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*Helping to understand, identify, record and conserve molluscs*

# Molluscs from fishing nets retrieved from the North Sea, June 2018

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This paper is a translation of Raven, J.G.M. & S. van Leeuwen (2019) Mollusken uit opgedoken visnetten. Duik de Noordzee Schoon juni 2018 (Molluscs from fishing nets retrieved from the North Sea, June 2018). *Spirula*, **418**: 44 – 54. Between square brackets a few sentences have been added to explain the campaign to our new audience, and to mention some recent developments.

## Summary.

Every year, a dive team recovers lost fishing nets and other materials from ship wrecks in the North Sea – coordinated by ‘Stichting Duik de Noordzee Schoon’ (Foundation DDNZZ, or ‘Dive to Clean the North Sea’). Unlike on previous occasions, this time material from the British part of the North Sea was collected and only one locality in Dutch waters was sampled. Data about the mollusc fauna of the wrecks was gathered via inspection of the retrieved fishing nets and via soil samples taken by the divers. Most samples were small, but relatively rich in species (in total at least 106). As a result of the different sampling area, this included quite a few that had not been seen during earlier DDNZZ expeditions. *Modiolula phaseolina* (Philippi, 1844) was recorded for the first time from several localities in the British part of the southern North Sea.

## Introduction

Each year since 2007 Foundation ‘Duik de Noordzee Schoon’ (DDNZZ, or ‘Dive to Clean the North Sea’) has organised an expedition to study animals and seaweed on ship wrecks. [This foundation aims to further the protection and the sustainable use of the North Sea. One of its activities is to organise dive expeditions with voluntary divers to clean, investigate and protect ship wrecks in a sustainable way.] A group of divers, including biologists, record species observed and remove lost fishing nets and other [artificial] materials from wrecks. This trash is brought to port and since 2015 it has been studied by another group of people to record all kinds of organisms. Reports of earlier activities and specific finds of molluscs have been described in Gittenberger et al. (2013), Bartelink et al. (2016), Driessen (2016), Van Leeuwen et al. (2016 and 2017) and Van Leeuwen (2018). In separate papers other organisms have also been reported.

## Sampling at sea

In June 2018 wrecks in both the British and the Dutch parts of the southern North Sea were to be visited. Because of bad

weather, the second part had to be cancelled (although there was one big bag from a *Sabellaria* reef on the ‘Friese Fronten’ in the Netherlands). An overview of the localities visited is given in table 1 and figure 1. As a result, the 2018 activity of sifting through the retrieved nets relates almost entirely to the British part of the North Sea. Also, during the 2015 expedition, wrecks in the British part of the North Sea were visited, but because the research then focused primarily on Dutch fauna, the nets were not kept separate and no locality data were available (Van Leeuwen et al., 2016). In 2018 Floor Driessen ensured that all recovered nets were preserved with locality data. Some of the wrecks are Dutch ships, sometimes with a turbulent history, such as the ‘Koningin Regentes’, a hospital ship that sank during the First World War after being torpedoed by a German submarine. More information about the wrecks can be found in the archaeological report of the expedition (Van den Berg & Mulder, 2018).

Also new is that Dick Hoeksema (DH) received sediment samples from two participants of Dive Team Zeeland [who participated in the expedition of DDNZZ]. These samples (5 samples of approximately 150 ml each) were found to contain a rich mollusc fauna; some samples are from wrecks from which no other material was collected, and others from wrecks from which retrieved nets were studied. Biologists who participated in the DDNZZ expedition also recorded species during their dives. After each dive they noted their observations on standard forms. As these records have not yet been validated, they could not be included in this paper.

## Sifting through the nets

Sylvia van Leeuwen coordinated the participation of members of the Netherlands Malacological Society (Nederlandse Malacologische Vereniging or NMV) and Lilian Schoonderwoerd of members of the Biological Working Group (Biologische Werkgroep or BW) of the Dutch Underwater Sports Association (Nederlandse Onderwatersport Bond). This year they [the volunteers who investigated the nets in the harbour] were Hanco Bakker (HB), Bob Bruins, Bart van Heugten, Dennis Leeuw (DL), Sylvia van Leeuwen (SL), Han Raven (HR), Erick Staal, Fred Vervaet (FV), Anne Lamers and Hans Spierenburg.

