

Short Communication

Occurrence of the kuruma prawn *Marsupenaeus japonicus* (Spence Bate, 1888) in the Celtic Sea, English Channel, and North-West France

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Abstract

The most northern occurrence in European waters of the Japanese or kuruma prawn *Marsupenaeus* (*Penaeus*) *japonicus* Bate, 1888 is reported from the Celtic Sea. Two specimens were captured during the winter and spring of 2007 from depths ~40 to 60m over mobile sediments by trawling. Other northern European records are reviewed.

Key words: *Marsupenaeus*; Celtic Sea; English Channel; NW France; aquaculture; exotic species

Introduction

Marsupenaeus japonicus (Spence Bate, 1888) is a commercially important penaeid with a native range encompassing the Indo-West Pacific from the Red Sea, E and SE Africa to Korea, Japan, and the Malay Archipelago, and it has also been reported from Fiji (Holthuis 1980). The species is thought to have invaded the eastern Mediterranean through the Suez Canal during the 1920s and since has spread successively along the Levantine coast (Egypt, Israel, Lebanon, Syria, and Turkey) to Greece (Rhodes) and Cyprus (Galil et al. 2002). Indeed, d'Udekem (1999) reported that *M. japonicus* has almost excluded the previously commercially-important native penaeid prawn *Melicertus kerathurus* (Forskål, 1775) from the easternmost part of the Mediterranean.

The kuruma prawn has been farmed in Japan since the late 1950s (Honma 1980) and, during the 1980s, *M. japonicus* was introduced to a number of European countries (Italy, France, Spain and Portugal) for pond aquaculture (<http://www.fao.org/fishery/introp/search/en>). It is

now successfully cultivated in the Central and Western Mediterranean (Galil and Zenetos 2002; Streftaris et al. 2005), and there is some cultivation along the French Atlantic coast (Quero and Vayne 1998); previously as far north as Brest (IFREMER Hatchery, Argenton, NW Brittany; 48.5167°N, 04.7417°W) and the Cherbourg Peninsula (SATMAR Hatchery, Barfleur, Normandy; 49.6711°N, 01.2633°W) (Clark 1990a, b). The species is currently farmed semi-extensively in coastal brackish-water lagoons in the Marennes-Oleron (45.9536°N, 01.2497°W) area (near La Rochelle) and marginally near Guerande, S Brittany (47.3281°N, 02.4333°W). Prawn larvae are obtained from hatcheries located in the Gironde Estuary (Le Petite Canau, Le Port de Saint-Vivien (45.4320°N, 01.0360°W), near Bordeaux and Spain (Andalusia), and reared from May to October to a market weight of 20–40 g. Total French production is ~30 tonnes per year. Occasional captures in the Bay of Biscay (Mazurie 2005) [Figure 1] have been attributed to escapees from these French farms (N. Ranninger, Bord Iascaigh Mhara - BIM, Paris, France pers. comm.).



Figure 1. Japanese or kuruma prawn *Marsupenaeus* (*Penaeus*) *japonicus*, male, 190mm TL, 42g, Bay of Quiberon, Brittany, NW France, 16.05.2005 (Photograph by Joseph Mazurie).

Methods

Specimens of *M. japonicus* have been collected by a variety of Irish-, British (UK)-, and French-registered commercial fishing vessels or by individual recorders. The identification of Irish-caught specimens were verified by Mark Holmes at the National Museum of Ireland (NMI), UK-caught specimens were verified by experts at the Natural History Museum, London (NHM), MBA (Plymouth, UK) and CEFAS (UK), and French records were verified by Joseph Mazurie (IFREMER, France).

Results

On 25 January 2007, a 60 g *Marsupenaeus japonicus*, measuring 210 mm total length (TL), 73 mm carapace length (CL) was captured in a demersal *Nephrops* trawl at a depth of ~40 m over a mixture of mud, sand, and gravel substrate off Galley Head (51°15'N, 09°30'W), Co. Cork. The mean surface seawater temperature in the general area during January 2007 was 11.1°C (range: 10.7-11.6°C; Irish Marine Weather Buoy Network, Station M3, 51.2166°N, 10.5500°W; <http://www.marine.ie>). On 14 April 2007, a second 60 g specimen measuring ~210 mm TL, 78 mm

CL was captured in a *Nephrops* trawl at a depth of ~60 m on similar type of ground on the Smalls Bank (51°25'N, 06°04'W) off Milford Haven, Pembrokeshire, SW Wales (UK). The mean surface seawater temperature in the general area during April 2007 was 11.5°C (range: 9.4-13.3°C; Irish Marine Weather Buoy Network, Station M5, 51.6900°N, 06.7040°W; <http://www.marine.ie>). At depths of 31-80 m the median bottom salinity in the Celtic Sea between October and December 1997-2005 fluctuated from 34.8 to 35.4 and below 80 m salinity remained constant at around 35.5 (Persohn et al. 2007).

The first specimen represented the first known record from Irish waters and the second a northward extension of ~120 km in the NE Atlantic. Both specimens have been deposited in the National Museum of Ireland, Dublin (NMI NH 2007.45 and NMI NH 2009.15).

