A new squat lobster family of Galatheoidea (Crustacea, Decapoda, Anomura) from the hydrothermal vents of the Pacific-Antarctic Ridge

Enrique MACPHERSON
Centro de Estudios Avanzados de Blanes (CSIC),
C. acc. Cala San Francesc 14, E-17300 Blanes (Spain)
macpherson@ceab.csic.es

William JONES
Monterey Bay Aquarium Research Institute,
7700 Sandholdt Road, Moss Landing CA (USA)
jones@mbari.org

Michel SEGONZAC
Ifremer, Centre de Brest,
DEEP/Laboratoire Environnement Profond-Centob,
BP 70, F-29280 Plouzané (France)
segonzac@ifremer.fr

Macpherson E., Jones W. & Segonzac M. 2005. — A new squat lobster family of Galatheoidea (Crustacea, Decapoda, Anomura) from the hydrothermal vents of the Pacific-Antarctic Ridge. *Zoosystema* 27 (4) : 709-723.

ABSTRACT
A new monotypic family, Kiwaidae n. fam., is proposed for *Kiwa hirsuta* n. gen., n. sp., new genus and new species collected in hydrothermal vents of the Pacific-Antarctic Ridge, south of Easter Island. The new family belongs to the superfamily Galatheoidea, having similarities with the family Chirostylidae, but with distinctive characters including carapace shape and ornamentation, insertion of fifth pereopod not visible and situated below sternal plastron, sternite between third maxillipeds large and strongly produced anteriorly; eyes strongly reduced, antennal scale absent and chelipeds and walking legs with dense mat of setae. Molecular data (18S rRNA) gene confirm the clear difference between anomuran families, placing the new taxa closer to the families Chirostylidae, Galatheidae and Porcellanidae than to Aeglidae.

KEY WORDS
Crustacea,
Decapoda,
Anomura,
Galatheoidea,
Kiwaidae n. fam.,
Kiwa n. gen.,
hydrothermal vents,
Pacific-Antarctic Ridge,
new family,
new genus,
new species.

RÉSUMÉ

Une nouvelle famille de Galatheoidea (Crustacea, Decapoda, Anomura) des sources hydrothermales de la dorsale Pacifique-Antarctique.

Une nouvelle famille monotypique, Kiwaidae n. fam., est proposée pour *Kiwa hirsuta* n. gen., n. sp., récolté sur les sites hydrothermaux de la dorsale Pacifique-Antarctique, au sud de l'Île de Pâques. La nouvelle famille appartient à la superfamille Galatheoidea et présente des similitudes avec la famille des Chirostylidae, mais s'en distingue nettement par la forme et l'ornementation de la carapace, la base des cinquièmes péréiopodes, située sous le plastron sternal, et non visible ventralement, le sternite situé entre les troisièmes maxillipèdes, de grande taille et fortement prolongé antérieurement, les yeux réduits, l'écaille antennaire absente, et la dense couverture de soies. Les données moléculaires (rRNA 18S) confirment la nette différence entre les familles d'anomoures, plaçant le nouveau taxon plus près des Chirostylidae, Galatheidae et Porcellanidae que des Aeglidae.

MOTS CLÉS
Crustacea,
Decapoda,
Anomura,
Galatheoidea,
Kiwaidae n. fam.,
Kiwa n. gen.,
sources hydrothermales,
dorsale Pacifique-Antarctique,
nouvelle famille,
nouveau genre,
nouvelle espèce.

INTRODUCTION

The decapod crustacean fauna associated with the hydrothermal vents is represented by about 70 species (Wolff 2005), including 15 species of Anomura belonging to four families: Lithodidae Samouelle, 1819, Chirostylidae Ortmann, 1892, Galatheidae Samouelle, 1819, and Parapaguridae Smith, 1882 (Chevaldonné & Olu 1996; Saint Laurent & Macpherson 1997; Baba & Williams 1998; Lemaitre 2004; Baba 2005; Macpherson & Segonzac in press; Martin & Haney in press).

During March-April 2005 a research cruise, PAR 5 (Pacific-Antarctic Ridge 2005; http://www.mbari.org/expeditions/eastermicroplate) organized by MBARI (RV *Atlantis* and DS *Alvin*, R. Vrijenhoek, Chief scientist), was carried out along four hydrothermal vent areas of the Easter Microplate and Pacific-Antarctic Ridge between 23°S and 38°S (Fig. 1). The 38°S site is the southernmost vent area known on the complex East Pacific Rise/Pacific-Antarctic Ridge and it exhibits the highest known spreading rates, *c.*100 mm/year vs 160 mm/year at 31°S (Hey *et al.* 2004), which are expected to affect the turnover rate off local vent communities. The substratum consists of very glassy basalt with no sediment cover, suggesting the lava emissions are very young.

