ON HERMIT-CRABS (FAMILY PAGURIDAE) IN THE COLLECTION OF THE INDIAN MUSEUM.

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This short note deals with a small collection of the Hermit-crabs preserved in the collection of the Zoological Survey of India. Besides descriptive notes on some known forms, one new genus based on the characters of a female, and one new variety have been described.

My very sincere thanks are due to Dr. S. L. Hora, Director, Zoological Survey of India, for placing the material at my disposal, to Dr. B. N. Chopra, Deputy Fisheries Development Adviser to the Government of India, for his kindness in critically examining my material and checking my identifications, to Dr. B. S. Chauhan, Assistant Superintendent, for his encouragement and help and to Mr. K. K. Tiwari, Assistant Zoologist, also for his willing help.

Family Paguridae.

Sub-family *PAGURINAE*.

Paguropsis typicus (Henderson).

1888. *Paguropsis typicus*, Henderson, *Challenger Anomura*, p. 99.

1899. *Chloenopagurus andersoni*, Alcock, *Journ. As. Soc. Bengal* LXVIII, p. 115.

1905. *Paguropsis typica*, Alcock, *Cat. Indian Dec. Crust.* Part II, p. 414.

1943. *Paguropsis typica*, Thompson, *Sci. Rep. John Murray Exped.* VII, No. 5, p. 414.

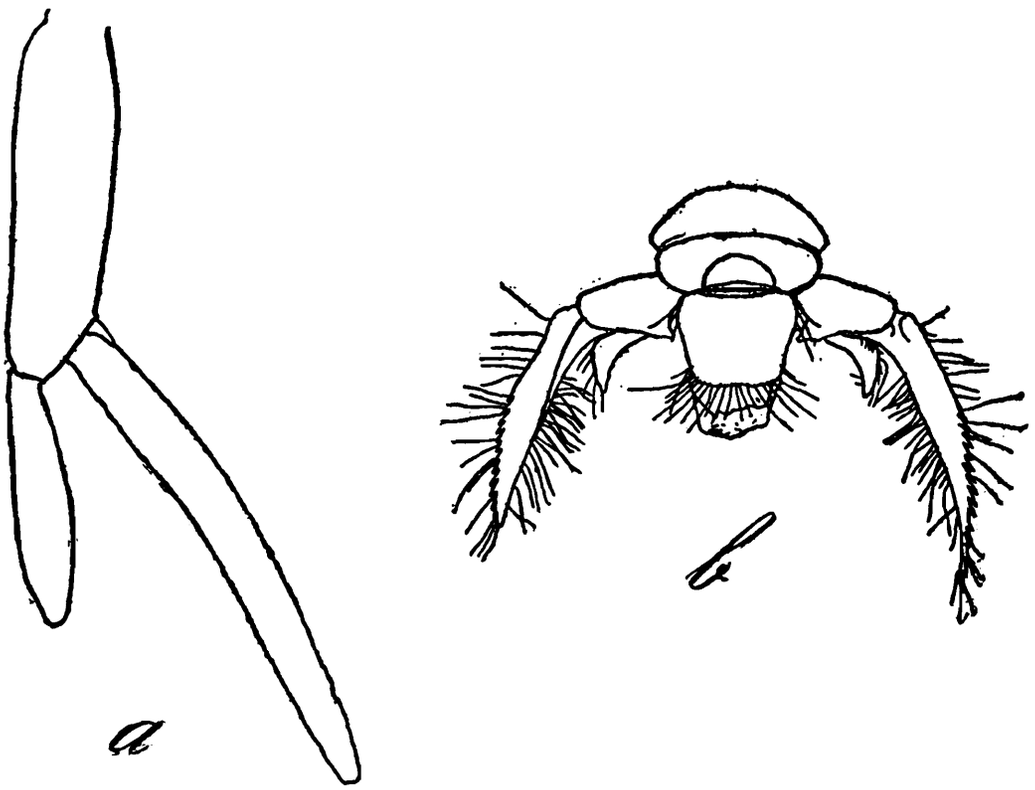
The genus *Paguropsis*, containing only one species, was described by Henderson. Since then it has been revised by Alcock (*op. cit.*) and it range of distribution extended by Thompson (*op. cit.*) to Zanzibar.

After a critical examination of a large series of this species preserved in the Zoological Survey of India, the following remarks are added to supplement the descriptions already published.

