we had a guided tour of the Takitumu Conservation Area. The area is home to the Kakerori or Rarotongan Flycatcher (*Pomarea dimidiata*). The story of this bird represents a conservation success story. In 1989 the population had diminished to a total of 29 birds and it was at

serious risk of extinction. The bird was not legally protected and museum collectors were killing and taking birds without permission. The local people realized that something had to be done so they set aside a conservation area of 150 hectares. The nature reserve is managed by the Kainuku, Manavaroa, and Karika families who lead small group tours by request. Prior to conservation efforts, most kakerori nests were destroyed by rats but some were also taken by cuckoos, mynas, and cats. The group have been able to improve the nesting success of the species through rat poisoning and tree banding to prevent climbing predators from reaching the nests. Today the flycatcher is thriving with an estimated population of 250 individuals. To further ensure the survival of the species a small "insurance population" was transfered to the nearby island of Atiu.



We also visited the neighboring atoll of Atuitaki where we saw giant clams being raised at a marine research facility. The local people are attempting to preserve their lagoon habitats for ecotourism, and the commercial rearing of giant clams and black pearl oysters. Even with the awareness that the reefs needed to be protected, we saw many instances of unhealthy coral including bleaching, heavy siltation from run-off, algal growths, damage by crown-of-thorns sea urchins and fish feeding (using non-nutritious white bread).

Our next stop was the Octopus Resort on the island of Waya in Fiji. Here, due to its remoteness, the corals were much healthier and the fish populations were amazing. Living up to its name, we even saw a small octopus hiding amongst the plate coral heads. One surprise find was a school of mating reef squid around an offshore islet. Even with choppy seas we were able to take some incredible video footage of mate-guarding and egg-laying. Another highlight was a night snorkel in which we followed a guide with underwater flashlights. We saw many nocturnal creatures including lobsters and squirrelfish. One unpleasant aspect was the encounter with tiny (1 cm diameter) stinging box jellyfish that were attracted to our lights. Kit is shown here with a sea cucumber.

There were two main reasons for travel in New Zealand: to expand our knowledge base of wildlife in this region, and to visit and interact with colleagues at the University of Otago. New Zealand is highly unusual, in that there was a total lack of mammalian predators prior to human colonization; the wildlife consists primarily of birdlife, of which many species have lost the ability to fly, presumably because the lack of predators reduced the need for flight. When humans colonized New Zealand they brought various predator species, including rats, stoats, cats, and dogs. Consequently, much of the wildlife of New Zealand has been decimated by introduced predators, resulting in either extinction or imminent threat. This is a fascinating aspect of animal behavior in that many bird species have lost their behavioral adaptations for avoiding predators, and there is a great deal of research into conservation of

these threatened or endangered species. While visiting Ian Jamieson who works on the conservation of endangered species at the University of Otago, Bruce presented an invited seminar entitled "Variations on a Theme: Life History Strategies of Water Mites" to the Dept. of Zoology (November 11, 2005).

Our travel within New Zealand was concentrated on parks and natural areas, with two being islands which have been established as predator-free environments for endangered species. Ian had arranged for us to visit with his research technician, on Ulva Island, off the southern tip of South Island, New Zealand (www.doc.govt.nz/conservation/Showcase-Areas/Ulva-Island-Open-Sanctuary.asp). This was a unique opportunity to have an inside view of his research on the New Zealand Robin (pictured on Kit's foot begging for meal worms) and the South Island Saddleback, two bird species that are subjects of intense conservation effort. The populations of New Zealand Robins have been decimated and their distribution has been restricted to isolated pockets of native bush, however the species never reached threatened or endangered status. The Saddleback suffered extreme predation, to the point that the South Island species was reduced to only 35 individuals in 1962 rescued from the only remaining population, and the population on that offshore island was subsequently extirpated the next year by rats. The Saddlebacks have now increased in numbers to around 700 individuals, but their total distribution remains limited to a handful of islands with a cumulative area of about 7 square miles and their status remains as endangered.

While on the North Island near Auckland, we visited Tiritiri Matangai Island (www.tiritirimatangi.org.nz), a predator-free refuge in which there is a concentrated research and conservation effort on threatened species. This is one of the only remaining islands colonized by Stitchbirds, North Island Saddlebacks (pictured to the right), Fernbirds, Brown Teal, and on which there is a reintroduction of the Takahe, a large flightless coot-like bird. If you ever have a chance to visit this island we highly recommend it as a day-trip from Auckland. It has an extensive series of easy hiking trails and many enthusiastic volunteers ready to answer questions about the fauna and flora of the islands.

Field-related experiences in the South Pacific have broadened our perspective, and the biological experiences in a different and largely divergent faunal region can now be shared with Ithaca College students through our teaching. Bruce delivered a seminar entitled "Population Differentiation in Water Mites" to the Ithaca College Biology Dept. on March 16th 2006, of which the first half was a report on our travels. He has already incorporated some of the video footage we took (of a nesting colony of gannets) into his Animal Behavior class taught in the Spring of 2006. We are grateful for the opportunities that were provided to us by Ithaca College through the sabbatical leave program.