Literature: Kemp, 1910:103, Pl. 14, Fig. 1.

Distribution: North Atlantic: Arctic Ocean south to the North Sea and Massachusetts, U.S.A. ? North Pacific.

Habitat: Depth 16 to 400 m. Marine

Size: Maximum total length about 60 mm.

Interest to Fishery: Longhurst (1970:258) indicated that in the N.W. Atlantic the present species and *S. lilljeborgii* (see there) are only exploited incidentally to the fishery of *Pandalus borealis*.

FAMILY PROCESSIDAE Ortmann, 1896

Processidae Ortmann, 1896, Zool.Jahrb.(Syst.Geogr.Biol.Thiere), 9:415,424

Processa canaliculata Leach, 1815

PROC Proc 1

Processa canaliculata Leach,1315, Malacostraca podophthalmata Britanniae, Pl. 41

Synonymy: *Nika couchii* Bell, 1847; *Nika edulis britanica* Czerniavsky, 1334; *Nika mediterranea* Parisi, 1915; *Processa prostatica* Zariquiey Cenarro, 1941; *Processa mediterranea* - Zariquiey Alvarez, 1955.

FAO Names: Processa shrimp (En), Guernade processe (Fr), Camarón procesa (Sp).

Literature: Nouvel & Holthuis, 1957:41, Figs. 205-220 (as Processa mediterranea); Al-Adhub & Williamson, 1975:694, Figs. lc,d,2c,d,4.

Distribution: Eastern Atlantic: British Isles to the Mediterranean (as far east as Aegean Sea).

Habitat: Depth 70 to 600 m. Bottom mud. Marine.

Size: Maximum total length 67 mm (♂), 75 mm (♀).

Interest to Fishery: Brian (1941:42) reported *Processa canaliculata* from the fish market in Genoa, Italy, where it was sold "in quantità discreta". Judging by the size of Brian's specimens (68 to 75 mm) and the depth from which they were taken (120 to 130 m), they indeed belong to the present species. Zariquiey Alvarez (1963:159; under *P. mediterranea*) remarked that the species is "cogida en gran cantidad por las barcas de arrastre de Rosas, Blanes y Barcelona [all three localities on the Mediterranean N.E. coast of Spain], a profundidades de más de 200 metros; se vende en el mercado". As the specimens of this species are larger than those of *P. edulis*, they are more attractive commercially; on the other hand, the species lives far deeper and can be caught in quantity by deep trawling only.

Remarks: This species was treated by Nouvel & Holthuis, 1957, under the name *Processa mediterranea* (Parisi). However, Al-Adhub & Williamson, 1975, who examined the holotype of *Processa canaliculata* Leach, 1315, found that it belongs in the present species, so that the specific name *mediterranea* Parisi, 1915, falls as a junior synonym of *canaliculata* Leach, 1815. The species that Nouvel & Holthuis (1957) had indicated with the name *Processa canaliculata* Leach, 1815, was given the new name *Processa nouveli* by Al-Adhub & Williamson.

Processa edulis (Risso, 1816)

PROC Proc 2

Nika edulis Risso, 1816, Hist.Nat.Crust.Nice, 85

Synonymy: *Nika edulis typica* Czerniavsky, 1334.

FAO Names: Nika shrimp (En),Guemade nica (Fr), Camarón nica (Sp).

Local Names: Saletto (Adriatic Sea, Italy; vid. Pesta, 1918:137), Italienischer Granatkrebs (Germany), Green shrimp (England, see Patterson,,1905:332).

Literature: Nouvel & Holthuis, 1957:10, Figs. l-27.

Distribution: Eastern Atlantic: British Isles to the Mediterranean. The typical subspecies is restricted to the Mediterranean, in the Atlantic there are two subspecies *P. e. arcassonensis* Nouvel & Holthuis, so far only known from S.W. France and *P. e. crassipes* Nouvel & Holthuis from the rest of the European Atlantic coast.

Habitat: Shallow water (often among Zostera and Posidonia). Marine.

Size: Maximum total length 30 mm (♂), 44 mm (♀).