Only in females and young males, the antennal acicle is shorter than the eye-stalks. In medium-sized males, the antennal acicle is as long as, and in very large-sized males from Waltair, stout and distinctly longer than the eye-stalks. The size of the antennal peduncle also varies with age. In females and young males it is only one-fourth as long as the antennular peduncle, in older males half as long and in large-sized males it is three fourths as long as the antennular peduncle.

The form and structure of the abdominal appendages of the males differ from those given in the earlier descriptions ; the first two segments of the abdomen carry a pair of uniramous appendages each. The segments three to five carry only one appendage, either on the right or on

the left side, but out of the 205 specimens examined, 163 carry it on the right side. These appendages according to Henderson (1888) and Alcock (1899) are uniramous, but on examining them under binoculars, I find them to be biramous (Text-fig. 1*a*), although the endopodite is rudimentary. The tail fan in the males is symmetrical but in the females the ramus of the uropod on the side bearing pleopods is longer than on the other side (Text-fig. 1*b*).



TEXT-FIG. 1.—*Paguropsis typicus* Henderson. *a*. Pleopod of male : × 14 ; *b*. Uropod of female : × 62.

In the rest of the characters the specimens agree with the descriptions of Henderson and Alcock.

Distribution.—Paguropsis typicus has been recorded from the Philippine Islands (Henderson), Gulf of Martban and Cape Comorin (Alcock) and Zanzibar (Thompson). The specimens from Waltair Coast examined by me come within this range.

Diogenes custos var. **waltairensis**, nov.

The following description of this new variety of *Diogenes custos* is based on two examples collected at Waltair (Text-fig. 2*d*) :

The carapace is almost as long as broad. The cervical groove is deep ; the portion anterior to it is octagonal, and the lateral sides are straight. The surface is irregularly ridged with ridges of various sizes. The posterior margins of the carapace are rounded. The rostrum is prominent extending up to the base of the eye-stalks and is slightly longer than the ophthalmic scales. The antennal angles are prominent from where the frontal border of the carapace runs outwards and backwards and joins the sides.

The eye-stalks are long and slender, the cornea occupying one-fourth of their length. They are a little more than half the length of the anterior border of carapace and much shorter than the antennal and antennular peduncles. Ophthalmic scales are well developed and lie closely applied to the rostrum and their margins are finely serrated.

The antennular peduncles are glabrous and longer than the antennal peduncles. The antennal peduncles are hairy and the basal segment bears a stout spine on its outer anterior margin. The acicle, whose anterior margin is ciliate, is conspicuously bifurcate and its outer fork touches the base of the terminal peduncular segment. The flagellum is as long as the median length of the carapace and is uniserially setose throughout its length.

Chelipeds are dissimilar and unequal, the left being twice as long as the right. The former is slightly shorter and stouter than the legs and less hairy than the right cheliped. The right cheliped, unlike the other appendages, is neither spinose nor tuberculose. The merus of the left cheliped is high. Its lower and outer margins are finely serrate, and just below and parallel to the upper margin there is a row of rounded granules. Carpus is longer than broad, its lower half studded with low, small granules interspersed with spines, which are less than those of the upper surface. Its upper half is granular and spinose, the upper edge possessing two rows of well defined spines. The movable finger is studded with rounded tubercles which form longitudinal rows on the upper margin.

Second and third pairs of legs are similar, being longer than the left cheliped by about half their dactylus and the second pair slightly exceeds the third pair. The upper, inner edges of merus and carpus of two pairs are beset with strong and forwardly directed spines. Their outer surfaces are uniformly granulose. The granules are small and low. The dactyli are ridged and the two upper ridges are serrate, and bear two rows of silky hairs, one on the upper and the other on the lower border while the rest of the segments are destitute of hairs.

The anterior region of the carapace and merus, are reddish-pink, the carpus of the legs and the carpus and the hand of the chelipeds are with violet patches, and the posterior three-fourths of propodus and dactylus of the legs are violet in one of the specimens. The other specimen is predominently creamy yellow but the upper surfaces of the propodus and dactylus of the appendages are orange in colour.

