



A new record of *Styela clava* Herdman, 1882 (Urochordata, Ascidiacea) from the central German Bight

Roland Krone^{*}, Carsten Wanke and Alexander Schröder

Alfred Wegener Institute for Polar and Marine Research, Bürgermeister-Smidt-Straße 20, D-27568 Bremerhaven, Germany, E-mail: Roland.Krone@awi.de

^{*}Corresponding author

Received 12 September 2007; accepted in revised form 29 October 2007

Abstract

The Asian ascidian *Styela clava* was recorded for the first time from the island of Helgoland-Düne, Germany, in July 2007. This is the first record of this species from the only two offshore islands in the SE North Sea.

Key words: *Styela clava*, Asiatic ascidian, new record, German Bight, Helgoland

Styela clava, indigenous to the NW Pacific, has spread to several world regions (Minchin et al. 2006). This is the first account from Helgoland, (Figure 1) a rocky area with harbours on each of its two islands. This solitary ascidian can attain a maximum tunic length of 20 cm and live up to about two years (Davis and Davis 2007, Davis et al. 2007). It becomes mature at a size of 5.0 to 7.5 cm after about ten months and tolerates temperatures from -2 to +23°C and salinity ranging from 20 to 32 psu. The conditions found at Helgoland lie well within this range. Its pelagic larvae have a life expectancy of up to 28 hours and appear from late July to the end of October (Lützen 1999). This ascidian attaches to various natural solid substrates, such as rocks, oyster shells and other firm surfaces including

harbour structures such as sheet pilings, fender beams, and mooring lines. Densities of up to 1000 individuals m⁻² of *S. clava* have been found in sheltered places between 0.3 m above and 25 m below low water spring tide (Minchin et al. 2006, Lützen 1999).

Due to the short planktonic phase of the larvae, they settle close to areas where it has become established. However, they will also settle on the hulls, or within the sea chests, of vessels. Their planktonic stage may also be carried in ship's ballast water over greater distances. Transfers with oyster movements are possible (Locke et al. 2007) and their spread attached to floating debris may also occur. In the past, *S. clava* was not believed to endanger autochthonous communities (Lützen 1999).

However, on the coast of Prince Edward Island, Canada, the extent of the fouling on mussel lines has resulted in a decline in production (Bourque et al. 2007) and it is an important fouling organism even within its native range (Minchin et al. 2006). European populations of *S. clava* have persisted where they have become established (Davis and Davis 2007) and it is listed in the UK Biodiversity Action Plan (1999) as a potential threat to native species.

After the species' first discovery in Europe (Plymouth, Britain) in 1953 (Carlisle 1954) it spread to several other sites in the British North Sea and Atlantic, to the coasts of Ireland, Belgium, The Netherlands, Germany and Denmark, and southward on to Portugal (Davis and Davis 2007, Davis et al. 2007, Minchin et al. 2006).

It was first recorded in German waters from Sylt island in the Wadden Sea in 1997 and from Wilhelmshaven port in 1998 (Lützen 1999). In 1999 it was found at the Wadden Sea island Norderney (Daehne 2000) (Figure 2). Despite its abundance it has not resulted in any economic impact along German coasts (K. Reise, pers. comm.).

In July 2007 two specimens of *S. clava* were collected while diving in the harbour of the "Düne", Helgoland ("Dünenhafen"; 54°11.117'N, 07°54.120'E; 32 psu; 18°C). These were photographed then preserved in a 4% formalin solution. Specimens were found attached to an iron bulkhead 2 m below the low water line in an area where six horizontal transects (each 2.0 m x 15.0 m) were made on the harbour wall. No further specimens were detected in six similar transects on concrete pilings in the sheltered Südhafen or during underwater surveys in the Nord-Osthafen. Helgoland quay walls have been surveyed to the depth of 7m each year for the last ten years and this account reports the first specimens to be found (H.-D. Franke, pers. comm.).

