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# Records of five bryozoan species from offshore gas platforms rare for the Dutch North Sea

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**Abstract**

This study reports on bryozoan species collected at three offshore gas platforms in the Dutch part of the North Sea. Four out of thirteen observed species are considered as rare in the Netherlands, whereas *Cribrilina punctata* is a new species for Dutch waters.

**Keywords:** Bryozoa, North Sea, Netherlands, Offshore, Gas platform, *Cribrilina punctata*, *Arachnidium fibrosum*, *Electra monostachys*, *Scruparia ambigua*, *Scruparia chelata*

## Introduction

The Dutch continental shelf of the North Sea largely consists of sandy bottoms. Rocky substrates are only present on the Cleaver Bank (Schrieken et al. 2013), the Borkum Reef Grounds (Coolen et al. 2015) and the Texel Rough (personal observation J.W.P. Coolen). Furthermore, artificial hard substrates are formed by shipwrecks (Lengkeek et al. 2013a), wind farms (Lindeboom et al. 2011; Vanagt et al. 2013) and gas platforms (Van Buuren 1984; Van der Stap et al. 2015).

Bryozoa grow on various hard substrates such as rocks, shells, wood, and plastic material, but also on macroalgae and Hydrozoa (De Blauwe 2009). Previous observations of Bryozoa in the Netherlands concentrated on southern coastal areas (Faasse and De Blauwe 2004). Faasse et al. (2013) recently reviewed the list of known Dutch Bryozoa which now comprises a total of 58 marine and estuarine species. They excluded specimens found on beached material, but included fauna from several recent offshore surveys of the Cleaver Bank (Van Moorsel 2003), the Princess Amalia Wind Farm (PAWF; Vanagt et al. 2013) and a shipwreck on the sandy Dogger Bank (Schrieken et al. 2013).

This article reports on the finding of 13 bryozoan species on three offshore gas platform in the Dutch part of the North Sea. Of these species, *Cribrilina punctata* is new to the Dutch fauna, and four species are considered rare to the Dutch waters.

## Materials and methods

The Bryozoa described here were observed during inventories of the fouling community of three stationary offshore gas platforms. The platforms differed in their distance from the Dutch shore, maximum depth and year of construction, and were sampled at different times during 2014 and 2015 (Table 1). Macrofauna samples were taken from the platform foundation by a commercial diver using a putty knife to detach the organisms and a surface supplied airlift sampler to collect them. In the airlift, all organisms were sieved over a 500 μm mesh. Further details of the airlift sampler and collection methods are described in Coolen et al. (2015). Triplicate samples were taken at 5 m depth intervals between 0 and 25 m and from the scour protection rocks on the bottom. After collection samples were fixed in a 6 % formalin solution buffered with 2 g $L^{-1}$ borax. Following transport to the lab (between three and five days after collection) all organisms were conserved in 70 % ethanol until sorted by major taxonomic units and identified. All

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**Table 1** Three offshore gas platforms were visited during several inventories in 2014 and 2015. The platforms differed in their distance from shore, depth at the seabed and year of construction

| Platform | Location | Distance from shore (km) | Maximum depth (m) | Year of construction | Sampling date |
|---|---|---|---|---|---|
| L10-G | 53°29′N, 4°11′E | 70 | 26 | 1984 | June 2014 |
| L10-A | 53°24′N, 4°12′E | 48 | 27 | 1972 | April and June 2014, October 2015 |
| L15-A | 53°19′N, 4°49′E | 5 | 21 | 1992 | June 2014 |

shells of *Mytilus edulis*, other biogenic hard substrates and the scour protection rocks were inspected for the presence of Bryozoa. Any detached colonies were identified as well.

For identification Hayward and Ryland (1998), Hayward and Ryland (1999) and De Blauwe (2009) were consulted. The World Register of Marine Species (WoRMS Editorial Board 2015) was used as a taxonomic standard. Specimens were observed using a Zeiss SteREO Discovery.V8 stereomicroscope. When a specimen was covered by a thin layer of organic material which impeded observing the zooids, it was immersed in bleach for half an hour, then rinsed and dried in order to reveal the calcified skeleton.

## Results

In 35 samples, a total of 13 species of Bryozoa were observed (Table 2). In ten samples no Bryozoa were encountered. Here, the findings of four species rare to Dutch waters and one new species for the Netherlands are described in more detail.