The two specimens are of the same size and measurements (in millimetres) of one of them are given below :—

Greatest breadth of carapace	11·2
Median length of carapace	11·3
Length of eye-stalk (excluding cornea)	3·1
Length of antennular peduncle	7·5
Length of antennal peduncle	6·9
Anterior breadth of carapace	5·2

The following table illustrates the differences between *D. custos waltairensis* and other known varieties :

	D. custos.	*D. c. affinis.*	*D. c. violaceous.*	*D. c. planimanus.*	*D. c. waltairensis.*
Eye-stalk	Less than ⅓ of the frontal border of carapace.	Less than ⅓ of the frontal border of carapace.	Less than ⅓ of the frontal border of carapace.	Less than ⅓ of the frontal border of carapace.	Slightly more than half the length of the ant. border of carapace.
Rostrum	Reaches well beyond ophthalmic scales.	Only slightly longer than ophthalmic scales.	Only slightly longer than ophthalmic scales.	Only slightly longer than ophpthalmic scales.	As long as ophthalmic scales.
Antennal and Antennular peduncles.	Are of equal length.	Antennular peduncle shorter than antennal peduncle.	Are of equal length.	Antennular peduncle shorter than antennal peduncle.	Antennular peduncle longer than antennal peduncle.
Antennal acicle	Outer fork reaches well beyond the base of the terminal joint.	Outer fork does not reach to the base of the terminal joint and indistinctly bifurcate.	Outer fork reaches well beyond the base of the terminal joint.	Outer fork reaches well beyond the base of the terminal joint.	Reaches well beyond the base of last segment and distinctly bifurcate.
Hand	Short and broad; dactylus does not make up ⅔ the total length of hand. Lower edge of fixed finger sinuous.	Short and broad; dactylus does not make up ⅔ the total length of hand. Lower edge of fixed finger sinuous.	Longer than broad and the fixed finger has straight lower margin.	As long as high and the fixed finger is straight.	One and a half times as broad, the tip of fixed finger turned outwards and proximal portion concave.

Locality.—Lawson's Bay, Waltair, 14·2.47. Caught in fishermen's nets.

Type-specimen.—Regd. No.C 2892/1, Zoological Survey of India, Calcutta.

Diogenes miles (Henderson).

1905. *Diogenes* miles, Alcock, *Indian Mus. Dec. Crust.*, Part II, Anomura, p. 62.

Twenty specimens collected from Madras Coast and one from a *Conus* shell at Waltair, agree fairly well with the description of Alcock and are undoubtedly referable to this species.

The specimens from the Madras coast carry an exceptionally large number of eggs for their size. The abdomen of a fairly large specimen measures around 16 mm. but it carries on an average 1,200 eggs of 302μ in diameter whereas, according to Jackson *Eupagurus bernhardus* (Leach) which is twice as large as *D. miles*, carries on an average not more than 1,600 eggs of the same size as those of *D. miles*. The pleopods are more hairy than in the typical forms and the upper surface of the abdomen on the right side is thickly setose. On the antennular peduncles and on the lower surfaces of the appendages there are, deep red, rounded spots which are absent in specimens described by Alcock. Moreover, the present specimens are not fastidious about the choice of their shells while the known specimens so far collected were found only in the shells of *Oliva*. Small fish, prawns, polychaete worms, and molluscs were found as commensals in the shell and also on the body of the crab.

The specimen from the *Conus* shell has the calcified regions of the carapace, the rostrum, the ophthalmic scales, the antennal acicle, the merus and carpus of chelipeds as well as those of the second, third and fourth pairs of legs, pink and white patches. The eye-stalks, dactyli and propodites of the chelipeds and legs are longitudinally banded with pink.

Diogenes diogenes (Henderson).

1905. *Diogenes miles,* Alcock, *Indian Mus. Decap. Crust.,* Part II, Anomura' p. 67.

Two specimens from Lawson's Bay, Waltair, one from *Babylonia* shell and the other from *Murex* shell are referable to this species.

The specimen from the *Babylonia* shell has the anterior region of the carapace, the ophthalmic scales, the antennal peduncles, acicles and the upper surfaces of the appendages pinkish on a light cream ground colour. The eye-stalks are longitudinally banded with pink.

The specimen from the *Murex* shell has the flagellum thickly setose throughout its length, whereas according to Alcock it is only sparsely setose at the base.

Pagurus guttatus de Man.

1905. *Pagurus guttatus,* Alcock, *Indian Mus. Decap. Crust.,* Part 11, Anomura, p. 37.

There is a single specimen of this species in the unnamed collection.

This specimen differs from Alcock's description in the following characters :—

1. The right cheliped is twice as stout as the left and longer than it by a dactylus length. Alcock, however, mentions that the chelipeds are equal and similar in form.
2. This specimen is less hairy.
3. The left cheliped is studded with sharp acute horny spines which are numerous on the hand and the fixed finger, these being absent on the right cheliped.
4. The spur is thick and fleshy and is not very hairy. The colour of the specimen is purplish crimson.