The larger specimen is likely to have been in reproductive condition and both were probably less than one year of age based on information from Lützen (1999).

Helgoland is the only offshore island in the SE North Sea and is situated in the centre of cyclonic water currents (Giménez and Dick 2007). It is difficult to see how *S. clava* could have reached Helgoland by natural means (Davis et al. 2007). However, there are up to five visits daily by ferryboats and many visits from recreational vessels, which sail from "*S. clava* ports"



Figure 1. *Styela clava* specimens from Helgoland (scale bar 10 cm) (R. Krone)



Figure 2. *Styela clava* in the SE North Sea (● record, ○ no record, scale bar 10 km) (K. Jerosch)

around the North Sea in the summer. It is likely that ferryboats or other craft were responsible for the arrival some eight to ten years after its first discovery from the German inshore coast. It is possible that other specimens were present and it is unclear whether all of these would normally survive as it is unlikely there are sufficient numbers present to form a viable population and any small individuals present may be

compromised by predation by snails or fish, as has been observed elsewhere (Osman and Whitlatch 1999). In north-western Europe adults have no known predators (Lützen 1999).

Further surveys for this species in Helgoland could form a useful basis for the study of the colonisation process and of the alien's interactions with the native fauna.

Acknowledgements

We thank the center for scientific diving of the Alfred Wegener Institute for Polar and Marine Research for logistical support.

References

- Bourque D, Davidson J, MacNair NG, Arsenault G, LeBlanc AR, Landry T and Miron G (2007) Reproduction and early life history of an invasive ascidian *Styela clava* Herdman in Prince Edward Island, Canada. *Journal of Experimental Marine Biology and Ecology* 342:78-84
- Carlisle DB (1954) *Styela mammiculata* n. sp., a new species of ascidian from the Plymouth area. *Journal of the Marine Biological Association of the United Kingdom* 33:329-334
- Daehne B, Watermann B, Haase M, Michaelis M, Isensee J and Jakobs R (2000): Alternativen zu TBT - Erprobung von umweltverträglichen Antifoulinganstrichen auf Küstenschiffen im niedersächsischen Wattenmeer. Abschlussbericht Phase II, Anhang, Umweltstiftung WWF Deutschland
- Davis MH and Davis ME (2007) The distribution of *Styela clava* (Tunicata, Ascidiacea) in European waters. *Journal of Experimental Marine Biology and Ecology* 342:182-184
- Davis MH, Lützen J and Davis ME (2007) The spread of *Styela clava* Herdman, 1882 (Tunicata, Ascidiacea) in European waters. *Aquatic Invasions* 2 (4): 378-390
- Giménez L and Dick S (2007) Settlement of shore crab *Carcinus maenas* on a mesotidal open habitat as a function of transport mechanisms. *Marine Ecology Progress Series* 338:159-168
- Locke A, Hanson JM, Ellis KM, Thompson J and Rochette R (2007) Invasion of the southern Gulf of St. Lawrence by the clubbed tunicate (*Styela clava* Herdman): Potential mechanisms for invasions of Prince Edward Island estuaries. *Journal of Experimental Marine Biology and Ecology* 342:69-77
- Lützen J (1999) *Styela clava* Herdman (Urochordata, Ascidiacea), a successful immigrant to North West Europe: ecology, propagation and chronology of spread. *Helgoländer Meeresuntersuchungen* 52:383-391
- Minchin D, Davis MH and Davis ME (2006) Spread of the Asian tunicate *Styela clava* Herdman, 1882 to the east and south-west coasts of Ireland. *Aquatic Invasions* 1(2):91-96
- Osman RW and Whitlatch RB (1999) Ecological interactions of invading ascidians within epifaunal communities of southern New England. In: Pederson J (ed): *Marine bioinvasions: Proceedings of conference, January 1999, Massachusetts Institute of Technology, Cambridge, Massachusetts*, 164-174 2037-2052