

A translation of Bishop Gunnerus' description of the species *Hydroides norvegicus* with comments on his *Serpula triquetra*

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SUMMARY: In 1768 J.E. Gunnerus first described the species *Hydroides norvegicus* (Polychaeta, Serpulidae), the type of the genus *Hydroides* which today includes close to 90 species worldwide and is the largest serpulid genus. This description has therefore great value as a type description, but as it is written in an old-fashioned Danish/Norwegian language with a font which is hard to interpret, the description is rather inaccessible to most polychaetologists. This paper presents a translation of Gunnerus' description of *H. norvegicus* and a brief review of the present day status of the species. Comments on Gunnerus' description of *Serpula triquetra* are also included, as well as references to his correspondence with Swedish naturalist Carolus Linnaeus regarding the species in question.

Keywords: J.E. Gunnerus, Serpulidae, *Hydroides*, *H. norvegicus*, *Placostegus tridentatus*, translation, *Lophelia*, *Pomatoceros triquetra*.

RESUMEN: UNA TRADUCCIÓN DE LA DESCRIPCIÓN DE *HYDROIDES NORVEGICUS* POR *BISHOP GUNNERUS*, CON COMENTARIOS SOBRE *SERPULA TRIQUETRA*. – En 1768 J.E. Gunnerus describió la especie *Hydroides norvegicus* (Polychaeta: Serpulidae), especie tipo del género *Hydroides*. Este género incluye en la actualidad 90 especies, siendo el género más numeroso de la familia Serpulidae. Esta descripción presenta pues un gran valor como descripción del tipo; sin embargo, la descripción está realizada en un antiguo y desfasado lenguaje mezcla del Danés y el Noruego, con fuentes difíciles de interpretar e inaccesibles para la mayoría de los poliquetólogos. Este trabajo presenta una traducción de la descripción de *H. norvegicus* realizada por Gunnerus y una revisión actualizada del “status quo” de la especie. Se incluyen asimismo comentarios realizados por Gunnerus sobre *Serpula triquetra*, así como referencias de la correspondencia que sobre esta especie realizó el autor con Carolus Linnaeus.

Palabras clave: J.E. Gunnerus, Serpulidae, *Hydroides*, *H. norvegicus*, *Placostegus tridentatus*, traducción, *Lophelia*, *Pomatoceros triquetra*.

GUNNERUS AND HIS WORK

In 1758, Johan Ernst Gunnerus (1718-1773) (Fig. 1) was consecrated Bishop of Trondhjem, a bishopric that then stretched from Romsdal, through central Norway to the Russian border in the northernmost part of the country. In addition to his theological work, he had a profound personal interest in

natural history and biology. J.E. Gunnerus is regarded by many as the founder of modern natural science in Norway (Nordgård, 1918). In 1760 he founded Norway's first scientific institution, Det Trondhiemske Selskab (The Trondheim Society) together with historians Gerhard Schøning and Peter Frederik Suhm. The Society received royal recognition in 1767 and was renamed Det Kongelige

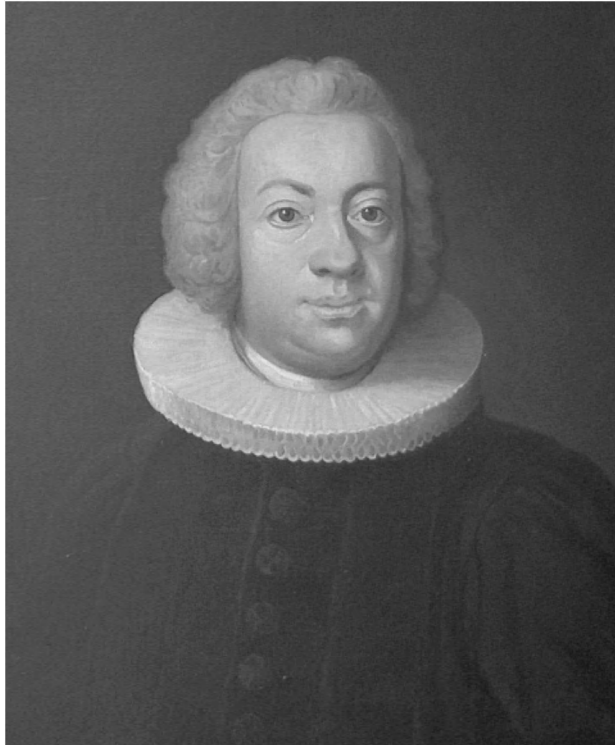


FIG. 1. – Johan Ernst Gunnerus (1718-1773). Photo of painting by Schweiger, donated to DKNVS by Gunnerus' sister. (Photo: Toril L. Moen)

Norske Videnskabers Selskab (DKNVS, The Royal Norwegian Society of Sciences and Letters). The Society's journal, *Det Kongelige Norske Videnskabers Selskabs Skrifter*, is still being published, and is thereby the oldest journal in the Nordic countries that has been published without interruption.

Gunnerus also started a library and an object collection in connection to the Society, which resulted in the library and museum known today as The Gunnerus Library and Vitenskapsmuseet (The Museum of Natural History and Archaeology). He also spoke strongly in favour of establishing a Norwegian university but he did not have any success on this matter before he died.