Interest to Fishery: The specific name *edulis* already shows that the species is eaten. Risso (1816:86) in the original description stated on this account "c'est particulierement cette espèce qui est employée comme comestible aux environs de Nice, et qu'on vend pendant toute l'année", and (on p. 85) "La chair . . . offre, en tout temps un mets savoureux et agréable; et l'on s'en sert comme d'un excellent appât pour prendre les poissons". Pesta (1918:140), under the name *Processa canaliculata*, remarked for the Adriatic area that "Die Form wird auf den Fischmärkten (mit der "Minutaglia") als essbar verkauft". This is confirmed by Giordani Soika (l946:26), who reported that at the fishmarket of Venice "*Processa canaliculata*" was sold between November and January mixed with *Crangon crangon* and, *Palaemon adspersus*. As both Pesta and Giordani Soika dealt with shallow water shrimps it is most likely that their material belongs to the present species rather than to the deep sea *Processa canaliculata*. Although *Processa edulis* is the most common Mediterranean shallow water *Processa*, it is possible that older records of it dealt partly (or entirely) with other Mediterranean shallow water forms like *P. acutirostris* Nouvel & Holthuis, *P. robusta* Nouvel & Holthuis, etc., as several of these species have only been distinguished rather recently (see under Remarks below).

Outside the Mediterranean the present species is hardly of commercial importance, although it is occasionally eaten in Great Britain, as shown by Bell's (1847:277) remark that the specimen of "Nika edulis" "from which my figure and the above description are given was accidentally found by myself in a dish of boiled prawns, on which I was abbut to breakfast, at Bognor, in the year 1842".

Remarks: Until 1936 most zoologists were of the opinion that the genus *Processa* was represented in Eastern Atlantic waters by a single species which was indicated with the name *Processa canaliculata* Leach, 1815, or *Processa* (or *Nika*) *edulis* (Risso, 1816). In 1936 Lebour showed that *P. edulis* and *P. canaliculata* are distinct species, and in 1957 Nouvel & Holthuis recognized no less than eight species of *Processa* in European waters, one represented by three subspecies. In 1975 Al-Adhub & Williamson showed that the species that Nouvel & Holthuis had indicated with the name *Processa mediterranea* (Parisi, 1915) should bear the name *Processa canaliculata* Leach, 1815, while the species to which the latter name was assigned by Nouvel & Holthuis needed a new name *P. nouveli* Al-Adhub & Williamson, 1975.

The great confusion that has existed in the species taxonomy and the nomenclature of *Processa* makes it difficult to correctly evaluate old records. This is especially true for the shallow water species.

SUPERFAMILY PANDALOIDEA Haworth, 1825

Pandaloida Alcock, 1901, Descr.Catal.Indian.Deep Sea Crust.Macr.Anom, 55

Of the three families in this superfamily only one is known to contain species of commercial interest.

FAMILY PANDALIDAE Haworth, 1825

Pandalidae Haworth, 1825, Philos.Mag.J., 65:184

The family Pandalidae is, from a commercial point of view, one of the most important families of prawns, second only to the Penaeidae. While the fishery for Penaeidae is mostly confined to the tropics and subtropics, that for Pandalidae is done in colder waters of both the northern and southern hemisphere. Several genera of Pandalidae are of commercial importance, *Pandalus* being the foremost among these.

Chlorotocus crassicornis (Costa, 1871)

PANDL Chlo 1

Pandalus crassicornis Costa, 1871, Annu.Mus.Zool.Univ.Napoli, 6:89

Synonymy: *Chlorotocus gracilipes* A. Milne Edwards, 1882; *Palaemon chlorotocus* Filhol, 1886.

FAO Names: Green shrimp (En), Crevette verte (Fr), Camarón Verde (Sp).

Literature: Crosnier & Forest, 1973:184, Figs. 58-60.

Distribution: Eastern Atlantic: from the Bay of Biscay to Congo; Mediterranean. Records from South and East Africa, India and China Sea need confirmation.

Habitat: Depth 75 to 600 m. Bottom mud and sandy mud. Marine.

Size: Maximum total length 78 mm.

