Derraik, J. 2009a: Association between habitat size, brushtail possum density, and the mosquito fauna of native forests in the Auckland region, New Zealand. *EcoHealth* 5: 229-238.
Derraik, J. 2009b: The mosquito fauna of phytotelmata in native forest habitats in the Auckland region of New Zealand. *Journal of Vector Ecology* 34: 157-159.
Derraik J.G.; Heath A.C. 2005: Immature Diptera (excluding Culicidae) inhabiting phytotelmata in the Auckland and Wellington regions. *New Zealand Journal of Marine and Freshwater Research* 39: 981-987.
Frank, J.H.; Lounibos, L.P. 2009: Insects and allies associated with bromeliads: a review. *Terrestrial Arthropod Review* 1: 125-153.
Jocque, M.; Kernahan, A.; Nobes, A.; Williams, C.; Field, R. 2010: How effective are non-destructive sampling methods to assess aquatic invertebrate diversity in bromeliads? *Hydrobiologia* 649: 293-300.
Mogi, M. 2004: Phytotelmata: hidden freshwater habitats supporting unique faunas. In C. M. Yule & H. S. Yong (Eds.), Freshwater Invertebrates of the Malaysian Region (pp. 13). Malaysia: Academy of Sciences.
Panizzo, J. 2011: Physical factors influencing macro-invertebrate assemblages in epiphytic bromeliads in the rainforest of Belize. Oslo: Norwegian University of Life Sciences.
Richardson B.A. 1999: The bromeliad microcosm and the assessment of faunal diversity in a neotropical forest. *Biotropica* 31: 321-336.
Sophia M.G.; Carmo B.P; Huszar V.L. 2004: Desmids of phytotelm terrestrial bromeliads from the National Park of "Restinga de Jurubatiba", Southeast Brasil. *Algological Studies* 1141: 99-119.
Torreias, S.R.d.S.; Ferreira-Keppler, R.L. 2011: Macroinvertebrates inhabiting the tank leaf terrestrial and epiphyte bromeliads at Reserva Adolpho Ducke, Manaus, Amazonas. *Brazilian Archives of Biology and Technology* 54: 1193-1202.
Wittman, P.K. 2000: The animal community associated with canopy bromeliads of the lowland Peruvian Amazon rain forest. *Selbyana* 21: 48-51.

The amazing beach foam of Puaotetai Bay, south Piha

Mike Wilcox

Fig. 1. Puaotetai, 'foam bay', at low tide, south Piha. Photo: Mike Wilcox, 20 Sep 2014.

Fig. 2. The Gap, south Piha. Photo: Mike Wilcox, 20 Sep 2014.

During the Bot Soc trip to Piha (Fig. 1) on 20 September 2014 we were much impressed by the abundant white foam washing through The Gap (Fig. 2) and the Taitomo Island "Keyhole" tunnel into Puaotetai Bay. The name Puaotetai actually refers to "the foam that piles up in the bay during stormy weather". According to Wikipedia, sea foam, ocean foam, beach foam, or spume is a type of foam created by the agitation of seawater, particularly when it contains higher concentrations of dissolved organic matter (including proteins, lignins, and lipids) derived from sources such as the breakdown of algal blooms. These compounds can act as surfactants or foaming agents. As the seawater is churned by breaking waves in the surf zone adjacent to the shore, the presence of these surfactants under these turbulent conditions traps air, forming persistent bubbles that stick to each other through surface tension. In this way, foam forms when dissolved organic matter in the sea is churned up. Sea foam results mainly from the enrichment of surface-active substances exuded by (i) phytoplankton blooms, (ii) seaweed or (iii) even terrestrial plants (Schilling & Zessner 2011). The enriched material is whisked into foam by the action of waves and washed ashore (Fig. 3).

When large blooms of algae decay offshore, great amounts of decaying algal matter often wash ashore and algal blooms are one common source of thick sea foams. Vivienne Cassie Cooper (1996) indicates that the main algae involved in our surf beach foam are the centric diatoms *Attheya armatus*, *Asterionellopsis glacialis* and *Aulacodiscus*

kittonii. The same assemblage, but with a predominance of *Aulacodiscus kittonii*, has been recorded from Kawerua, Northland (Sharma 1975). At the end of a bloom in the surf zone on the west coast beaches, mounds of detergent-like foam may accumulate in blanketing clouds. Thus, blooms of surf-zone benthic diatoms are commonly responsible for the sea foam. In particular, *Attheya armatus* has a remarkable ability to accrete sand and clay particles and to form sticky aggregates that foam on the shore (Lewin & Norris 1970; Crawford et al. 1994). This species is not planktonic, but benthic, dwelling in the sand.

Another possible source of the sea foam at Piha is bull kelp (*Durvillaea antarctica*). Mass die-offs of bull kelp occurred on Auckland's west coast in 1995 and 1998. Microscopic examination of the September 2014 Piha foam revealed an abundance of brown, cellular detritus particles which could well have been sloughings from *Durvillaea*. Very few unicellular algae were detected, though the detritus may represent sticky diatom aggregates.

As to the environmental effects of the foam, it was apparent at south Piha during the Bot Soc visit that intertidal sea life was unusually sparse. Foam may well have affected invertebrates (Fig. 4), and also seaweeds, which were noticeably absent over large areas. Toxic effects of water foams have been well documented (Schilling & Zessner 2011).

Fig. 3. Sea foam, Taitomo Island, south Piha. Photo: Mike Wilcox, 20 Sep 2014.

Fig. 4. Sea foam overlying a colony of mussels (*Xenostrobus pulex*) at The Gap, Photo: Josh Salter, 20 Sep 2014.

References

Cassie Cooper, V. 1996: *Microalgae*. Riverside Books, Hamilton.

Crawford, R.M.; Gardner, C.; Medlin, L.K. 1994: The genus *Attheya* I. A description of four new taxa, and the transfer of *Gonioceros septentrionalis* and *G. armatum*. *Diatom Research* 9 (1): 27-51.

Lewin, J.; Norris, R.E. 1970: Surf-zone diatoms of the coasts of Washington and New-Zealand (*Chaetoceros armatum* T.West and *Asterionella* spp.). *Phycologia* 9: 143-149.

Schilling, K.; Zessner, M. 2011: Foam in the aquatic environment. *Water Research* 45: 4355-4366.

Sharma, P. 1975: A note on the algal bloom at Kawerua coast, North Island, New Zealand. *Tane* 21: 55-58.

Wittrockiella salina in Auckland – a green alga at the crossroads

M.D. Wilcox

Introduction

Since 2005 I have been studying the marine algae of Auckland, recording their occurrence, habitats and distribution. The goal is to compile a comprehensive account of Auckland's seaweeds, supported by herbarium specimens and field observations. A large range of habitats has been surveyed covering the main harbours (Waitemata, Mahurangi, Whangateau, Manukau and Kaipara), the west coast shores, the east coast shores, and the Hauraki Gulf Islands. Observations and collections have ranged from subtidal rocky reefs and channels (thanks to the efforts of various SCUBA divers) to the intertidal rocky shores and mudflats.

Of all the 550 or so species of marine algae we have in Auckland waters, one stands out for its specialised high-intertidal brackish habitat which is at the