During his many visits around the bishopric, Gunnerus eagerly collected various plants and animals, both terrestrial and marine (Marsh, 2002). Throughout the years he discovered and described a number of organisms not previously known to science: The basking shark *Cetorhinus maximus* (1765b as *Squalus maximus*), the roundnose grenadier *Coryphaenoides rupestris* (1765b), the algae *Aglaothamnion sepositum* (1772 as *Conferva seposita*), *Laminaria hyperborea* (1766 as *Fucus hyperboreus*) and *Osmundea oederi* (1772 as *Fucus*

oederi, see McIvor *et al.*, 2002), the copepod *Calanus finmarchicus* (1770 as *Monoculus finmarchicus*), the holothurians *Parastichopus tremulus* (1767 as *Holothuria tremula*) and *Cucumaria frondosa* (1767 as *Holothuria frondosa*), the gorgonian coral *Primnoa resedaeformis* (1763 as *Gorgonia resedaeformis*), and a number of birds. He discussed many of these findings with the Swedish naturalist Carolus Linnæus through their extensive correspondence (letters published in Amundsen, 1976).

'ON SOME NORWEGIAN CORALS' AND WORMS

In 1768 Gunnerus' pioneer work 'Om nogle Norske Coraller' [On some Norwegian corals] in the Society's *Skrifter* (Gunnerus, 1768) reports on eight species of corals encountered during his travels. Interestingly, he also describes three polychaetous annelids that he observed associated with the coral *Madrepora pertusa* (now: *Lophelia pertusa*). He recognized two of these worms as new to science and named them '*Nereis madreporæ pertusæ*' and '*Hydroides norvegica*'. In his text he also mentions another worm which he refers to as a variety of Linnæus' '*Serpula triquetra*', although he remarks on the presence of minute teeth on one of the tube's keels, a character not reported by Linnæus. The description of '*Nereis madreporæ pertusæ*' has been shown to refer to the species *Eunice norvegica* (L., 1767 as *Nereis norvegica*) in the family Eunicidae (Winsnes, 1989; Fauchald, 1992). The other two species, which refer to calcareous tubeworms within the family Serpulidae, are addressed below. He included drawings of all three worms (Fig. 2).

Gunnerus' account is printed in old-fashioned Norwegian/Danish language with black letter font (German type) and is thereby hard to interpret and not easily accessible to the scientific community (Fig. 3). It is important that original descriptions are readily available in order to distinguish between species and to avoid misinterpretations. The aim of this paper is to provide a translation of the descriptions of the two serpulids, with main focus on the original description of *Hydroides norvegicus*, and to give a short review of the present day status of the species. Because of the typical old-fashioned mode of expression in the original text, I have aimed to retain this style in the transla-

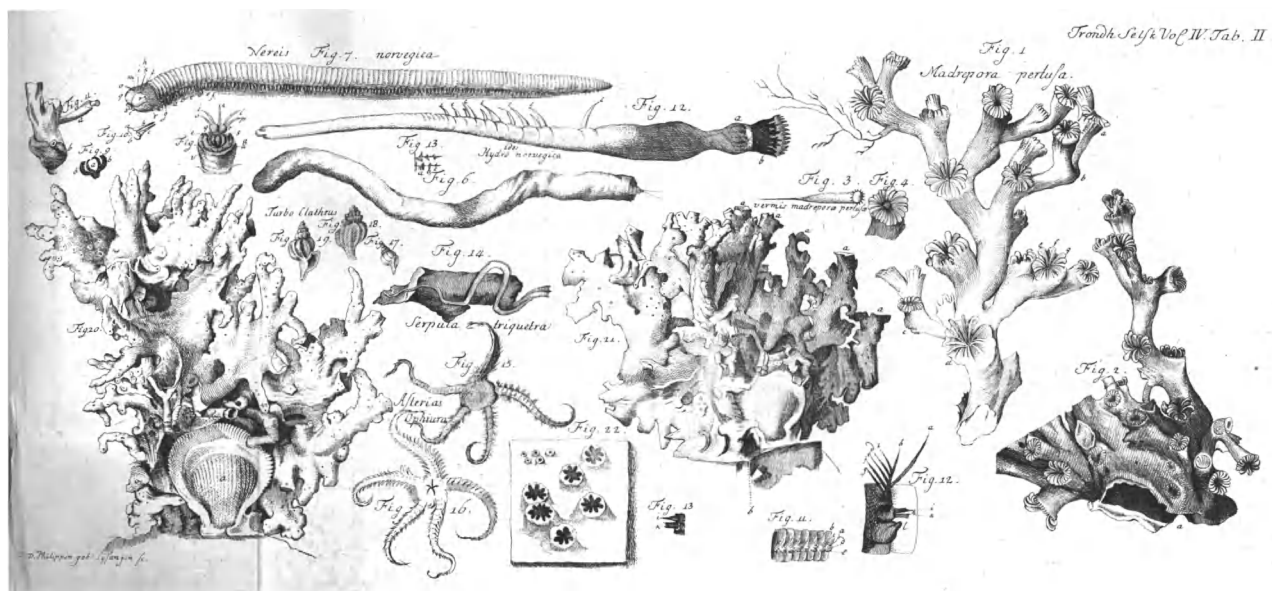


FIG. 2. – The complete Plate II in Gunnerus (1768) showing details from his ‘*Madrepora pertusa*’, ‘*Hydroides norvegica*’, ‘*Serpula triquetra*’, and ‘*Nereis madreporæ pertusæ*’, among others.

2.) Et Orme: Rør, Fig. 11. litt. a. ic. litt. b., graat, uigiennemfigtigt, tykt som en Due: Pen, halvanden Tomme langt, en Tomme, eller noget mindre, frit udstaaende fra Corallen, trindt og noget krumt, for saa vidt det udstaaer; men, for saa vidt det med sin Bagdeel er fastvoeret til Corallen, ujevnt, kroget og fringelboiet; saa at man paa dette
 D 2 Sted

FIG. 3. – An example of the original text of Gunnerus’ ‘Om nogle Norske Coraller’.

tion. The use of comma and semicolon is also maintained. The comments in brackets, [], are mine. Gunnerus usually wrote the binomial Latin names with only the species name in italics, as shown in the preceding paragraph. In the translations I have strived to maintain this style.