Discussion

Marsupenaeus japonicus has been recorded on at least 15 occasions from UK, Irish, and NW French Atlantic waters over the last twenty years (Appendix 1, Figure 2); with most (N=12) from the western approaches of the English Channel reported during the last two decades (~57% were recorded during 2007 alone). It is interesting that ~73% (N=11) of the specimens were recorded during the first half of the year (January to June inclusive) and it may mean that *M. japonicus* is more vulnerable to capture during periods of lower water temperatures due to inactivity, perhaps during hibernation, and/or their daytime burrowing behaviour (Abe et al. 2007).

It has been suggested that the *M. japonicus* found in UK waters may have escaped from one or more French farms (Clark 1990a, b). This may also be the case for the two records reported here. Attempts at rearing several species of penaeid prawns (including *M. japonicus*) within enclosed warm-water recirculation units were carried out at Conwy (53.2829°N, 03.8295°W), North Wales during the 1970s (Forster and Wickins 1972; Forster and Beard 1974; Walne 1977; Wickins and Beard 1978; Lee and Wickins 1992). However, these trials were terminated in 1980 (Ian Laing pers. comm.) and could not be considered responsible for the findings since 1989 and 1990 given that the life-span of *M. japonicus* is approximately 2.5 years in the Mediterranean (Tom and Lewinsohn 1983; Galil et al. 2002).

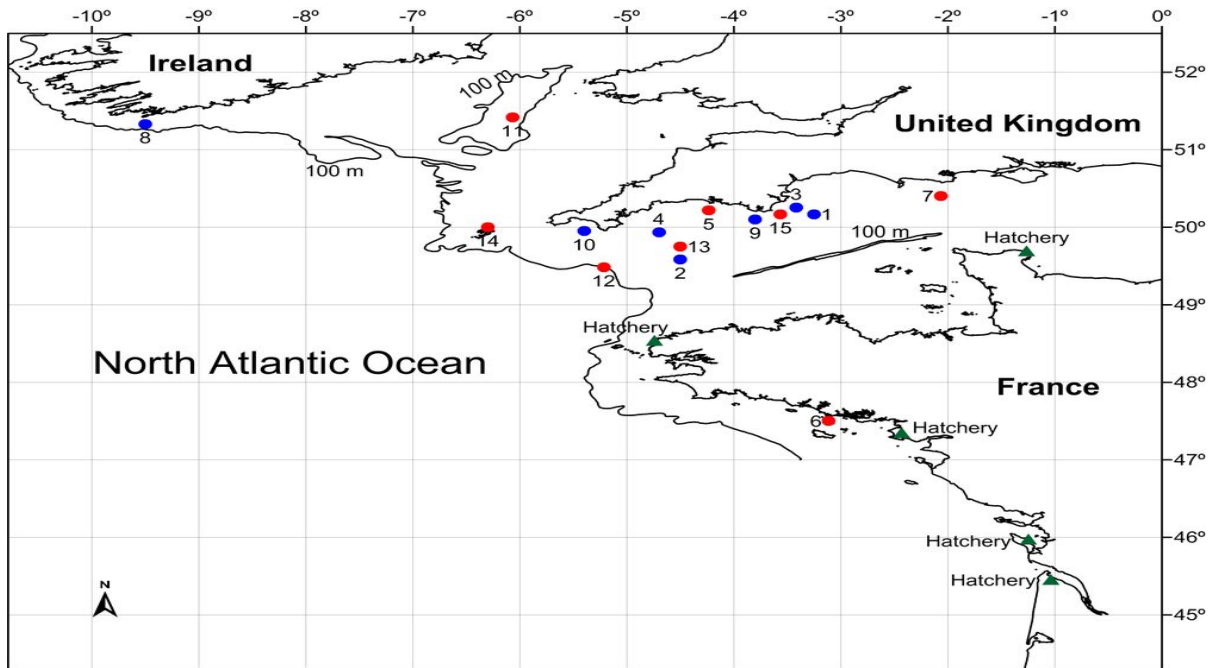


Figure 2. Distribution of Japanese or kuruma prawn *Marsupenaeus (Penaeus) japonicus* records in the Celtic Sea, English Channel and NW France. Specimens captured during the first half of the year (January – June) are indicated by blue circles while specimens captured during the second half of the year (July – December) are indicated by red circles. The location of French kuruma prawn hatcheries are indicated by green triangles.

Marsupenaeus japonicus larvae require water temperatures above 24°C; the rate of growth increases with temperature to 32°C, the optimum being 28-30°C (Galil 2006; Hewitt and Duncan 2001). However, adults can tolerate water temperatures down to 10°C (Lucas and Southgate 2003). Salinities below 27 and above 35 inhibit hatching and induce high mortalities. However, adults are poor osmoregulators compared with the young, preferring salinity > 35 (Galil 2006). Considering their thermal and salinity preferences, it seems more likely that the Irish and UK specimens were derived from the immigration of benthic juveniles and/or adults from southern latitudes rather than by the northward dispersal of free-swimming larval-stages. Increasing sea water temperatures in the area during recent decades (Boelens et al. 2005) may have facilitated their survival.