Five young colonies of the cheilostomatous *Cribrilina punctata* were found on three scour protection rocks of platform L10-G consisting of 10 to approximately 30 non-ovicellate zooids (Fig. 1). A sub-oral bar with acute median mucro and 3–6 oral spines were present.

The ctenostomatous *Arachnidium fibrosum* was encountered in two samples taken from the foundation of platform L10-G at 10 m depth. Both colonies were attached to *Mytilus edulis*. Another colony of *A. fibrosum* was observed on a scour protection rock collected at the bottom of platform L15-A. Zooids were arranged in rows, and the colonies were sometimes branched.

A colony of *Electra monostachys* comprising several dozens of zooids was found on one of the scour protection rocks from platform L10-G. De Blauwe (2009)

**Table 2** Bryozoa species encountered on the platform legs and/or the scour protection rocks at the bottom of the platforms L10-G, L10-A and L15-A

| | Platform legs | | Scour protection rocks | |
|---|---|---|---|---|
| Species | L10-G | L10-A | L10-G | L15-A |
| *Alcyonidioides mytili* | x | x | | x |
| *Arachnidium fibrosum*[a] | x | x | | x |
| *Aspidelectra melolontha* | | | x | |
| *Callopora dumerilii* | x | x | x | |
| *Celleporella hyalina* | x | x | | |
| *Conopeum reticulum* | x | x | x | x |
| *Cribrilina punctata*[a] | | | x | |
| *Electra monostachys*[a] | | | x | |
| *Electra pilosa* | x | x | x | x |
| *Microporella ciliata* | x | | | |
| *Schizomavella linearis* | x | x | | x |
| *Scruparia ambigua*[a] | x | x | | |
| *Scruparia chelata*[a] | x | x | | |

[a]indicates species discussed in the article

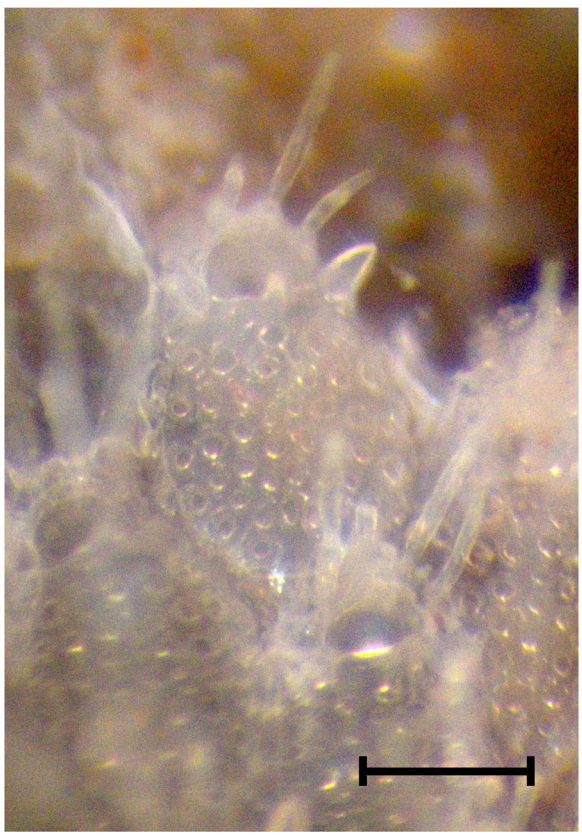

**Fig. 1** *Cribrilina punctata* zooids as found on a scour protection rock at the bottom of the platform. Scale bar: 0.2 mm

described a radiating crust as being characteristic for the species; this shape was also observed here. In addition to the relatively long proximal spine and pair of shorter distally located spines, almost all zooids still had their 4–6 pairs of shorter spines located around the frontal membrane.

Two members of the genus *Scruparia* were encountered. *Scruparia ambigua* was observed in one sample attached to *M. edulis* collected at 10 m depth at platform L10-G, but detached specimens were found as well. Several samples from platform L10-A taken between 5 and 15 m depth also contained a number of *S. ambigua* colonies. *Scruparia chelata* was observed at different depths (5–25 m) on platforms L10-G and L10-A, both as detached specimens and attached to *M. edulis*.

