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JANUA (DEXIOSPIRA) BRASILLIENSIS (GRUBE (POLYCHAETA: SPIRORBIDAE): A NEW RECORD FROM THE SOUTH-WEST NETHERLANDS

by

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A new record in the distribution of the immigrant spirorbid *Janua (Dexiospira) brasiliensis* is reported from Dutch waters. This is only the second European locality for the serpulid worm, otherwise known from warmer latitudes. *J. (D.) brasiliensis* (Grube) was found associated with the marine angiosperm *Zostera marina* L. and the exotic brown alga *Sargassum muticum* (Yendo) Fensholt, within the protected environment of a saline canal in the south-west Netherlands.

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INTRODUCTION

During routine examination of populations of the invasive brown alga, *Sargassum muticum* (Yendo) Fensholt, within the Eastern Scheldt in 1982, unusually dense settlements of spirorbid tube worms were observed on the thalli of *S. muticum* and the leaves of the seagrass *Zostera marina* L. at

Goessche Sas. Subsequent indentification revealed the worms to be *Janua (Dexiospira) brasiliensis* (Grube). For a description of *J. (D.) brasiliensis* and taxonomic synonyms see Knight-Jones, Knight-Jones & Kawahara, 1975; Knight-Jones *et al.*, 1975. The distribution of *J. (D.) brasiliensis* is widespread, almost cosmopolitan and includes the following localities: Brazil; United States (California, Gulf of Mexico, Mississippi, North Carolina); South and East Africa; Red Sea (Port Sudan); Indian Ocean (Amsterdam Island); Australia; New Zeeland; Pacific Ocean (Marshall Islands); Japan and Britain (Knight-Jones, Knight-Jones & Kawahara, 1975; Knight-Jones *et al.*, 1975; Knight-Jones & Knight-Jones, 1977).

MATERIALS AND METHODS

For taxonomic study the animals were fixed in either 70% alcohol or 4% formalin in seawater neutralised with sodium tetraborate (Borax). The setae were viewed in polyvinyl-lactophenol mounts (after Knight-Jones, 1972). The taxonomic characters which separate *Janua (Dexiospira) brasiliensis* from the closely related *J. (D.) pseudocorrugata* (Bush) include differences in setation and the nature of the calcification of the opercular brood chamber. Not only are there differences in the number of thoracic setae and uncini, but the blades of the collar setae on the convex side of the body of *J. (D.) brasiliensis* are less coarsely serrated and lack cross-striations (Knight-Jones, *et al.*, 1975; Knight-Jones & Knight-Jones, 1977). The observation by these same authors that *J. (D.) brasiliensis* has more thickly calcified walls to the brood chamber demands the use of neutral fixatives to prevent any decalcification of the wall occurring.

Reference material of *J. (D.) brasiliensis* is lodged in collections at both the Department of Biological Sciences, Portsmouth Polytechnic, U.K. (CHT/ATC 0001) and the Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands (RMNH 19501).

DISCUSSION

Prior to the present report the only European record of *Janua (Dexiospira) brasiliensis* was from Portsmouth Harbour, Hampshire, on the south coast of Britain (Knight-Jones *et al.*, 1975; Fig. 1) where it occurs together with another alien spirorbid *Pileolaria (Pileolaria) rosepigmentata* (Uchida) on *Sargassum muticum* and the submerged vertical faces of the floating pontoons

supporting the *S. muticum*. The Dutch populations of *J. (D.) brasiliensis* are almost exclusively confined to Goessche Sas at the seaward end of the canal connecting the port of Goes to the Eastern Scheldt (Fig. 2). The reduced salinity canal (27-29‰) connects into the Eastern Scheldt, some 20 km from the open sea, through sluice gates which are opened several times each day to enable the passage of both commercial and pleasure traffic to take place. Careful investigation of the shores of the Eastern Scheldt, both adjacent to the canal sluice gates and at its junction with the North Sea failed to reveal