As noted above, Gunnerus discussed a number of his findings with Carolus Linnæus. The letters were written in Latin, Swedish and Norwegian. A large part of their correspondence has been preserved, and has been published together with a Norwegian translation of each letter (Amundsen, 1976). I include a translation of the notes concerning the polychaetes in question. The original letters from Carolus Linnæus are owned by The Royal Norwegian Society of Sciences and Letters in Trondheim, while the ones from Gunnerus to Linnæus are found at The Linnean Society of London. In Scandinavia, Carolus Linnæus is mainly known as Carl von Linné, the



FIG. 4. – Gunnerus’ figures 1-2 of the coral *Lophelia pertusa* (as *Madrepora pertusa*). This drawing is the very first to be made of this species and is often used by other authors as an illustration.

name he received after being made a knight in 1757 (officially accepted in 1762). In the letters since 1762, this was the name used by both Gunnerus and Linnæus himself, and the name (von) Linné might therefore appear in this text.

TABLE 1. – Summary of the eight corals referred to in Gunnerus (1768). All the organisms are mentioned in the correspondence between Gunnerus and Carolus Linnæus, including No. VIII, which is in fact a calcareous alga of the genus *Lithothamnion* Heydrich, 1897 (see Foslie, 1894).

'Corals' I-VIII listed by Gunnerus		Reference and comments by Gunnerus
No. I	<i>Madrepora pertusa</i>	Linnæus S.N. X, p. 797
No. II	<i>Madrepora virginea</i>	Linnæus S.N. X, p. 798
No. III	<i>Millepora tarandicornis</i> (n. sp.)	in a P.S. Gunnerus states that Linnæus calls it <i>Cellepora pumicosa</i> after seeing a sample of the organism
No. IV	<i>Millepora muricata</i>	Linnæus S.N. X, p. 792
No. V	<i>Millepora norvegica</i> (n. sp.)	in a P.S. Gunnerus states that the name of this organism is <i>Millepora aspera</i> in the eleventh edition of Linnæus' Systema Naturæ, which is in press [*]
No. VI	<i>Millepora cellulosa</i>	Linnæus, 'looks like a straw hat'
No. VII	<i>Isis hippuris</i>	Linnæus S.N. X, p. 799
No. VIII	<i>Apora</i> sp. (nov. gen.)	Gunnerus comments that Linnæus has called it '(in adversariis suis) <i>Millepora polymorpha</i> '

* This information was intended to be included in the 11th edition of Systema Naturæ. It is unclear whether it was actually published.

CORALS AND LOCATIONS

In the account, special emphasis is placed on the species *Madrepora pertusa* L., which was given the new combination *Lophelia pertusa* by Dons (1944). Gunnerus' figures were the very first drawings documented of this species, and have later become widely used by other scientists (see Fig. 4). The drawings in Gunnerus' works were since 1766 mainly made by Assistant Professor Jacob von der Lippe Parelius. Before this, the painter I.F. Schweiger did all the artwork (Nordgård, 1918, p.127). A list of the corals observed by Gunnerus is found in Table 1.

Gunnerus starts his account by listing a number of locations where he has encountered the coral *Lophelia pertusa* (as *Madrepora pertusa*). He does not give any precise reference to the locations where the worms were found associated with this coral. The places mentioned here are therefore the only locations we know with certainty that Gunnerus also might have encountered the worms in question. The present distribution of *Lophelia pertusa* is described by Fosså *et al.* (2002).

Translation from the beginning of the account on page 38:

"No. 1. The first of these which I have drawn a branch Pl. II, fig. 1, and another, smaller, with a piece of the foot, fig. 2, is by Mr. von Linné called MADREPORA *pertusa* ramosissima, glabra, axillis perforatis, stellis conicis S. N. X. [Systema Naturæ vol. X] 797, n. 36. It is found in large amounts in the North Sea, and I have gained several from Nordland county, as well as Foosnæs in Nummedalen [Fosnes in Namdalen], Hitteren [Hitra] in Fosen district, Aure on Nordmøre, and recently, as fresh as it was taken from the sea, in seawater supplied from

Statsbøiden [Statsbygd]. It feeds, as the others, on cliffs and protruding rocks in the sea, and is usually taken on about 80 fathoms, where the redfish (*Perca marina*) is captured; yet sometimes a lot more shallow, as one can see from the report on corals in general which appears with Mr. Strøm in his Sundmørs Beskriv. 1. part, p. 141."

Gunnerus' figures 1-2 are presented in Figure 4. Fosnes (64°45'N 11°25'E), Hitra (63°35'N 8°50'E) and Statsbygd (63°30'N 10°00'E) are locations in Trøndelag, and Aure (63°15'N 8°10'E) is situated in Møre og Romsdal county.