Dive	Date (June 2018)	Locality	Longitude	Latitude	Diving depth in metres (Floor)	Nets	Sediment
1	15	U31	N52° 47.351'	E03° 03.170'	32.5	x	
2	15	Koningin Regentes (paddle steamer)	N53° 00.008'	E02° 52.582'	NA	x	x
3	16	Tropic Shore	N53° 24.922'	E02° 18.925'	26.6		
4	16	UK6744	N54° 13.033'	E01° 46.200'	32.3	x	
7	18	UK57037	N55° 00.035'	W01° 22.786'	19.8		x
5, 6	17	70500	N55° 02.239'	E01° 42.016'	31.3; NA	x	x
8	18	Mars	N55° 03.814'	W01° 24.095'	29.1		x
9, 13	19, 20	Somali	N55° 34.089'	W01° 36.025'	29.5; 13.3	x	x
10, 12	19, 20	Farne (eco dive, without wrecks)	N55° 38.212'	W01° 36.988'	12.1; 13.3		
11	20	Chris Christonson (wreck not found)	N55° 38.400'	W01° 36.500'	-		

table 1: Dive localities, arranged from south to north.



figure 1: Dive localities (Google Earth).

On previous occasions the nets were delivered at Scheveningen. Due to the bad weather not only was the second part of the dive trip cancelled, but also at the last minute there were changes to both location and arrival time. The ship moved to the port of Antwerp and the nets were eventually transported to the port of Stellendam, where we could inspect them on Saturday 23<sup>rd</sup> June 2018. Some participants had to cancel their participation, but the remaining group was still quite big.

For a while we were threatened to be sent away by the harbour master who, due to a misunderstanding, was not informed about our arrival. Fortunately, that could be solved on the spot. Unlike previous years, the ‘big bags’ with nets were not placed on the quay, but in a container with ship's waste (figure. 2). Therefore, the workspace was cramped and awkward and we had to search and drag big bags around to find and sample the right bags. Most nets had been in the big bags for days, which was obvious from their smell. Good cooperation ensured that different nets could be sampled at the same time (figure 3). Part of the sifting through material was done on site. Under the guidance of Dennis Leeuw, a lobster trap (figure 4) from the Somali was completely disassembled: animals were found on the trap and in all kinds of cavities. In addition, pieces of net, rope and animal debris from the bags were collected, as well as material that fell to the bottom of the big bags. After returning home it became clear that a good method was to wash the samples in fresh water, put all the material in containers with alcohol, after a few days rinse it through a fine strainer and then dry it. Earlier we had already learned to also retain the finest fraction (that passes through a sieve with mesh <0.5 mm) because it might contain very small species, as indeed was now the case.

#### What was found in the nets and sediment samples?

An overview of the species of molluscs found is given in table 2 [see note below (Ed.)]. This is a simplified version. The complete database with records per participant (including other species groups) has been compiled by

Sylvia van Leeuwen. This is available on request and has also been made available to the DDNZS and ANEMOON foundations, who will record the data in their databases [after publication the database has also been shared for inclusion in the National Biodiversity Network (NBN) atlas]. From a few wrecks there are no observations from the nets because there was not always interesting growth on them. Some big bags were positioned so deep within the container that they were not easily accessible. In total almost 500 records of molluscs were collected, but the same species was often reported several times from the same wreck: by different collectors or on different substrates.



figure 2: The nets have been placed in a container (left to right: Dennis Leeuw, Hannco Bakker, Fred Vervae). (photo: Han Raven)



figure 3: Sifting through the nets (left to right: Sylvia van Leeuwen, Bob Bruins and Fred Vervae). (photo: Han Raven)

Most specimens collected were fresh, presumably many animals were taken alive. These are animals that lived on the substrate of nets, ropes or traps: attached (mussels, *Heteranomia squamula*), in cavities (*Hiatella arctica*, *Sphenia binghami*, *Kellia suborbicularis*, *Talochlamys*

*pusio*) or freely mobile (*Emarginula fissura*, *Trivia arctica*). Of some species only old specimens were found, as indicated in the table. Likely these species also live at the same locality, but most are species that live in soft sediment and very little sediment has been sampled.