Although some of the Irish and UK specimens were relatively large (mean TL 185 mm; range 80-240 mm; N=9), there is currently no indication of natural reproduction at this northern edge of its range. Females mature at

>140 mm TL and reproduce from April to November in the south-eastern coast of the Mediterranean (Tom and Lewinsohn 1983). According to Holthuis (1980) the maximum TL (and CL) for males and females is 190 mm (53mm) and 225 mm (66mm), respectively.

All of the specimens recorded to date have been captured in demersal gear, including beam trawls (6), otter trawls (3), *Nephrops* trawls (2), prawn pots (2), and shrimp nets (1) at depths of 1 to 90 m (mean depth 54 m; N=7). According to Galil et al. (2002) and Holthuis (1980), *M. japonicus* is usually found on sandy, or sandy-mud bottoms at depths of 0-90 m, usually <50 m. Although Tom and Lewinsohn (1983) discovered that *M. japonicus* migrate from inshore waters to the open sea during their benthic life cycle on the south-eastern coast of the Mediterranean Sea, no apparent difference was noted in the seasonal distribution of records in the current study (Figure 2). The two pot-captured specimens (record numbers 6 and 13), both taken during September, are likely to have been actively feeding. Further records may be expected.

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Supplementary material

The following supplementary material is available for this article.

Appendix 1. Japanese or kuruma prawn *Marsupenaeus (Penaeus) japonicus* records from the Celtic Sea, English Channel and NW France.

Appendix 1. Japanese or kuruma prawn *Marsupenaeus (Penaeus) japonicus* records from the Celtic Sea, English Channel and NW France.

Record No. (Map ref.)	Record Location and Date	Capture Method, Depth (m)	Total Length/ Carapace Length (mm)	Weight (g)	Vessel (& Skipper)	Recorder	Reference
1	S Devon (50°10'N, 03°15'W), 3 February 1989	beam trawl, 50			MFV <i>Marilyn Jane</i> (Brixham)	Peter Walker	Clark (1990a)
2	S Eddystone Rock, Cornwall (49°35'N, 04°30'W), 7 January 1990	beam trawl, 70			MFV <i>De Vrouw Marie</i> (Brixham)	Paul Clark (NHM)	Clark (1990a)
3	Off Brixham, Devon, (50°23'N, 03°31'W), March 2001	beam trawl				John Hingley	Present study
4	~29km S Falmouth Bay, Cornwall (49°56'N, 04°42'W), Early March 2004	beam trawl			MFV <i>Admiral Grenville</i> (Richard Chamberlain, Eaten)		Present study
5	The Ledges, off Rame Head, SE Cornwall (50°19'N, 04°14'W), 31 August 2004	otter trawl	170		MFV <i>Ella</i> (Robert Hocking)	David Sims (MBA, Plymouth)	Present study
6	Bay of Quiberon, NW Brittany, France (47°48'N, 03°11'W), 16 May 2005	shrimp net, 1	190	42		Joseph Mazurie (Ifremer, France)	Mazurie (2005)
7	Chapman's Pool, St Aldhelm's Head, Dorset (50°35'N, 02°04'W), 22 September 2005	prawn pot	80		MFV <i>Caralan</i> (Alan Lander)	David Sales	Present study
8	Off Galley Head, Co Cork (51°15'N, 09°30'W), 25 January 2007	Nephrops trawl, ~40	210/73	60	MFV <i>Coral Strand</i> S234 (Tadhg O'Regan, Union Hall)	Mark Holmes NMI NH 2007.45	Present study
9	Off Start Point, S Devon (50°06'N, 03°48'W), 25 January 2007	beam trawl, 70	150-170		MFV <i>Harm Johannes</i>	David Putt & Jim Ellis (CEFAS)	J. Ellis & I. Laing, pers. comm.
10	Mount's Bay, Cornwall (49°57'N, 05°24'W), early March 2007				MFV <i>Adella</i>	Robin Turner	Present study
11	Smalls Ground, SW Wales (51°25'N, 06°04'W), 14 April 2007	Nephrops trawl, ~60	210/78	60	MFV <i>Random Harvest III</i> D672 (Gerard Foley, Duncannon)	Mark Holmes NMI NH 2009.15	Present study
12	37km off Lizard Point, Cornwall (49°29'N, 05°13'W), 2 May 2007	otter trawl, 90	190		MFV <i>Crystal Sea</i> (David Stevens)	Jim Helliwell & Robin Turner	Present study
13	SE Lizard Point, Cornwall (49°45'N, 04°30'W), 15 May 2007	beam trawl	240	50	MFV <i>Sapphire</i> (Paul Corin)	Callum Gough (NHM)	Present study
14	St Martin's, Isles of Scilly (50°00'N, 06°18'W), September 2007	prawn pot			MFV <i>Rockhopper</i> (Keith Lowe)	Keith Lowe	Present study
15	Start Bay, Devon (50°16'N, 03°34'N), 25 October 2007	otter trawl	220		MFV <i>Amy R</i> (Martyn Rogers)	Ian Todd	Present study