'HYDROIDES NORVEGICA' / *H. NORVEGICUS*

Translation starting with last paragraph, page 51:

"2) A worm tube Fig. 11, grey, opaque, as thick as a pigeon's leg, one and a half inch long, pointing out an inch or somewhat less from the coral, plump and somewhat bent, where it is protruding; but where its posterior end is fastened to the coral, uneven, bent and curved; so that one on this place does not see a regular tube, and often may two such tubes Fig. 11. lit. a. and b. meet one-another with their uneven and bent posteriors, and come so close to each-other that one has trouble separating these uneven rings. The tube opening that is found on the end of the protruding part, is evenly round yet looks slantingly cut. The head of a living red worm appeared in the middle, and it later protruded about 4 lines further out, where one could clearly see its head, as a small, low, round cup, with a fairly small mouth like a dot, in the middle, and 16 small teeth or beams around the head's edge, which represent a

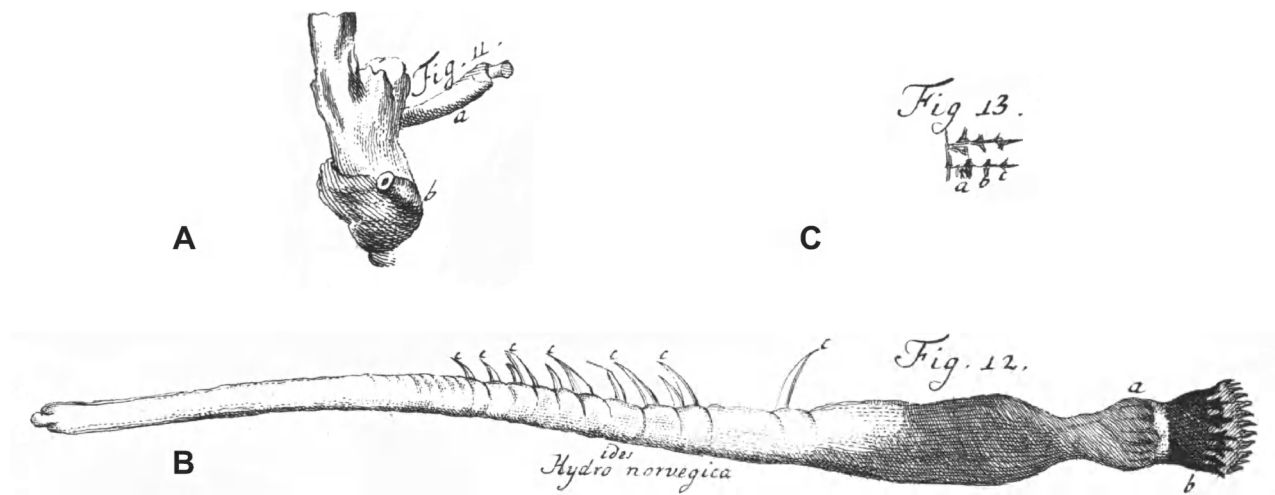


FIG. 5. – Gunnerus' figures 11-13 showing *H. norvegicus*. A) Figure 11 illustrates an attached tube with the anterior part of the worm protruding from the tube (see a, another intertwined tube is marked b). B) Figure 12 depicts an entire worm. Gunnerus' 'head' or opercular funnel is depicted in figure 12a, and 12b marks the verticil and 12c the seven chaetae. C) Figure 13 shows an enlargement of two opercular spines, with the lateral spinules referred to as a, b and c.

TABLE 2. – Summary of the seven organisms referred to as being found together with the coral *Madrepora pertusa*.

Organism	Reference and comments
1. A worm, <i>Nereis madreporæ pertusæ</i>	see Winsnes (1989) and Fauchald (1992)
2. A worm tube, <i>Hydroides norvegica</i>	see text herein
3. Another kind of worm tube, <i>Serpula triqvetra</i>	see text herein
4. A sea star, <i>Asterias ophiura</i>	Linnaeus S. N. X, p. 662
5. A snail, <i>Turbo clathrus</i>	Linnaeus S. N. X, p. 765
6. A shell, <i>Chiton albus</i>	Linnaeus S. N. X, n.sp. Name will be printed in the 11 th ed. of Systema Naturæ. [*]
7. <i>Gorgonia placomus</i>	Gunnerus Act. Nidros. III, p. 1 [Gunnerus, 1765a]

* This information was intended to be included in the 11th edition of Systema Naturæ. It is unclear whether it was actually published.

small garland or crown, as is showed in the drawing Pl. II. Fig. 11, where a part of the body that protruded from the tube, was drawn in natural size while it was still alive. The very accurate appearance under a magnifying glass is shown in Pl. II, Fig. 12, as a is the head, b the crown, 7 c its feet or tentacula on one side, which showed itself to the illustrator, and Fig. 13. shows a couple of distinct beams of the crown, where each had 2 to 3 small branches on each side [a, b, c]. I call this animal, until Mr. v. Linné makes its genus known: *Hydroides norvegica*, radiis capituli XVI., pedibus septenis vix oculo nudo observabilibus; and the tube where the animal lies, belongs to *Serpulas* Linn., whose character becomes: *Serpula norvegica*, lævis, teres, incurva; ore oblique truncato; basi anfractuosa, subobsoleta, adnata."

Here Gunnerus describes both the tube and the worm inside, complete with operculum and chaetae. The characters of the operculum are especially detailed, including what Gunnerus calls the 'head'

(today known as the opercular funnel) and the crown (identical to the verticil) (for terminology see ten Hove, 1990). The illustration of the spines in the opercular verticil, with its lateral spinules, is particularly precise. The seven feet or 'tentacula' refer to the thoracic chaetigers. The branchial crown, uncini, and thoracic membrane are not mentioned.

It should be noted that on Plate II there is a double set of figures numbered fig. 11, fig. 12 and fig. 13. Gunnerus' figures 11-13 of *H. norvegicus* are found in the upper part of the plate, and is shown here as Figure 5. The other figures labelled 11, 12 and 13 show characters of *Eunice norvegica*, and are found in the lower part of the plate (Fig. 2).

