

Sabellaria, a polychaete host for the gastropods *Noemiamea dolioliformis* and *Graphis albida*

Ian J. Killeen* and Janice M. Light†

*Malacological Services, 163 High Road West, Felixstowe, Suffolk, IP11 9BD. E-mail: ian@malacserv.demon.co.uk

†Carbonate Group, Department of Geology, Royal Holloway University of London, Egham, Surrey, TW20 0EX.
E-mail: jan@aquamar.demon.co.uk

Molluscan biogeographical studies around the British Isles and along the north coast of France have revealed a recurring association between the tube-building polychaetes *Sabellaria* spp. and two marine snails: the pyramidellid gastropod *Noemiamea dolioliformis* and the acclid, *Graphis albida*. Whilst few pyramidellids are considered to be host-specific, the evidence from these studies has shown that living animals of *N. dolioliformis* are only ever associated with *Sabellaria* spp. There is also a clear relationship between *G. albida* and *Sabellaria* spp. but as yet insufficient evidence that it associates only with these polychaetes.

The Pyramidellidae is a family of small, white gastropods, all of which are ectoparasites of other marine organisms, particularly polychaetes and molluscs. Several of the more common intertidal and shallow water species each have a range of, often temporary, hosts and very few are host-specific (Høisæter, 1989). The only pyramidellid in north-west Europe which appears to be host-specific is *Ondina perezi* (Dautzenberg & Fischer, 1925) with the sipunculan *Phascolion strombi* (Montagu) (see Høisæter, 1989). Aclidids are principally parasites of echinoderms and have an intermittent association with their host. However, few specific host or food relationships have been identified.

In the last ten years, distributional studies of British marine molluscs have focused on using finer resolution mapping and a more systematic approach to recording (Light, 1998). With increased knowledge of species' ecology and food/host associations, intertidal sampling aims at targeting these specialist habitats. To collect pyramidellids this work has focused on sampling sedentary, tube-dwelling polychaetes, particularly *Pomatoceros*, *Spirorbis* and *Sabellaria* spp.

Initial results from this technique suggested that *Sabellaria* spp. might be host species of two gastropods rarely recorded alive: the pyramidellid *Noemiamea dolioliformis* (Jeffreys, 1848) and the 'acclid' *Graphis albida* (Kanmacher in G. Adams, 1798) (Light & Killeen, 1992; Killeen, 1992). [The taxonomic position of *G. albida* is unclear. It has formerly been placed within the Aclididae, however, the presence of a long proboscis and absence of a radula suggest a systematic position close to *Cima* (Warén, 1993; personal communication).] *Noemiamea dolioliformis* is a southern species ranging from the British Isles to the Mediterranean, but not occurring in Scandinavia (Fretter et al., 1986). The distribution of *G. albida* is given by Fretter & Graham (1982) as ranging from the Mediterranean north to southern Norway. The distribution of both species in north-west Europe is given by Seaward (1990). However, few of the records are based on living animals.

To clarify our observations and inferences, samples of *Sabellaria* have been collected from 24 locations around the British Isles and northern France (Appendix 1). (We have also included records of *N. dolioliformis* from two sites (6 and 12) from monitoring surveys carried out by the UK Environment Agency.) The method of collection varied according to the nature and extent of the *Sabellaria* colony. On extensive reefs only a surface layer was removed with hammer and trowel, to

an approximate depth of 2 cm. Where smaller colonies occurred as veneers on rocks, or where they were binding pebbles and cobbles, samples were collected by carefully removing portions of veneer or clumps of tubes. The amount collected varied from 0.5 to 5 kg. The resultant sample was broken up into small pieces, soaked in fresh water for six hours and sieved. The >2 mm fraction was discarded and the residue retained by a 0.3 mm sieve preserved in 80% industrial methylated spirit until analysed. Both species of *Sabellaria* which occur around the British Isles and on the northern coast of France, *S. alveolata* (L., 1758) and *S. spinulosa* Leuckart, 1849 were sampled.

Table 1 shows the presence/absence of *N. dolioliformis* and *G. albida* at all of the *Sabellaria* sample sites. *Noemiamea* was found at 19 and *G. albida* at 13 sites, with coincidences at six sites. Only *Noemiamea* was present along the coast of the southern North Sea (sites 512), and only *Graphis* was found on the west coast of Ireland (sites 1 and 2) and in north-west England (site 3). *Noemiamea* was found in *Sabellaria* colonies from mid-shore level (site 10) and sublittorally to a depth of 20 m (site 12), whereas *Graphis* records were from intertidal sites at low water, spring tides (LWST). Both molluscs were found with *S. alveolata* and *S. spinulosa* with no evidence for a preference for either species. *Graphis* always occurred in low numbers (<5 individuals per sample), and sometimes only a single specimen was found. *Noemiamea* was generally found in higher numbers. At site 7, for example, >100 individuals were retrieved from approximately 5 kg of *Sabellaria* sample.

