

1957
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KONINKLIJKE NEDERLANDSCHE AKADEMIE VAN
WETENSCHAPPEN

The Identity of *Penaeus
monodon* Fabr.

BY

L. B. HOLTHUIS

Reprinted from Proceedings Vol. LII, No. 9, 1949

1949
NORTH-HOLLAND PUBLISHING COMPANY

(N.V. Noord-Hollandsche Uitgevers Mij.)
AMSTERDAM

Zoology. — *The Identity of Penaeus monodon Fabr.* By L. B. HOLTHUIS.
(Communicated by Prof. H. BOSCHMA.)

(Communicated at the meeting of October 29, 1949.)

The genus *Penaeus* Fabr. from a commercial point of view undoubtedly is the most important group of prawns. It occurs in the tropical and sub-tropical waters of the world and is used for food throughout its range of distribution. To make clear the economic importance of the genus, one only has to mention that the value of the catch of *Penaeus setiferus* (L.) along the South Atlantic and Gulf coast of the United States of America, in 1943 alone, amounted to 15 million dollars (cf. ANONYMUS, 1945, p. 91). In the Mediterranean it is *Penaeus kerathurus* (Forssk.) (the Langostino of the Spanish and Caramote of the French) which is fished and sold for food, while in E. Australia *Penaeus plebejus* Hess and *Penaeus esculentus* Haswell are caught in huge quantities. In the rest of the indo-westpacific region too the prawns of the genus *Penaeus* play an important rôle in the commercial fisheries.

At present in India and Indonesia much attention is given to the problem of intensifying the prawn fisheries and developing the prawn industries. These economic studies of the prawns are greatly complicated by the fact that the nomenclature of two of the indo-westpacific species is hopelessly confused. It is the object of the present paper to establish the correct names of the two species involved and to be in this way of some help to those who study the prawn fisheries of the indo-westpacific area.

The two species with which we are concerned here, have been given most frequently the names *Penaeus monodon* Fabricius (1798), *Penaeus semisulcatus* De Haan (1841), and *Penaeus carinatus* Dana (1852), while also the names *Penaeus tahitensis* Heller (1862) and *Penaeus ashiaka* Kishinouye (1900) have been used for them.

In 1906 ALCOCK gave a revision of the Indian species of the genus *Penaeus*. In this revision he includes two species, which he names *Peneus monodon* Fabricius and *Peneus semisulcatus* De Haan. The main difference between these two forms is that in the former the fifth pair of legs bears a small exopod, while this exopod is absent in the latter. Now in 1911 DE MAN, who had examined the type specimens of *Penaeus semisulcatus* De Haan, pointed out that these type specimens belong to the species which bears a small exopod on the last pereopods and thus is different from ALCOCK's *Peneus semisulcatus*, it probably should be identical with his *monodon*. DE MAN does not use the name *monodon* at all, but gives the name *Penaeus carinatus* Dana to the species which ALCOCK named *P. semisulcatus*. The other species is named by him *Penaeus semisulcatus* De Haan. DE MAN further remarks that the species to which has been given the name *P. carinatus* Dana eventually may get the name *Penaeus monodon* Fabr.,

when the identity of *P. monodon* of Alcock and *P. semisulcatus* De Haan is established. Then KEMP (1915, p. 317) proves the identity of *Peneus monodon* of ALCOCK and *P. semisulcatus* De Haan. KEMP prefers, however, not to use the name *monodon* at all because as "Alcock's application of *monodon* is shown to be incorrect, I do not think it can safely be used for any other species". Most of the later authors as PARISI (1919), SCHMITT (1926), and BALSS (1933) follow KEMP in using the names *P. semisulcatus* and *P. carinatus*.