'SERPULA TRIQVETRA' / PLACOSTEGUS TRIDENTATUS

Translation of continued text, page 53:

"3) Another kind of worm tube, which is a variety of *Serpula triqvetra*, testa repente flexu-

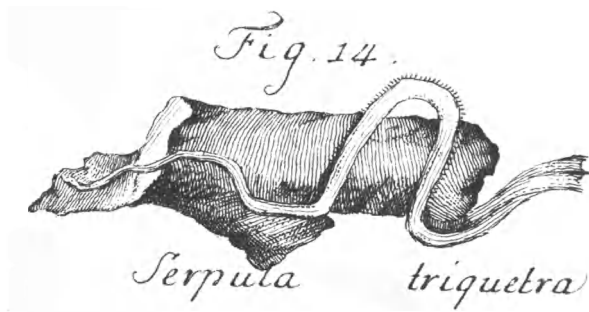


FIG. 6. – Gunnerus' figure 14 depicting the tube of his 'Serpula triquetra', now known as *Placostegus tridentatus* (J. C. Fabricius, 1779).

osa triquetra. Linn. Faun. Svec. 2206. Podr. Mus. Reginae Svec. ULRICÆ ELEONORÆ p. 698. which is drawn on Pl. II, Fig. 14. It looks bluish like glass and is transparent; but becomes white and opaque when it has been laying for a long time in sunlight. It is only open in one end, as I have noted on a couple of specimens which were complete; yet otherwise one often finds it broken in the other end, and one could then assume that it belonged to Dentalia Linn., when one had not before seen it more complete. On the edge of the referred opening one can see 3 rather large and pointy teeth. Along the tube are 3 somewhat elevated sides with sharp edges, whereas the outermost has very fine, short and sharp teeth in an area below the mouth and down to the end. Most tubes are bent posteriorly, where they are attached, and the neck, or the protruding part, is on a few somewhat rotated. I can not find that Mr. v. Linné reports anything about the rather small, fine teeth, which I recently reported from the outer edge of the tube; but nevertheless I have placed it with his *Serpula triquetra*, as this fact alone does not appear to me to be sufficient to make a new and until now unknown species."

Linnæus' species *Serpula triquetra* is today known as *Pomatoceros triquetra* (L., 1758) and is a common species in Norwegian waters. Gunnerus here only presents a description of the tube and nothing on the worm itself (Fig. 6). Nonetheless, from the precise characteristics such as the glass-like appearance and the toothed keel and tube opening, it is evident that this tube does not belong to a species within the genus *Pomatoceros* but to the species later described as *Placostegus tridentatus* (J.C. Fabricius, 1779, as *Serpula tridentata*) (see Mörch, 1863; Bush, 1904). The genus *Placostegus* is monotypic in Norwegian waters.

Although Gunnerus did not acknowledge 'S. triquetra' as a new species, he does give a valid description of it, and according to the principle of priority (ITZN, 1985: Article 23), *Serpula triquetra* should be the valid species name. However, this name turns out to be a junior homonym with Linnæus' *Serpula triquetra* from 1758.

The name *Dentalia* refers to the scaphopod genus *Dentalium* L., 1758, or possibly an even earlier description of Linnæus from 1747 (see Mörch, 1863).

LETTERS BETWEEN GUNNERUS AND LINNÆUS

Carolus Linnæus was clearly impressed by Gunnerus' efforts to investigate the Norwegian fauna and flora. In a letter of March 4., 1769 he not only refers to Gunnerus as a superior doctor and bishop as was his custom, but also salutes him as a Norwegian captain. He praises the fourth volume of Skrifter: "There were so much special and wondrous, that I had never seen its equal." (Amundsen, 1976, p. 95).

Three years before, in a long letter to Linnæus of May 19., 1766, Gunnerus lists a wide variety of organisms that he intends to publish in the fourth volume of Skrifter (1768). Among these are: "... b) *Hydra norvegica* with 16 beams on the head, 7 feet on each side, barely visible for the naked eye. c) *Serpula norvegica*, smooth, cylindrical, curved; the mouth slantingly cut; at he base crooked, uneven, grown. This is the tube of b). d) Variety of your *Serpula triquetra*, vitreous, bluish; the preserved or outer edge is on the inside provided with teeth. The reason that I count it as a variety of your *Serpula triquetra*, is that I think I have seen the same as white or opaque; no small teeth is to be seen on the outer side of the edge." The worm and its tube mentioned in b) and c) refer to the species *Hydroides norvegicus* described in the said account. The name *Hydra*, and the later *Hydroides*, seem to refer to the many-headed aquatic snake that was slain by Hercules in Greek mythology. But more specifically, it refers to the resemblance to the cnidarian genus described by Linnæus in 1758 (Cnidaria: Hydrozoa) (but see also below). Linnæus' answer to this letter is lost or non-existent, but he answers to many of the Norwegian's other organisms in a letter of December 1., 1766.



FIG. 7. – The present distribution of *H. norvegicus* in the North-east Atlantic region. Black circles indicate material studied by the author, open circles are localities from the literature. From Moen (1998).

Almost a year later, on January 3., 1767 Gunnerus again mentions the species, and even includes an illustration. He states: “**In a *Serpula* that is attached to this madrepora, I have discovered a small animal of this size and shape: [minute drawing] under the microscope it looks like this [same drawing but bigger] The head is cup-shaped in front (like a somewhat concave cup), in the middle there is a rather small mouth, like a dot; the tentacles are attached to the head or encircle it; under the microscope one can see about 7 feet on each side. To what genus should I assign this? I have called it a *Hydra*, but it has no floriferous tip. I don’t know if I should rather say a *Holothurium*. Among the nereids I dare not include it.**” From this, one also sees that Gunnerus wonders about placing the worm with the sea cucumbers (Holothurioidea). The drawing is identical with his figure 12 in *Skrifter* (Fig. 5B).