Four other pyramidellids were recorded from the *Sabellaria* samples: *Partulida spiralis* (Montagu, 1803) and *Odostomia turrita* Hanley, 1844 occurred most often and in greatest abundance. *Odostomia plicata* (Montagu, 1803) was found mainly at sites in the English Channel, where it was often common. *Odostomia unidentata* (Montagu, 1803) was infrequent in occurrence and usually in low numbers. It is inferred that all of these species are feeding on the *Sabellaria* worms. Other gastropods most often recorded from the *Sabellaria* samples were *Hinia reticulata* (L., 1758), and rissoids which are probably derived from epiphytic algae. Associated bivalve species include *Hiatella arctica* (L., 1767), *Venerupis senegalensis* (Gmelin, 1791), *Thracia distorta* (Montagu, 1803) (south-west England only) and *Mysella bidentata* (Montagu, 1803). Studies by other workers on the fauna associated with *Sabellaria alveolata* colonies, e.g. Duckpool, Cornwall (Wilson, 1971), Loire Atlantique (Gruet, 1971), Ria de

Table 1. Results showing presence/absence of *Noemiamea dolioliformis* and *Graphis albida*.

Area	Site no.	<i>Noemiamea dolioliformis</i>	<i>Graphis albida</i>	
Western Ireland	1		x	
	2		x	
Irish Sea	3		x	
	4	x	x	
North Sea	5	x		
	6	x		
	7	x		
	8	x		
	9	x		
	10	x		
	11	x		
	12	x		
	Channel-England	13	x	
		14	x	
		15	x	x
16			x	
17		x	x	
18		x	x	
19		x		
20			x	
Channel Islands	21		x	
	22		x	
Channel-France	23	x	x	
	24	x	x	
	25	x		
	26	x		

Vigo (Anadon, 1981), north Devon (Bamber & Irving, 1993) have all listed significant numbers of taxa associated with *Sabellaria* reefs, but none has recorded any mollusc species which are regarded as ectoparasites on the worms.

The evidence that *Noemiamea* and *Graphis* are host-specific on *Sabellaria* is further supported by the negative results from the other tube-dwelling polychaetes *Pomatoceros*, *Spirorbis*, and *Serpula* which have been sampled for pyramidellids. Samples of these polychaetes from over 100 locations around the British Isles and on the northern coast of France have never yielded *Noemiamea* or *Graphis*. At most sites *Odotostomia turrata* was the commonest pyramidellid species, with generally lower numbers of *O. unidentata*, *O. plicata* (particularly at Channel sites), *Partulida spiralis*, *Brachystomia eulimoides* and *B. cf angusta*.

During the present study occasional living specimens of *Noemiamea* were retrieved from weed samples (mainly *Ceramium* spp.) growing on *Sabellaria* colonies at Joss Bay (site 5). Collection of the weeds with their holdfasts can incorporate the sediment of the worm tube apertures, and this may account for observations on habitat given in Fretter et al. (1986) where *Noemiamea* is described as living on seaweeds, and in rock pools at LWST. The two most recent records of *Graphis* prior to this study are also based on specimens from weed samples (Seaward, 1987; Turk, 1974). Clark (1850) records *Graphis* from near Exmouth, Devon as being found 'at low water mark, on the margin of a deep and quiet pool'. As *Sabellaria* is a common feature of many rocky shores, especially on the south coast of Devon, the living specimens of *Graphis* and *Noemiamea* may have come from the holdfasts of weeds attached to the colonies. A. Warén (personal communication) informs us that the few specimens he has found alive in Scandinavia came from coarse sand at a depth of a few metres where *Sabellaria* was also present.

The present work has not established whether the snails live within the tubes or around the apertures. The spindle-shaped shell of *Graphis* (height 23 mm, width 0.5 mm) may allow the animals to live in the tubes or attached to the worm bodies. All

of the living examples of *Graphis* collected during this study have clean shells with no evidence of any epibiota or encrusting deposits. As the worms are able to retract into their tubes and seal off much of the opening with the operculum, it would seem unlikely that there would be sufficient space within the tubes for adult animals of *Noemiamea* (shell height 2 mm, width 1.2 mm) although this may not be the case for juveniles. It is inferred that the adult snails live around the worm tube apertures and feed on the worms whilst the prey itself is feeding. This theory is supported by the presence on some large, adult *Noemiamea* of epiphytic algal growth.

We thank Anders Warén at the Swedish Museum of Zoology in Stockholm for helpful information and discussion, Roger Bamber, Natural History Museum, London for useful references, Mike Bailey for providing Wash data, the Environment Agency for permission to use results from their surveys and Peter Garwood for drawing our attention to Crouch specimens and allowing us to examine them.