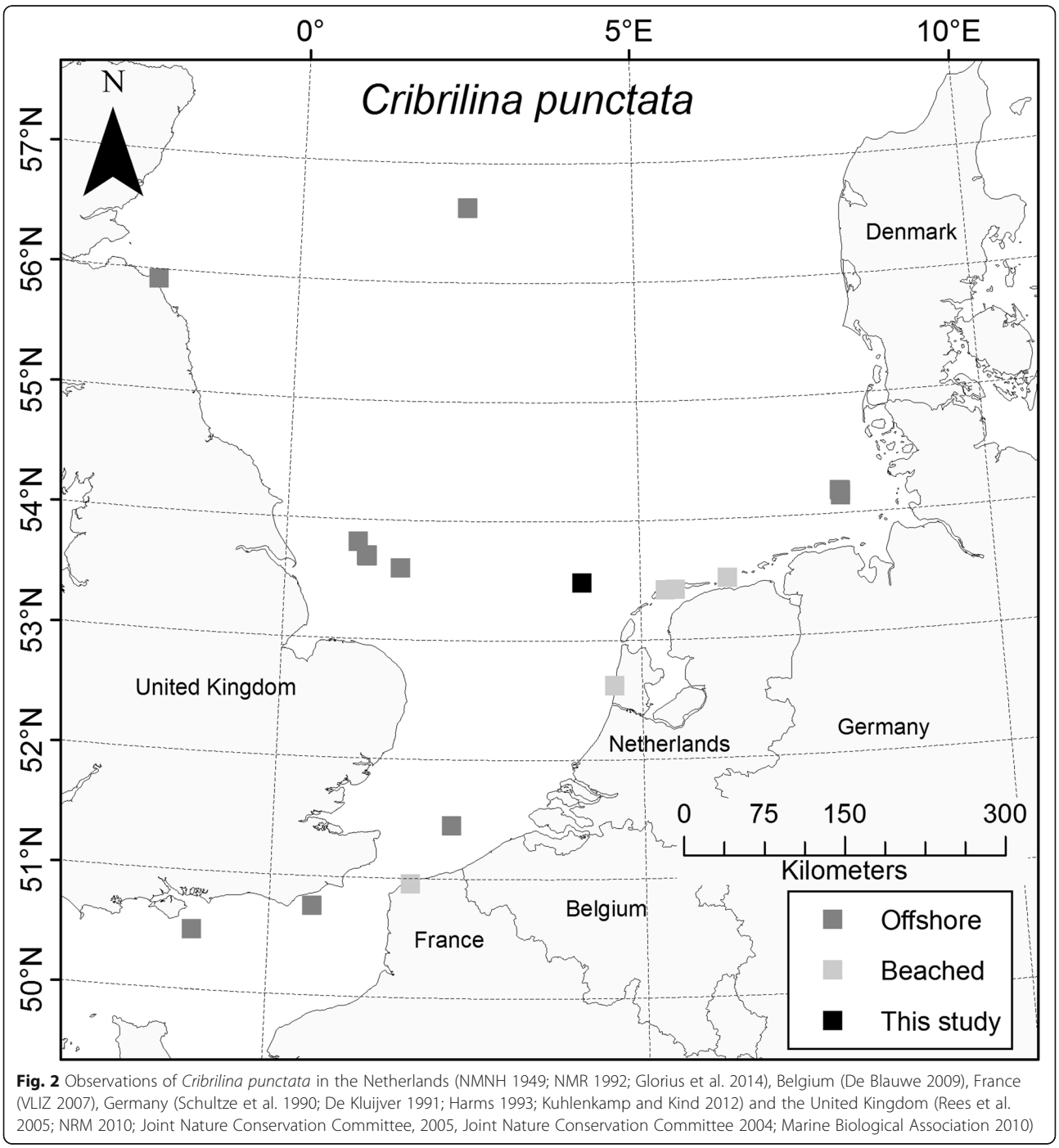


**Fig. 2** Observations of *Cribrilina punctata* in the Netherlands (NMNH 1949; NMR 1992; Glorius et al. 2014), Belgium (De Blauwe 2009), France (VLIZ 2007), Germany (Schultze et al. 1990; De Kluijver 1991; Harms 1993; Kuhlenkamp and Kind 2012) and the United Kingdom (Rees et al. 2005; NRM 2010; Joint Nature Conservation Committee, 2005, Joint Nature Conservation Committee 2004; Marine Biological Association 2010)

## Discussion

### Cribrilina punctata

*Cribrilina punctata* is considered a rare species for the southern North Sea with only observations of beached specimens in the Netherlands on bivalve shells (NMNH; NMNH 1949), wood (NMR 1992) and plastic (De Ruijter 2014). Figure 2 shows all observations of *C. punctata* in the southern North Sea. The authors here now report the first observation of *C. punctata* attached to a fixed object on the Dutch continental shelf.