The species were identified by the participants themselves, but several troublesome species and deviating identifications were then checked by other participants and specialists, helped by the mutual sharing of lists of records and photos.



figure 4: The lobster trap from the Somali is being disassembled. At first sight holding little promise, but eventually many interesting species were found on this object. (photo: Han Raven)

### Some special finds

- *Modiolula phaseolina* (Philippi, 1844). Many samples contain large numbers of hairy mussels (figure 11). We thought we were dealing with juvenile *Modiolus modiolus* (Linnaeus, 1758). But after cleaning at home, shape (relatively narrow and pinched, not triangular), periostracum with coarse hairs, a curved rib on the inside bordering the anterior muscle scar and a small field with nodules / grooves near the dorsal edge near the umbo confirmed that this is *M. phaseolina*. The differences between the two taxa are very clear in the figures in Oliver et al. (2016). *Modiolula phaseolina* is widespread around the British Isles but according to the website of Natural History Museum of Wales (Oliver et al., 2016) it is not present in the southern North Sea. Our findings show that the species occurs on the British side, the species is widespread (table 2) and numerous. Van Leeuwen et al. (2016: fig. 5e-5f) image specimens that closely resemble it (from the Dogger Bank; DDNZS 2015 campaign in the Dutch North Sea), but which are clearly larger than our

specimens. These shells lacked the characteristic grooves near the dorsal edge that are characteristic of *Modiolula* and are therefore identified as juvenile *Modiolus modiolus* [post script: recently *Modiolula phaseolina* has been confirmed to also occur on the Dutch side of the southern North Sea, see Van Leeuwen, 2019].

- According to Oliver et al. (2016) the small cockles *Parvicardium pinnulatum* (Conrad, 1831) and *P. scabrum* (Philippi, 1844) are widespread in muddy sand and gravel in the shallow littoral and the continental shelf of the United Kingdom. On their distribution cards, Oliver et al. (2016) colour the entire southern North Sea, but on the Dutch side *P. pinnulatum* has only once been found (De Graaf et al., 2017). *Parvicardium pinnulatum* (figures 13-14) differs from *P. scabrum* (figure 15) in the more convex shape, the more forward placed umbo and therefore more sloping posterior, rounder ribs, narrower grooves between the ribs and spines on the rear ribs (instead of scales). The specimens from the Somali wreck show an interesting variation: in the specimen in figure 14 towards the ventral side the ribs split into two or three parts separated by shallow grooves. The growth lines are clearly more inclined on the central part.

- A broken valve (figure 18) from the Mars sediment sample gave headaches: it is quite round, surface with fine pits, a striking umbo formed by the prodissoconch, and a sturdy hinge. It is the hinge that caused confusion: at the front a short, striking lateral tooth and at the back a long lateral tooth and further inwards a shorter one. Several people looked at it and suggested various families, but the Lasaeidae remained as only serious candidate. Ultimately, from the website of the Natural History Museum Wales (Oliver et al., 2016: photo MO11772) it became clear this is *Hemilepton nitidum* (Turton, 1822), of which the shorter 'tooth' at the rear is in reality the edge of the ligament. The anterior lateral tooth is half broken and the cardinal tooth is worn. Incidentally, in the same sample also complete specimens of this species were found [but these were not shown to us].

- *Gari tellinella* (Lamarck, 1818). The identification of a few juvenile valves (figure 19) turned out to be quite a challenge. Shape, hinge and pallial sinus indicate it is a tellinid, but which one? The weak colour bands (at the edges) did not fit anywhere. In the end we found the solution for this species on the website of the Natural History Museum Wales (Oliver et al., 2016) on which a growth series of *Gari tellinella* is shown. The species is not known from the Netherlands but occurs around the British Isles, except in the southern North Sea. We indeed found the species only at northern localities (Somali and 70500).