REFERENCES

- Anadon, N., 1981. Contribución al conocimiento de la fauna bentónica de la ría de Vigo. III. Estudio de los arrecifes de *Sabellaria alveolata* (L.) (Polychaeta, Sedentaria). *Investigación Pesquera, Barcelona*, **45**, 105–122.
- Bamber, R.N. & Irving, P.W., 1993. Littoral Studies at Hinkley Point 2: the growth of *Sabellaria* reefs. *Fawley Aquatic Research Ltd Report*, FRR 043/93.
- Clark, W., 1850. *A history of the British marine testaceous Mollusca*. London: John van Voorst, London.
- Fretter, V. & Graham, A., 1982. The prosobranch molluscs of Britain and Denmark. Part 7. 'Heterogastropoda' (Cerithiopsacea, Triforacea, Epitonacea, Eulimacea). *Journal of Molluscan Studies*, **11**, Supplement, 363–434.
- Fretter, V., Graham, A. & Andrews, E.B., 1986. The prosobranch molluscs of Britain and Denmark. Part 9—Pyramidellacea. *Journal of Molluscan Studies*, **16**, Supplement, 557–649.
- Gruet Y., 1971. Morphologie, croissance et faune associée des récifs de *Sabellaria alveolata* (Linné) de la Bernerie-en-Retz (Loire Atlantique). *Téthys*, **3**, 321–380.
- Høisæter, T., 1989. Biological notes on some Pyramidellidae (Gastropoda: Opisthobranchia) from Norway. *Sarsia*, **74**, 283–297.
- Killeen, I.J., 1992. Further records of *Noemiamea dolioliformis* (Jeffreys). *Journal of Conchology*, **34**, 258.
- Killeen, I.J. & Light, J.M., 1989. Marine recording on the Burren. *Conchologists' Newsletter*, **111**, 242–245.
- Light, J.M., 1998. Marine molluscan conservation: the value of mapping as a conservation tool. In *Molluscan conservation: a strategy for the 21st century* (ed. I.J. Killeen and M.B. Seddon), pp. 147–154. Place? Publisher? [Journal of Conchology Special Publication, no. 2.]
- Light, J.M. & Killeen, I.J., 1992. *Noemiamea dolioliformis* (Jeffreys) and *Graphis albida* (Kanmacher) living at Criccieth, North Wales. *Journal of Conchology*, **34**, 117–118.
- Seaward, D.R., 1987. *Graphis albida* in south Devon. *Journal of Conchology*, **32**, 386.
- Seaward, D.R., 1990. *Distribution of the marine molluscs of north west Europe*. Peterborough: Nature Conservancy Council.
- Turk, S.M., 1974. Proceedings for 1973. Recorder's report: marine mollusca. *Journal of Conchology*, **28**, 259–261.
- Warén, A., 1993. New and little known Mollusca from Iceland and Scandinavia. Part 2. *Sarsia*, **78**, 159–201.
- Wilson, D.P., 1971. *Sabellaria* colonies at Duckpool, north Cornwall. *Journal of the Marine Biological Association of the United Kingdom*, **51**, 509–580.

Submitted 27 July 1999. Accepted 18 February 2000.