The first question occurring to us is: Is KEMP right in suppressing the name *monodon* in this case? In my opinion this question must be answered in the negative. FABRICIUS, when establishing his new genus *Penaeus*¹⁾ in 1798 included in it three species: *P. monodon*, *P. monoceros* and *P. planicornis*. Of these only *P. monodon* at present is maintained in the genus *Penaeus*, *P. monoceros* is considered to form part of the genus *Penaeopsis* Bate, while *P. planicornis* is a species incerta, which certainly does not belong to the genus *Penaeus* (cf. ALCOCK, 1906, p. 55). *Penaeus monodon* furthermore was made the type of the genus *Penaeus* by LATREILLE (1810, p. 422). As thus *Penaeus monodon* Fabr. is the type species of the genus *Penaeus* and, moreover, is the only species of the genus *Penaeus* in the sense of modern authors which is included by FABRICIUS in the original genus, it would be extremely unpleasant to have this species made a species incerta. In my opinion it seems best to attach the trivial name *monodon* to that species which proves to be most appropriate to bear it; this procedure very often is followed with species inadequately described by LINNAEUS, FABRICIUS and others. In the present case it is rather easy, since *Penaeus monodon* can only be one of two known species, FABRICIUS's description excluding the possibility that it is identical with a species other than the forms named *Penaeus semisulcatus* and *P. carinatus* by DE MAN (1911) and KEMP (1915).

The second question with which we have to occupy ourselves is to which of the two species the name *monodon* should be given. In the first place we have to try and find in the original material and the original description of *Penaeus monodon* indications for applying that name to one of the two species. FABRICIUS's material of the species was collected by DAGOBERT CARL DE DALDORFF, a lieutenant in the Danish East India Company at Tranquebar on the Coromandel Coast of India. According to HORN & KAHLE (1935—1937, p. 50) the DALDORFF collections partly are preserved in the Zoological Museum at Copenhagen, Denmark, and partly in the Zoological Museum of the University at Kiel, Germany. The late Dr. K. H. STEPHENSEN of the Zoological Museum at Copenhagen informed me by letter that his Museum only possesses Insect and Brachyuran types of

¹⁾ The name *Peneus* Weber (1795) is not valid. WEBER namely establishes this genus for the species *P. monodon*, *P. monoceros*, and *P. planicornis*, of which he only gives the names and which for the first time are described by FABRICIUS in 1798.

FABRICIUS. Professor Dr. WOLF HERRE, director of the Zoological Museum at Kiel, was so kind to send me a list of the Fabrician Decapods in his Institution, which fortunately all have come safely through World War II. Though the list contains two Caridean names (*Palaemon carcinus*, which of course is not a type as the species was first described by LINNAEUS as *Cancer Carcinus*, and *Palaemon quadricornis*, which may be an error for *Palinurus quadricornis*), no Penaeidea are included in it. The Penaeid types of FABRICIUS thus are no longer extant and can not be used for solving the puzzle of the identity of *Penaeus monodon*.

FABRICIUS's description of *Penaeus monodon* runs as follows:

"P[enaeus]. rostro porrecto adscendente supra serrato subtus tridentato. Habitat in Oceano Indico edulis Dom. Daldorff.

Corpus maiusculum, variegatum. Thorax laevis dentibus anticis utrinque duobus. Rostrum porrectum, adscendens, supra serratum, subtus tridentatum. Chelae sex filiformes posticis longioribus."

The description of the animal itself makes it possible only to decide that the species is either *P. semisulcatus* De Haan or *P. carinatus* Dana, to use DE MAN's (1911) and KEMP's (1915) nomenclature. As already stated above DALDORFF lived at Tranquebar and it is most probable that his specimen(s) originate(s) from there. The fact that FABRICIUS states that the species is „edulis” is a strong indication for the possibility that DALDORFF obtained this material from the fish market or from fishermen. Now ALCOCK (1906, p. 11) in his revision of the Indian *Penaeus* species states that his *Penaeus semisulcatus*, which is the *Penaeus carinatus* of later authors, "is the commonest salt-water prawn of the Calcutta market", and CHOPRA (1943, p. 2) in his paper on the prawn fisheries of India extensively deals with *Penaeus carinatus* as a very important food prawn, while no mention is made of *P. semisulcatus*. This evidence thus makes it very probable that *Penaeus monodon* Fabr. is identical with *Penaeus carinatus* of modern authors.