- *Abra prismatica* (Montagu, 1808). A juvenile valve (figure 21) is clearly an *Abra*, but is it *Abra nitida* (Müller, 1776) or *A. prismatica*? Because the valve is not fully grown a comparison with the outline of adult specimens does not provide a definite answer. Also here, Oliver et al. (2016) provided the solution, again through photos of growth series. Moreover: in our valve a tiny pearl is visible to the left of the middle.



figures 6–15:

- (6) *Nuculana minuta* (O.F. Müller, 1776), Mars, sediment sample, L 5.1 mm (DH);  
 (7) *Crenella decusata* (Montagu, 1808), Somali, sediment sample, L 2.5 mm (DH);  
 (8) *Musculus discors* (Linn., 1767), Somali, lobster trap, L 7.9 mm (HR);  
 (9–10) *Musculus subpictus* (Cantraine, 1835), Somali, rope (HR): (9) L 6.2 mm. (10) L 7.2 mm;  
 (11) *Modiolula phaseolina* (Philippi, 1844), Somali, rope, L 11.2 mm (HR);  
 (12) *Mytilus galloprovincialis* Lamarck, 1819. Somali, rope, L 10.6 mm (HR);  
 (13–14) *Parvicardium pimulatum* (Conrad, 1831), Somali, lobster trap: (13) L 5.5 mm (HR), (14) L 5.6 mm (FV);  
 (15) *Parvicardium scabrum* (Philippi, 1844), Somali, L 3.6 mm (FV).

(photos: Han Raven)

**Abbreviations used in all figures of shells:**

L = length, H = height



figures 16–26:

- (16) *Kellia suborbicularis* (Montagu, 1803), Somali, rope, L 5.0 mm (HR);  
 (17) *Kurtiella bidentata* (Montagu, 1803), Somali, lobster trap, L 1.8 mm (HR);  
 (18) *Hemilepton nitidum* (Turton, 1822), Mars, sediment sample, L 2.1 mm (DH);  
 (19) *Gari tellinella* (Lamarck, 1818), Somali, lobster trap, L 3.2 mm (HR);  
 (20) *Abra alba* (W. Wood, 1802), 70500, L 10.5 mm (HR);  
 (21) *Abra prismatica* (Montagu, 1808), Somali, lobster trap, L 4.6 mm (HR);  
 (22) *Ashjornsenia pygmaea* (Lovén, 1846), Somali, lobster trap, L 3.8 mm (HR);  
 (23) *Venus casina* Linn., 1758, UK57037, sediment sample, L 3.0 mm (DH);  
 (24) *Thracia villosiuscula* (MacGillivray, 1827), Koningin Regentes, L 3.9 mm (FV);  
 (25) *Sphenia binghami* W. Turton, 1822, Somali, lobster trap, L 11 mm (HR);  
 (26) *Hiatella arctica* (Linn., 1767), Somali, lobster trap, L 13 mm (HR).

(photos: Han Raven)

• *Emarginula fissura* (Linnaeus, 1758) was found alive on the lobster trap from the Somali wreck (figure 5). An old specimen was found among nets of the UK6744 wreck.

• *Dikoleps nitens* (Philippi, 1844) has no sculpture, with the exception of a few spiral lines in the umbilicus (figure 29). It is a very small species that lives between seaweed in the tidal zone (own observation HR) but occurs to a depth of 100 m (Graham, 1988: 136). The species has not been found alive in Dutch waters (De Bruyne et al., 2013), although fairly fresh specimens are known from the Holocene 'Angulus pygmaeus Fauna' (e.g. De Bruyne et al., 1987; Hoeksema et al., 2018). According to Graham (1988: 136) the species does not occur in the British part of the southern North Sea. It was only found in the northernmost locality (Somali), being most numerous in the sediment sample.