Interest to Fishery: Brian (1941:40) noted that since in Italy in the Genoa area trawlfishing had started at depths between 150 and 400 m, the species is rather frequently caught and is relatively common at the fishmarket, although these prawns are not sold in great quantities. Zariquiey Alvarez (1946:67) indicated that the species is caught "con bastante frequencia" by trawlers along the entire Catalonian coast of Spain. Heldt & Heldt (1954:11) listed the species among the edible shrimps of Tunisia, but remarked that it is not sold separately on the market, always being mixed with *Parapenaeus*. Longhurst (1970:299) reported that off the coast of Natal, S. Africa *Chlorotocus crassicornis* is taken in "quantities, which are often not marketed". The systematic and nomenclatural status of the S.E. African *Chlorotocus* is not yet positively known and the form occurring there may be a distinct species.

Dichelopandalus bonnieri Caullery, 1896

PANDL Dich 1

Dichelopandalus bonnieri Caullery, 1896, Ann.Univ.Lyon, 26:379.

Synonymy: Pandalus bonnieri - Calman, 1399.

FAO Names: Whip shrimp (En), Crevette fouet (Fr), Camarón latiguillo (Sp).

Literature: Calman, l899:34, Pls. 1-4, Fig. 3.

Distribution: Eastern Atlantic: West coast of Europe from Norway to the Bay of Biscay.

Habitat: Depth 60 to 1 200 m. Marine.

Size: Maximum total length 120 mm.

Interest to Fishery: Cole (in Graham:l956:194) stated that in the Clyde below Millport (S.W. Scotland) there exist "considerable quantities of Pandalus bonnieri . . . a prawn . . . , obviously of commercial importance if it is present in sufficient quantities". Longhurst (1970:265) confirmed this.

Heterocarpoides levicarina (Bate, 1888)

PANDL Het 1

Dorodotes levicarina Bate, 1888, Rep.Voyage Challenger, (Zool.), 24:680

Synonymy: *Heterocarpus (Heterocarpoides) levicarina* - De Man, 1917.

FAO Names: Dorodotes shrimp (En), Crevette dorodo (Fr), Camarón dorodó (Sp).

Literature: De Man, 1920:178, Pl. 15, Fig. 44.

Distribution: Indo-West Pacific: Red Sea to Japan and Indonesia.

Habitat: Depth 31 to 274 m. Marine.

Size: Maximum total length 45 mm.

Interest to Fishery: Minor if at all. Yasuda (1957:30) 1isted the species among those that are important in the shrimp fishery in the Inland Sea of Japan near Seto.

Heterocarpus dorsalis Bate, 1888

PANDL Heter 1

Heterocarpus dorsalis Bate, 1888, Rep.Voyage Challenger, (Zool.), 24:630

Synonymy: Heterocarpus alphonsi Bate, 1888.

FAO Names: Madagascar nylon shrimp (En), Crevette nylon malgache (Fr), Camarón nailón malgache (SP).

Literature: De Man, 1920:171, Pl. 15, Fig. 43.

Distribution: Indo-West Pacific: East and South-east Africa to Japan, the Philippines and Indonesia.

Habitat: Depth 185 to 1 325 m. Bottom mud or sandy mud. Marine.

Size: Maximum total length 154 mm (♂), 165 mm (♀); maximum carapace length (without rostrum) 34.5 mm (♂), 36.5 mm (♀).

Interest to Fishery: Crosnier & Jouannic (1973:13) considered this species "éventuellement commercialisable" on the continental slope of Madagascar.

Heterocarpus ensifer A. Milne Edwards, 1881

PANDL Heter 2

Heterocarpus ensifer A. Milne Edwards, 1881, Ann.Sci.Nat.Paris(Zool.), (6)11(4):8

Synonymy: *Pandalus carinatus* Smith, l882; *Heterocarpus carinatus* - Agassiz, 1888; *Atlantocaris gigas* Ortmann, 1893; *Procletes atlanticus* Lenz & Strunck, 1914; *Procletes gigas* - Gurney & Lebour, 1941..

FAO Names: Armed nylon shrimp (En), Crevette nylon armée (Fr), Camarón nailón armado (Sp).

Literature: Crosnier & Forest, 1973:189, Fig. 61a.