*Cribrilina punctata* is easily confused with *Collarina balzaci*. According to Faasse and De Blauwe (2004) several observations of *C. punctata* had been wrongly identified in the past leading to the exclusion of *C. punctata* from the list of Dutch fauna. Moreover, Faasse et al. (2013) excluded specimens found on beached material.

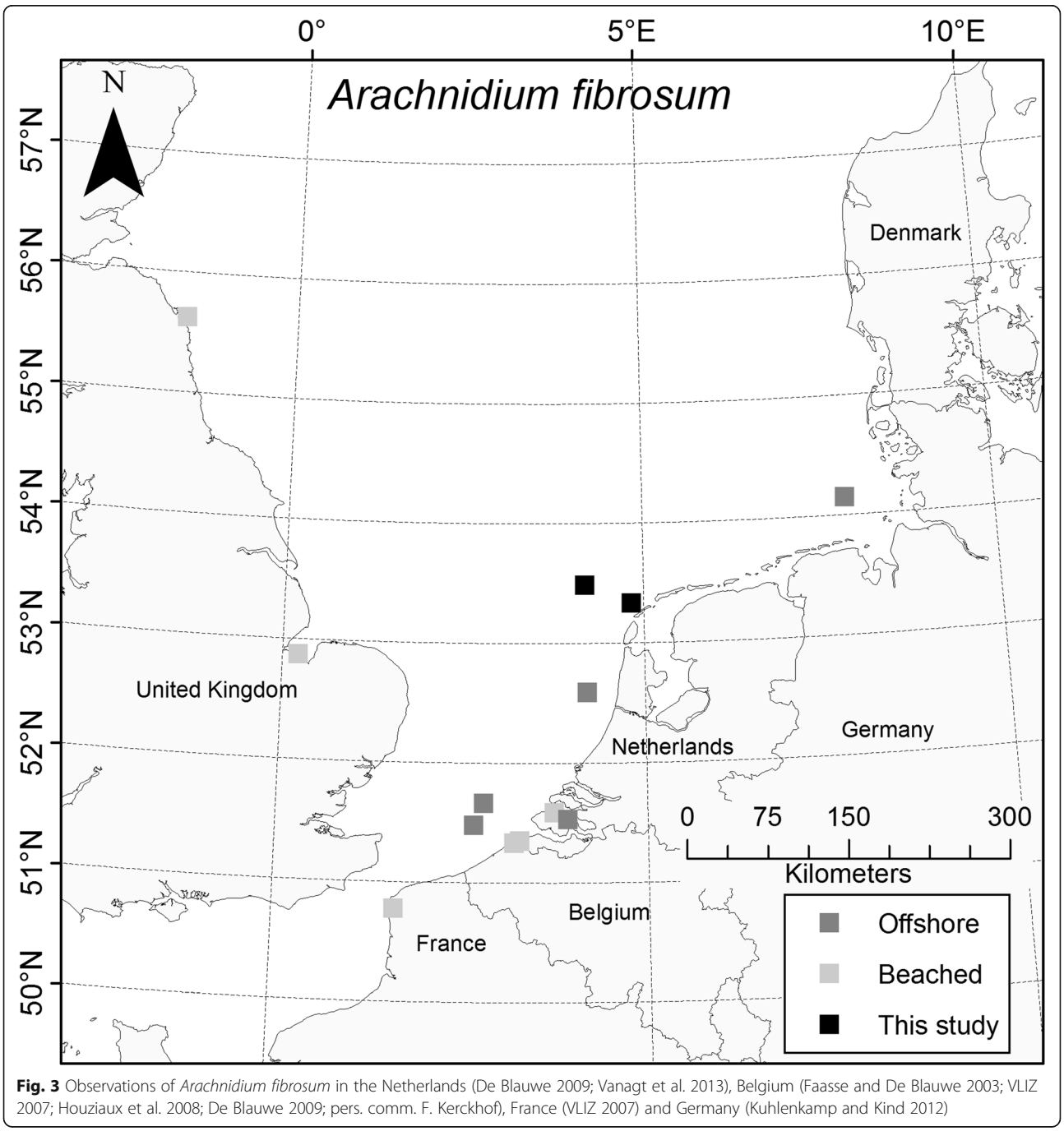


**Fig. 3** Observations of *Arachnidium fibrosum* in the Netherlands (De Blauwe 2009; Vanagt et al. 2013), Belgium (Faasse and De Blauwe 2003; VLIZ 2007; Houziaux et al. 2008; De Blauwe 2009; pers. comm. F. Kerckhof), France (VLIZ 2007) and Germany (Kuhlenkamp and Kind 2012)