figure 5: *Emarginula fissura* (Linnaeus, 1758) in living position on the lobster trap from the Somali (DL). (photo: Han Raven)

• *Pusillina inconspicua* (Alder, 1844) turned out to be widespread and common. The identification of these shells cost us quite a few headaches and our identification is not entirely satisfactory. Some specimens have the typical appearance of the species, with red protoconch, rapidly increasing width and with axial ribs. However, we also found numerous tall specimens without sculpture or with ribs only on an intermediate whorl, with extremely elongated brown spots on the upper side of the whorls and not always with the characteristic red protoconch (figures 35–37). Also, the shell is somewhat slimmer than usual, with slightly less convex whorls. Initially, some participants identified these as *Setia pulcherrima* (Jeffreys, 1848) but none of the specimens have the characteristic colour pattern of that species: spiral bands of speckles, while the species has not (yet) been recorded from the North Sea (Graham, 1988: 228; NBN atlas, 2018). However, due to climate change it is not inconceivable that *Setia pulcherrima* will expand into the North Sea. Based on the relatively large aperture, also the smooth form of *Rissoa parva* (Da Costa, 1778) has been considered. However, the brown comma-shaped spot on the peristome characteristic for that species

is missing, and the whorls of our shells are wider and more convex than in that species. At several localities both species (*Pusillina inconspicua* and *Rissoa parva*) occur syntopically.

• *Caecum glabrum* (Montagu, 1803). Several specimens of this species were found (figures 39–41). DH also found a few protoconchs, one of which is depicted, a specimen with a small piece of teleoconch (figure 41). Sometimes the protoconchs are mistaken for *Omalogyra atomus* (Philippi, 1841), but that species has a brown shell with all whorls in a plane. The specimen in figure 40 may be confusing because it still has a small piece of protoconch attached to the teleoconch.

• Seven specimens of *Trivia arctica* (Pulteney, 1799) were found on the Somali lobster trap (figure 43). The juvenile animal of figure 42 also is a *Trivia*. Because only *T. arctica* was found on the trap, this is probably the same species.

• *Tritia incrassata* (Strøm, 1768). This species was found at quite a number of localities (table 2; figures 47–49) and thus appears to be more common in the British part of the North Sea than in the Dutch part, although in recent years this species has been observed there several times (Vanagt & Faasse, 2014; Van Moorsel et al., 2015; Van Moorsel, 2016; Van Leeuwen et al., 2016 and 2017). Two specimens from the Somali are different (figure 47): the shells are smaller, slimmer, thinner, and especially the upper whorls are much more convex than in the typical form (figure 49) – compared with juvenile specimens (figure 48) the difference is striking. Because the shells are otherwise similar - especially the characteristic black spot in the siphonal canal - we have attributed these deviating specimens to the same species. We would like to be notified if similar specimens have been found elsewhere.

