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Rapid Communication

First record of the caprellid amphipod *Caprella andreae* Mayer, 1890 (Crustacea, Amphipoda, Caprellidae) from New Zealand

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Abstract

On 14 October 2012, two representative individuals (one male and one female) of an unidentified caprellid amphipod were collected from a mussel farm near Opotiki, northern New Zealand. These specimens were identified as *Caprella andreae* Mayer, 1890. This is the first record of this species from New Zealand waters and only the second record from the southern hemisphere. The wider distribution of *C. andreae* around New Zealand and any potential impacts are currently unknown.

Key words: *Caprella andreae*, caprellid amphipod, non-indigenous species, New Zealand, mussel farm

Introduction

Caprellid amphipods are common inhabitants of many marine epibiotic fouling communities and are distinguished by their elongate, stick-like body form and reduction of the abdominal appendages specialized for clinging to surfaces. In New Zealand, the caprellid fauna includes: the cosmopolitan *Caprella equilibra* Say, 1818; *Caprellina longicollis* (Nicollet, 1849), a cold-temperate species occurring widely in southern waters; and *Pseudoprotomima hurleyi* McCain, 1969, an endemic deeper water species (McCain 1969). Another four species (*Caprellinoides mayeri* Pfeffer, 1888, *Caprella manneringi* McCain, 1979, *Pseudaeginella campbellensis* Guerra-García, 2003 and *Caprellaporema subantarctica* Guerra-García, 2003) are confined to New Zealand's subantarctic islands (Guerra-García 2003). The non-indigenous and invasive *Caprella mutica* Schurin, 1935, has also recently become established in southern New Zealand (Willis et al. 2009). This study represents the first record of a second non-indigenous species, *Caprella andreae* Mayer, 1890 from New Zealand waters and discusses its potential impacts on the coastal ecosystem.

Methods

On 14 October 2012, researchers collected biofouling from a sub-surface mussel farm near Opotiki (37°54'12.414"S; 177°13'01.983"E; Figure 1) on the North Island of New Zealand. Samples were collected at a depth of 0 to 16 m as part of a project comparing biofouling between offshore and near-shore sites. For this research, randomly selected 50-cm sections of mussel rope taken from within the farm were cleared of all biota. The biota were transported (chilled) to the laboratory where they were processed and specimens preserved for identification using taxon-appropriate fixatives.

Two individuals of an unusual caprellid (preserved in 80% ethanol) were sent to Marine Invasive Taxonomic Service (MITS). MITS is a centralised identification service funded by the