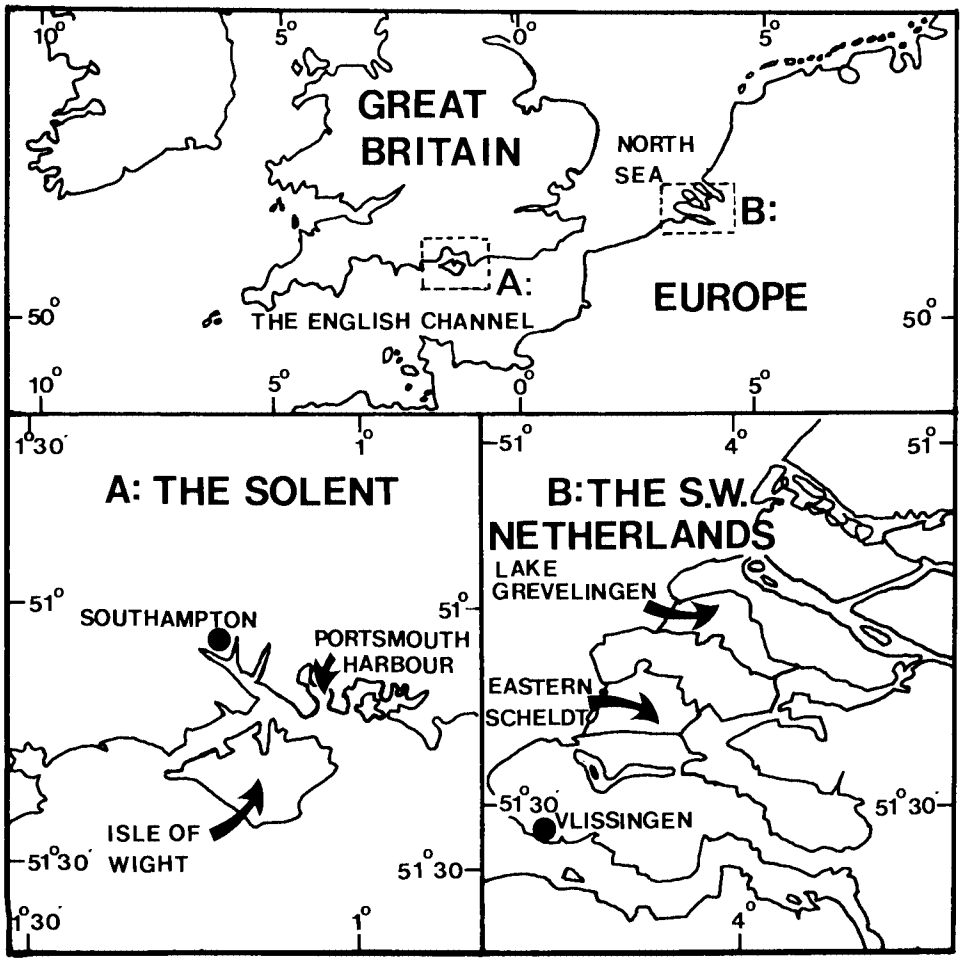

Figure 1. The European distribution of *Janua (Dexiospira) brasiliensis*. Inset A: The Solent, showing the position of Portsmouth Harbour, south coast of Britain. Inset B: The south-west Netherlands showing the position of the Eastern Scheldt.

