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Seahorse species (genus *Hippocampus*, Pisces) described by C. Linné

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A b s t r a c t . The analysis of the original Linnaeus' description of *Syngnathus hippocampus* and post-Linnaeus publications demonstrates that this description is based on the long-snout seahorse species. Thus, the name *Hippocampus hippocampus* is validated for the long-snout European seahorse and the name *H. brevirostris* is available for the short-snout European seahorse. The neotypes of both species are designated.

Key words: nomenclature of European seahorses, original description, species validity, designation of neotypes

Introduction

In spite of recent intensive studies on different aspects of seahorse life (see www.projectseahorse.org) the taxonomy of these fish still remains unsettled. For example, L o u r i e et al. (1999) recognized 32 species in the genus *Hippocampus*, yet K u i t e r (2000, 2001) believed that there might be over 50 species. Recent attempts to resolve the entire phylogeny of seahorses using the cytochrome b gene of mitochondrial DNA led to conclusion that several species designations needed re-evaluation (C a s e y et al. 2004). Thus, one should agree with F o s t e r & V i n c e n t (2004) that the difficulties with species identification and the large number of nominate names (>120) used in the early literature meant that the names given to seahorses were often unreliable.

The nomenclature and taxonomy of European seahorse taxa seem to be the most problematic. After a long period of time, being characterised by using of a number of different names for European seahorses, their nomenclature arrived to two-three nominal names. Namely, most of recent authors classify the short-snout European seahorse as *H. hippocampus* (Linnaeus, 1758) and the long-snout one as *H. guttulatus* Cuvier, 1829. Some authors regard *H. ramulosus* Leach, 1814 as not identifiable with Mediterranean species (L o u r i e et al. 1999, G o l a n i & F i n e 2002, C a s e y et al. 2004, C u r t i s & V i n c e n t 2005, 2006, C u r t i s 2006), while some others consider *H. ramulosus* a junior synonym of *H. guttulatus* (W h e e l e r 1973, D a w s o n 1986, R a s s 1987, 1993, M i l l e r & L o a t e s 1997, V a s i l'e v a 1999, 2004). Now some authors suppose that *H. ramulosus* may be a valid species with an unknown geographical range at the present-day of knowledge (L o u r i e et al. 2004). It should be mentioned that in this case native European seahorse species are discussed only, but not *H. fuscus* Rüppell, 1838 newly discovered in the eastern Mediterranean and probably migrated from the Red Sea (G o l a n i & F i n e 2002).

According to recent studies, two European seahorse native species are sympatric in some parts of their areas and significantly differ in morphology, body pigmentation, ecology and genetics (D a w s o n 1986, L o u r i e et al. 1999, 2004, F o s t e r & V i n c e n t 2004, C a s e y et al. 2004, C u r t i s & V i n c e n t 2005, 2006, C u r t i s 2006). Their

main diagnostic characters are the numbers of dorsal (*D*) and pectoral (*P*) fin rays, snout length, and colour pattern, while the development of skin filaments was demonstrated to be unreliable for their identification (Curtis 2006). Besides, the short-snout seahorse prefers biotopes with stronger currents and greater depths: it occurs up to depth 60 m in contrast with the long-snout species occurring up to depth 12 m, and thus is about ten times less abundant in the areas of their cohabitation (Foster & Vincent 2004, Curtis & Vincent 2005). Moreover, both species are distributed in the North-eastern Atlantic and Mediterranean, but the recent area of the short-snout seahorse is somewhat displaced to the south: some authors consider that it does not occur in the Atlantic to the north from the south French coasts (Dawson 1986, Miller & Loates 1997), while the others believe it to be very rare there (Wheeler 1973, Lourie et al. 2004).

The most common recent classification of the short-snout European seahorse as *H. hippocampus* (Linnaeus) and the long-snout seahorse as *H. guttulatus* Cuvier was proposed by Ginsburg (1937) after his special analysis of previous publications on seahorse taxonomy. This author concluded that the first binominal scientific name proposed for seahorses by Linnaeus (1758) actually related to more than one species. The main reason for this conclusion was the combination of 20 dorsal rays and 45 tail rings ("laminae caudae" sensu Linnaeus) in the original description. (This combination is unknown among seahorse species.) His further discussion was dealt with attempts to geographically restrict "the use of specific name *hippocampus*" based on post-Linnaeus publications. It looks quite paradoxical, but Ginsburg concluded that *hippocampus* is the available name for the short-snout seahorse – European species without any diagnostic character corresponding to Linnaeus' description. It was especially strange in relation to the descriptions proposed by him for "*H. hippocampus*", "*H. guttulatus guttulatus*", and newly described *H. guttulatus multiannularis*. According to these descriptions, only two last taxa more or less correspond to the characters of Linnaeus' *Syngnathus hippocampus* with a new subspecies especially similar in tail ring number. Possibly, this strange nomenclatural conclusion was caused by the fact that Ginsburg considered the development of spines (=tubercles) the main diagnostic character for "*hippocampus*" and "*guttulatus*" and used it in his key. The present study is aimed at solution of nomenclatural and taxonomic problems among native European seahorses.