In March 1769 Linnæus replies to this query and mentions the calcareous tubeworm. He states that “*Serpula norvegica* pl.2.f.11,12 is a very special

new species” after having read the now published account in the Society’s *Skrifter*. Linnæus here clearly accepts the worm as new to science, although he uses the name for the tube, *Serpula*, instead of *Hydroides*, for the worm.

BRIEF REVIEW OF *HYDROIDES* AND *H. NORVEGICUS*

According to Ben-Eliahu and ten Hove (1992), the genus name *Hydroides* is masculine, changing the species name from *norvegica* to *norvegicus*. The genus *Hydroides* and the species *Hydroides norvegicus* are still valid and the genus today includes almost 90 species.

The morphology, ecology and distribution of the type of genus is now fairly well-known (see e.g. Zibrowius 1971) but it has been confused with other species (see below). In the 1950s and 1960s focus was mainly on the regenerating abilities of the species’ operculum and, briefly, on reproduction (see e.g. Abeloos, 1954; Wolsky, 1955).

Later authors who have given descriptions of the genus are Wollebæk (1912), Zibrowius (1968), and Uchida (1978). The diagnosis of the genus was emended by Imajima and ten Hove (1989). It is the serpulid genus with the largest number of species. The species are mainly distinguished by the morphological characters of the operculum. Ten Hove (1990) gave a standardised terminology for the structures of the operculum, and ten Hove and Jansen-Jacobs (1984) discussed the terminology describing the collar chaetae. For a historical review and a revision of *Hydroides* from the American coasts, see Bastida-Zavala and ten Hove (2002; 2003). For further descriptions of the species *Hydroides norvegicus*, see Hansen (1878), Zibrowius (1968; 1971; 1973), and especially Wollebæk (1912) who describes the chaetae thoroughly, including some exceptional drawings of the operculum and chaetae.

The distribution of *H. norvegicus* extends from Spitzbergen, the east coast of Greenland, Iceland, along the Norwegian coastline and the European west coast to Gibraltar, and the Mediterranean (Fig. 7). It is found from the eulitoral zone to about 350 metres depth and is a true marine species. On numerous occasions it has been confused with the harbour fouling invasive species *H. elegans* (Haswell, 1883) and also other species (see

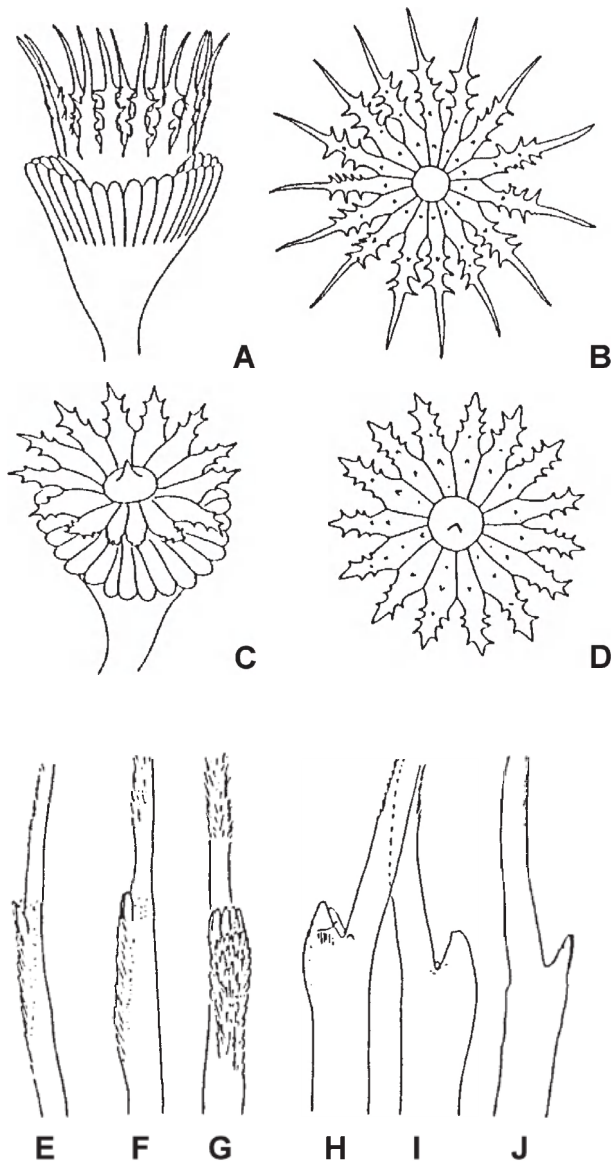


FIG. 8. – Differences in the opercula and collar chaetae of *Hydroides norvegicus* and *H. elegans*. A-B and H-J are *H. norvegicus*, C-G are *H. elegans*. From Zibrowius (1971) and ten Hove (1974).

Zibrowius, 1971; 1972). *H. elegans* is found subliterally in tropical and subtropical waters around the world, and has also been detected in artificially heated waters in Swansea, United Kingdom and Vlissingen, the Netherlands (ten Hove 1974). Its area of origin is not known but the species was first described from Sydney Harbour. The species *Hydroides norvegicus* and *H. elegans* can be distinguished by the opercular verticil and collar chaetae (Fig. 8; ten Hove, 1974; Zibrowius, 1971).

Today there remain only a few insects and marine invertebrates of Gunnerus' extensive faunal

collection, and these have been on display in the Museum of Natural History and Archaeology (Bakken, 1999). There are no annelids among the remaining objects. His herbarium is still at the Museum of Natural History and Archaeology (Krovoll and Nettelbladt 1985).

ACKNOWLEDGEMENTS

My sincere thanks goes to Harald Nissen at DKNVS for giving me a copy of the book containing the correspondence between Gunnerus and Linnæus, to Stein Johansen at the Gunnerus Library who scanned plate II from Gunnerus (1768), and to Turid Fredagsvik at DKNVS who gave me access to the painting of J.E. Gunnerus. I also thank Torleif Holthe for inspiration, and Holthe and two anonymous reviewers for providing valuable comments on the manuscript.

