

Short Communication

Invasive bryozoans in Ireland: first record of *Watersipora subtorquata* (d'Orbigny, 1852) and an extension of the range of *Tricellaria inopinata* d'Hondt and Occhipinti Ambrogi, 1985

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Abstract

Two invasive bryozoan species were discovered at Dun Laoghaire Harbour, Dublin during a bryozoan survey. *Watersipora subtorquata* (d'Orbigny, 1852) and *Tricellaria inopinata* d'Hondt and Occhipinti Ambrogi, 1985 were discovered in Dun Laoghaire marina. Research shows that this is a first record for *W. subtorquata* in Ireland and a range extension for *T. inopinata*. In recent years the numbers of invasive marine species in Ireland has increased. The presence of these species within the marina and not in areas surrounding the marina suggests that they have been spread via shipping activities.

Key words: *Watersipora subtorquata*, *Tricellaria inopinata*, invasive species, Ireland, Dun Laoghaire Harbour

Introduction

The increasing numbers of aquatic invasive species which have been reported around Ireland in recent years may have a detrimental effect on the native biodiversity and ecosystem in which they occur (Carlton and Geller 1993; Caffrey et al 2011). Globally the cost to biodiversity due to the introduction and spread of invasive species can amount to millions of euro per annum (Oreska and Aldridge 2011). While habitat destruction is considered the greatest threat to biodiversity (Fahrig 2003; Klausmeier 1998, Tittensor et al 2010), competition from invasive species constitutes a serious threat to native species (Bax et al. 2003).

Non-native bryozoans are one of the many marine groups which have appeared in Irish waters; they are known to be introduced by both natural dispersal and man-made dispersal through shipping (fouling and ballast water) and fisheries activities (Carlton and Geller 1993). This paper deals with two such bryozoan species, *Watersipora subtorquata* (d'Orbigny, 1852) and *Tricellaria inopinata* d'Hondt and Occhipinti Ambrogi, 1985.

Survey methods

A survey of the bryozoans of Dun Laoghaire Harbour, Co. Dublin (53°30'N, 06°14'W) and the immediate adjacent coastline on the east coast of Ireland was carried out between 21/06/2011 and 04/08/2011. Bryozoa from the harbour were collected by hand from twenty sites, in the first metre of water, at as close to low tide as possible to ensure the recovery of the maximum number of species. In addition seven sites were examined outside the harbour; bryozoans were collected from shallow water from five of these, a number of specimens were recovered while scuba diving and snorkelling. Samples were collected from both artificial and natural substrates, stored initially in sample tubes filled with seawater, and subsequently either air-dried or preserved in 70% alcohol. Bryozoans were examined with a binocular microscope, photographed and identified using the standard taxonomic keys (Hayward and Ryland 1998, 1999) and relevant literature (De Blauwe 2009; Hayward 1985; Hayward and Ryland 1985; Ryland et al 2009).

Results and discussion

In this survey a total of fourteen species were located:

Cyclostomata:

Crisidia cornuta (Linnaeus, 1758)

Crisia eburnea (Linnaeus, 1758)

Tubulipora sp.

Ctenostomata:

Alcyonidium sp.

Flustrellidra hispida (Fabricius, 1780)

Cheilostomata (Anasca):

Membranipora membranacea Linnaeus, 1758

Electra pilosa Linnaeus, 1761

Flustra foliacea (Linnaeus, 1758)

Scrupocellaria scruposa (Linnaeus, 1758)

Tricellaria inopinata d'Hondt & Occhipinti Ambrogi, 1985

Bugula flabellata Thompson, in Gray, 1848

Cheilostomata (Ascophora):

Cryptosula pallasiana Moll, 1803

Celleporella hyalina Linnaeus 1758

Watersipora subtorquata (d'Orbigny, 1852)

All but two taxa have been recorded from Dublin previously (Wyse Jackson 1991). *Watersipora subtorquata* (d'Orbigny, 1852) is herein reported from Ireland for the first time while the Dun Laoghaire Harbour locality for *Tricellaria inopinata* d'Hondt and Occhipinti Ambrogi, 1985 extends its range. These invasive species are discussed more fully below.

