Journal of the Marine Biological Association of the United Kingdom, 2017, 97(5), 1051–1058.
doi:10.1017/S0025315417000704

Revisited Syllidae of the English Channel coarse sediment communities

JEAN-PHILIPPE PEZY, ALEXANDRINE BAFFREAU AND JEAN-CLAUDE DAUVIN

Laboratoire Morphodynamique Continentale et Côtière, Normandie Univ, UNICAEN, UNIROUEN, UMR CNRS 6143, 24, rue des Tilleuls, F-14000 Caen, France

Among the polychaetes, the Syllidae comprise numerous species whose study over many years has benefitted from valuable revisions and descriptions of new species in Europe. This abundant literature proves very useful for revisiting the taxonomy and distribution of the Syllidae in the English Channel (EC), mainly as regards existing studies on coarse sediment communities in the eastern part of the Channel. This habitat is one of the most widespread in the EC and is known as favourable for the small polychaete fauna including Syllidae. A 2-year survey (winter and summer sampling periods) covering 19 stations, associated with the Branchiostoma lanceolatum *coarse sand community offshore Dieppe-Le Tréport, led to the identification of 6537 individuals from 29 taxa including 27 species. Six fine sand stations were also sampled in which only 12 individuals were collected. Among these species, seven are new for the EC polychaete fauna and six others are observed for the first time in the eastern part of the EC. All the new species for the EC are warm temperate species previously only known south of the Bay of Biscay. The Syllidae list given in Dauvin* et al. *(2003) has been re-analysed and amended with our list and that of the Chausey Archipelago study (Olivier* et al.*, 2012). To date, 91 Syllidae species have been recorded in the EC and are established mostly in coarse sediments.*

Keywords: Syllidae, taxonomy, Polychaeta, species richness, English Channel

Submitted 2 November 2016; accepted 4 April 2017

INTRODUCTION

The English Channel is a maritime domain characterized by strong tidal currents, with surficial sediments dominated by coarse sand, gravel and pebbles which cover about 80% of the sea bed (Larsonneur *et al.*, 1982). Among these coarse habitats, the *Branchiostoma* (ex-*Amphioxus*) clean coarse sand community is known to show a high species richness of the small interstitial fauna, mainly composed of small polychaetes and amphipods, and generally associated with low abundances (Dauvin, 1988a, b). The Syllidae family (Annelida, Polychaeta) is very well represented in such clean coarse sand sediments, both in the subtidal and intertidal zones (Dauvin & Lee, 1983; Olivier *et al.*, 2012). Moreover, the Syllidae family is one of the more diverse families of marine Polychaeta, comprising 74 genera and more than 700 species (San Martín, 2003; San Martín & Aguado, 2014; San Martín & Worsfold, 2015).

At the scale of the English Channel, an updated list of the polychaetes recorded was established by Dauvin *et al.* (2003). This inventory was based on benthic and systematic studies available at the beginning of the year 2000; a total of 493 species were recorded, with the Syllidae making up one of the more diversified families including 78 species (16% of all species). In their inventory, San Martín & Worsfold (2015) listed 63 Syllidae species in United Kingdom (UK) waters, which is of the same order of magnitude as the number of species recorded for the EC in both UK and French waters.

Nevertheless, recent European studies on the taxonomy of the families have revealed that several Syllidae species are in fact a complex of species, while others have been confused with other existing species as synonymies. The description of new species in addition to the synonymies of several species have created much confusion about the existing species in an area such as the English Channel.

This paper focuses on two main aspects: (1) taxonomic inventory of the Syllidae found in the coarse sediment of the Dieppe-Le Tréport site; and (2) taxonomic features, i.e. comparing the list of the Syllidae collected in this area of the eastern part of the EC with analogous sediment types in the western part of the EC, and re-analysing the list of the Syllidae recorded in the EC.

MATERIALS AND METHODS

Dieppe-Le Tréport study area and sampling design

In view of the future siting of a wind farm offshore Dieppe-Le Tréport (eastern part of the English Channel) (Figure 1), 25 benthic stations were sampled twice-yearly from September 2014 (Campaign 1: C1), March 2015 (C2), September 2015 (C3) and March 2016 (C4) with a 0.1 m^2 Van Veen grab (five replicates per station and per sampling date). The water depths ranged from 12 to 25 m. Two main benthic assemblages were identified corresponding to the clean fine

Corresponding author:
J.-P. Pezy
Email: jean-philippe.pezy@unicaen.fr

Fig. 1. Location of coarse sand sampling stations used for compilation of the regional inventories (see Dauvin *et al.*, 2003). Roscoff: Cabioch *et al.* (1968); Plymouth: MBA (1957); Musk *et al.* (2016); Normand-Breton Gulf: Retière (1979); de Saint Joseph (1887, 1888, 1895); Olivier *et al.* (2012); Bay of Seine: Bellan (1961); Wimereux: Glaçon (1977).

and medium sand *Nephtys cirrosa* community (six stations) and the clean coarse sand *Branchiostoma lanceolatum* community (19 stations).