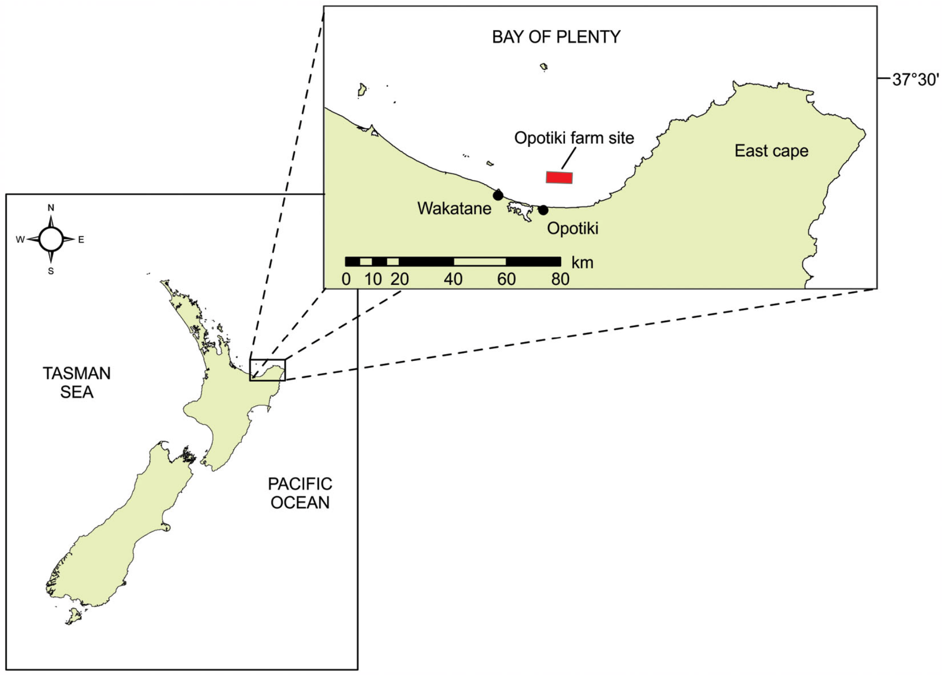

Figure 2. Map of New Zealand showing the location of the mussel farm where specimens of *Caprella andreae* were collected.

New Zealand Ministry for Primary Industries (MPI) (Gould and Ahyong 2008). The caprellids were identified as *Caprella andreae* based on the descriptions of Aoki and Kikuchi (1995) and Sezgín et al. (2009). Both caprellids were deposited in the MITS collection, with catalogue number 70230.

Results

The specimens retained comprised one mature male (16 mm body length) and one mature female (8 mm body length) (excluding antennae and pereopods) (Figure 2). The male was missing left gnathopod 2. The preserved specimens were a relatively uniform light-brown in colour. Caprellids can change their colour to varying degrees to match their background (Lacerda and Masunari 2011).

Diagnostic characters

Cephalon with anteriorly directed short, blunt triangular projection; body otherwise relatively smooth and robust (Figures 3 and 4). Antenna 1 shorter than half of body; peduncle articles 1–2 inflated in male, sparsely setose, longer than flagellum (Figure 3A and B). Antenna 2 longer than peduncle of antenna 1, bearing long dense setae on ventral margin. Mandible without palp.

Gnathopod 1 robust, with palmar margin of propodus setose with pair of proximal grasping spines; palm somewhat straight; dactylus serrate (Figure 3B and D). Gnathopod 2 in male arising at mid-length of pereonite 2; basis shorter than half the length of propodus and half of pereonite 2; palmar region of propodus slightly concave, densely setose with distal rectangular projection and slight proximal spiniform process; dactylus strong, apex pointed and constricted medially with distal end slightly serrate (Figure 3A and C). Gnathopod 2 in female inserted distally on pereonite 2; palm of propodus convex (Figure 4A and B).

Pleura developed on pereonites 3 and 4 in male (Figure 2).

Gills rounded and quite large and inflated in male, maximum diameter subequal in length to pereonite 4 (Figure 3A and E). Gills oval to elliptical and smaller in female (Figure 4C).

Pereopods 3 and 4 absent.

Pereopods 5–7 increasing in length posteriorly; palmar margin of propodus convex bearing short dense setae with two median grasping spines (Figures 3F and 4D).

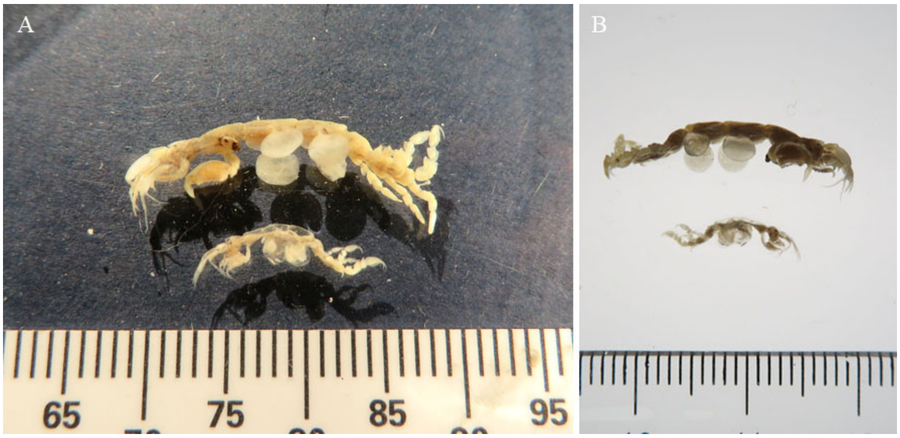

Figure 2. Left (A) and right (B) lateral views of male (upper) and female (lower) *Caprella andreae* collected from a mussel farm near Opotiki, New Zealand. Scale rule marked in mm. Photographs by Chris Woods.

