Aquatic Invasions (2008) Volume 3, Issue 4: 413-415
doi: http://dx.doi.org/10.3391/ai.2008.3.4.6

Open Access

Short communication

A new record of the introduced seaweed *Undaria pinnatifida* (Laminariales, Phaeophyceae) from the Cantabrian Sea (northern Spain) with comments on its establishment

César Peteiro

Instituto Español de Oceanografía (IEO), Centro Oceanográfico de Santander, Promontorio de San Martin s/n., Apdo. 240, 39080 Santander, Spain

E-mail: peteiro@st.ieo.es

Received: 31 March 2008 / Accepted: 11 September 2008 / Published online: 18 December 2008

Abstract

Undaria pinnatifida was recorded for the third time at the Cantabrian Sea, northern Spain. This record represents the easternmost occurrence of this non-indigenous seaweed along the Spanish coast. Information on the establishment of the species is also provided.

Key words: brown algae, Cantabrian Sea, establishment, introduction vector, non-indigenous species (NIS), Spain, *Undaria pinnatifida*

The Asian kelp *Undaria pinnatifida* (Harvey) Suringar, 1873 (Laminariales, Phaeophyceae) is a non-indigenous aquatic plant species (NIS) which has become established in Europe since 1971 (see review by Inger Wallentinus (ICES 2007) for details). In Spain, *U. pinnatifida* was recorded for the first time in the Atlantic coast of Galicia (northwestern Spain) at Ria de Arousa in 1988. The most likely vector was imported spat of oysters *Crassostrea gigas* (Thunberg, 1973) from France. Since then, it has spread throughout the western Galician coast mainly due to aquaculture activities. Subsequently, it has also been reported in the Cantabrian Sea (northern Spain). The first record was from Gijón harbour, Asturias in 1995, and the most likely vector was on the hulls of fouled pleasure craft from France. It was next found in Cudillero harbour, Asturias in 2001 presumably moved there by shipping (see Figure 1 and references in Annex).

In this paper, a new locality for *Undaria pinnatifida* is reported which represents its third record, extending its eastern distribution limit in the Cantabrian Sea, northern Spain (see Figure 1 and Annex 1). The species was found on 23th June 2007 in the marina located inside Lastres inlet, Colunga (Asturias). No further population was found outside the marina of Lastres during this period. The specimens were found just below the water line attached to floating marina piers, where they formed small and scattered populations. Populations were composed of adult individuals with an average length of 40 cm. Individuals showed blade deterioration and possessed well-developed mature sporophylls, indicating that they were in a senescent phase.

These observations agree with the seasonality observed in the Atlantic and Pacific populations where the macroscopic stage of *U. pinnatifida* appears during winter months, matures during spring and senesces during summer (e.g., see ICES 2007 and references therein). Voucher specimens were deposited in the herbarium MGC-Phyc of Universidad de Málaga (UMA). It is important to point out that *U. pinnatifida* was observed again in the marina of Lastres inlet on February 2008, showing the successful establishment of this species.

The occurrence of *Undaria pinnatifida* in the marina of Lastres cannot be considered as a natural expansion based upon small natural dispersal of this species (Forrest et al. 2000). Fouling of boasts hulls cannot be completely ruled out as the introduction vector, but it seems not to be a feasible source since the marina had only 60 boats with local traffic. Furthermore,

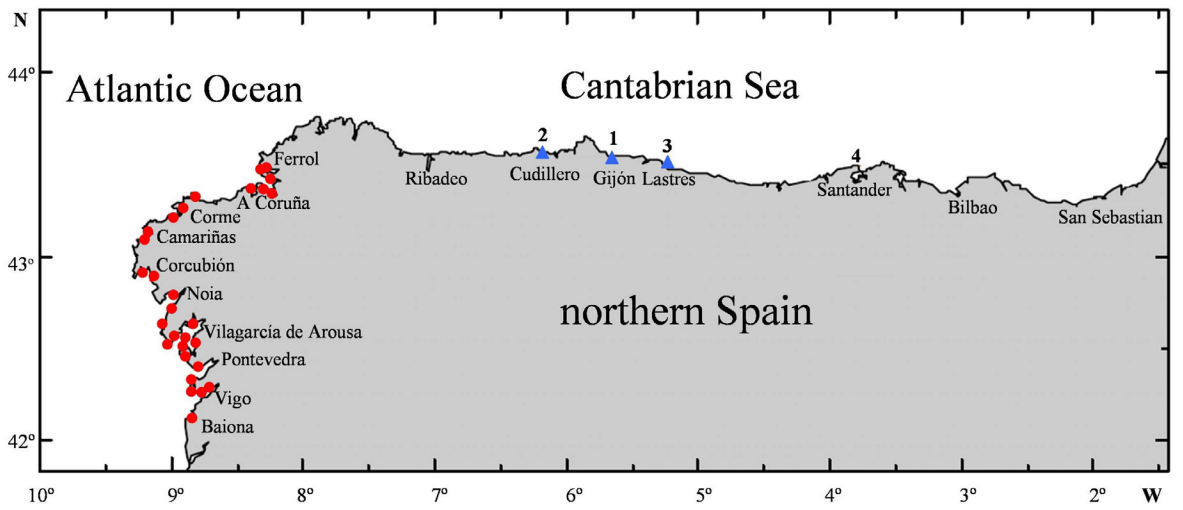

Figure 1. Map of the distribution of *Undaria pinnatifida* in northern Spain (▲, ● record; see Annex 1 for details).