Comparison with other studies

The Dieppe-Le Tréport Syllidae list is compared with lists compiled by:

- Dauvin & Lee (1983), who established a list for the subtidal coarse sand *Branchiostoma lanceolatum* (ex-*Amphioxus lanceolatus*) – *Clausinella* (ex-*Venus*) *fasciata* community in the Bay of Morlaix at 25 m depth (Dauvin, 1988a, b). This community was sampled quarterly from August 1977 to August 1980 (13 dates) with a 0.25 m² Hamon grab (10 replicates per date) covering a total sampling area of 32.5 m²;
- Olivier *et al.* (2012), who recorded fauna from a *Glycymeris* coarse sediment habitat in 192 samples on six intertidal sites of the Chausey Archipelago (English Channel, France). Sampling was carried out in 2007 with a 1/50 m² hand corer (total of 3.84 m²);
- Dauvin *et al.* (2003), who compiled a list of all the benthic polychaetes recorded over the entire EC at the beginning of the year 2000.

RESULTS

Importance of species-level identification of Syllidae in ecology studies

ENVIRONMENTAL CHARACTERISTICS

The salinity of the study area is homogeneous between the surface and the bottom as well as during the year with a mean value of 34.5‰. The sea temperature varies from 16°C in summer to 7.5°C in winter. The turbidity is of 0.33 NTU in summer and 3.61 NTU in winter (J.P. Pezy, unpublished data). The water depth ranges from 12 to 25 m. Three sedimentary types are found in the study area during the sampling period with a grain-size increasing gradient from south-east with sand to north-west with gravelly sand and sandy gravel, the sediment classes are determined according to Folk (1954) (Figure 2). Supporting the entire dataset, two communities were identified according to the EUNIS classifications: the *Branchiostoma lanceolatum* community in circalittoral coarse sand with shell gravel (A5.145) for coarse sediments and the *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* community in circalittoral fine sand (A5.251). On the gravelly sand and sandy gravel sediments, patches of live *Spirobranchus* were collected that could provide a potential habitat for Syllidae. Syllids were collected mostly in the coarse sand community (99.8%) and thus only data relevant to this habitat were considered in this study, accounting for a total sampling area of 38 m².

SPECIES RICHNESS AND ABUNDANCES

A total of 29 taxa including 27 species were identified among the 6549 individuals of Syllidae collected during the four campaigns for the sandy (five species for 12 individuals) and gravelly sandy communities (27 species for 6537 individuals). For the sandy habitat, 11 of 12 individuals are localized on a transitional station between medium sands and gravelly sands. In the gravelly sand community (19 stations), the total Syllidae species richness (SR) is comprised of between nine and 18 species per station. The seasonal SR is evaluated as 20 for C1 (1786 individuals), 15 for C2 (1565 individuals), 23 for C3 (2175 individuals) and 19 for C4 (1023 individuals) (Figure 2). Highest occurrences and the highest abundances during the four campaigns were observed for the three species *Syllis garciai*, *Syllis variegata* and *Trypanosyllis* (*Trypanosyllis*) *coeliaca*. The polychaetes represent between 34 (C1) and 62% (C3) and, among them, the Syllidae between 5 and 9% of the total number of individuals collected during the monitoring.

Taxonomic traits of Syllidae species new for the EC or the eastern part of the EC

The English Channel can be divided into two main parts with different physical and ecological characteristics. The Atlantic Ocean and warm waters influence the Western basin (from Brest to La Hague) and the North Sea and cold waters influence the Eastern basin (from La Hague to Calais) (Dauvin, 2012).

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press

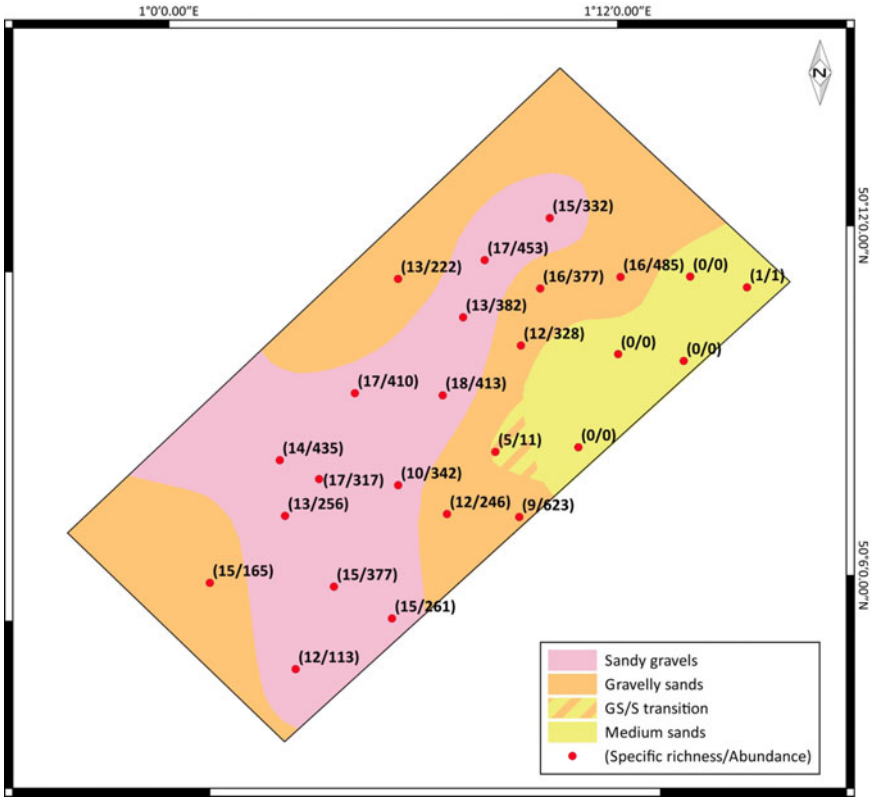

Fig. 2. Specific richness and total abundances of Syllidae collected by stations during the four campaigns at the Dieppe-Le Tréport site superimposed with sedimentary types (based on Folk, 1954).