Materials and Methods

The analysis of nomenclature and taxonomy of native European seahorses is based on the original descriptions of the main nominal European seahorse species, as well as pre-Linnaeus publications used in the original description, and publications dealing with taxonomic and nomenclatural problems in this group published from the Linnaeus period up to our days. To define the variability of diagnostic characters used in recent investigations and evaluate relations between the original descriptions of nominal species and recently recognized taxa, seahorses from the collection of the Zoological Museum of the Moscow State University (ZMMU) were studied. Totally 35 specimens were investigated (Table 1). Six of them were identified in this study as the short-snout European seahorse represented by samples from the Mediterranean (Naples, Villafranca) and Eastern Atlantic (Arcachon) and 29 specimens were related to the long-snout European seahorse from the Mediterranean (Naples) and the Black Sea. Fishes were subjected to morphological study based on characters used in seahorse taxonomy (Lourie et al. 1999, 2004, www.projectseahorse.org).

Table 1. Materials on seahorses (genus *Hippocampus*) from the collection of ZMMU examined.

Species	Collection number	Collection data
H. hippocampus	P - 677	Naples, date unknown, 1 spec., coll. Pangeri
	P - 3084	Black Sea, 1907, 1 spec., coll. Belogolovyi
	P - 3085	Black Sea, date unknown, 1 spec.
	P - 3086	Black Sea, Anapa, 1907, 3 spec., coll. Belogolovyi
	P - 3087	Black Sea, Sebastopol, 1896, 2 spec., coll. Petrunkevitch
	P - 3107	Black Sea, Miskhor, 1903, 3 spec., coll. Somov
	P - 3452	Naples, 1868, 2 spec., coll. Bogdanov
	P - 4313	Black Sea, Sebastopol, date unknown, 2 spec., coll. Kozhevnikov
	P - 4315	Black Sea, Sebastopol, date unknown, 3 spec.
	P - 5317	Naples, 1868, 2 spec., coll. Bogdanov
	P - 8590	Black Sea, date unknown, 4 spec.
	P - 9076	Black Sea, date unknown, 1 spec.
	P - 19035	Sea of Azov, Semenovka, 1987, 2 spec., coll. Vasil'ev & Vasil'eva
	P - 20455	Sea of Azov, Kerch Strait, 1996, 1 spec., coll. Shaganov
	P - 21676	Naples, 1868, 1 spec., coll. Bogdanov
H. brevirostris	P - 676	Naples, 1868, 1 spec., coll. Bogdanov
	P - 3453	Arcachon, 1902, 1 spec.
	P - 4318	Villafranca, date unknown, 1 spec., coll. Bogdanov
	P - 4337	Villafranca, date unknown, 1 spec., coll. Bogdanov
	P - 5601	Locality and date unknown, 1 spec.
	P - 19097	Naples, 1868, 1 spec., coll. Bogdanov

Results and Discussion

The analysis of specimens from ZMMU collection confirms a high diagnostic value of characters recently used for identification of two European seahorse species (L o u r i e et al. 2004), but adds some new data to their variability. According to both my and literature data, the short-snout European seahorse has *D* 16–19 (mainly 16–17), *P* 13–15 (mainly 14), its relation between head length and snout length (*HL/SnL)* varies from 2.6 to 3.4 (mainly 2.8–3.0), its body is "brown, orange, purple or black, sometimes with tiny white dots (these do not coalesce into thick horizontal wavy lines as in" the long-snout seahorse). At the same time the long-snout European seahorse has *D* 17–21 (mainly 19–20), *P* 15–18 (mainly 17), *HL/SnL* 2.2–2.9 (mainly 2.3–2.6), its body is "variable brown" with "prominent white spots", "often with a dark ring around them, that tend to coalesce into horizontal wavy lines, may be variously mottled or with pale saddles across dorso-lateral surface" (W h e e l e r 1973, L o u r i e et al. 1999, 2004, this study).