In the second place we have to take into account the opinion of "the first reviser", i.e., in the present case, the first author who recognises and treats the two forms as distinct species. This author undoubtedly is DE HAAN (1849, p. 190), who gives a key to the species of *Penaeus* known at that moment. In this key he separates *Penaeus semisulcatus* from *P. monodon* by the fact that in the former species "sulcus a basi rostri ad marginem posteriorem thoracis", while in the latter "sulcus inter basin rostri et marginem posticum thoracis nullus". Now in *P. semisulcatus* the post-rostral carina is always distinctly sulcate, while in *P. carinatus* the "post-rostral carina [is] usually more or less sulcate" (SCHMITT, 1926, p. 359). The character of the presence or absence of the groove is not very constant in *P. carinatus*, but the fact that it is absent or vague in DE HAAN's *P. monodon* already proves that that species can not be identical with *P. semisulcatus* De Haan and thus only can be *P. carinatus* since the shape of the rostrum as described by DE HAAN excludes the possibility of being

identical with other Indian *Penaeids*. The decision taken by the first reviser thus also confirms that *Penaeus carinatus* and *P. monodon* must be considered synonyms.

In the third place we have to consider the practical advantages and disadvantages of applying the name *monodon* to either *P. carinatus* or *P. semisulcatus*. When we give the name *monodon* to the species named *Penaeus carinatus* by DE MAN and KEMP, the other species automatically keeps the name *semisulcatus*. *Penaeus semisulcatus* De Haan is a well established species of which a good original figure and description were given and of which the types still are extant, so that there is not the slightest doubt as to the identity of the species. The only disadvantage as I see it is that the names *semisulcatus* and *monodon* then are used exactly in the opposite sense as it was done by ALCOCK (1906) in his revision of the Indian *Penaeus* prawns. ALCOCK is the first to give really good and reliable characters to separate the two forms; before 1906 the name *monodon* has been used for both species. Five years after the publication of ALCOCK's paper DE MAN already pointed to the fact that ALCOCK had used the name *semisulcatus* in an incorrect sense. Since that time ALCOCK's nomenclature for the two species has been abandoned, though his revision still is one of the most important papers on the indowestpacific *Penaeids*. The restoration of the name *monodon* for ALCOCK's *Peneus semisulcatus* probably will cause as little confusion as the substitution of the name *semisulcatus* for his *monodon* did. When we take the other course and use the name *monodon* for *P. semisulcatus* De Haan, the name *monodon* as used by ALCOCK will remain, but his *semisulcatus* nevertheless has to disappear. For the latter species most modern authors use the name *Penaeus carinatus* Dana, of which, as KEMP (1915, p. 317) already pointed out, it is doubtful whether it really is identical with the species named *semisulcatus* by ALCOCK. DANA's description and figure are not sufficient to establish the identity of the two forms beyond doubt. Though we may accept with the larger part of the modern authors the identity of *Penaeus carinatus* Dana with the form named *P. semisulcatus* by ALCOCK, we still may not use DANA's name, since the name *Penaeus carinatus* Dana (1852) is preoccupied by that of *Penaeus carinatus* Otto (1821). The only other name which remains for the species then is *Penaeus tahitensis* Heller (1862). PESTA (1912) examined the type specimens of HELLER's species, which are preserved in the Vienna Museum, and came to the conclusion that they are very probably identical with *Penaeus carinatus*, but as the specimens are damaged no full certainty could be obtained in this respect. When we thus should keep the name *Penaeus monodon* Fabr. for *P. semisulcatus* De Haan, the other species has to have the name *Penaeus tahitensis* Heller or has to receive a new one.