Only two taxa (three *Dioplosyllis* and 35 *Myrianida*) out of a total of 29 taxa were not identified to species level. Among the 27 other species, seven are new for the EC fauna and six others are sampled for the first time in the eastern part of the EC. For each of these 13 species, we give some general information about the Dieppe-Le Tréport material examined and their general distribution in the world ocean.

NEW RECORDS FOR THE ENGLISH CHANNEL

Prosphaerosyllis xarifae (Hartmann-Schröder, 1960)

Sphaerosyllis xarifae Hartmann-Schröder (1960): 103–104, pl. 14 figures 121–122, pl. 15. figures 123–124.
Sphaerosyllis xarifae San Martín (2003): 225–227, figures 119–120.

MATERIAL EXAMINED: One individual sampled in September 2015.

DISTRIBUTION: Red Sea; Mediterranean Sea; Australia; North-east Atlantic from the Canary Islands to the Bay of Biscay; eastern part of the English Channel.

Sphaerosyllis pirifera Claparède, 1868

Sphaerosyllis pirifera Claparède (1868): 515–516, pl. 14 figure 2.
Sphaerosyllis pirifera San Martín (2003): 212–215, figures 111–113.

MATERIAL EXAMINED: Two individuals sampled in September 2015.

DISTRIBUTION: Eastern Mediterranean Sea; North-east Atlantic from the Gibraltar Strait to Galicia; eastern part of the English Channel.

Streptodonta pterochaeta (Southern, 1914)

Opisthodonta pterochaeta Southern (1914): 30–32, pl. 4 figure 6A–G.
Opisthodonta pterochaeta San Martín (2003): 51–54, figures 13–14.
Streptodonta pterochaeta San Martín & Hutchings (2006): 353, figure 81 A–E.

MATERIAL EXAMINED: 15 individuals, one in September 2014, 11 in September 2015 and three in March 2016.

DISTRIBUTION: North-east Atlantic, from the North Sea to Gibraltar Strait; eastern part of the English Channel, but in its range of geographic distribution.

Syllis columbretensis (Campoy, 1982)

Typosyllis columbretensis Campoy (1982): 413–418, pls. 46–47.
Syllis columbretensis San Martín (2003): 443–447, figures 244–245.

MATERIAL EXAMINED: One individual in September 2014.

DISTRIBUTION: From the southern part of the Bay of Biscay to the eastern part of the Mediterranean Sea; eastern part of the English Channel.

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press

Syllis mauretanica (Licher, 1999)

Typosyllis mauretanica Licher (1999): 78–81, figures 35–36.

MATERIAL EXAMINED: 272 individuals, 42 in September 2014, 13 in March 2015, 68 in September 2015 and 149 in March 2016.

DISTRIBUTION: Banc d'Arguin, Mauritania (Licher, 1999), Alicante, Spain, Mediterranean Sea (Del-Pilar-Ruso & San Martín, 2012); eastern part of the English Channel.

Syllis parapari San Martín & López, 2000

Syllis parapari San Martín & López (2000): 426–429, figures 1–2.
Syllis parapari San Martín (2003): 409–413, figures 224–225.

MATERIAL EXAMINED: 501 individuals, 381 in September 2014, 42 in March 2015, 62 in September 2015 and 16 in March 2016.

DISTRIBUTION: From the Gibraltar Strait to the southern part of the Bay of Biscay; eastern part of the English Channel.

Syllis pulvinata (Langerhans, 1881)

Typosyllis pulvinata Langerhans (1881): 104, pl. 4 figure 9.
Syllis pulvinata San Martín (2003): 372–375, figures 202–204.

MATERIAL EXAMINED: One individual in September 2014.

DISTRIBUTION: Red Sea and Mediterranean Sea, North-east Atlantic from the south of the Bay of Biscay to the Canary Islands; eastern part of the English Channel.

NEW RECORDS FROM THE EASTERN PART OF THE ENGLISH CHANNEL

Palposyllis prosostoma Hartmann-Schröder, 1977

Palposyllis prosostoma Hartmann-Schröder (1977): 87, figures 41–43.
Palposyllis prosostoma San Martín (2003): 57–61, figures 17–18.

MATERIAL EXAMINED: 92 individuals, six in September 2014, 12 in March 2015, 64 in September 2015 and 10 in March 2016.

DISTRIBUTION: North-east Atlantic, from Britain and English Channel to Canary Islands; eastern part of the English Channel.