Neopagurus gen. nov.

Carapace moderately elongate, broadened posteriorly, strongly calcified in front of the cervical groove and partially in the cardiac region the rest of the carapace being soft and pliable. A pair of conspicuous, brown, oval patches on the posterior part of the gastric region. Rostrum absent. Antennal projections very prominent, reaching beyond the base of the ophthalmic scales.

Abdomen well developed, spirally coiled ; the terga broad, widely separated and fairly calcified.

Eye-stalks stout, fairly elongate ; ophthalmic scales large and widely separated.

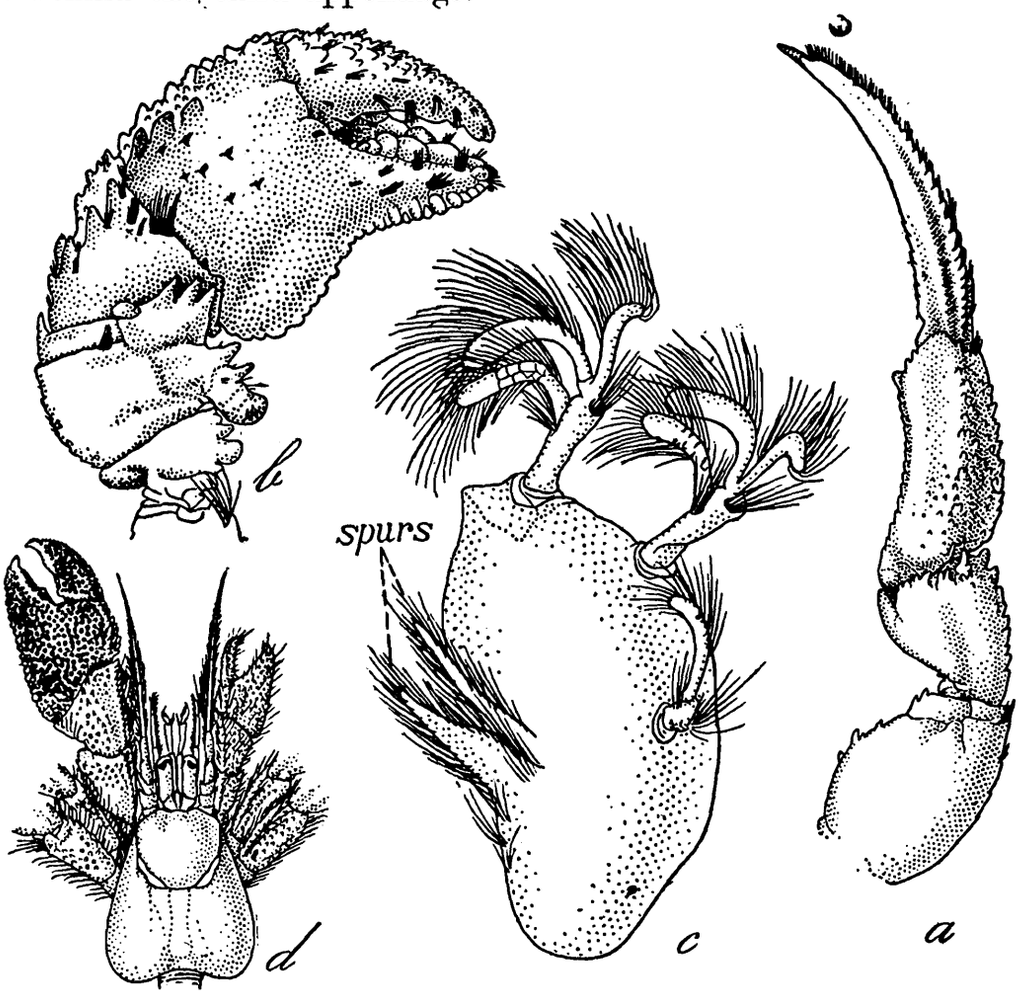
Antennules long and stout ; antennae broad, antennal acicle short, the flagellum long and non-setose.

External maxillipeds approximated at base ; the exopodites of all three pairs of maxillipeds with a well developed flagellum, the endopodite of the first maxillae non-flagellate.

The chelipeds dissimilar and unequal, the left being greatly the larger ; finger tips blackened and articulating in a vertical plane.