Appendix 1. *Locations and descriptions of sample sites.*

Site no.	Area	Location	Latitude	Longitude	Description
1	Western Ireland	Fanore, County Clare	53°06.8'N	09°16.8'W	Sandy bay with small reefs of <i>Sabellaria alveolata</i> see Killeen & Light, 1989).
2	Western Ireland	Tralee Bay, County Kerry	52°17.2'N	10°11.7'W	Sandy bay with large boulders colonized by <i>Sabellaria</i> and <i>Pomatoceros</i> .
3	Irish Sea	Nethertown, Cumbria, England	54°25.6'N	03°34.5'W	Sandy beach with extensive reefs of <i>S. alveolata</i> on middle to lower shore. Small colonies of <i>Sabellaria</i> spp. binding smaller stones and rocks on the lower shore.
4	Irish Sea	Criccieth, Lleyrn Peninsula, Gwynedd, Wales	52°55'N	04°13'W	Steeply sloping shore with closely packed rocks, many resting on coarse sand and gravel. Small colonies of <i>Sabellaria</i> binding smaller stones and rocks see Light & Killeen, 1992).
5	North Sea	Joss Bay, Kent	51°22.9'N	01°27.1'E	Wave-cut chalk platform with colonies of <i>Mytilus edulis</i> . Small colonies of <i>S. spinulosa</i> occurring as veneers on large rocks covered by <i>Fucus serratus</i> , <i>Ceramium rubrum</i> and <i>Cladophora rupestris</i> see Killeen, 1992.
6	North Sea	River Crouch estuary, Essex	51°37.1'N	00°54.2'E	Sand, stones and <i>S. spinulosa</i> grabbed from 5 m depth.
7	North Sea	Off Essex	51°39.5'N	01°11.5'E	Rocks, stones and dead shells covered with colonies of <i>S. spinulosa</i> . Dredged from 16 m depth.
8	North Sea	Mersea Estuary, off Essex	51°45.5'N	01°01.5'E	Bed of dead <i>Ostrea edulis</i> shells covered with colonies of <i>S. spinulosa</i> . Dredged from 8 m depth.
9	North Sea	Dovercourt, Essex	51°55.3' N	01°16.3'E	Muddy/sandy shore with rocks and small ledges colonized by <i>S. spinulosa</i> .
10	North Sea	Harwich, Essex	51°56.3'N	01°19.6'E	Muddy gravel shore on northern side of concrete breakwater. Mudstone ledge at mid-shore level with veneers of <i>S. spinulosa</i> . Algae included <i>F. serratus</i> , <i>C. rubrum</i> and <i>C. rupestris</i>
11	North Sea	Felixstowe, Suffolk	51°57.6'N	01°22.1'E	Shingle beach. Colonies of <i>S. spinulosa</i> on concrete groynes and mudstone rocks at extreme low water-level spring tides.
12	North Sea	Wash	53°00.7'N	00°24.0'E	Sand, stones and <i>S. spinulosa</i> grabbed from 20 m depth.
13	Channel-England	St Mary's Bay, Brixham, Devon	50°23.3'N	03°30.2'W	Shore with sandstone rocks and ledges. Small colonies of <i>Sabellaria</i> binding smaller stones and rocks.
14	Channel-England	Broadsands Bay, Devon	50°24.6'N	03°33.3'W	Colonies of <i>S. alveolata</i> on lower shore sandstone rocks and ledges.
15	Channel-England	Ladram Bay, Devon	50°39.3'N	03°16.8'W	Extensive reefs of <i>Sabellaria</i> on ledges, amongst large rocks and in pools.
16	Channel-England	Shaldon, Devon	50°32.1'N	03°29.9'W	Colonies of <i>Sabellaria</i> on lower shore sandstone rocks and ledges.
17	Channel-England	Beer, Seaton, Devon	50°41.6'N	03°05.6'W	Small, wave-cut chalk platform at west end of shingle shore. Colonies of <i>S. alveolata</i> covering the platform and large stones.
18	Channel-England	Lyme Regis, Dorset	50°43.6'N	02°55.7'W	Extensive <i>S. alveolata</i> colonies on hard clay ledges and in shallow depressions on lower/middle shore.
19	Channel-England	Newhaven, Sussex	50°46.8'N	00°03.3'E	10 m high concrete breakwater at harbour entrance with a sandy bay on inner side. Many detached concrete rocks at the base of the inner side of the breakwater exposed at LWST, covered with <i>S. spinulosa</i> and occasional plants of <i>C. rubrum</i> and <i>Mastocarpus stellatus</i> .
20	Channel-England	Birling Gap, Sussex	50°44.6'N	00°11.8'E	Wave-cut chalk platform. Small colonies of <i>S. spinulosa</i> occurring as veneers on large rocks covered by kelp (<i>Laminaria</i> spp.) and <i>F. serratus</i> at LWST.
21	Channel-England	Beachy Head, Sussex	50°44.2' N	00°15.4'E	Wave-cut chalk platform with Lower Greensand reef. Small colonies of <i>S. spinulosa</i> occurring as veneers on compacted large flints in sheltered gulleys.
22	Channel Islands	Flicquet Bay, Jersey	49°13.5'N	02°01.1'W	Rocky shore with occasional small colonies of <i>Sabellaria</i> binding smaller stones and rocks.
23	Channel-France	St Michel en Grève, Côtes d'Armor, Brittany	48°41.6'N	03°34.0'W	Extensive colonies of <i>S. alveolata</i> covering rocks and ledges at eastern end of sandy bay.
24	Channel-France	Poul-Rodou, west of Locquirec, Finistère, Brittany	48°41.3'N	03°42.2'W	Colonies of <i>S. alveolata</i> binding partially embedded boulders and rock outcrops at mid to low water mark.
25	Channel-France	St Quay-Portrieux, Côtes d'Armor, Brittany	48°39.0'N	02°49.5'W	Rocky headland and islets at northern end of sandy/muddy bay. Small colonies of <i>Sabellaria</i> binding smaller stones and rocks.
26	Channel-France	Pointe de Pordic, Plage de Petit Havre, Côtes d'Armor, Brittany	48°35.6'N	02°47.6'W	Rocky headland at southern end of sandy bay. Small colonies of <i>Sabellaria</i> binding smaller stones and rocks.