Distribution: Western Atlantic: from North Carolina (U.S.A.) south to the Caribbean area. Eastern Atlantic: from off S. Spain to the Congo. Indo-West Pacific: near Madagascar, Reunion and Hawaii (several other Indo-West Pacific records of this species may pertain to different forms).

Habitat: Depth 146 to 885 m. Bottom mud. Marine.

Size: Maximum total length 124 mm; maximum carapace length 34.8 mm.

Interest to Fishery: Experiments carried out near Reunion indicated a potential commercial importance of this species, which was obtained at great depths (250 to 650 m) with fish traps (Guézé, 1976:279). The species then proved commercially less attractive, however, than *H. laevigatus* with which it was often captured together. Crosnier & Jouannic (1973:ll) reported upon the potential commercial importance of the species near Madagascar, Reunion and Hawaii.

Heterocarpus gibbosus Bate, 1888 | PANDL Heter 3

Heterocarpus gibbosus Bate, 1888, Rep.Voyage Challenger, (Zool.), 24:634

FAO Names: Humpback nylon shrimp (En), Crevette nylon bossue (Fr), Camarón nailón jorobado (SP).

Literature: De Man, 1920:163, Pl. 14, Fig. 39.

Distribution: Indo-West Pacific: East Africa to the Philippines and Indonesia.

Habitat: Depth 265 to 1 280 m. Bottom mud. Marine.

Size: Maximum total length 140 mm; maximum carapace length (rostrum excluded) 40 mm.

Interest to Fishery: Potential. Off S.W. India the species, although trawled in small numbers only, seems to have commercial possibilities (Jones, 1969:747; Suseelan, 1976; Kurian & Sebastian, 1976:94).

Heterocarpus laevigatus Bate, 1888 | PANDL Heter 4

Heterocarpus laevigatus Bate, 1888, Rep.Voyage Challenger, (Zool.), 24:636

FAO Names: Smooth nylon shrimp (En), Crevette nylon inerme (Fr), Camarón nailón liso (Sp).

Literature: Crosnier & Forest, 1973:195, Fig. 61c.

Distribution: Eastern Atlantic: Madeira to Cape Verde Islands. Indo-West Pacific: South Africa and the Arabian Sea to the Malay Archipelago and Hawaii.

Habitat: Depth 302 to 1 156 m. Bottom sand or sandy mud. Marine.

Size: Maximum total length 181 mm (♂); 180 mm (♀), maximum carapace length 44 mm (♂). 49 mm (♀).

Interest to Fishery: According to Crosnier & Jouannic (1973:13) the species is "éventuellement commercialisable" on the continental slope of Madagascar. Experiments carried out near Reunion indicated a potential commercial importance of this species there, if fished at great depths (550 to 800 m) with fish traps (Guézé, 1976:270,282). The species is found there together with *H. ensifer*, but at the depths of 550 to 800 m it forms 75% of the catch.

Heterocarpus reedi Bahamonde, 1955

PANDL Heter 5

Heterocarpus reedi Bahamonde, 1955, Invest.Zool.Chil., 2:105

FAO Names: Chilean nylon shrimp (En), Crevette nylon chilienne (Fr), Camarón nailón (Sp).

Local Names: Camarón nailon, Camarón de profundidad, Gamba (Chile).

Literature: Bahamonde & Henriquez, 1970:l 607-I 627, Figs. l-7.

Distribution: Eastern Pacific: off Chile between 25ºS and 39ºS.

Habitat: Depth 155 to 424 m. Bottom clay, mud or sandy mud. Marine.

Size: Maximum carapace length (without rostrum) 34 mm (♂), 39 mm (♀).

Interest to Fishery: Considerable. This species is trawled, it formed 95% of the total shrimp catch of Chile (Hancock & Henriquez, 1968). The species is used fresh, dried, boiled and peeled. It is exported also. According to Longhurst (1970:303) it also is fished in Peru. The catch (in metric tons) taken annually in Chile amounted to 8 300 (in 1973), 7 550 (in 1974), 7 935 (in 1975), and 6 197 (in 1976).