Parexogone hebes (Webster & Benedict, 1884)

Paedophylax hebes Webster & Benedict (1884): 716–717, pl. 3 figures 31–36.
Exogone (*Parexogone*) *hebes* San Martín (2003): 236–239, figures 125–126.

MATERIAL EXAMINED: Seven individuals collected in March 2015.

DISTRIBUTION: Both sides of North Atlantic, from the North Sea to the Mediterranean Sea; eastern part of the English Channel, but in its range of geographic distribution.

Sphaerosyllis taylori Perkins, 1981

Sphaerosyllis taylori Perkins (1981): 1140–1143, figure 26.

Sphaerosyllis taylori San Martín (2003): 206–208, figure 108.

MATERIAL EXAMINED: 17 individuals, three in March 2015, six in September 2015 and six in March 2016.

DISTRIBUTION: Atlantic Ocean, Mediterranean Sea, western part of the English Channel; eastern part of the English Channel.

Syllis garciai (Campoy, 1982)

Langerhansia garciai Campoy (1982): 386–389, pls. 36–38.
Syllis garciai San Martín (2003): 400–405, figures 219–221.

MATERIAL EXAMINED: 2387 individuals, 790 in September 2014, 630 in March 2015, 859 in September 2015 and 108 in March 2016.

DISTRIBUTION: North-east Atlantic, Mediterranean Sea; eastern part of the English Channel.

Syllis hyalina Grube, 1863

Syllis hyalina Grube (1863): 45–46, pl. 4 figure 8.
Syllis hyalina San Martín (2003): 426–429, figures 234–235.

MATERIAL EXAMINED: 49 individuals, 27 in September 2014, eight in March 2015, six in September 2015 and eight in March 2016.

DISTRIBUTION: Cosmopolitan species in temperate and tropical waters; eastern part of the English Channel.

Xenosyllis scabra (Ehlers, 1864)

Syllis scabra Ehlers (1864): 244–248, pl. 11 figures 1–3.
Xenosyllis scabra San Martín (2003): 303–307, figures 167–168.

MATERIAL EXAMINED: Four individuals, one in September 2014, one in March 2015 and two in September 2015.

DISTRIBUTION: North-east Atlantic from the English Channel to the eastern part of the Mediterranean Sea. Mexico Gulf; eastern part of the eastern Channel which is the eastern boundary of the species.

DISCUSSION

The Dieppe-Le Tréport *Branchiostoma lanceolatum* coarse-sand community appears particularly rich in Syllidae, with 6537 individuals from a total sampling area of 38 m^2, i.e. a mean density of 172 ind. m^{-2}. In comparison, those sampled on the same benthic habitat at the Primel station in the Bay of Morlaix, from a similar total sampling area of 32.5 m^2, had a mean density of 41 ind. m^{-2} and 1359 individuals belonging to 18 species of Syllidae (Dauvin & Lee, 1983). During the 3-year monitoring programme on this western station of the English Channel, the total number of collected species was 181, 86 of which were collected only occasionally (one or two times). Polychaetes represent nearly 50% of the total species recorded (87 species), and are numerically dominated by small-sized species (Dorvilleidae, Glyceridae and Syllidae) which account for 39% of the total number of sampled macrofauna and 20% of the Syllidae.

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press

Table 1. Syllidae in the English Channel. ROS: Roscoff; PLY: Plymouth; NBG Normano-Breton Gulf; BSE: Bay of Seine; WIM: Wimereux, from Dauvin *et al.* (2003), Olivier *et al.* (2012) and Musk *et al.* (2016). PRI, Primel from Dauvin & Lee (1983); CHA, Chausey, from Olivier *et al.* (2012); TRE: Dieppe-Le Tréport, this study; *grey boxes new species for the eastern part of the English Channel; **grey boxes new species for the Channel. ? Doubtful occurrence which remains to be confirmed.

