Additional UK records of the non-native prawn *Palaemon macrodactylus* (Crustacea: Decapoda)

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Since the discovery of the non-native prawn Palaemon macrodactylus in the Orwell estuary in December 2001, the species is now reported from other estuaries in the greater Thames area: Stour, Medway and Thames. A specimen from archived samples from the Thames is now the earliest European record (1992) but the original site and date of introduction into Europe and Britain remains unknown. Competition with the native P. longirostris is a possibility and biologists and naturalists are advised to check prawn specimens from current and archived samples collected from any British or European estuary for P. macrodactylus.

Keywords: Crustacea, Decapoda, Caridea, Palaemon macrodactylus, new records, distribution, United Kingdom, alien species

INTRODUCTION

The prawn Palaemon macrodactylus Rathbun, 1902, indigenous to East Asia, has been introduced to many locations outside its native range. Its first appearance as a non-native was from San Francisco Bay (Newman, 1963) and it has since been found in Australia (Buckworth, 1979; Holthuis, 1980; Pollard & Hutchings, 1990; Bruce & Coombes, 1997; Walker & Poore, 2003), Argentina (Spivak et al., 2006), Spain (Cuesta et al., 2004; González-Ortegón et al., 2005), Belgium and the Netherlands (d'Udekem d'Acoz et al., 2005; Faasse, 2005; Tulp, 2006) and Great Britain (Ashelby et al., 2004). The first British records were from beam trawl surveys of the Stour and Orwell estuaries (Essex and Suffolk) in 2002. Palaemon macrodactylus has been described and illustrated, with identification keys, by Ashelby et al. (2004), d'Udekem d'Acoz et al. (2005) and González-Ortegón & Cuesta (2006). Current records are from shallow, estuarine waters.

MATERIALS AND METHODS

Subtidal beam trawl and intertidal trawl sampling continued in the Stour and Orwell estuaries, following the original findings of *Palaemon macrodactylus*, and additional stations with records of the species were noted. It also seemed likely that *P. macrodactylus* could be present in other areas. Staff members from other organizations were contacted for potential specimens. In particular, Renata Kowalik (Zoological Society of London), Kevin O'Connell (Environment Agency), Martin Attrill and Alex Fraser (both University of Plymouth) provided material from the Thames estuary. All material arriving at Unicomarine was carefully checked for *P. macrodactylus*.

RESULTS

Palaemon macrodactylus was found in one sampling station in each of the Stour and Orwell estuaries, in addition to those already reported by Ashelby *et al.* (2004). Most records are from subtidal beam trawls of the mid Orwell estuary; *P. macrodactylus* has been found at Trawl Stations OR03 (1.268°E 51.992°N), OR05 (1.223°E 51.999°N) and OR06 (1.193°E 52.009°N), most regularly at the latter. There are new finds from the intertidal trawl YF23 (1.280°E 51.981°N) and the beam trawl ST06 (1.180°E 51.958°N) from the Orwell and Stour, respectively in addition to the original Stour record from the intertidal trawl YF9 (1.137°E 51.952°N).

Four specimens found in 0.1 m^2 Day grab samples from Rochester, Kent (0.5013°E 51.3918°N and 0.5144°E 51.3856°N), in connection with an impact assessment (Jones & Worsfold, 2004) on 8 September 2004, represent the first records from the Medway estuary.

A large number of specimens was collected by Renata Kowalik from the water intake to Tilbury Power Station, Thames estuary $(0.389^{\circ}E 51.4515^{\circ}N)$ on 29 March 2006. The majority of the palaemonids (169) from the sample were Palaemon macrodactylus, though smaller numbers of P. longirostris H. Milne-Edwards, 1837 and P. serratus (Pennant, 1777) were also present (28 and 7, respectively). Additional specimens from the Thames were found in several one-minute kick net samples from the Environment Agency's routine Thames Tideway samples from Greenwich (0.0096°W 51.484°N), collected on 19 September 2005 and analysed by Unicomarine. Three samples from this location contained 4, 13 and 13 P. macrodactylus, along with 5, 7 and 20 P. longirostris, respectively. Archived samples from West Thurrock Power Station (0.290°E 51.469°N), collected by Martin Attrill on 13 November 1992 (Attrill et al., 1999) were found to contain one P. macrodactylus, in addition to many P. longirostris.

Some of the specimens from the Thames have been deposited in the Oxford University Museum of Natural History



Fig. 1. Current British records of Palaemon macrodactylus.

Tilbury: (OUNMH 2006-01-0039 from **OUNMH** 2006-01-0040 from Greenwich and the 1992 specimen from West Thurrock Power Station: OUNMH 2006-01-041). Material from the Orwell had been deposited at the Nationaal Natuurhistorisch Museum, Leiden (RMNH D 49812) and at the Natural History Museum, London (NHM 2004.2581-2589) after the initial discovery of P. macrodactylus in British waters (Ashelby et al., 2004). Additional Orwell specimens have now been deposited at the Oxford University Museum of Natural History (OUNMH 2005-02-001). Those from the Medway are retained at Unicomarine. The recorded distribution of P. macrodactylus in Britain is shown in Figure 1.

DISCUSSION

The additional British records of *Palaemon macrodactylus* presented here are unsurprising, given the species' wide range on the continental North Sea coast (d'Udekem d'Acoz *et al.*, 2005). The records also demonstrate that the species has a wider range in Britain than previous records showed. It is highly likely that *P. macrodactylus* will eventually be found in most Essex estuaries and possible that it is also already present in other estuaries outside the area.

It should be noted that almost all current British records are from samples originally collected for purposes other than monitoring of aliens and that the records depend upon recognition of *P. macrodactylus* as distinct from other prawns. Samples that are most likely to include *P. macrodactylus* (e.g. sweep nets and trawls) are often processed in the field, where specific identification of prawns may be problematic. The presence of a longitudinal white stripe extending along the centre of the dorsal surface of both the carapace and the abdomen could be a useful feature for recognizing *P. macrodactylus* in the field (d'Udekem d'Acoz *et al.*, 2005). The pattern is not universally present, however, and was absent in some of the smaller specimens from the Orwell; it should be used only for initial field observations, not definitive identifications.

Much emphasis has recently been placed upon specific studies to monitor particular alien species in British waters (e.g. Marlin, 2006). The results presented here demonstrate that monitoring the spread of non-native marine invertebrates could be greatly improved through the maintenance of specimens from routine surveys, which can then be sent to interested parties. Further information on the spread of *P. macrodactylus* could be gained through the study of palaemonid material from estuaries outside the greater Thames region.

Some potential impacts of the introduction were discussed by Ashelby *et al.* (2004) and by González-Ortegón *et al.* (2005). The new records from the tidal Thames presented here show that *P. macrodactylus* can co-occur with *P. longirostris*, a species considered to have some conservation value (Chadd & Extence, 2004), in British estuaries, potentially occupying overlapping ecological niches. It is possible that *P. macrodactylus* has increased at the expense of *P. longirostris* in the Thames estuary but more data would be needed to confirm this and care should be taken not to assume negative impacts of non-native introductions without evidence (Reise *et al.*, 2006). Competition with indigenous species has been reported in Spain (González-Ortegón *et al.*, 2005).

The date of introduction of \vec{P} . macrodactylus to Europe remains unknown, as does the initial site of arrival. However, the 1992 record from the Thames now represents the earliest from Britain and Europe, indicating that the species was present in the area for many years before it was noticed.

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