cultivation trials with this species have been carried out in the Lastres inlet by Instituto Español de Oceanografía (IEO) and Centro de Experimentación Pesquera (CEP) since 2003. The marina of Lastres is only a few hundred metres away from the culture farm, what suggests farming as the most likely source of introduction for this species. Another well-known example of escaping from culture farms has been the introduction of *U. pinnatifida* in the Atlantic coast of France by Institut Français de Recherche pour l'Exploitation de la Mer (i.e. IFREMER) (Floc'h et al. 1991).

Of interest is the fact that *Undaria pinnatifida* has also been cultured with success by IEO since the early 2000s in Santander (Cantabria). This culture farm is placed outside the Bay of Santander at a small inlet adjacent to Mataleñas beach (see Figure 1 and Annex 1). At the culture ground the sandy bottom does not allow a settlement of benthic algae, but there is a rocky shore with an abundant algal community just a few metres away from the farm. A survey on these benthic algae has been carried out to search for *U. pinnatifida* during 2007 and 2008. However, this species has not been found although it was especially searched from the low neap tide water line (1.5 m) down to at least −5 m below the lower water line of spring tides (3.5 m). These lower intertidal and upper subtidal zones are the usual habit for this species in the Atlantic coast of Galicia (northwestern Spain) (Cremades et al. 2006). Specific surveys should be conducted to explain why *U. pinnatifida* has not become introduced in the Mataleñas inlet, Santander (Cantabria), opposite to what has happened in the Lastres inlet, Colunga (Asturias).

Acknowledgements

The author is very thankful to J. C. Báez for their contribution to present paper, and to A. López and N. Sánchez for correcting the English style of the paper. I would also like to thank the anonymous reviewer for valuable comments.

References

Cremades J, Freire Ó, Peteiro C (2006) Biología, distribución e integración del alga alóctona *Undaria pinnatifida* (Laminariales, Phaeophyta) en las comunidades bentónicas de las costas de Galicia (NW de la Península Ibérica). *Anales del Jardín Botánico de Madrid* 63: 169-187

Floc´h JY, Pajot R, Wallentinus I (1991) The japanese brown alga *Undaria pinnatifida* on the coast of France and its possible establishment in Europe waters. *Journal du Conseil International pour L' Exploration de la Mer* 47: 379-390

Forrest BM, Brown SN, Taylor MD, Hurd CL, Hay CH (2000) The role of natural dispersal mechanisms in the spread of *Undaria pinnatifida* (Laminariales, Phaeophyceae). *Phycologia* 39: 547-553, http://dx.doi.org/10.2216/i0031-8884-39-6-547.1

ICES (2007) Alien Species Alert: *Undaria pinnatifida* (wakame or Japanese kelp). ICES Cooperative Research Report No. 283, p 36

Pérez-Ruzafa I, Menéndez J, Salinas JM (2002) Mapas de distribución de algas marinas de la Península Ibérica e Islas Baleares. XV. *Undaria pinnatifida* (Harvey) Suringar (Laminariales, Phucophyceae). *Botanica Complutensis* 26: 147-151

Salinas JM, Llera EM, Fuertes C (1996) Nota sobre la presencia de *Undaria pinnatifida* (Harvey) Suringar (Laminariales, Phaeophyta) en Asturias (mar Cantábrico). *Boletín del Instituto Español de Oceanografía* 12: 77-79

Santiago Caamaño J, Durán Neira C, Acuña Castroviejo R (1990) Aparición de *Undaria pinnatifida* en las costas de Galicia (España). Un nuevo caso en la problemática de introducción de especies foráneas. Informes Técnicos, Centro de Investigaciones Submarinas (CIS), Santiago de Compostela, p 43

Annex 1. Records of *Undaria pinnatifida* in the Atlantic Ocean and the Cantabrian Sea, northern Spain.

Map Ref.	Location			Record Date	Pathway	Reference
	Region	Locality, Region	Geographic Coordinates			
●	Atlantic Ocean	from Ferrol to Baiona, Galicia	from 43º28'N–8º18'W to 42º7'N–8º60'W	from 1988 to 2007	aquaculture, shipping	Santiago Camaño et al. 1990; Pérez-Ruzafa et al. 2002; Cremades et al. 2006
1 ▲	Cantabrian Sea	Gijón, Asturias	43º33'N–5º40'W	1995	shipping	Salinas et al. 1996
2 ▲		Cudillero, Asturias	43º34'N–6º9'W	2001	shipping	Pérez-Ruzafa et al. 2002
3 ▲		Lastres, Asturias	43º31'N–5º16'W	2007	farming*	present study
4		Mataleñas, Cantabria	43°29'N–3°47'W	not found	farming**	present study

* *Undaria* was cultured in the inlet of Lastres, Colunga since 2003

** *Undaria* has been cultured in the inlet of Mataleñas, Santander since early 2000s but it have not been found in nature