Scientific name after revision in WORMS (accessed January 2017) plus additional records since 2003	ROS	PLY	NBG	BSE	WIM	PRI	CHA	TRE
Amblyosyllis formosa (Claparède, 1863)	+	+	+	+	+			
Anoplosyllis edentula Claparède, 1868	+							
Brania pusilla (Dujardin, 1851)	+	+	+		+		+	
Brevicirrosyllis weismanni (Langerhans, 1879)	+							
Dioplosyllis cirrosa Gidholm, 1962 (not determined to species level)	+					+		
Dioplosyllis Gidholm, 1962								+
Ehlersia nepiotoca Caullery & Mesnil, 1916			?					
Epigamia alexandri (Malmgren, 1867)[a]	+	+	+	+	+			
Erinaceusyllis erinaceus (Claparède, 1863)	+	+	+					
Eurysyllis tuberculata Ehlers, 1864	+	+	+		+	+		+
Eusyllis assimilis Marenzeller, 1875	+			+	+			
Eusyllis blomstrandi Malmgren, 1867	+	+	+		+	+		
Eusyllis intermedia de Saint-Joseph, 1887	+		+					
Eusyllis lamelligera Marion & Bobretzky, 1875	+	+			+			
Exogone (*Exogone*) *fauveli* Cognetti, 1961	+							
Exogone (*Sylline*) *brevipes* (Claparède, 1864)	+	+						
Exogone naidina Örsted, 1845	+	+	+		+	+	+	+
Exogone verugera (Claparède, 1868)		+						
Haplosyllis spongicola (Grube, 1855)[b]	+	+		+				
Myrianida brachycephala (Marenzeller, 1874)	+	+	+	+	+			
Myrianida edwarsi (de Saint Joseph, 1887)	+	+	+	+	+			
Myrianida inermis (de Saint Joseph, 1887)	+	+	+					
Myrianida Milne Edwards, 1845 (not determined to species level)								+
Myrianida pinnigera (Montagu, 1808)	+	+	+	+	+			
Myrianida prolifera (Müller, 1788)	+	+	+	+	+		+	
Myrianida quindecimdentata (Langerhans, 1884)	+	+	+					
Myrianida rubropunctata (Grube, 1860)	+	+	+		+			
Nudisyllis divaricata (Keferstein, 1862)	+			+				
Nudisyllis pulligera (Krohn, 1852)[c]	+				+	+		
Odontosyllis ctenostoma Claparède, 1868	+	+	+	+	+			
Odontosyllis cucullata (Mc Intosh, 1908) (Wight Island)	?	?	?	?	?	?		
Odontosyllis fulgurans (Audouin & Milne Edwards, 1833)	+	+	+	+	+	+		+
Odontosyllis gibba Claparède, 1863	+	+	+		+	+		
Odontosyllis polyodonta de Saint Joseph, 1887	+		+					
Palposyllis propeweismanni (Dauvin & Lee, 1983)	+					+		
Palposyllis prosostoma Hartmann-Schröder, 1977*							+	+
Paraehlersia ferrugina (Langerhans, 1881)	+	+						
Parapionosyllis brevicirra Day, 1954							+	
Parapionosyllis minuta (Pierantoni, 1903)	+						+	
Parexogone hebes (Webster & Benedict, 1884)*	+							+
Opisthodonta longocirrata (Saint Joseph, 1887)	+		+					
Plakosyllis brevipes Hartmann-Schröder, 1956	+					+	+	
Proceraea aurantiaca Claparède, 1868	+	+	+					
Proceraea cornuta (Agassiz, 1862)		+						
Proceraea picta Ehlers, 1864	+	+	+		+			+
Proceraea scapularis (Claparède, 1864)	+		+					
Procerastea halleziana Malaquin, 1893	+	+			+			
Procerastea nematodes Langerhans, 1884	+			+				+
Prosphaerosyllis chauseyensis Olivier, Grant, San Martín, Archambault & McKindsey, 2012							+	
Prosphaerosyllis giandoi (Somaschini & San Martín, 1994)							+	
Prosphaerosyllis laubieri Olivier, Grant, San Martín, Archambault & McKindsey, 2012							+	+
Prosphaerosyllis tetralix (Eliason, 1920)	+					+		
Prosphaerosyllis xarifae (Hartmann-Schröder, 1960)**								+
Salvatoria clavata (Claparède, 1863)	+	+			+			
Salvatoria limbata (Claparède, 1868)	+	+		+		+		
Salvatoria swedmarki (Gidholm, 1962)	+						+	
Sphaerosyllis bulbosa Southern, 1914	+	+			+	+	+	+
Sphaerosyllis glandulata Perkins, 1981							+	
Sphaerosyllis hystrix Claparède, 1863	+	+	+		+	+		

Continued

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press

Table 1. Continued

Scientific name after revision in WORMS (accessed January 2017) plus additional records since 2003	ROS	PLY	NBG	BSE	WIM	PRI	CHA	TRE
Sphaerosyllis ovigera Langerhans, 1879		+						
Sphaerosyllis pirifera Claparède, 1868**								+
Sphaerosyllis taylori Perkins, 1981*							+	+
Streptodonta pterochaeta (Southern, 1914)**								+
Streptosyllis bidentata Southern, 1914	+					+		
Streptosyllis campoyi Brito, Núñez & San Martín, 2000		+					+	
Streptosyllis nunezi Faulwetter, Vasileidadou, Papageorgiou & Arvanitidis 2008		+						
Streptosyllis varians Webster & Benedict, 1887			+					
Streptosyllis websteri Southern, 1914	+	+					+	+
Syllides longocirratus (Örsted, 1845)	+	+	+					
Syllis amica Quatrefages, 1866	+		+					
Syllis armillaris (Müller, 1776)	+	+	+	+	+	+		+
Syllis atlantica Cognetti, 1960	?		?					
Syllis columbretensis (Campoy, 1982)**								+
Syllis cornuta[d]	?	?	?	?		?		
Syllis garciai (Campoy, 1982)*	?	?	?	?		?	+	+
Syllis gracilis Grube, 1840	+	+	+	+	+			+
Syllis hyalina Grube, 1863*	?	?	?	?	?	?	?	+
Syllis krohnii Ehlers, 1864	+	+	+	+				
Syllis licheri Ravara, San Martín & Moreira, 2004							+	
Syllis mauretanica (Licher, 1999)**	?	?	?	?		?		+
Syllis parapari San Martín & López, 2000**	?	?	?	?		?		+
Syllis pontxioi San Martín & López, 2000							+	
Syllis prolifera Krohn, 1852		+	+	+				+
Syllis pulvinata (Langerhans, 1881)**								+
Syllis variegata Grube, 1860	+	+	+	+	+	+		+
Syllis vittata Grube, 1840			+					
Synmerosyllis lamelligera (de Saint-Joseph, 1886)	+	+	+				+	
Trypanosyllis (*Trypanosyllis*) *coeliaca* Claparède, 1868	+	+	+	+		+	+	+
Trypanosyllis zebra (Grube, 1860)	+	+	+	+				+
Virchowia clavata Langerhans, 1879	+	+						
Xenosyllis scabra (Ehlers, 1864)*	+							+