Taking all this evidence into account, I am convinced that the only correct thing to do is to give the name *Penaeus monodon* Fabr. to the species indicated with the name *Penaeus carinatus* Dana by DE MAN

(1911), KEMP (1915) and many subsequent authors. The other species has to bear the name *Penaeus semisulcatus* De Haan.

As the real types of *Penaeus monodon* are lost, I have indicated a specimen of this species in the collection of the Leiden Museum as the neotype of *Penaeus monodon* Fabr.

A short account of the material of the two species preserved in the Rijksmuseum van Natuurlijke Historie at Leiden is given here.

Penaeus monodon Fabricius, 1798

Synonyms: *Penaeus carinatus* Dana, 1852 (non Otto, 1821); *Penaeus tahitensis* Heller, 1862; *Penaeus semisulcatus* Alcock, 1906 (non De Haan, 1841).

Last pereopod without exopod. Rostral carina with the sulcus more or less distinct. Carina and groove running upwards from the hepatic spine only feebly indicated.

The collection of the Leiden Museum contains the following specimens:

- Pulu Weh, off N. Sumatra; 1910, January 1917, August 1925; leg. P. BUITENDIJK. — 4 ♂♂ 71—156 mm, 2 ♀♀ 108 and 114 mm.
 Atjeh (= Atchin); 1879; leg. WALRAVEN. — 1 ♂ 180 mm.
 Belawan Deli, N.E. Sumatra; May 1929; leg. P. BUITENDIJK. — 1 ♀ 71 mm.
 Noordpoel, Verlaten Island, Strait Sunda; December 1933; leg. K. W. DAMMERMAN. — 2 ♂♂ 145 and 147 mm.
 Java Sea; 1906; leg. P. BUITENDIJK. — 1 ♂ 121 mm, 2 ♀♀ 92 and 220 mm.
 West Java; 1914; leg. J. F. VAN BEMMELEN. — 3 ♂♂ 195—227 mm.
 Batavia; leg. P. BLEEKER. — 1 ♂ 200 mm.
 Batavia; 1896; leg. A. G. VORDERMAN. — 1 ♀ 158 mm.
 Bay of Batavia; January 1908, August 1908, June 1924; leg. P. BUITENDIJK. — 3 ♂♂ 116—200 mm, 3 ♀♀ 76—210 mm.
 Bay of Batavia; July 1938; leg. F. P. KOUMANS. — 2 ♂♂ 85 and 96 mm.
 Tandjong Priok, harbour of Batavia; November 1926, August 1927; leg. P. BUITENDIJK. — 1 ♂ 92 mm, 2 ♀♀ 84 and 90 mm.
 Mouth of river W. of Tandjong Priok; July 1911; leg. P. BUITENDIJK. — 1 ♀ 137 mm.
 Coast near Tandjong Priok; 1906; leg. P. BUITENDIJK. — 1 ♀ 190 mm.
 Near Tjiluwung River, near Batavia; 1906; leg. P. BUITENDIJK. — 1 ♀ 200 mm.
 Kampong Makasar near Batavia; leg. Mr. GROEN. — 1 ♀ 195 mm.
 Indramaju, north coast of W. Java; September 1924; leg. P. BUITENDIJK. — 3 ♂♂ 57—60 mm, 1 ♀ 77 mm.
 Tegal, north coast of Central Java; November 1927; leg. P. BUITENDIJK. — 1 ♂ 90 mm.
 Off Semarang, north coast of Central Java; December 1910, March 1912; leg. P. BUITENDIJK. — 3 ♂♂ 98—200 mm, 1 ♀ 136 mm.
 Surabaya, E. Java; November 1926, February 1927, November 1927, June 1930; leg. P. BUITENDIJK. — 3 ♂♂ 55—90 mm, 3 ♀♀ 53—136 mm.
 Pasuruan, north coast of E. Java; May 1929; leg. P. BUITENDIJK. — 2 ♀♀ 46 and 52 mm.
 Probolinggo, north coast of E. Java; August 1, 1924; leg. P. BUITENDIJK. — 1 ♀ 65 mm.
 Madura; July 1920, July 1928, March 1930; leg. P. BUITENDIJK. — 1 ♂ 58 mm, 2 ♀♀ 88 and 116 mm.
 Ondolean, E. Celebes; December 18, 1904. — 1 ♀ 130 mm.
 Makassar, S.W. Celebes; leg. D. M. PILLER. — 3 ♀♀ 125—210 mm.
 Moluccas; 1895; leg. W. A. MOREAUX. — 1 ♂ 200 mm, 3 ♀♀ 200—220 mm.
 Japan. — 1 ♂ 92 mm.