Watersipora subtorquata (d'Orbigny, 1852) (Figure 1)

On the 23/06/11 a red encrusting sample of *W. subtorquata* was collected from a permanent floating dock pontoon in Dun Laoghaire Marina. The specimen was identified using the morphological characters and dimensions described in Ryland et al. (2009a) and subsequently this identification was confirmed by Prof. John Ryland (University of Swansea).

In Dun Laoghaire Harbour it was found from one location, on a pontoon of a pleasure craft marina in a shaded area and not in any other locations in the harbour or the surrounding areas. If this is the only harbour where this species is present so far in Dublin a method of removal could be investigated.

Watersipora subtorquata was first recorded from Europe in the Bay of Arcachon, Bordeaux, France by d'Hondt (1984) where it is thought to

have arrived sometime between 1968 and 1973 on the shells of the oyster – *Crassostrea gigas* which were imported from Japan. This invasive bryozoan species was then recorded from 1999 in other locations in Brittany, France such as St-Jacut-de-la-Mer (1999, 2005), Iles Chausey (2002), near Gujan-Mestras (2003), St-Lunaire (2005), Golfe de Morbinan (2006) and Erquy (2008). In 2007 *W. subtorquata* was recorded from the QEII Marina, Guernsey and from both Queen Anne's Battery marina in Plymouth, England and Poole harbour in southeast England (Ryland et al. 2009a).

Ryland et al. (2009a) reported on the current enlarged distribution of a number of *Watersipora* spp. in Western Europe. *Watersipora subtorquata* is a persistently aggressive invasive bryozoan species. This species has been introduced to Australia and New Zealand and has displaced the related species *Watersipora arcuata* by out competing it in many environments. It was discovered for the first time in New Zealand in 1982 on experimental panels in Victoria Wharf, Dunedin and Carey's Bay, Port Chalmers but was not found at the same location in 1977 which indicates the arrival time to be between these dates (Gordon and Mawatari 1992). *W. subtorquata* is an encrusting species coloured dark orange/red in Dublin but has been found in other locations in other darkly pigmented shades. The calcified frontal membrane contains numerous circular pseudopores. This group of bryozoans can be difficult to identify to species level correctly due to the lack of morphological features such as avicularia, spines and ovicells which are used to identify other bryozoan species. This has inevitably caused much confusion and incorrect identification of many of the Watersiporid species. These species are capable of quickly becoming the most prevalent bryozoan in a short time with it becoming the most common bryozoan at St-Jacut-de-la-Mer Beach, Brittany within 5 years of introduction (Ryland et al. 2009a). Species of this kind can quickly cause a near monocultured ecosystem as they compete with other sessile organisms for settlement space on hard substrates. *Watersipora subtorquata* has also been found in the QE II marina in Guernsey, Channel Islands in 2007. The specimen found in the QE II marina, Guernsey was found in very similar conditions to that of the Dun Laoghaire marina samples from this study. In Guernsey *W. subtorquata* was found on a floating pontoon in the shade, away from direct sunlight (Ryland et al. 2009a).

Figure 1. *Watersipora subtorquata* from Dun Laoghaire Harbour, Dublin.