Crawling legs long, those on the right side longer than those on the left, the right third leg being the longest. The fourth pair subchelate and the fifth pair chelate ; both with a patch of imbricating corneous granules, near the tip on the outer surface, this patch being more prominent in the fourth pair.

The abdominal appendages four in number, excluding the tail-fan, placed on the left side on somites 2-5. First three very large, massive and triramous, the fourth minute and uniramous. *Two* soft, partly calcified *setose spurs* (Text-fig. 2*c*) present on the abdomen ventrolaterally ; one between the second and the third appendages and the other just behind the third appendage.



TEXT FIG. 2.—*Neopagurus horai*, gen. *et* sp. nov. *a*. Third leg : × 1 ; *b*. Left cheliped : × 1 ; *c*. abdomen : × 1. *d*. Anterior region of the body of *Diogenes custos* var. *waltairensis*, nov. × 1.

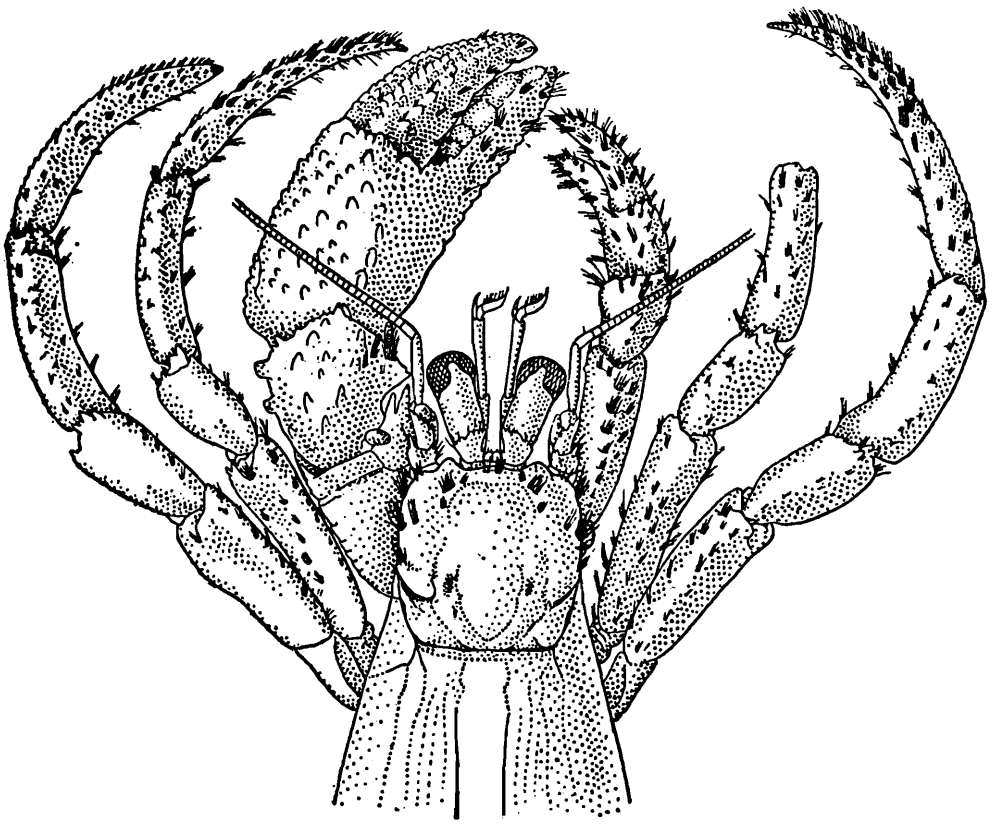
Branchiae 14 in number, phyllobranchiate, arranged as in *Pagurus*.

Locality.—Unknown.

This genus is closely allied to *Pagurus* Fabr. from which it differs in having two spurs in the abdomen (Text-fig. 2*c*) and having the antennal acicle blunt and not elongated.

Neopagurus horai[1] gen. *et* sp. nov.

The following description is based on a single female holotype :



TEXT-FIG. 3.—Dorsal view of the anterior region of the body of *Neopaguru horai*, gen, *et.* sp. nov.×.

Carapace is not depressed, its greatest breadth across the branchial region is less than half its length in the middle line, setose only on the antero-lateral margins.