To evaluate the availability of the name "*hippocampus*" for one of these species we should first appeal to the original Linnaeus' description. The last part of the description, namely "Laminae corporis trunci 17, caudae 45" (Fig. 1) is completely inappropriate for any seahorse species characterized by 10–12 trunk rings, but suitable for a pipefish. However, we should not conclude that Linnaeus confused a seahorse and a pipefish in his description (these fishes are very different) or described a new pipefish species with the name "*hippocampus*" since the species name, diagnostic characters presented in the first part of the description, as well as cited non-binominal synonyms, and figures from B r a d l e y (1721) ("Bradl. natur."), and O l e a r i u s (1674) ("Olear. mus.") undoubtedly belong to seahorses

(Figs 1, 2). And only data on ring numbers cited above, as well as the characters presented from A r t e d i (1738) ("Art. gen. I. fyn. I"), namely "D. 35. P. – – V. 0. A.0. C.0" (Fig. 1) certainly concern a pipefish, namely any species from the genus *Nerophis* Rafinesque, 1810 lacking pectoral, anal, caudal fins, as well as pectoral fins in adult specimens. But this fact does not affect the availability of the name "*hippocampus*" (ICZN, 1999, art. 18) and its validity for the long-snout seahorse, which completely corresponds to the first part of the original description and the pictures from B r a d l e y (1721) and O l e a r i u s (1674) (Figs 1, 2), in contrast with the short-snout seahorse.

B l o c h (1785) was the first author using binominal names who accepted the name *hippocampus* for the long-snout seahorse presented by him on Tafel 109, Fig. 3. The diagnostic characters presented by him, namely "B. II. P. XVII. A. IV. D. XX" (p. 6) also correspond to ones of the long-snout European seahorse. G i n s b u r g (1937) noted that Bloch has presented the figure of the long-snout seahorse. But he reproached Bloch in unrestrictedly using of the name *hippocampus,* since he just implied its distribution all over the Mediterranean. This criticism was caused by G i n s b u r g ' idea (1937) about four European seahorse taxa, namely long-snout *H. guttulatus multiannularis* Ginsburg, 1937 at the Atlantic coast of Europe, and *H. guttulatus guttulatus* at the Mediterranean coast, as well as short-snout *H. hippocampus* in the Mediterranean, and *H. europaeus* Ginsburg, 1937 at the Atlantic European coast.

P a l l a s (1814) also accepted the name *hippocampus* as the only valid name for seahorses from Russia which have been studied by him from the Black Sea where only the long-snout seahorse was still recorded (see S v e t o v i d o v 1964, B ă n ă r e s c u 1964, P r o d a n o v et al. 1998). The same name was used for seahorses from the Black Sea by E i c h w a l d (1831), K n i p o v i c h (1923), P o p o v (1927) and some other pre-Ginsburg authors.

Among the authors of the 18–19th century who used binominal species names and investigated seahorse taxonomy and nomenclature (mainly by description of new species or presentation of replaced names for *hippocampus* to avoid tautonymy) only J o r d a n & E v e r m a n n (1896) presented the first lengthy re-description of common European seahorse *H. hippocampus* to separate it from American species. This re-description included several characters recently used to distinguish short- and long-snout seahorses. "Dorsal fin with 20 (19) rays. Tubercles generally well developed on the head and body, and subacute,

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Hippo-campus. 7. S. pinna caudæ nulla, corpore ſeptemangulato tuberculato, cauda quadrangulata. D. 20. P. 18. V. 0. A. 4. C. 0.
Art. gen. 1. *fyn.* 1. Syngnathus corpore quadrangulo, pinna caudæ carens. D. 35. P. - - V. 0. A. 0. C. 0.
Olear. muſ. 53. *t.* 26. *f.* 4. Hippocampus.
Bradl. natur. t. 4. *f.* 3. Eqvus marinus.
Habitat in Pelago.
Laminæ corporis trunci 17, *caudæ* 45.

Fig. 1. The original description of *Syngnathus hippocampus* from Linnaeus (1758).