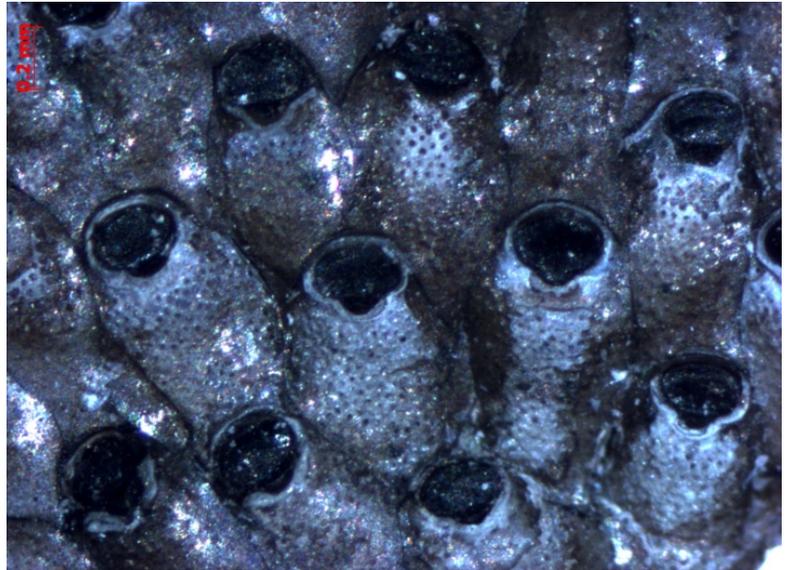
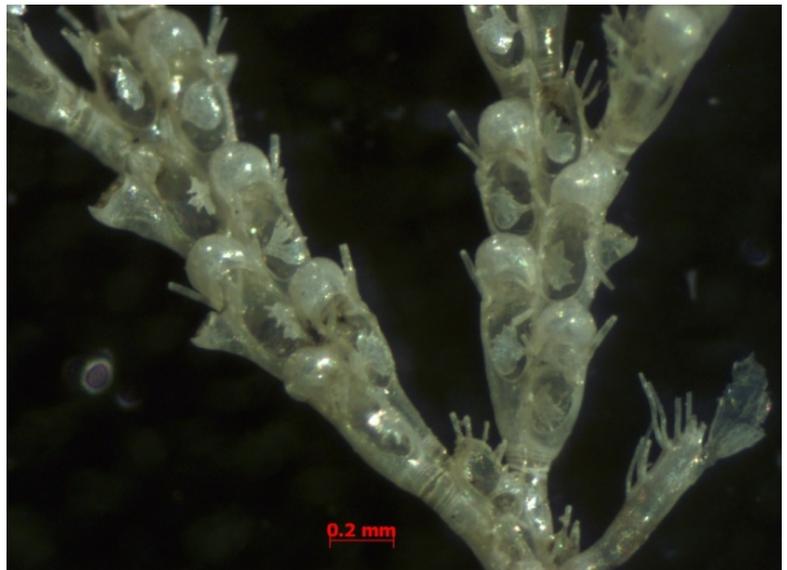


Figure 2. *Tricellaria inopinata*, frontal view with scutum, from Dun Laoghaire Harbour, Dublin.



Tricellaria inopinata d'Hondt and Occhipinti Ambrogi, 1985 (Figure 2)

During this survey specimens of *T. inopinata* were collected on 21/06/11 and 23/06/11 from algae growing in the marina. The sample of *T. inopinata* was identified using De Blauwe (2009) and confirmed by Hans De Blauwe (Bruges). This species was first described in

1985 (d'Hondt and Occhipinti Ambrogi 1985) based on specimens discovered in May 1982 from waterways leading to the central part of the Lagoon of Venice. Earlier surveys had failed to document this species which pointed to it being a recent invasive. It spread rapidly to other parts of the lagoon (Occhipinti Ambrogi 1991) which recently has been found to possess the highest number of marine invasive species in Italy (Occhipinti Ambrogi et al. 2010).