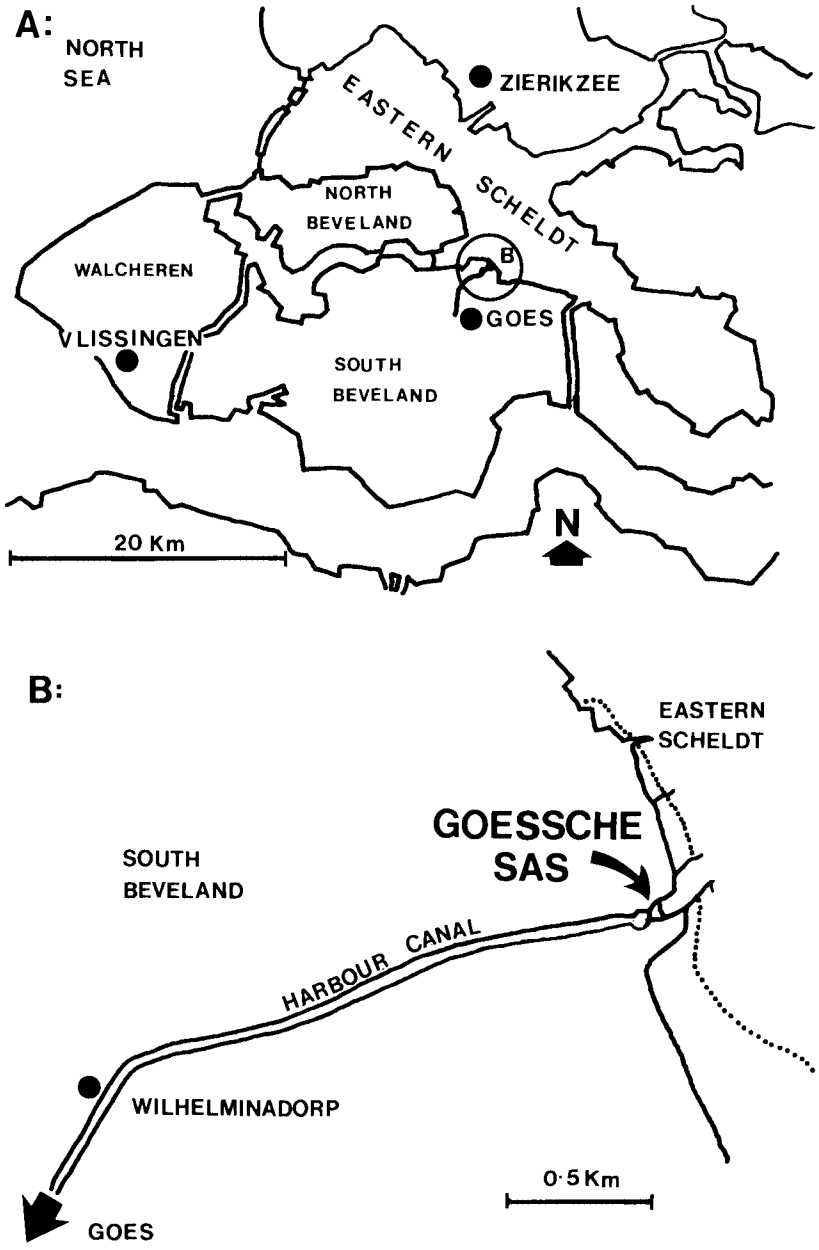

Figure 2. The location of *Janua (Dexiospira) brasiliensis* in the south-west Netherlands. A. The position of the harbour canal (open circle, B) on the island of South Beveland, situated 20 km from the North Sea. B. Goessche Sas and the harbour canal linking Goes to the Eastern Scheldt.

any settlement of *J. (D.) brasiliensis* outside the Goes canal other than two individuals attached to *Fucus serratus* L. within 10 m of the sluice gates at Goessche Sas.

In Portsmouth Harbour *J. (D.) brasiliensis* exhibits a marked settlement preference for *S. muticum* in contrast to the submerged pontoon surfaces (Gray, 1978). At Goessche Sas a similar settlement preference for plant substrata is exhibited when contrasted with the sloping surfaces of the concrete canal walls. Furthermore, at Goessche Sas a distinct preference for *Zostera marina* rather than *S. muticum* is apparent (Critchley & Thorp, in prep.). Heavy settlements of *J. (D.) brasiliensis* were not observed in 1981 although the *S. muticum* population was being monitored (Dr. P.H. Nienhuis, Mr. K. Verschuure pers. comm.). It remains a possibility, however, that sparse settlements of the spirorbid have been overlooked.

In a recent inventory of the aquatic plants and animals of the Eastern Scheldt (Elgershuisen, Bakker and Nienhuis, 1979) the only spirorbids recorded were *Janua (Janua) pagenstecheri* (Quatrefages) (as *Spirorbis pagenstecheri)* and *Spirorbis* sp. While it is possible for *J. (D.) brasiliensis* and *J. (D.) pseudocorrugata* to be confused if opercular characters only are relied upon, the form of the brooding chamber in these two species is sufficiently different from other European species to demand attention. That neither species was recorded by Elgershuisen *et al.,* (1979) suggests that the introduction of *J. (D.) brasiliensis* into the Eastern Scheldt has been very recent.

Knight-Jones and Knight-Jones (1980) reported that most spirorbids rely on passive means for dispersal as they only have a brief, motile larval stage. Knight-Jones *et al.,* (1975) considered the arrival of *J. (D.) brasiliensis* on British shores by means of current drift; whilst this method of dispersal is not impossible they suggested that the most likely agency of introduction was international shipping. Whereas the spread of *J. (D.) brasiliensis* within European waters by current drift is again possible, the disjunct and isolated nature of the present population argues against this manner of dispersal. Crisp (1958), in discussing the spread of the barnacle *Elminius modestus* (Darwin) in European waters, suggested two methods whereby this could be accomplished: marginal dispersal where the limits of the population are gradually extended by normal larval dissemination, and remote dispersal where agencies other than natural means operate. The latter method could operate by means of the release of larvae from mature adults carried on ships' hulls, transplanted shellfish stocks, etc. at sites too far removed from established populations to be accounted for by planktonic larval dispersal.