Heterocarpus sibogae De Man, 1917

PANDL Heter 6

Heterocarpus sibogae De Man, 1917, Zool.Meded., Leiden, 3:283

FAO Names: Mino nylon shrimp (En),Crevette nylon mino (Fr), Camarón nailón mino (Sp).

Local Names: Mino ebi (Japan).

Literature: De Man, 1920:169, Pl. 14, Fig. 42.

Distribution: Indo-West Pacific: Maldives to Japan and Indonesia.

Habitat: Depth 233 to 560 m. Bottom mud. Marine.

Size: Maximum total length 140 mm.

Interest to Fishery: Yasuda (1957:30) listed this species among those that are important in the shrimp fishery in the Inland Sea of Japan near Seto.

Heterocarpus tricarinatus Alcock & Anderson, l894

PANDL Heter 7

Heterocarpus tricarinatus Alcock & Anderson, 1894, J.Asiat.Soc.Bengal, 63(2):154

FAO Names: Scarred nylon shrimp (En), Crevette nylon balafrée (Fr), Camarón nailón chirlo (Sp).

Literature: De Man, 1920:161, Pls. 13,14, Fig. 38.

Distribution: Indo-West Pacific: S.E. Africa and Arabian Sea to Indonesia.

Habitat: Depth 500 to 2 000 m. Bottom mud. Marine.

Size: Total length 119 mm (♂), 58 to 94 mm (♀).

Interest to Fishery: Crosnier & Jouannic (1973:13) considered this species "éventuellement commercialisable" on the continental slope of Madagascar.

Heterocarpus vicarius Faxon, 1893 — PANDL Heter 8

Heterocarpus vicarius Faxon, 1893, Bull.Mus.Comp.Zool.Harv.Coll., 24:203

FAO Names: Northern nylon shrimp (En), Crevette nylon nordique (Fr), Camarón nailón norteño (Sp).

Local Names: Camello, Torobado, Small red shrimp (Costa Rica, Panama).

Literature: Faxon, 1295:148, Pl. 40, Fig. 1, Pl. 41, Fig. 2.

Distribution: Eastern Pacific: Mexico to Panama.

Habitat: Depth 73 to 550 m. Bottom mud. Marine.

Size: Total length 28 to 110 mm; carapace length (without rostrum) 7.5 to 29 mm.

Interest to Fishery: The species is commercially fished for in Costa Rica and Panama at depths of 180 to 270 m (I. Pérez-Farfante, in Litt.; see also Vidal & Rosetti, 1971, 1971a).

Heterocarpus woodmasoni Alcock, 1901 — PANDL Heter 9

Heterocarpus woodmasoni Alcock, 1901, Descr.Cat.Indian Deep Sea Crust.Macr.Anom., 108

FAO Names: Indian nylon shrimp (En), Crevette nylon indienne (Fr), Camarón nailón indio (Sp).

Literature: De Man, 1920:156, Pl. 13, Fig. 36.

Distribution: Indo-West Pacific: E. Africa to Indonesia.

Habitat: Depth 290 to 640 m. Bottom mud. Marine.

Size: Maximum total length 131 mm (♂). 149 mm (♀); maximum carapace length (rostrum excluded) 27 mm (♂), 32 mm (♀).

Interest to Fishery: Crosnier & Jouannic (1973:ll) listed this species as "éventuellement commercialisable" on the continental slope of Madagascar. Like *H. gibbosus*, the present species was mentioned by Jones (1969:747), Suseelan (1976) and Kurian & Sebastian (1976:94) as of possible commercial importance in Indian waters.

Pandalopsis dispar M.J. Rathbun, 1902 — PANDL Pand 1

Pandalopsis dispar M.J. Rathbun, 1902, Proc.U.S.Natl.Mus., 24:902

Synonymy: *Pandalus dispar* - Taylor, 1912.

FAO Names: Sidestripe shrimp (En), Crevette à flancs rayés (Fr), Camarón de banda (Sp).

Local Names: Side-stripe shrimp (Canada; U.S.A.), Giant red shrimp (Canada).

Literature: M.J. Rathbun, 1904:54, Pl. 1, Fig. 2.