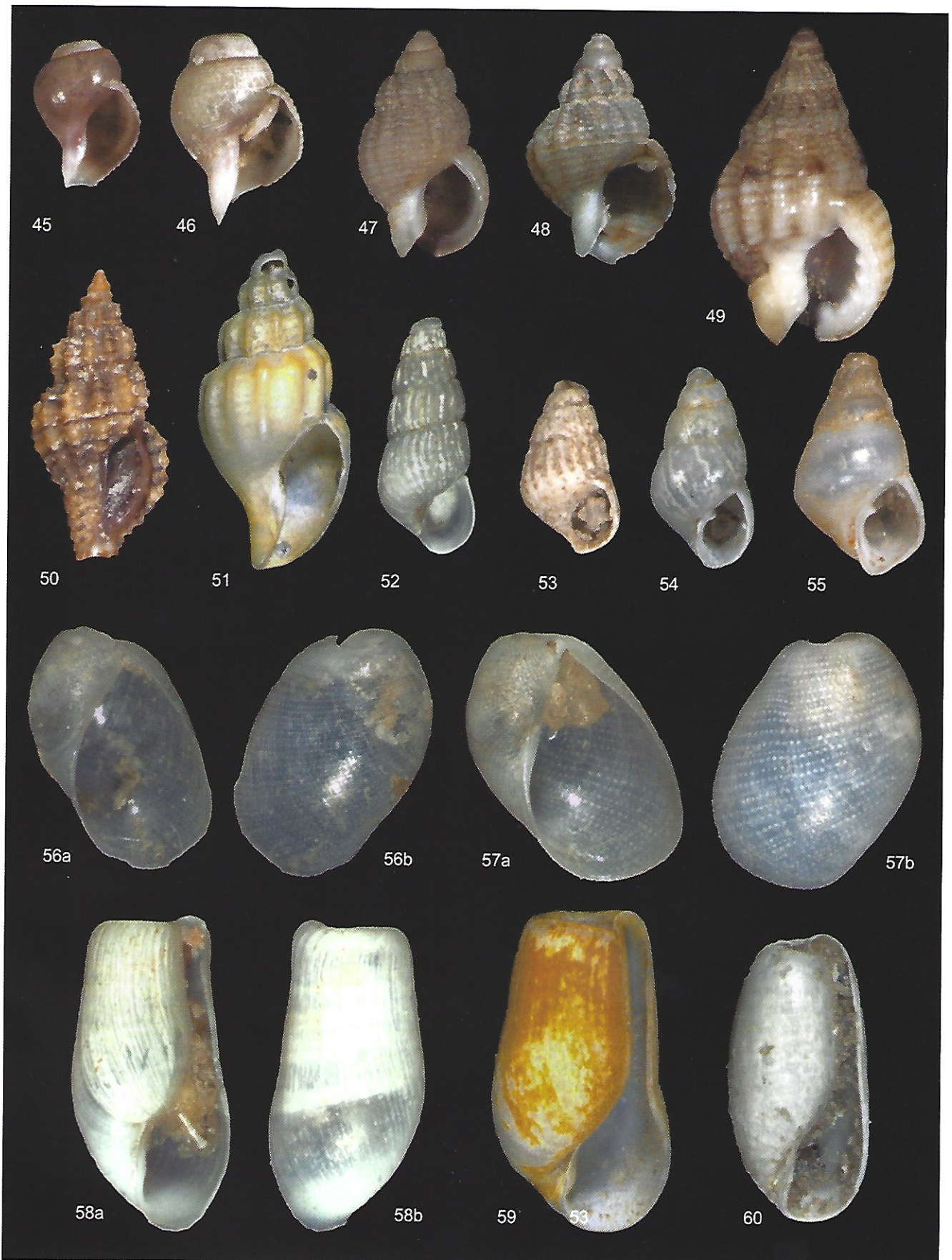
## Discussion

Compared with previous DDNZS results this is a very varied fauna (at least 106 species recorded). 35 species were only recorded in sediment samples, 25 only in nets and 46 in both the sediment samples and the nets. From the data it is evident that the combination of both methods gives a more complete impression of the fauna than just the study of the nets. The number of species recorded from fishing nets (71) is also larger than for the expeditions of 2015 and 2016 (Van Leeuwen et al., 2016: 61 species; Van Leeuwen et al., 2017: 66 species). The higher frequency of hard substrate in the British part of the North Sea may play a role, as it provides stepping stones to the wrecks. Several species have not been recorded previously from DDNZS activities.

The sediment samples also contain species that live in the sediment. Nothing indicates this material to be older than Holocene, and we expect these species to still occur on location. Old specimens from the sediment were also found in nets, ropes and lobster trap, because often some sediment was caught in these materials. Thus, there is no sharp biotope separation between the species from both sampling methods. Nets, ropes and lobster trap provided relatively more fresh material than the sediment samples.