Figure 3. Detail of male *Caprella andreae.* (A) antennae to gills, (B) antennae and gnathopod 1, (C) gnathopod 2, (D) gnathopods 1, (E) gill, (F) pereopods 5-7. Photographs by Chris Woods.

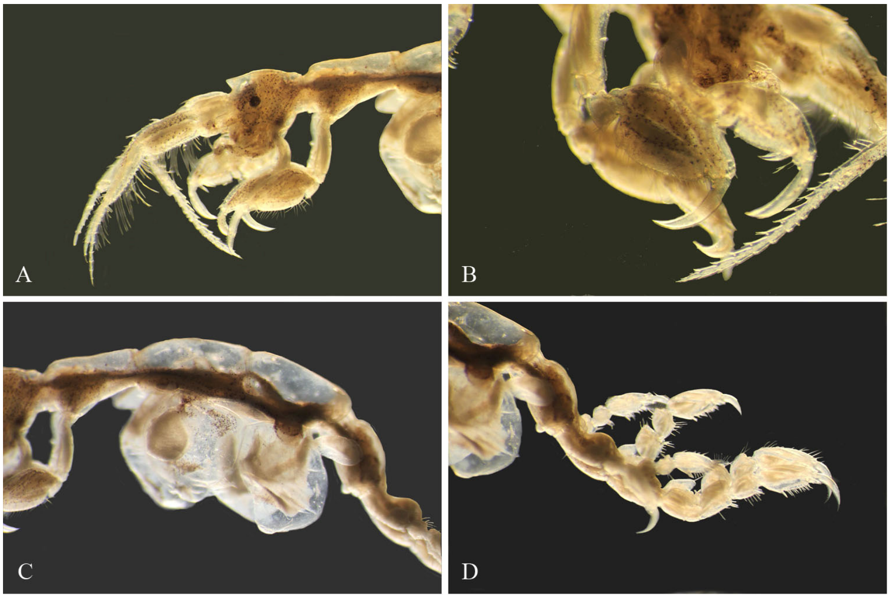

Figure 4. Detail of female *Caprella andreae.* (A) Antennae to brood pouch, (B) gnathopods 1 and 2, (C) brood pouch and gills, (D) pereopods 5-7. Photographs by Chris Woods.

Discussion

Phenotypic variability in morphological characters can cause considerable difficulties in caprellid taxonomy (Guerra-García et al. 2006). *Caprella andreae* closely resembles *C. dilatata* Leach, 1814 and *C. penantis* Kroyer, 1843, which also belong to the old 'acutifrons' complex, but is distinguished by its pereopod morphology (Guerra-García et al. 2006; Cabezas et al. 2013a). A cosmopolitan cryptogenic species that requires further taxonomic resolution (Cabezas et al. 2013b), the known distribution of *Caprella andreae* includes: Northeastern Atlantic; Mediterranean Sea; Hawaii; Sea of Japan; Korean Strait; Atlantic coast of the USA; and Cuba (McCain 1968; Aoki and Kikuchi 1995; Foster et al. 2004; Sezgin et al. 2009). The Australian Museum has one record for *C. andreae* from South Solitary Island, New South Wales (Australian Museum Marine Invertebrate Collection, catalogue No. P.78425), and this represents the only other record for the species in the southern hemisphere.