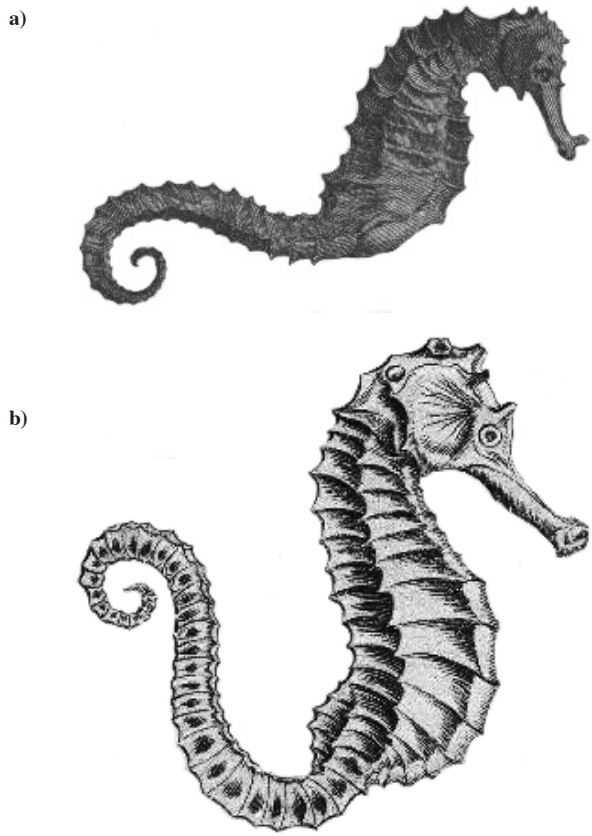

Fig. 2. Figures of seahorses from Bradley (1721) (a) and Olearius (1674) (b) cited by Linnaeus (1758) in his original description of *Syngnathus hippocampus*.

rarely blunt. Length of the snout equal to the distance between the hind margin of the orbit and gill opening. Spines on the head and neck sometimes with simple filaments. Brown, with bluish-white dots, more or less confluent into lines on the lower part of the side and gill cover; dorsal fin with a black submarginal band. Coasts of southern Europe, north to England; abundant in the Mediterranean. Brown the sides profusely spotted with white, the snout plain" (p. 775). They also presented the correct identification of "Habitat" from Linnaeus (1758): "open sea", but not "in ocean [=Greece]", as certified by Eschmeyer (1998). Their description is quite similar to recent diagnoses of the long-snout European seahorse (see above) and contrasts with diagnostic characters of the short-snout seahorse, but Ginsburg (1937) did not mention Jordan & Evermann in his discussion. Instead of this, he decided that the character "angles of body slightly tuberculated", which has been presented by Leach (Leach & Nodder 1814) for *H. antiquorum* proposed as a substitute name for *hippocampus* as the Mediterranean seahorse, sufficed to relate both names with the short-snout European seahorse.

Thus, the name *hippocampus* should be undoubtedly validated for the long-snout European seahorse, whereas the short-snout seahorse needs another nominal name. Such available name is *H. brevirostris* presented at first by Schinz (1822). The

same nomenclatural conception was proposed by Popov (1927) after his studies on seahorses from the museum collections and the analysis of previous publications. This author presented his own key for identification of two seahorse species with the next set of diagnostic characters: snout length, a number of dorsal fin rays, relative development of spines, and dorsal fin depth. He noted that *H. brevirostris* was absent in the Black Sea, whereas *H. hippocampus* occurred both in the Mediterranean Sea and the Black Sea. It is very strange, but Svetovidov (1964) quite incorrectly cited this author.

It is a high time to re-establish the name *H. hippocampus* for the long-snout European seahorse actually described by Carl Linné for the date of 300 years from his birthday. This nomenclatural act will not disturb stability or universality (ICZN 1999, art. 23.2) of *Hippocampus* nomenclature, since it is not stable or universal till now. For example, different authors record the only long-snout seahorse species occurring in the Black Sea basin under several different names, namely *H. ramulosus* (Wheeler 1973, Dawson 1986, Rass 1987, 1993, Prodanov et al. 1998, Vasil'eva 1999, 2004, Parin 2001), *H. guttulatus* (Lourie et al. 1999, 2004, Bilecenoglu et al. 2002, Froese & Pauly 2007), *H. hippocampus microcoronatus* Slastenenko, 1938 (Drenski 1951), *H. guttulatus microstephanus* Slastenenko, 1937 (Bănărescu 1964, Svetovidov 1964), and even *H. brevirostris* (Bilecenoglu et al. 2002).