REFERENCES

- Abeloos, M. – 1954. Morphogénèse de l'opercule du serpulide *Hydroides norvegica* (Gunn). *Comptes Rendus des Séances de la Société de Biologie et de ses Filiales*, 148(15-1): 1440-1441.
- Amundsen, L. – 1976. *Johan Ernst Gunnerus og Carl von Linné brevveksling 1761-1772*. [Johan Ernst Gunnerus and Carl von Linné correspondence 1761-1772.] Det Kongelige Norske Videnskabers Selskab. Universitetsforlaget. 207 pp. [in Norwegian]
- Bakken, T. – 1999. A catalogue of the type specimens of protozoans, invertebrates and fish in the Museum of Natural History and Archaeology, NTNU. *Gunneria*, 74: 1-38.
- Bastida-Zavala, J.R. and H.A. ten Hove. – 2002. Revision of *Hydroides* Gunnerus, 1768 (Polychaeta: Serpulidae) from the Western Atlantic region. *Beaufortia*, 52(9): 103-178.
- Bastida-Zavala, J.R. and H.A. ten Hove. – 2003. Revision of *Hydroides* Gunnerus, 1768 (Polychaeta: Serpulidae) from the eastern Pacific region and Hawaii. *Beaufortia*, 53(4): 67-110.
- Ben-Eliahu, M.N. and H.A. ten Hove. – 1992. Serpulids (Annelida: Polychaeta) along the Mediterranean coast of Israel - New population build-ups of lessepsian migrants. *Israel J. Zool.*, 38: 35-53.
- Bush, K.J. – 1904. Tubicolous annelids of the tribes Sabellides and Serpulides from the Pacific Ocean. *Harriman Alaska Expedition*, 12: 169-346.
- Dons, C. – 1944. Norges korallrev. *Det Kongelige Norske Videnskabers Selskabs Forhandling*, 16: 37-82. [in Norwegian]
- Fabricius, J.C. – 1779. *Reise nach Norwegen mit Bemerkungen aus der Naturhistorie und Oekonomie*. Hamburg (Carl Ernst Bohn).
- Fauchald, K. – 1992. A review of the genus *Eunice* (Eunicidae: Polychaeta) based upon type material. *Smithsonian Contr. Zool.*, 523: 1-422.
- Foslie, M. – 1894. The Norwegian forms of *Lithothamnion*. *Det Kongelige Norske Videnskabers Selskab Skrifter*, 3: 29-212.
- Fosså, J.H., P.B. Mortensen and D.M. Furevik. – 2002. The deep-water coral *Lophelia pertusa* in Norwegian waters; distribution and fishery impacts. *Hydrobiologia*, 417: 1-12.
- Gunnerus, J.E. – 1763. Om en Sjøvext, allevegne ligesom besat med Frøchuse, Gorgonia resedæformis. *Det Kongelige Norske Videnskabers Selskab Skrifter*, 2: 321-329. [in Norwegian]
- Gunnerus, J.E. – 1765a. Om et Sjø-træ, henhørende til Gorgonias