Goes is a popular port for yachts of British origin and the role of ship movements as a vector of dispersal cannot be ignored; *J. (D.) brasiliensis*

adults being carried either as fouling organisms attached to ships' hulls or taken on board, together with ballast, attached to flotsam. The close association between *J. (D.) brasiliensis* and *S. muticum* both in Portsmouth Harbour and the Goes canal, however, suggests that drifting fragments of *S. muticum* could also be a very likely agency for the introduction of *J. (D.) brasiliensis* into Dutch waters.

As part of the natural senescence cycle of *S. muticum*, reproductively mature fragments of primary laterals break off and may float for considerable periods (Norton, 1976; Farnham *et al.*, 1981; Deysher & Norton, 1982). Any attached spirorbids could drift in tandem and release larvae at new sites. The occurrence of large quantities of fertile drift of *S. muticum* is not unknown on the Dutch coastline (Prud'homme van Reine, 1977a, b; Prud'homme van Reine & Nienhuis, 1982) but, following the studies of Lucas (1950) much of this drift material is considered to have originated from the extensive French populations of *S. muticum* (Critchley, Farnham & Morrell, 1983). As Portsmouth Harbour remains the only other known European locality where *J. (D.) brasiliensis* occurs, it follows that any drift of *S. muticum* with attached *J. (D.) brasiliensis* probably has its origin there. The apparent absence of *J. (D.) brasiliensis* from other sites of established *S. muticum* on both the British and French coasts between Portsmouth and the Eastern Scheldt, however, may be a reflection on the lack of careful investigation. The population explosion of *J. (D.) brasiliensis* at Goessche Sas, far removed from Portsmouth Harbour, parallels the similar population explosion of the serpulid *Hydroides ezoensis* Okuda within Southampton Water (Thorp & Pyne, in press) following its introduction onto the Atlantic coast of France with imported oysters (*Crassostrea gigas,* Thunberg) from Japan (Gruet, Heral & Robert, 1976; Zibrowius, 1978).

The absence of *Pileolaria (Pileolaria) rosepigmentata* from Goessche Sas, despite its association with both *J. (D.) brasiliensis* and *S. muticum* in Portsmouth Harbour, is not difficult to explain. Gray (1978) reported that *P. (P.) rosepigmentata* exhibits a much greater settlement preference for the pontoons which support the *S. muticum* plants. This observation would be expected from the spirorbid's substratum preference for rock and stones in its native Japanese waters (Uchida, 1971). While it is possible that *P. (P.) rosepigmentata* could be disseminated by means of the small numbers that attach to *S. muticum* it is much less likely than for *J. (D.) brasiliensis*. Knight-Jones *et al.* (1975) suggested that *J. (D.) brasiliensis, P. (P.) rosepigmentata* and *S. muticum* could have been introduced into Portsmouth Harbour separately. While *S. muticum* most probably arrived as floating fertile fragments from established populations in France, introduced with oyster im-

ports (Farnham, 1980), the two spirorbids most probably arrived by way of the agency of international shipping. Although it seems most likely that *J. (D.) brasiliensis* reached Dutch waters in close association with *S. muticum* it cannot be discounted that *J. (D.) brasiliensis* arrived independently attached to the hulls of private or commercial craft.

CONCLUSIONS

The European presence of two geographically isolated populations of *J. (D.) brasiliensis* would seem to suggest a much wider, at present undetected, dissemination of this immigrant spirorbid. The fact that only extraordinarily heavy settlements of *J. (D.) brasiliensis* within a *Sargassum* study site prompted this investigation serves to emphasise that the initial stages of the introduction of exotic species are often overlooked (Farnham, 1980). Zibrowius & Thorp (in press) have emphasized the ecological and economic significance of serpulid and spirorbid introductions, and Knight-Jones, *et al.*, (1975) published in the interest of stimulating further studies into exotic but otherwise innocuous spirorbids. It is hoped that this further record may increase an awareness that *J. (D.) brasiliensis* is extending its European range.

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