Caprella andreae is typically found in shallow-water (<60 m depth) habitats such as seagrass, offshore buoys, and finfish farms; is regarded to be an obligate "rafter" on substrates such as driftwood, buoys, and seaweed; and is epibiotic on sea turtles (McCain 1968; Aoki and Kikuchi 1995; Relini et al. 2000; Foster et al. 2004; Sezgin et al. 2009; Cabezas et al. 2013b). Natural dispersal for obligate rafters with direct development, such as *C. andreae* (which appears to be relatively faithful to its floating substrate), is seen as a successful long-distance dispersal mechanism (Cabezas et al. 2013b). In addition to range extensions via rafting on floating natural and artificial substrates, non-indigenous caprellids are frequently transported to new environments in association with vessel biofouling and aquaculture activities (e.g. Buschbaum and Gutow 2005; Ashton et al. 2007; Montelli 2010; Ros and Guerra-García 2012). The Greenshell™ mussel industry in New Zealand does not import stock, as the mussels are indigenous to New Zealand, and there are no transfers of farm infrastructure between New Zealand and other countries. In addition, all aquaculture equipment used for the Opotiki mussel farm was new - no pre-used equipment was brought in from other domestic farms. Thus, the most likely primary vectors for introduction of *C. andreae* to New Zealand are rafting and vessel biofouling.

If international vessel biofouling is the vector responsible for introducing *C. andreae* into New Zealand, then its presence on the Opotiki mussel farm is likely to have resulted from secondary dispersal by rafting or domestic vessel movements, as Opotiki is ~100 km away from the nearest port of first arrival (Port of Tauranga) for international vessels visiting New Zealand. The mussel farm is serviced by boats from Tauranga and Whakatane ports. As Whakatane is a low salinity riverine port it is unlikely to be the source location based on known salinity tolerances of closely-related caprellid species (Takeuchi et al. 2003).

The biology and ecology of this species is not well understood. *Caprella andreae* has a wide latitudinal range in the northern hemisphere (~19º to 54ºN) and has been reported from a variety of habitats and substrates. It may, therefore, be able to inhabit many coastal ecosystems around New Zealand. It is not known what impacts, if any, this species would have on the New Zealand environment. The female *C. andreae* specimen collected was brooding four juveniles of a size (~2 mm in length) suitable for independent living, indicating that local conditions were suitable for reproduction to occur. Given her size, it is likely that the female was brooding more juveniles (see Cabezas et al. 2013b), but these may have been lost at capture or had already left her. Caprellids (which the researchers regarded at the time of collection as being the same species as the two specimens here identified as *C. andreae*) were observed to be abundant at the Opotiki mussel farm to the point where divers' wetsuits gained a "fur-like" appearance from attached caprellids during sampling of mussel line biota. Thus, it appears that *C. andreae* has become successfully established at the Opotiki farm. There is no information on *C. andreae* populations other than on drifting objects or vagile fauna, thus, further investigation of any *C. andreae* population on a fixed structure such as the mussel farm would be desirable for comparison.

Caprellid amphipods are typically detritivores, although some species (mainly those that are widely distributed) are considered to be opportunistic or predatory (Guerra-Garcia and de Figueroa 2009; Alarcon-Ortega et al. 2012). Extrapolating from the work of Guerra-García and de Figueroa (2009), who found them to be exclusively detritivorous, the diet of *C. andreae* could overlap that of *C. equilibra*, but possibly not that of *C. longicollis* (both species are widespread in New Zealand waters). There may also be potential for displacement of ecologically similar fauna by *C. andreae*, as has been demonstrated for other non-indigenous caprellids where they become established (e.g., Shucksmith et al. (2009) for *C. mutica*).

The distribution of *C. andreae* is not known in New Zealand. However, it may not be restricted to the mussel farm where it was first detected, and it may have gone undetected in New Zealand for some time. Currently, the total farm lease area (3800 hectares) of the Opotiki mussel farm is not developed as it is in commercial trial phase for determining farm viability. Aquaculture is identified as a priority in the Bay of Plenty's regional economic development strategy, which also includes greater regional development projects including maritime infrastructure projects that seek to increase commercial and recreational maritime activities in the area. Numerous recreational fishing vessels out of Tauranga and Whakatane exploit the fish-aggregating properties of the mussel farm, often tethering to the farm. Thus, there is real potential for *C. andreae* to further flourish on the Opotiki mussel farm as it develops, and spread from the mussel farm around coastal New Zealand via rafting and increasing vessel traffic.

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