figures 27–43: (27) *Emarginula fissura* (Linnaeus, 1758), UK6744, H 9.2 mm (FV); (28) *Gibbula tumida* (Montagu, 1803). Koningin Regentes, H 4.5 mm (FV); (29) *Dikoleps nitens* (Philippi, 1844), Somali, lobster trap, H 0.6 mm (HR); (30) *Obtusella intersecta*, Somali, lobster trap, H 0.8 mm (HR); (31) *Alvania punctura* (Montagu, 1803), Somali, lobster trap, H 2.2 mm (HR); (32) *Crisilla semistriata* (Montagu, 1808), Somali, lobster trap, H 2.3 mm (HR); (33–34) *Onoba semicostata* (Montagu, 1803), Somali, lobster trap (HR): (33) H 2.0 mm, (34) H 3.1 mm; (35–37) *Pusillina inconspicua* (Alder, 1844): (35) 70500, H 2.2 mm (HR), (36–37) U31 (SL): (36) H 2.1 mm, (37) H 2.1 mm; (38) *Rissoa parva* (da Costa, 1778). Somali lobster trap, H 2.1 mm (HR); (39–41) *Caecum glabrum* (Montagu, 1803): (39–40) Somali (HR): (39) L 1.2 mm, (40) L 1.0 mm, (41) Protoconch, Somali, sediment sample, L 0.4 mm (DH); (42) *Trivia* cf. *arctica* (Pulteney, 1799), juvenile, Somali, lobster trap, H 3.9 mm (FV); (43) *Trivia arctica* (Pulteney, 1799), Somali, lobster trap, H 7.5 mm (HR); (44) *Eulima glabra* da Costa, 1778, Koningin Regentes, H 5.3 mm (FV).  
 (photos: Han Raven)



figures 45–60: (45–46) *Buccinum undatum* Linnaeus, 1758, juvenile, Somali rope (HR), (45) H 2.7 mm, (46) H 4.2 mm; (47–49) *Tritia incrassata* (Strøm, 1768) Somali, lobster trap (HR), (47) Small form with globose whorls, adult, H 5.0 mm, (48–49) Typical form: (48) Juvenile, H 4.9 mm, (49) Adult, H 7.4 mm; (50) *Raphitoma linearis* (Montagu, 1803), Somali, nets/rope, H 5.0 mm (HR); (51) *Propebela turricula* (Montagu, 1803), Somali, H 10.2 mm (FV); (52) *Parthenina interstincta* (J. Adams, 1797), 70500, sediment sample, H 2.2 mm (DH); (53) *Parthenina* cf. *suturalis* (Philippi, 1844), Somali, lobster trap, H 1.3 mm (HR); (54) *Odostomia turrita* Hanley, 1844, 70500, sediment sample, H 1.6 mm (DH); (55) *Odostomia unidentata* (Montagu, 1803), Somali, lobster trap, H 2.0 mm (HR); (56–57) *Philine punctata* (J. Adams, 1800): (56) Somali, H 1.7 mm (FV), (57) Koningin Regentes, H 1.8 mm (FV). (58–59) *Retusa truncatula* (Brugière, 1792): (58) Somali, lobster trap, H 4.0 mm (FV), (59) Somali, sediment sample, H 4.9 mm (DH); (60) *Retusa umbilicata* (Montagu, 1803), Koningin Regentes, H 4.4 mm (FV).  
 (photos: Han Raven)



## Acknowledgements

Floor Driessen coordinated the labelling of the nets and acted as contact person on board for those who came to sift through the nets. Willem Heijdeman maintained contact with the waste remover Beck & Verburg and ensured that the nets were transported to the port of Stellendam. DDNZS and the participating divers are thanked for organising the diving trip and making the material available, Betty van den Berg and Roel van der Mast (Dive Team Zeeland) also collected sediment samples. Lilian Schoonderwoerd for her help in coordinating our sampling event and Frank Wesselingh (Naturalis) for making the microscope available with which the photos were taken. Hanno Bakker, Bob Bruins, Bart van Heugten, Dick Hoeksema, Dennis Leeuw, Erick Staal and Fred Vervaet collected and identified material and submitted their species lists. Dick and Fred made interesting finds available for photos. Dick also helped with the identification of a few species of bivalves. Jan Johan ten Poorten identified the small cockles (*Parvicardium*), Joop Eikenboom and Guus Gulden contributed their thoughts on the identity of the snails that have now been reported as *Pusillina inconspicua*. Several of the aforementioned colleagues commented on the manuscript, which was thereby improved.