### Arachnidium fibrosum

In the Netherlands *Arachnidium fibrosum* had been observed before on empty shells in southern coastal waters of the North Sea at 5–10 m depth (De Blauwe 2009) and at the PAWF at 5, 10 and 17 m depth (Vanagt et al. 2013). This corresponds to our finding of the species at 10 m depth on *Mytilus edulis*. However, Vanagt et al. (2013) did not encounter the species on scour protection rocks at the bottom of the wind mill monopiles in contrast to our observation of *A. fibrosum* attached to rocks collected at 21 m and other observations on rocks from the Belgian Hinder Banks (Houziaux et al. 2008; De Blauwe 2009).

Both beached and offshore observations of *A. fibrosum* from the North Sea are relatively uncommon (Fig. 3) (Hayward 1985; De Blauwe 2009). Indeed, Faasse and De

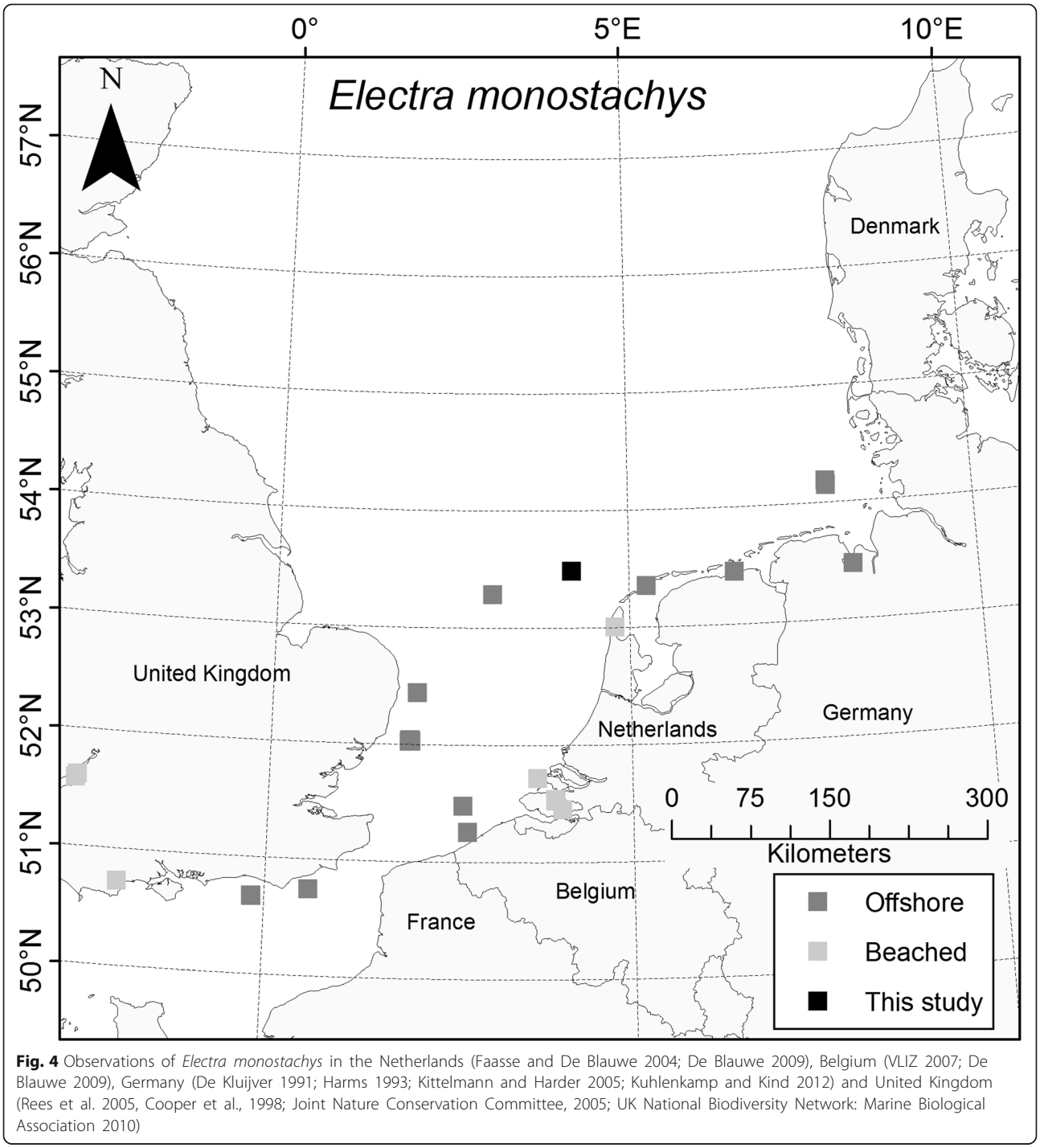


**Fig. 4** Observations of *Electra monostachys* in the Netherlands (Faasse and De Blauwe 2004; De Blauwe 2009), Belgium (VLIZ 2007; De Blauwe 2009), Germany (De Kluijver 1991; Harms 1993; Kittelmann and Harder 2005; Kuhlenkamp and Kind 2012) and United Kingdom (Rees et al. 2005, Cooper et al., 1998; Joint Nature Conservation Committee, 2005; UK National Biodiversity Network: Marine Biological Association 2010)

Blauwe (2004) emphasize the capability of *A. fibrosum* zooids to adhere sand and detritus to themselves, making it difficult to observe and identify the species. They suggest this would partly explain the low amount of observations in general. The species often stays unnoticed in preserved material, especially if *Jassa* spp. (Arthropoda, Malacostraca) tubes are present. *Arachnidium fibrosum* was extremely common on reef balls deployed in 2013 on the Bligh Bank and studied in 2014 (pers. comm. F. Kerckhof). Research on living material would facilitate the discovery and identification of this species in future research.

#### *Electra monostachys*

*Electra monostachys* has been observed several times on beached material along the Dutch coast and on shell