South Seas; 1887; Museum Godeffroy. — 1 ♀ 128 mm.
 Locality unknown. — 2 ♂♂ 78 and 162 mm, 1 ♀ 108 mm.

Type. A male of 200 mm length from the Bay of Batavia (June 1924, leg. P. BUITENDIJK) has been chosen as the neotype of this species.

Penaeus semisulcatus De Haan

Synonyms: *Penaeus ashika* Kishinouye, 1900; *Peneus monodon* Alcock, 1906 (non Fabricius, 1798).

Last pereopod provided with a small exopod. Rostral carina with the sulcus always distinct. Carina and groove running upwards from hepatic spine much stronger and sharper than in *Penaeus monodon*.

The collection of the Leiden Museum possesses the following material of this species:

Jidda, Red Sea; 1880; leg. J. A. KRUYT. — 3 ♂♂ 53—95 mm, 2 ♀♀ 90 and 123 mm.
 Japan; types. — 1 ♂ 170 mm, 2 ♀♀ 170 and 205 mm.

Japan. — 1 ♂ 155 mm, 1 ♀ 190 mm.

Philippines; 1893; leg. A. VAN DER VALK. — 1 ♂ 138 mm.

Pulu Weh, off N. Sumatra; 1910, January 1913, January 1927, February 1927, April 1928; leg. P. BUITENDIJK. — 4 ♂♂ 62—88 mm, 5 ♀♀ 65—130 mm.

Belawan Deli, N.E. Sumatra; September 1929; leg. P. BUITENDIJK. — 1 ♂ 70 mm.

Buitenzorg²); 1909; leg. H. VAN DER WEELE. — 1 ♂ 78 mm.

Batavia; leg. P. BLEEKER. — 1 ♀ 140 mm.

Bay of Batavia; January 1908, August 1926; leg. P. BUITENDIJK. — 1 ♂ 65 mm,
 1 ♀ 72 mm.

Mouth of river W. of Tandjong Priok; July 1911; leg. P. BUITENDIJK. — 1 ♀ 111 mm.

Near Tjiliwung River, near Batavia; 1906; leg. P. BUITENDIJK. — 1 ♀ 85 mm.

Cheribon, north coast of W. Java; July 1926; leg. P. BUITENDIJK. — 1 ♀ 63 mm.

Off Semarang, north coast of Central Java; October 1912; leg. P. BUITENDIJK. —
 1 ♀ 62 mm.

Makassar, S.W. Celebes; 1888—1889; leg. M. WEBER. — 1 ♂ 80 mm.

Amboina, Moluccas; leg. D. J. HOEDT. — 1 ♀ 105 mm.

Moluccas; 1895; W. A. MOREAUX. — 2 ♂♂ 59 and 63 mm.

Locality unknown. — 1 ♀ 165 mm.

Type. As indicated above there are three cotypes, one male and two females, originating from Japan. It is not certain whether the two other specimens from Japan also are types.

The species *Penaeus semisulcatus* De Haan generally is considered to date from 1849; this is incorrect, however, since plate 46 of the Crustacean volume of the Fauna Japonica, which contains the figure and the name of *Penaeus semisulcatus*, was issued as early as 1841. The text describing the species was published in 1849.

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²) This locality probably is not correct, as it lies far in the interior of Java.

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