[a]Ex-*Autolytus alexandri* Malmgren, 1867 and *Autolytus paradoxus* de Saint Joseph (1887).
[b]Ex-*Haplosyllis spongicola* (Grube, 1855), *Haplosyllis spongicola spongicola* (Grube, 1855) and *Haplosyllis spongicola tentaculata* Marion, 1877.
[c]ex-*Pionosyllis pulligera* (Krohn, 1852) and *Pionosyllis serrata* Southern (1914).
[d]*Ehlersia* (*Syllis*) *cornuta* (Rathke, 1843) not in this area = *Syllis garciai* (Campoy, 1982)*; or *Syllis mauretanica* (Licher, 1999)** or *Syllis parapari* San Martín & López (2000)**.

On the Dieppe-Le Tréport stations, the total number of Syllidae (29 taxa including 27 species) was higher than that found at Primel, with a higher number of taxa and individuals in summer than in winter. The Syllidae account for 9–10% of the species richness and 6–9% of the total number of individuals collected during our monitoring, which are particularly high proportions for the coarse sand community at the scale of the EC (Dauvin 1988a, b). Among the Syllidae, five species are dominant: *Syllis garciai* (191 ind. m^{-2}), *Syllis variegata* (99.6), *Trypanosyllis* (*Trypanosyllis*) *coeliaca* (69.2), *Syllis parapari* (40) and *Syllis armillaris* (33.8) which represent 83% of the sampled Syllidae. From a *Glycymeris* coarse sediment habitat in the intertidal zone of the Chausey Archipelago (western English Channel, France), Olivier *et al.* (2012) sampled 5700 individuals of Syllidae belonging to 21 species (based on 192 benthic samples collected in May 2007) and described two new species *Prosphaerosyllis chauseyensis* and *Prosphaerosyllis laubieri*. Five species dominate the collection: *Sphaerosyllis taylori* (560 ind. m^{-2}), *Sphaerosyllis bulbosa* (417.5), *Syllis garciai* (176) *Salvatoria swedmarki* (124.5) and *Streptosyllis campoyi* (77.5), which together represent 91% of the total number of Syllidae.

Recently, Musk *et al.* (2016) collected three specimens of a new species for the EC, *Streptosyllis nunezi* (Faulwetter, Vasileidadou, Papageorgiou & Arvanitidis, 2008), from sites off Devon and in the Scilly Isles (UK) associated with three other *Streptosyllis* species.

Finally, the list of Syllidae given by Dauvin *et al.* (2003) for the EC is amended taking into account the more recent publications, the revisions of species names and synonymies according to WORMS (http://www.marinespecies.org; accessed 1 July 2016) (see Table 1). A total of 91 species of Syllidae are recorded in the EC, as against 78 recorded at the beginning of the year 2000 (Dauvin *et al.*, 2003). Thus, 14% of the Syllidae have been recorded recently in the EC due to the particular attention paid to the identification of species stemming from new publications and fauna collections (San Martín, 2003; San Martín & Worsfold, 2015). It is probable that other species new to science will be found in future collections mainly on the coarse sand community, as in the case of the Chausey Archipelago, as well as new species for the EC inventory. The benthic assemblage related to subtidal coarse sands includes abundant interstitial fauna such as Syllidae, and covers a very large area of sea bed in the EC. It

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press

is remarkable that, out of the 14 new records for the EC reported in Olivier *et al.* (2012) and in this study, 13 correspond to warm temperate species, the EC representing the northern limit of the Syllidae in the North-east Atlantic. *Streptodonta pterochaeta* is the only species that is present also in the North Sea in coarse sand, from depths of 6 to 50 m (San Martin & Hutchings, 2006). Although it is difficult to be certain considering the numerous errors of identification and the sparse research on the taxonomy of Syllidae over the last two decades, we think that many recent records in the English Channel could reflect a northward extension of their geographic limits in response to the increase in sea temperature in the EC due to climate change.

The Syllidae family appears highly sensitive to organic enrichment pollution and to other kinds of stress (Giangrande *et al.*, 2004, 2005; Musco *et al.*, 2004). Del-Pilar-Ruso *et al.* (2014) revealed that Syllidae distribution is influenced by environmental features which can also alter the original habitat such as the change of depth and the modification of grain size as also found at small scale under mussel farming constraint (Grant *et al.*, 2012). The most abundant species in the Dieppe-Le Tréport area, *S. garciai* (Campoy, 1982), is considered a sensitive species to organic enrichment (Simboura & Zenetos, 2002). All these features seem to indicate that the Dieppe-Le Tréport area is of a high ecological status that allowed the development of a high diversity and abundance of Syllidae.