Eye-stalks are not very depressed. They are slightly broadened distally, being half the length of the carapace, and reach little beyond the second joint of the antennular peduncle and up to two-thirds the length of the terminal joint of the antennal peduncle, and are slightly constricted in the middle. Eyes are reniform and occupy three-fourths the length of the eye-stalk. Ophthalmic scales are broad, three-edged, upper edge being serrate at the tip.

Antennal acicle is truncated. It just touches the base of the terminal joint of the antennal peduncle and possesses two spines and setae.

Except in the terminal joints, the legs and chelipeds are sparsely setose. The left cheliped, which is about one and three quarters of the median dorsal length of the carapace, is vastly the larger. The lower border of the merus is elate and strongly and irregularly serrate. The elation is divided into an anterior and a posterior portion. The former

[1] Named after Dr. S. L. Hora, Director, Zoological Survey of India.

is tridentate and the latter is also tridentate but in the former all the teeth are of the same size while in the latter the posterior tooth is highly enlarged and has a truncated tip. Wrist has the upper and outer surface beset with strong teeth of which those along the inner border are the largest. The hand is short and deep. In addition to a row of sharp teeth along the inner border, it bears two raised longitudinal rows of tubercles along its upper surface. Its lower border is well defined and crenulate, but the lower part of its outer surface is smooth. The dactylus (Text-fig. 2 *b*) is beset with rounded, smooth tubercles and its inner upper edge which is not crested, is marked by straight row of uniform tubercles. There are a few tufts of setae on the inner anterior surface of the carpus, the propodite and the dactylus.

The legs on the right side are longer than these on the left and reach well beyond the larger cheliped, the third pair being longer than the second.

The anterior border of the merus is spinose. The upper surfaces of the propodites are beset with tubercles. The dactylus has a single continuous row of spines on its outer border in the third left leg, in the rest of the legs this row is broken. The inner and upper surfaces of the dactyli are beset with setae, arising in groups.

The animal is uniformly cream-yellow in colour, except for the membranous region of the carapace, the abdominal terga and the setae, which are brown in colour.

The measurements (in millimetres) of the specimen are given below :—

1. Median length of gastric region of carapace	41·9
2. Median length of posterior part of carapace	31·8
3. Anterior breadth of carapace	18·9
4. Length of eye-stalk	8·2
5. Length of antennal peduncle	15·3
6. Length of antennular peduncle	14·2

Type-specimen.—One female. Regd. No. C 2896/1, Zoological Survey of India, Calcutta.

Locality.—Unknown.

Neopagurus horai is closely allied to *Pagurus deformis* M-Edw., from which, besides the two spurs on the abdomen, it can be distinguished by the following characters :—

1. The inner edge of the upper surface of the dactylus of the left cheliped does not form an upstanding crenulated crest.
2. In the male, the whole of the dactylus is beset with very well formed granules.
3. The thin, sharp, finely-crenulated, *overhanging crest* on *outer edge* of the *upper surface* of the *third leg* is *absent.* (Text-fig. 2 *a*).
4. The antennal acicle has a truncated tip and is very short, reaching only up to the base of the terminal peduncular joint.

Neopagurus sp.

A single male specimen from South Seas, bearing the number 1289 in the register of the Zoological Survey of India, and labelled as " *Pagurus* M-Edw. " is undoubtedly referable to the genus *Neopagurus*, since it possesses the *two spurs* on the abdomen, characteristic of this genus.

This specimen differs from the female, described above, in some respects and it is not sure whether the differences are due to sexual dimorphism or they are specific in nature. The following are the characters in which this specimen differs from the female of *Neopagurus horai* :—

1. The eye-stalks are surrounded by a whitish thickening in the middle.
2. The terminal joint of the antennal peduncle possesses two spine only and no setae.
3. The teeth on the upper outer surface of the wrist are larger and more numerous than in the female.
4. The hand does not possess two raised longitudinal rows of tubercles along its upper surface. The tubercles are more pronounced and numerous and are irregularly scattered, even in the lower part of the outer surface. The setae are more numerous than in the female.

The measurements (in millimetres) of the male specimen are given below :—

1. Median length of gastric region of carapace	48·3
2. Median breadth of gastric region of carapace	41·3
3. Anterior breadth of carapace	25·1
4. Length of antennal peduncle	19·2
5. Length of antennular peduncle	16·9

It differs from *Pagurus gemmatus* M-Edw. in *lacking* the strong *crenulated crest* on the *propodite* of the *third leg* and in having *two spurs* on the abdomen.

Until more material of *Neopagurus horai* is available for examination, I defer assigning any specific name to this specimen.