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## Table 2 [Note from the Editor]

Table 2, the list of the species of molluscs recorded for each sampling location, is not reproduced here but is available to download at: <https://www.duikdenoordzeeschoon.nl/wp-content/uploads/2019/03/Spirula-418-Raven-van-Leeuwen-44-54.pdf> (accessed 02/2020).

### The species recorded from the British part of the North Sea (extracted from Table 2)

*Acanthochitona crinita*, *Callochiton septemvalvis*, *Hanleya hanleyi*, *Leptochiton asellus*, *Heteranomia squamula*, *Astarte borealis*, *Astarte sulcata*, *Goodallia triangularis*, *Cerastoderma edule*, *Parvicardium pinnulatum*, *Parvicardium scabrum*, *Corbula gibba*, *Donax vittatus*, *Hiatella arctica*, *Bornia sebetia*, *Hemilepton nitidum*, *Kurtiella hientata*, *Lucinoma borealis*, *Spisula elliptica*, *Spisula subtruncata*, *Sphenia binghami*, *Crenella decussata*, *Modiolula phaseolina*, *Modiolus barbatus*, *Modiolus modiolus*, *Modiolus* sp., *Musculus subpictus*, *Mytilus galloprovincialis*, *Nuculana minuta*, *Nucula nucleus*, *Ostrea edulis*, *Aequipecten opercularis*, *Mimachlamys varia*, *Palliohum tigerinum*, *Talochlamys pusio*, *Ensis siliqua*, *Ensis* sp., *Phaxas pellucidus*, *Barnea candida*, *Zirfaea crispata*, *Gari fervensensis*, *Gari tellinella*, *Abra alba*, *Abra* cf. *alba*, *Abra prismatica*, *Arcopagia crassa*, *Asbjornsenia pygmaea*, *Asbjornsenia* cf. *pygmaea*, *Fabulina fabula*, *Macomangulus tenuis*, *Thracia phaseolina*, *Thracia villosiuscula*, *Chamelea striatula*, *Clausinella fasciata*, *Dosinia exoleta*, *Dosinia lupinus*, *Dosinia* sp., *Timoclea ovata*, *Venerupis corrugata*, *Venerupis* sp., *Venus casina*, *Venus verrucosa*, *Venus* sp., *Buccinum undatum*, *Caecum glabrum*, *Capulus ungaricus*, *Bittium reticulatum*, *Doto hydrallmaniae*, *Epitonium clathratulum*, *Eulima glabra*, *Emarginula fissura*, *Lacuna* cf. *crassior*, *Littorina saxatilis*, *Bela nebula*, *Propebela rufa*, *Propebela turricula*, *Boreotrophon truncatus*, *Trophonopsis muricata*, *Tritia incrassata*, *Tritia* cf. *incrassata*, *Euspira nitida*, *Euspira* sp., *Philine punctata*, *Brachystomia eulimoides*, *Eulimella/Turbonilla?*, *Odostomia turrita*, *Odostomia unidentata*, *Odostomia* cf. *unidentata*, *Odostomia* sp., *Ondina* sp., *Parthenina indistincta*, *Parthenina interstincta*, *Parthenina* cf. *interstincta*, *Parthenina* cf. *suturalis*, *Spiralinella spiralis*, *Turbonilla lactea*, *Raphitoma linearis*, *Retusa mammillata*, *Retusa truncatula*, *Retusa umbilicata*, *Alvania punctura*, *Crisilla semistriata*, *Manzonina crassa*, *Obusella intersecta*, *Onoba* cf. *aculeus*, *Onoba semicostata*, *Pusillina inconspicua*, *Rissoa parva*, *Dikoleps nitens*, *Trivia arctica*, *Trivia* cf. *arctica*, *Gibbula tumida*, *Steromphala cineraria*, *Turritella communis*, *Antalis* sp.

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