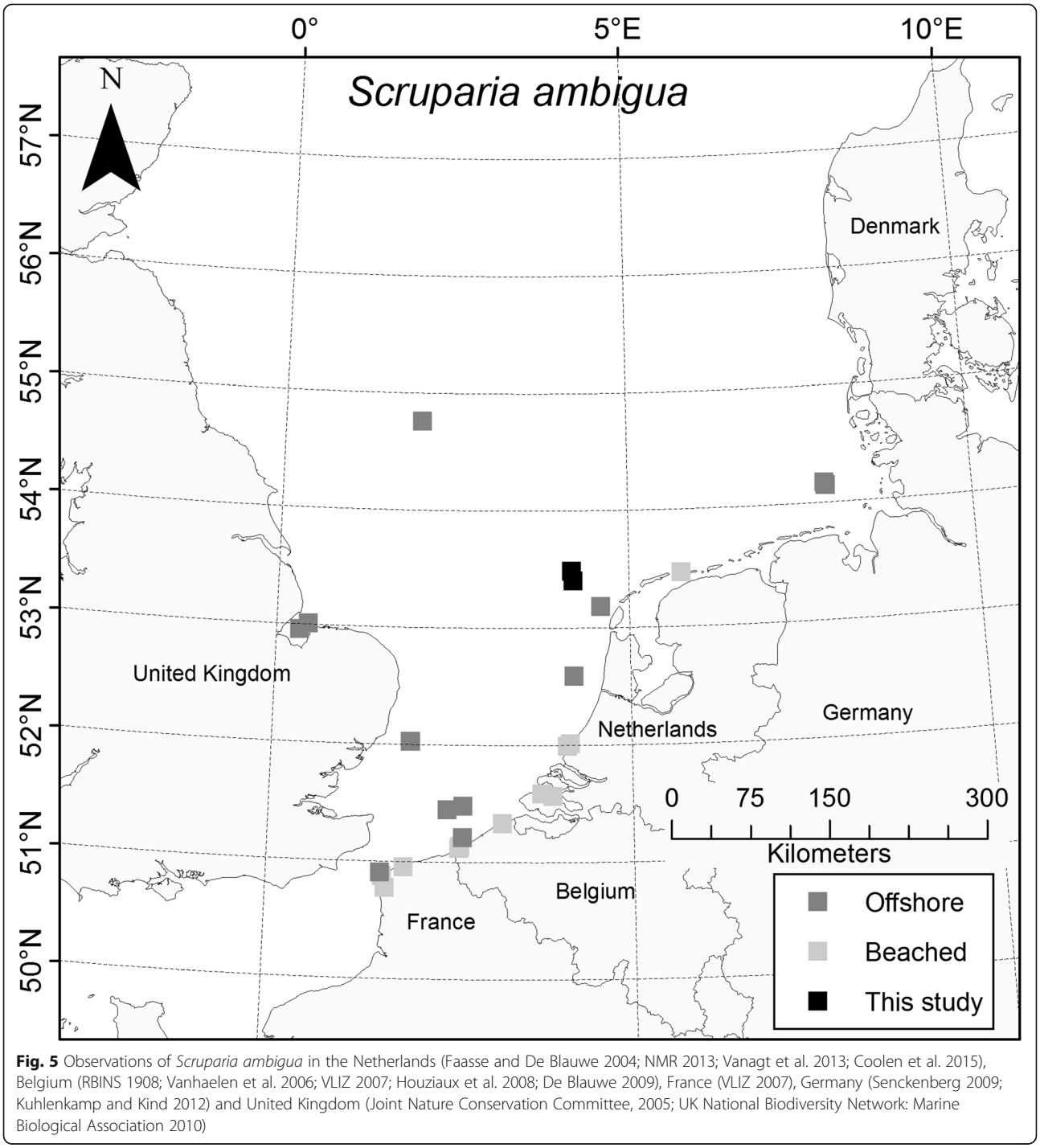


**Fig. 5** Observations of *Scruparia ambigua* in the Netherlands (Faasse and De Blauwe 2004; NMR 2013; Vanagt et al. 2013; Coolen et al. 2015), Belgium (RBINS 1908; Vanhaelen et al. 2006; VLIZ 2007; Houziaux et al. 2008; De Blauwe 2009), France (VLIZ 2007), Germany (Senckenberg 2009; Kuhlenkamp and Kind 2012) and United Kingdom (Joint Nature Conservation Committee, 2005; UK National Biodiversity Network: Marine Biological Association 2010)

banks around the Dutch Wadden Sea Islands (De Blauwe 2009). Observations in the entire North Sea reported both a more northern and southern distribution than our specimen (Fig. 4).

### Scruparia ambigua

Few observations of *Scruparia ambigua* exist for the Netherlands, and it is considered rare for the southern North Sea (De Blauwe 2009). In the Netherlands the most recent findings were at the PAWF (Vanagt et al. 2013) and the Borkum Reef Grounds (Coolen et al. 2015). In the current study the species was encountered at two platforms between 5 and 10 m depth, though Vanagt et al. (2013) observed the species several times at a slightly greater depth range (2–17 m). Several beached specimens have been reported as well (Fig. 5).