- Linnæi, og som kan kaldes Gorgonia Flabelliformis. *Det Kongelige Norske Videnskabers Selskab Skrifter*, 3: 1-14. [= Act. Nidros. III.] [in Norwegian]
- Gunnerus, J.E. – 1765b. Brugden (*Sqvalus maximus*). *Det Kongelige Norske Videnskabers Selskab Skrifter*, 3: 33-49. Pl. 2. [in Norwegian]
- Gunnerus, J.E. – 1766. *Flora norvegica. Observationibus præsertim oeconomicis Panosque Norvegici locupletata*. Pars 1. Nidrosiæ, typis Vindingianis. 108 pp. 3 plates.
- Gunnerus, J.E. – 1767. Beskrifning på Trenne Norriska Sjö-Kräk, Sjö-Pungar kallade. *Kungl. Vetenskaps Academiens Handlingar*, 28: 114-124. Stockholm. [in Swedish]
- Gunnerus, J.E. – 1768. Om nogle Norske Coraller. [On some Norwegian corals.] *Det Kongelige Norske Videnskabers Selskab Skrifter*, 4: 38-73. [in Norwegian]
- Gunnerus, J.E. – 1770. Nogle smaa rare og mestendeelen nye Norske Sædyr. *Acta Scient. Acad. Havn.* [Det Københavnske Selskabs Skrifter], 10: 166-176. [in Norwegian]
- Gunnerus, J.E. – 1772. *Flora norvegica*. Part 2. pp. [iv] + viii + 148 + [60] pages, IX plates. Hafnia (Copenhagen).
- Hansen, G.A. – 1878. Oversigt over de norske serpula-arter. *Arch. Math. Naturvid.*, 3: 39-44. [in Norwegian]
- Haswell, W.A. – 1883. On some new Australian tubicolous annelids. *Proc. Linnæan Soc. New South Wales*, 7: 633-638.
- Hove, H. A. ten. – 1974. Notes on *Hydroides elegans* (Haswell, 1883) and *Mercierella enigmatica* Fauvel, 1923, alien serpulid polychaetes introduced into the Netherlands. *Bull. Zool. Mus. Univ. Amsterdam*, 4(6): 45-51.
- Hove, H.A. ten. – 1990. Description of *Hydroides bulbosus* sp. nov. (Polychaeta, Serpulidae), from the Iranian Gulf, with a terminology for opercula of *Hydroides*. *Beaufortia*, 41(16): 115-120.
- Hove, H.A. ten and M.J. Jansen-Jacobs. – 1984. A revision of the genus *Crucigera* (Polychaeta; Serpulidae); a proposed methodological approach to serpulids, with special reference to the variation in *Serpula* and *Hydroides*. In: P.A. Hutchings (ed.), *Proceedings of the First International Polychaete Conference, Sydney, Australia, 1983*, pp. 143-180. The Linnæan Society of New South Wales, Sydney.
- Imajima, M. and H.A. ten Hove. – 1989. Two new species of serpulids (Annelida, Polychaeta) from Sesoko Island, Okinawa. *Bull. Nat. Sci. Mus. Tokyo*, 15(1): 11-17.
- International Trust for Zoological Nomenclature. – 1985. *International Code of Zoological Nomenclature*. Third edition. University of California Press.
- Krovoll, A. and M. Nettelblatt. – 1985. Catalogue of the J.E. Gunnerus herbarium. *Gummeria*, 52: 1-171.
- Linnæus, C. – 1746. *Fauna Svecica: sistens animalia Sveciæ regni, quadrupedia, aves, amphibia, pisces, insecta, vermes, distributa per classes and ordines, genera and species*. Stockholm: Sumtu and literis Laurentii Salvii, 1746. [28], 411 pp, 2 fold. pl.: ill. (*Ed. altera*. 1761, 578 pp.)
- Linnæus, C. – 1747. *Wästgöta-Resa, på riksens högloflige ständers befallning, förrättad år 1746. Med anmärkningar uti oekonomien, naturkungheten, antiquiteter, invånarnes seder och lefnads-sätt*. Stockholm. (Lars Salvii). 280 pp, Tab I-VI. [in Swedish]
- Linnæus, C. – 1758. *Systema naturæ per regna tria naturæ: secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. - Ed. decima, reformata. Holmiæ: Impensis Laurentii Salvii, 1758-1759. 2 volumes.
- Linnæus, C. – 1767. *Systema naturæ per regna tria naturæ: secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Ed. duodecima. Holmiæ.
- Marsh, G.M. – 2002. *A vivid shaft of northern light. Journeys with Bishop Johan Ernst Gunnerus and Flora Norvegica through three centuries*. Tapir Academic Press, Trondheim.
- McIvor, L., C.A. Maggs, M.D. Guiry and M.H. Hommersand. – 2002. Phylogenetic analysis of the geographically disjunct Genus *Osmundea* Stackhouse (Rhodomelaceae, Rhodophyta). *Constancea*, 83.9. <http://ucjeps.berkeley.edu/constancea/>
- Moen, T.L. – 1998. *Nordiske serpulide polychaeter: deres systematik, faunistikk og biogeografi*. Cand. scient. thesis, Norwegian University of Science and Technology, Museum of Natural History and Archaeology, Trondheim, Norway. 89 pp. + appendix. [in Norwegian]
- Mörch, O.A.L. – 1863. Revisio critica Serpulidarum. Et Bidrag til Røromenes Naturhistorie. *Naturhistorisk Tidsskrift, København*, 1: 347-470. [partly in Norwegian]
- Nordgård, O. – 1918. *Biskop Gunnerus som naturforsker. Johan Ernst Gunnerus 1718-26. Februar – 1918 Mindeblade*. Det Kongelige Norske Videnskabers Selskab. Aktietrykkeriet i Trondhjem, pp. 112-141. [in Norwegian]
- Strøm, H. – 1762-1766. *Physisk og Oeconomic Beskrivelse over Fogderiet Søndmør, beliggende i Bergens Stift i Norge: oplyst med Landkort og Kobberstykker*. Sorøe: Trykt hos Jonas Lindgren: København. 2 volumes. [in Norwegian]
- Uchida, H. – 1978. Serpulid tube worms (Polychaeta, Sedentaria) from Japan with the systematic review of the group. *Bull. Mar. Park Res. Stations*, 2(1/2): 1-98.
- Winsnes, I.M. – 1989. Eunicid polychaetes (Annelida) from Scandinavian and adjacent waters. Family Eunicidae. *Zool. Scr.*, 18(4): 483-500.
- Wollebæk, A. – 1912. Nordeuropæiske Annulata Polychaeta. I. Ammocharidae, Amphictenidae, Ampharetidae, Terebellidae og Serpulidae. *Videnskapsselskabet's Skrifter. I. Mat.-Naturv. Klasse.*, 18: 1-144. [in Norwegian]
- Wolsky, A. – 1955. Mode of cleavage of the eggs of *Hydroides norvegica* in the Mediterranean. *Nature*, 176(4471): 75-76.
- Zibrowius, H. – 1968. Étude morphologique, systématique et écologique des Serpulidae (Annelida Polychaeta) de la région de Marseille. *Rec. Trav. Stat. Mar. Endoume*, 43(59): 81-252.
- Zibrowius, H. – 1971. Les espèces Méditerranéennes du genre *Hydroides* (Polychaeta Serpulidae). Remarques sur le prétendu polymorphisme de *Hydroides uncinata*. *Tethys*, 2: 691-746.
- Zibrowius, H. – 1972. *Hydroides norvegica* Gunnerus, *Hydroides azorica* n.sp. et *Hydroides capensis* n.sp. (Polychaeta Serpulidae) espèces vicariantes dans l'Atlantique. *Bull. Mus. Hist. Nat., Paris*, 33(39): 433-446.
- Zibrowius, H. – 1973. Serpulidae (Annelida Polychaeta) des côtes ouest de l'Afrique et des archipels voisins. *Ann. Mus. Roy. Afr. Centr.*, 207: 1-93.

Received September 14, 2004. Accepted May 11, 2005.