ACKNOWLEDGEMENTS

The authors thank the captain and the crew of the Oceanographic Vessel 'Celtic Warrior'. We are grateful to Prof. G. San Martín and Prof. F. Olivier for the course on Syllids in July 2015 at the Marine Station of Banyuls-sur-Mer, France. The authors also wish to thank Dr M.S.N. Carpenter for revising the English style and grammar. The authors thank the two reviewers G. San Martín and F. Olivier for the useful comments and the editor T. Darbyshire for the additional corrections.

FINANCIAL SUPPORT

JPP benefitted from a CIFRE grant for the 'Compagnie du Vent'.

REFERENCES

Bellan G. (1961) Contribution à l'étude des Annélides Polychètes de la région de Luc-sur-mer. *Bulletin de la Société Linnéenne de Normandie* 10, 87–100.

Cabioch L., l'Hardy J.P. and Rullier F. (1968) Inventaire de la Faune Marine de Roscoff. *Travaux de la Station Marine de Roscoff, Nouvelle Série* 17, 1–95.

Campoy A. (1982) Fauna de anelidos poliquetos de la Peninsula Iberica. *Publicaciones de Biologia de la Universidad de Navarra, Serie Zoologica* 7, 1–781.

Claparède E. (1868) Les annélides chétopodes du Golfe de Naples. *Mémoires de la Société de Physique et d'Histoire Naturelle de Genève* 19, 313–584, plates I–XVI.

Dauvin J.C. (1988a) Structure et organisation trophique du peuplement des sables grossiers à *Amphioxus lanceolatus* – *Venus fasciata* de la baie de Morlaix (Manche Occidentale). *Cahiers de Biologie Marine* 29, 163–185.

Dauvin J.C. (1988b) Evolution temporelle (Août 1977–Août 1980) du peuplement des sables grossiers à *Amphioxus lanceolatus-Venus fasciata* de la baie de Morlaix (France). *Oceanologica Acta* 11, 173–183.

Dauvin J.C. (2012) Are the eastern and western basins of the English Channel two separate ecosystems? *Marine Pollution Bulletin* 64, 463–471.

Dauvin J.C., Dewarumez J.M. and Gentil F. (2003) Liste actualisée des espèces d'Annélides Polychètes présentes en Manche. *Cahiers de Biologie Marine* 44, 67–95.

Dauvin J.C. and Lee J.H. (1983) Description d'une nouvelle espèce de Syllidae: *Pionosyllis prope-weismanni* n. sp. (Annélide Polychète) de la région de Roscoff. *Bulletin de la Société Zooloogique de France* 108, 129–134.

Del-Pilar-Ruso Y., de-la-Ossa-Carretero J.A., Giménez-Casalduero F., Sánchez-Lizaso J.L. and San Martín G. (2014) Checking the concurrence among macrobenthic organism distribution patterns at different taxonomic scales in relation to environmental factors. *Journal of Sea Research* 86, 49–57.

Del-Pilar-Ruso Y. and San Martín G. (2012) Description of a new species of *Sphaerosyllis* Claparède, 1863 (Polychaeta: Syllidae: Exogoninae) from the Alicante coast (W Mediterranean) and first reports of two other species of Syllidae for the Mediterranean Sea and the Iberian Peninsula. *Mediterranean Marine Science* 13, 187–197.

de Saint-Joseph A. (1887) Les Annélides Polychètes des côtes de Dinard. Première Partie. *Annales des Sciences Naturelles (Zoologie) (sér. 7)* 1, 127–270.

de Saint-Joseph A. (1888) Les Annélides Polychètes des côtes de Dinard. Deuxième Partie. *Annales des Sciences Naturelles (Zoologie) (sér. 7)* 5, 141–338.

de Saint-Joseph A. (1895) Les Annélides Polychètes des côtes de Dinard. Quatrième Partie. *Annales des Sciences Naturelles (Zoologie) (sér. 7)* 20, 184–272.

Ehlers E. (1864) *Die Borstenwürmer (Annelida Chaetopoda) nach Systematischen und Anatomischen Untersuchungen*. Leipzig: Wilhelm Engelmann.

Faulwetter S., Vasileiadou A., Papageorgiou N. and Arvanitidis C. (2008) Description of a new species of *Streptosyllis* (Polychaeta: Syllidae) from the Mediterranean and Canary Islands with a re-description of *Streptosyllis arenae* and comments on the taxonomy of *Streptosyllis* and some morphologically similar genera. *Zootaxa* 1847, 1–18.

Folk R.L. (1954) The distinction between grain size and mineral composition in sedimentary rock nomenclature. *Journal of Geology* 62, 344–359.

Giangrande A., Delos A.L., Musco L., Licciano M. and Pierre C. (2004) Polychaetes assemblages of rocky shores along the South Adriatic coast (Mediterranean Sea). *Cahiers de Biologie Marine* 45, 85–95.

Giangrande A., Licciano M. and Musco L. (2005) Polychaetes as environmental indicators revisited. *Marine Pollution Bulletin* 50, 1153–1162.