Tricellaria inopinata is thought to have originated in the north Pacific Ocean (Dyrynda et al. 2000; De Blauwe and Faasse 2001) and was then introduced into Australia, New Zealand, Japan, Taiwan, the West Pacific and Venice (Occhipinti Ambrogi and d'Hondt 1994); it was just a matter of years after these introductions that it was reported from locations on the Atlantic coast such as France (Breton and d'Hondt 2005), Belgium, the Netherlands (De Blauwe and Faasse 2001), the northwest of Spain and Portugal in 2004 (Marchini et al. 2007). By 1998 this invasive species was present in central southern England (Dyrynda et al. 2000) and in the Netherlands (De Blauwe and Faasse 2001); it was found to be abundant on both natural and artificial surfaces such as ropes, buoys and other sessile fauna. Most recently it was also reported from Eel Pond, Woods Hole, Massachusetts in September 2010 (Johnson et al. 2012). The location of the first European report of this species was from the Lagoon of Venice (d'Hondt and Occhipinti Ambrogi 1985), which is a busy shipping route with ships crossing to Belgium, the UK and other European countries. For this reason it is quite likely that shipping was the cause of accelerated distribution of *T. inopinata* (Occhipinti Ambrogi 1991) with it being found possibly in every port and harbour in Europe (pers comm. H. De Blauwe 2011). *Tricellaria inopinata* has a number of characteristics which enable it to colonise many location types. This species is a generalist when it comes to habitat type with wide ranges in temperature (Dyrynda et al. 2000) (its location in Venice has a minimum temperature of 2-3°C), salinity (Occhipinti Ambrogi 1991) and levels of sedimentation toleration (De Blauwe and Faasse 2001). This species also has low substrate specificity and can be found on both natural and artificial substrates. Its ability to readily colonise pleasure craft is probably the reason for its introduction to marinas typically providing mooring for such boats (Minchin et al. 2006). In Ireland Ryland (Ryland et al. 2009b) noted the occurrence of this species in Counties Down and Dublin, and at Cork Harbour.

Timing of arrival in Ireland of the two species

During this study *Tricellaria inopinata* and *Watersipora subtorquata* have been collected. Examination of the published literature and museum collections have revealed no previous

records of these species having been collected from Dun Laoghaire (or indeed Ireland, with the exception of the three occurrences of *T. inopinata* noted by Ryland (unpublished)). This suggests they have been introduced relatively recently, possibly on leisure or commercial craft travelling to and from the UK and mainland Europe. Increased shipping, use of leisure craft and the import of the oyster *C. gigas* have been blamed as the cause of spread of non-native invasive species across the coasts of Europe, Britain and Ireland (Watts et al. 1998; Minchin et al. 2006; Ryland et al. 2009a, 2011; Sylvester et al. 2011). Ships and leisure craft can introduce non-native Bryozoa in ballast water and also from external areas of the hull which have become fouled with encrusting species (Carlton and Geller 1993; Watts et al. 1998; Sylvester et al. 2011). Fouling species can then reproduce while the vessel is docked at the port of call (Ruiz and Smith 2005). Over the last decade vessels have become faster which has cut transit times, increasing the chances that any 'hitchhiking' bryozoan colonies will still be able to reproduce when it arrives in port (Sylvester et al. 2011).

Other potential invasive Bryozoa to Dublin

Three alien species of *Bugula* have recently been reported from Britain and Ireland but not from Dun Laoghaire (Ryland et al. 2011). *Bugula neritina* was first reported from Plymouth in 1911 and is now present in locations along the southern North Sea, Ireland and South Scotland (Ryland et al. 2011). This species was recorded from Malahide Marina (25km north of Dun Laoghaire) in January 2006 with the likelihood that it was present in 2005 (Ryland et al. 2011). If this species is already present in other Dublin marinas it is quite likely that it is either already in Dun Laoghaire Harbour but was missed during this survey or that it will be there within the next few years. *Bugula simplex* was recorded in the 1950s from SW England, Belgium and the Netherlands (Ryland et al. 2011) but has not yet been reported from any location in Ireland. A third *Bugula* species, *B. stolonifera* also had very few records with the most recent from ports in Britain and Ireland prior to 1950 (Ryland et al. 2011). This species was reported from Cobh harbour, Cork by Ryland (1960). These three *Bugula* species have the potential to colonise other sites in Ireland and should be, if possible, targeted during invasive species surveys in

marinas and harbours as this is the most likely place for first introduction.

These three species are by no means an exhaustive list of potential species but merely an example of the possibilities. As these species were last recorded in locations in Ireland over 50 years ago this could indicate that they are either unlikely to spread quickly to other localities or that they are present and have not been recorded as of yet. The presence of these species may have been indicated if they were targeted by the marine invasive species survey that was carried out in 2005-2006 (Minchin 2007) which encompassed 4 marinas in Dublin, Malahide, Howth, Poolbeg and Dun Laoghaire as well as many more around the country.

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