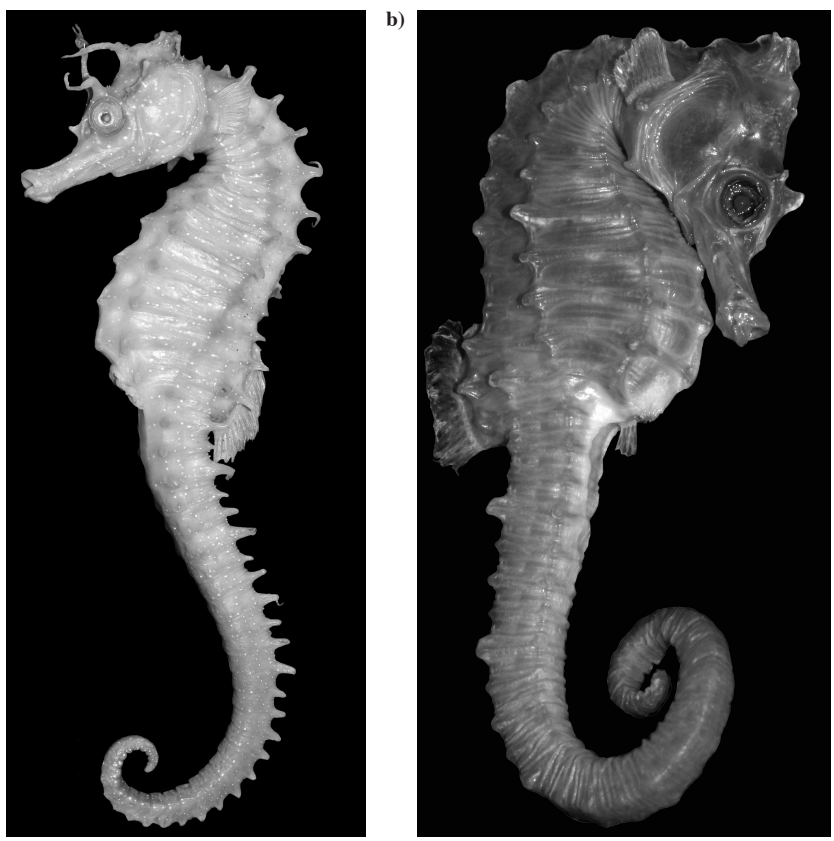

Fig. 3. Neotypes of *Hippocampus hippocampus* (a, ZMMU, P - 21676) and *H. brevirostris* (b, ZMMU, P - 676).

Therefore, in the interests of stability of nomenclature, and in the relation to the fact that the type specimens of both *H. hippocampus* and *H. brevirostris* were not designated in the original descriptions (L i n n a e u s 1758, S c h i n z 1822), their neotypes are designated in this paper with a statement of the characters differentiating these nominal species from the others to certify the taxonomic status of aforementioned nominal species (ICZN 1999, art. 75.3.1, 75.3.2, 75.3.4). Both type specimens are chosen from the ZMMU collection. In accordance with ICZN (1999) art. 75.3.6, specimens from the Mediterranean Sea at Naples are designated as neotypes, because the type location for *H. brevirostris* was certainly indicated as "Mittelmeer und andern Meeren" (S c h i n z 1822), and the most post-Linnaeus authors regarded *H. hippocampus* as common Mediterranean species. The descriptions of both neotypes demonstrating them to be consistent with original descriptions (ICZN 1999, art. 75.3.3, 75.3.5) are presented below. It should be also mentioned, that the designation of neotypes for two European seahorse species seems very important in view of further taxonomic investigations in this group, which may result in descriptions of new taxa.

1. *Hippocampus hippocampus* Linnaeus, 1758 – the long-snout European seahorse

Neotype – ZMMU, P-21676, Naples, 1868, coll. Bogdanov (Fig. 3a).

Height 119 mm, female; *D* 20, *P* 17, *A* 4; 11 trunk rings; 37 tail rings; 2 trunk rings and 1 tail ring supporting dorsal fin; *HL/SnL* 2.2; coronet enough high and distinct with four points continuing into elongated skin filaments; horizontal plate in front of coronet is lower than coronet itself, with a prominent spine at its front edge, provided by well developed skin filament; coronet not joined to neck; prominent eye spines with skin filaments; nose spine well developed, pointed; paired cheek spines; body spines well developed, dorsal ones elongated and pointed with short skin flaps; coloration light brown spotted with small white dots coalescing into horizontal wavy line on the body and radial lines beginning from eye on the head.

2. *Hippocampus brevirostris* Schinz, 1822 – the short-snout European seahorse

Neotype – ZMMU, P-676, Naples, 1868, coll. Bogdanov (Fig. 3b).

Height 95 mm, female; *D* 16, *P* 13, *A* 4; 10 trunk rings; 36 tail rings; 2 trunk rings and 1 tail ring supporting dorsal fin; snout short, *HL/SnL* 2.7; coronet more or less broad front and narrow back, with five blunt points, the hind unpaired point joined smoothly to nape of neck; horizontal plate in front of coronet as high as coronet itself front and some higher back, without a prominent spine; prominent paired eye spines; nose spine very small, blunt; paired cheek spines; body spines very low and blunt; there are no any skin filaments or flaps on head and body; coloration light brown without dots.

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