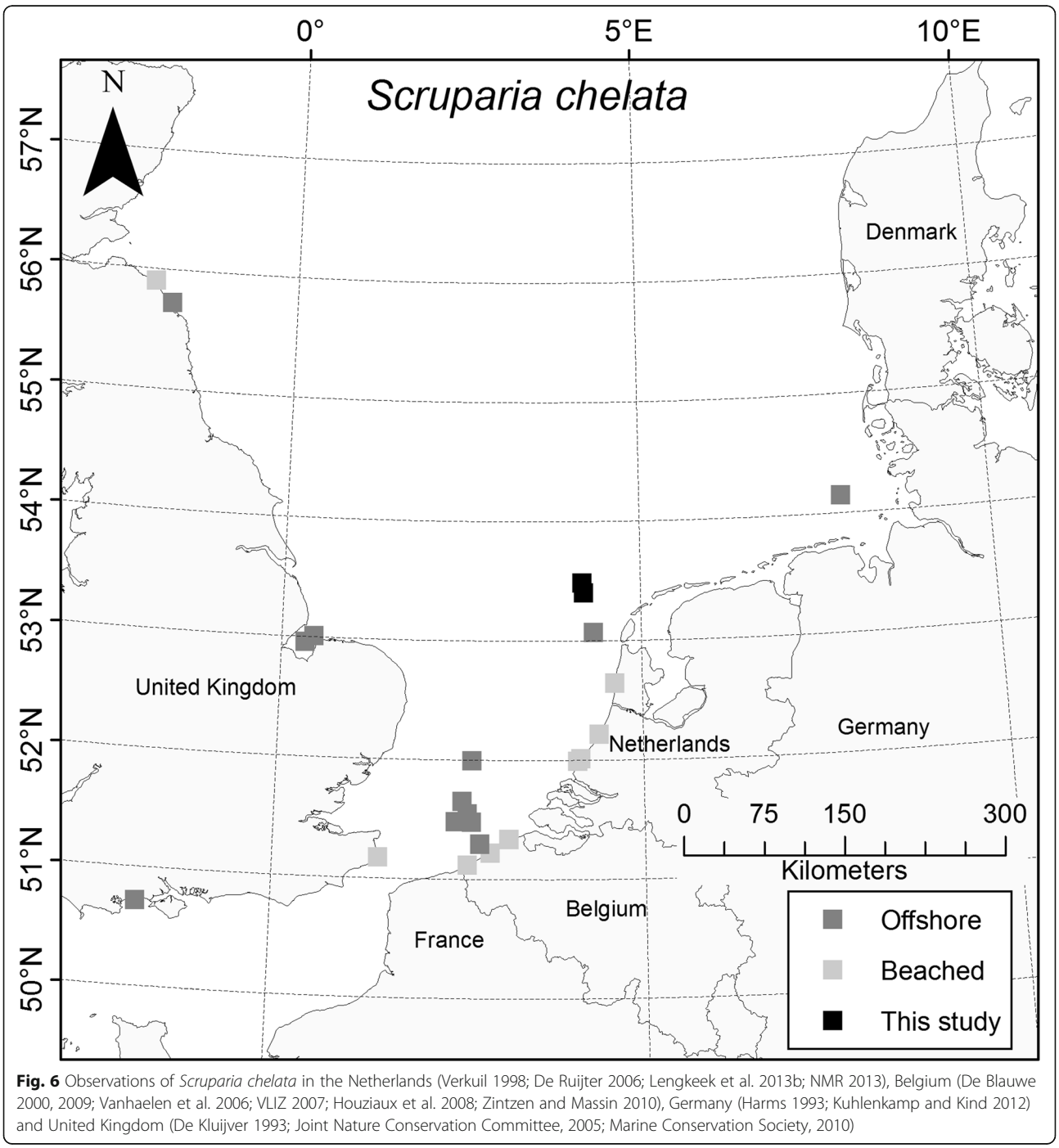


**Fig. 6** Observations of *Scruparia chelata* in the Netherlands (Verkuil 1998; De Ruijter 2006; Lengkeek et al. 2013b; NMR 2013), Belgium (De Blauwe 2000, 2009; Vanhaelen et al. 2006; VLIZ 2007; Houziaux et al. 2008; Zintzen and Massin 2010), Germany (Harms 1993; Kuhlenkamp and Kind 2012) and United Kingdom (De Kluijver 1993; Joint Nature Conservation Committee, 2005; Marine Conservation Society, 2010)

### *Scruparia chelata*

*Scruparia chelata* has only recently been discovered in the Netherlands on a shipwreck (24 km off the coast of Texel) by Lengkeek et al. (2013b) who investigated ten shipwrecks on the Dutch continental shelf. Other observations of the species across the North Sea have been reported from more northerly and southerly locations than the Dutch specimens (Fig. 6). De Blauwe (2009) considered *S. chelata* as rare for the southern North Sea, although beached specimens, most likely originating from the English Channel, are common.

### Absence of *Fenestrulina delicia*

*Fenestrulina delicia* Winston, Hayward and Craig, 2000 is an invasive species that has been present in European waters since 2002 or earlier (Wasson and De Blauwe 2014). It was reported in the Shetlands, in Northern Ireland, on the west coast of Scotland, on both sides of the English channel, in the North Sea along the coast of Belgium, the Netherlands and Germany as far as Helgoland and along the west coast of the UK (De Blauwe et al. 2014; Wasson and De Blauwe 2014). A majority of the locations inhabited by *F. delicia* are wind farms and gas platforms. It is therefore noteworthy that *F. delicia* was absent in our samples.

### More species to be expected

In this study six species were encountered mainly on *M. edulis* shells attached to the platform foundation while four species were found exclusively on the scour protection rocks at the seafloor. This indicates differences in preferred substrate and environmental conditions between bryozoan species. Some hard substrate areas on the Dutch continental shelf, such as the Texel Rough, remain uninvestigated. Moreover, bryozoan species known from empty shells on sandbanks on the Belgian and British continental shelf can be expected to be discovered also on Dutch sandbanks nearby (Faasse et al. 2013).

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#### Authors' contribuions

JCo designed the study, carried out the sampling and created the maps. JCo, EB and JL handled the samples in the lab and prepared them for taxonomic determination. EB, BW, JCu, HB and JL performed the taxonomic determination. EB collected data on observations of species at other locations and drafted the manuscript. All authors read and approved the final manuscript.

#### Competing interests

The authors declare that they have no competing interests.

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