Glaçon R. (1977) *Faune et flore du littoral du Pas-de-Calais et de la Manche orientale*. Multigraphié: Documentation de la Station Marine de Wimereux, 51 pp.

Grant C., Archambault P., Olivier F. and McKindsey C. (2012) Influence of 'Bouchot' mussel culture on the benthic environment in a dynamic intertidal system. *Aquaculture Environment Interactions* 2, 117–131.

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press

Grube A.E. (1863) Beschreibung neuer oder wenig bekannter Anneliden. *Archiv für Naturgeschichte* 29, 37–69.

Hartmann-Schröder G. (1960) Zur Polychaeten-Fauna von Peru. *Beiträge zur neotropischen Fauna* 2, 1–44.

Hartmann-Schröder G. (1977) Polychaeten aus dem Sublitoral und Bathyal vor der portugiesischen und marokkanischen Küste. Auswertung der Fahrt 8 (1967) von F.S. 'Meteor'. *METEOR Forsch-Ergebnisse, Ser. D* 26, 65–99.

Langerhans P. (1881) Ueber einige canarische Anneliden. *Nova Acta Academiae Leopoldino-Carolinae Germanicae Naturae Curiosorum* 42, 93–124.

Larsonneur C., Bouysse P. and Auffret J.P. (1982) The superficial sediments of the English Channel and its western approaches. *Sedimentology* 29, 851–864.

Licher F. (1999) Revision der Gattung *Typosyllis* Langerhans, 1879 (Polychaeta: Syllidae). Morphologie, Taxonomie und Phylogenie. *Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 551, 1–336.

Marine Biological Association (1957) *Plymouth marine fauna*, 3rd edition. Plymouth: Marine Biological Association, 457 pp.

Musco L., Cavallo A. and Giangrande A. (2004) I sillidi (Annelida, Polychaeta) del litorale brindisino: possibilità di un loro impiego come indicatori di qualità dell'ambiente. *Thalassia Salentina* 27, 161–174.

Musk W., Faulwetter S. and McIlwaine P. (2016) First record of *Streptosyllis nunezi* Faulwetter *et al.*, 2008 (Annelida, Syllidae) from the United Kingdom, and amendment to the genus *Streptosyllis* Webseter & Benedict, 1884. *ZooKeys* 582, 1–11.

Olivier F., Grant C., San Martín G., Archambault P. and McKindsey C.W. (2012) Syllidae (Annelida: Polychaeta: Phyllodocida) from the Chausey Archipelago (English Channel, France), with a description of two new species of the Exogoninae *Prosphaerosyllis*. *Marine Biodiversity* 42, 55–63.

Perkins T.H. (1981) Syllidae (Polychaeta), principally from Florida, with descriptions of a new genus and twenty-one new species. *Proceedings of the Biological Society of Washington* 93, 1080–1172.

Retière C. (1979) *Contribution à l'étude des peuplements benthiques du golfe normano-breton*. Thèse Doctorat Etat, ès Sciences Naturelles. Université de Rennes, France, 370 pp.

San Martín G. (2003) Annelida, Polychaeta II: Syllidae. In Ramos M.A. *et al.* (eds) *Fauna Ibérica*, Volume 21. Madrid: Museo Nacional de Ciencias Naturales, CSIC, 554 pp.

San Martín G. and Aguado M.T. (2014) Family Syllidae. In Schmidt-Rhaesa A. (ed.) *Phyllodocida: nereidiformia. handbook of zoology, Annelida. a natural history of the phyla of the animal kingdom*. Berlin: Verlag Walter der Gruyter GmbH & Co., 52 pp.

San Martín G. and Hutchings P. (2006) Eusyllinae (Polychaeta: Syllidae) from Australia with the description of a new genus and fifteen new species. *Records of the Australian Museum* 58, 257–370.

San Martín G. and López E. (2000) Three new species of *Syllis* (Syllidae: Polychaeta) from Iberian coasts. *Cahiers de Biologie Marine* 41, 425–434.

San Martín G. and Worsfold T.M. (2015) Guide and keys for the identification of Syllidae (Annelida, Phyllodocida) from the British Isles (reported and expected species). *ZooKeys* 488, 1–29.

Simboura N. and Zenetos A. (2002) Benthic indicators to use in ecological quality classification of Mediterranean soft bottom marine ecosystems, including a new biotic index. *Mediterranean Marine Science* 3, 77–111.

Southern R. (1914) Clare Island Survey. Archiannelida and Polychaeta. *Proceedings of the Royal Irish Academy* 31, 160.

and

Webster H.E. and Benedict J.E. (1884) The Annelida *Chaetopoda* from Provincetown and Wellfleet, Massachusetts. *Annual Report of the United States Commission of Fish and Fisheries, Washington* 1881, 699–747.

Correspondence should be addressed to:
J.P. Pezy
Laboratoire Morphodynamique Continentale et Côtière,
Normandie Univ, UNICAEN, UNIROUEN,
UMR CNRS 6143, 24, rue des Tilleuls,
F-14000 Caen, France
email: jean-philippe.pezy@unicaen.fr

https://doi.org/10.1017/S0025315417000704 Published online by Cambridge University Press