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First record of the alien caprellid amphipod, *Caprella mutica*, for the UK

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A large caprellid amphipod recently discovered at a salmon farm in the Lynne of Lorne near Oban, Scotland, has been identified as *Caprella mutica*, a species indigenous to north-east Asia. The caprellid population appears to have become established in the last four years at the site with a high abundance of animals occurring year round on the farm nets, mooring ropes and on artificial experimental structures located <10 m from the fish farm. This paper briefly describes *C. mutica* found in Scotland. Application of Chapman & Carlton's criteria for determining introduced species suggests that *C. mutica* is non-indigenous to the area.

Caprella mutica is a large caprellid amphipod originally described by Schurin (1935) from Peter the Great Bay, Siberian coast of the Sea of Japan. The species' natural distribution is the coastal waters of the sub-boreal areas of north-east Asia (Arimoto, 1976). The original description for *C. mutica* by Schurin (1935) is reproduced by Arimoto (1976). The description, however, is of a small male with a body length of 12 mm, hence certain distinguishing features, which become evident in larger adult male's are absent, such as the middle projection on gnathopod II which is not fully developed, and a reduced number of flagellum articles on the first antenna. Because of the inefficiencies in the description of large *C. mutica* males, it is relatively easy to mistakenly identify the species as the closely related large Asian species *Caprella acanthogaster*, which is sometimes found co-occurring with *C. mutica* in northern Japan. Thus, Takeuchi (1995) briefly describes the distinctive species' characteristics of *C. mutica* and *C. acanthogaster* collected from northern Japan.

Recently, specimens of a large caprellid amphipod collected from a salmon farm situated in the Lynne of Lorne near Oban, Scotland (56°27.090′N 05°27.733′W) have been identified as *C. mutica*. The first record of their presence at this fish farm was in July 2000, although it is not known how long they have been present at the site. Prior to this, *Caprella mutica* was unrecorded in British waters and is not listed in the species directory of the marine fauna and flora of the British Isles and surrounding seas (Howson & Picton, 1997).

In this study, individuals were collected during July to November 2002 from artificial polypropylene lines (100 cm length, 1.5 cm diameter) positioned approximately 10 m from the salmon farm and suspended vertically in the water column at a depth of 10 m. Regular sampling at the site has recorded abundant populations (55.38 ±26.96 ash-free dry weight $g\,m^{-2}$, July 2002) of the caprellid.

The major distinguishing features of adult male and female *C. mutica* found in Scotland are shown in Figure 1. Live specimens of *C. mutica* are orange to red in colour, and the brood pouch of the female is covered with dark red spots. The body lengths of mature adult specimens were measured using an Olympus SZX9 stereomicroscope with a calibrated eyepiece micrometer and are shown in Table 1. Total body length was measured from the basal part of antenna I on the head to the posterior end of pereonite VII. Adult male specimens were defined in this study as greater than 11 mm in length (instars 7–8). Adult females were defined as greater than 7 mm in length and possessed a fully developed brood pouch (instars 6–7). First instar juveniles (N=5) were also measured in November 2002 and were recorded as attaining 1.32 mm (±0.04 SD) total body length. The first two pereonites are elongated in the male and are densely covered with setae, with numerous small projections present on pereonites III to VII. The second pereonite is the longest of the seven pereonites. The first antennae of males are slightly greater than half the body length and have a flagellum of 20 (±2.35 SD) articles. On the male, gnathopod II arises from the distal end of pereonite II and is also densely setose. In large males, the middle projection is most prominent on the grasping margin of the propodus of gnathopod II. There is no setation on pereonites I and II in the females, which are greatly shortened compared with the male. Gnathopod II is located anteriorly on pereonite II of the female.

Caprella mutica has a history of accidental introductions. In the 1970s and 1980s, this species was discovered at various locations along the Pacific coast of North America (Cohen & Carlton, 1995). The most probable modes of introduction were either on shipments of Japanese oysters or in ballast water. The non-indigenous status of a species can be assessed using Chapman & Carlton's criteria (1994) as follows: (1) previously unknown in local region; (2) post-introduction range expansion; (3) human mechanism of introduction; (4) association with known introductions; (5) association with artificial or altered environments; (6) discontinuous or restricted regional distribution; (7) disjunct global distribution; (8) insufficient life history adaptations for global dispersal; and (9) exotic evolutionary origin. *Caprella mutica* scores positively on attributes 1, 2, 3, 5, 6, 7, 8, and 9. Thus, it is highly likely that *C. mutica* is a non-indigenous species in Scotland and that it has been introduced from its native East Asia. Although the life-history of *C. mutica* has not yet been elucidated, *Caprella* species spend their entire life on the substrate surface due to the absence of a planktonic larval stage; a characteristic that illustrates the difficulty for global dispersal

Figure 1. (A) Adult male and (B) female *Caprella mutica* collected off a mooring buoy at a salmon farm in the Lynne of Lorne, Scotland on 1 October 2003. Total body lengths are 22.43 mm (male) and 9.30 mm (female). (Photograph: T.D. Nickell, SAMS)

Table 1. *Major body dimensions of adult* Caprella mutica *collected from a salmon farm in the Lynne of Lorne, Scotland, during July to November 2002. Average values are shown and the standard deviation is shown in parentheses.*

	Male (N=82)	Female (N=116)
Total body length (mm)	21.9 (6.41)	11.5 (1.56)
Minimum body length (mm)	11.3	7.5
Maximum body length (mm)	35.1	15.6
Flagellum articles (AI)	20.2 (2.35)	19.4 (2.49)

and supports the hypothesis that *C. mutica* was introduced to Scotland from East Asia.

The caprellid amphipod fauna of the UK is relatively depauperate compared with similar areas in the Pacific, with only 22 species recorded (Howson & Picton, 1997). Of these, 11 species belong to the family Caprellidae. The Caprellidae endemic to the UK are smaller and less robust than *C. mutica* and are generally sublittoral, associated with algae, hydroids and Bryozoa. As mentioned above, *C. mutica* can be definitively identified from other species of *Caprella* in the UK by its relative large body size, and the presence of numerous setae and projections on the body somites. To date, *C. mutica* found in Scottish coastal waters have only been observed inhabiting artificial structures, such as mooring ropes, cages, and nets associated with aquaculture activities, and on artificial structures and boat hulls in marinas. Little is known about the biology or ecology of this species, or its potential impact on marine ecosystems where it has been inadvertently introduced.

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