On several occasions, scientists diving in the submarine *Alvin* on board the RV *Atlantis* observed a number of large (*c.* 15 cm length), white, "hairy" crustaceans (Fig. 2) and collected one of them. The specimen belongs to the superfamily Galatheoidea, a clade that includes the families Galatheidae, Chirostylidae, Porcellanidae Henderson, 1888 and Aeglidae Dana, 1852 (Borradaile 1907; Balss 1957), but does not fit within the morphological or genetic boundaries of any of these known families. The extraordinarily setose nature of the chelipeds and walking legs led to adoption of the common name, "Yeti" crab.

In this paper we describe and illustrate the morphological characters and molecular data that distinguish this unique specimen from those belonging to other galatheoidean families, and we also include some environmental information obtained during *in situ* observations.

ABBREVIATIONS

CL	carapace length, from the posterior border to the tip of the rostrum;
EPR	East Pacific Rise;
MBARI	Marine Biological Aquarium of Research Institute, Monterey;
MNHN	Muséum national d'Histoire naturelle, Paris;
PAR 5	Pacific-Antarctic Ridge 2005;
SEPR	South-East Pacific Rise;
TL	total length from the tip of the rostrum to the posterior border of the telson.

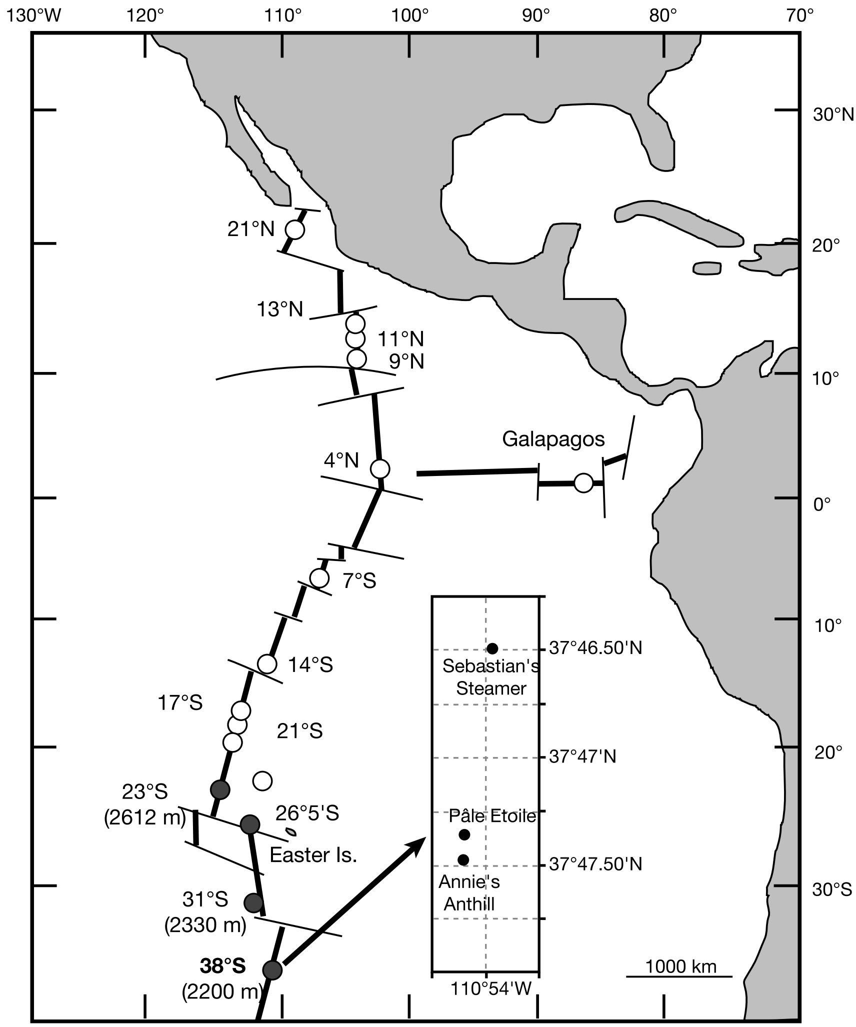

FIG. 1. — East Pacific Rise and Pacific-Antarctic Ridge showing the hydrothermal vent sites, the vent sites visited during the PAR 5 cruise (●), and the distribution of the new species at 38°S site (detail in rectangle).

MOLECULAR ANALYSIS

Genomic DNA was isolated from ethanol-preserved muscle (50 mg) treated with the Qiagen Dneasy isolation kit, according to manufacturer's instructions (Qiagen Inc., Valencia, CA). Polymerase chain reaction (PCR) conditions for amplification of the gene regions were as follows: 100 ng of template DNA, 5 µl 10X buffer (supplied by manufacturer), 5 µl $MgCl_2$ (2.5 µM), 2 µl of each primer (10 µM final conc.), 2.5 units of Taq polymerase (Promega Inc., WI), 5 µl of a 2mM stock solution of dNTPs, and sterile water to a final-volume of 25 µl. A ≈2000 bp fragment of the 18S rRNA gene was amplified with universal 18S rDNA primers, 18e (5'-CTGGTT GATCCTGCCAGT-3') and 18P (5'-TAAT GATCCTTCCGCAGGTTCACCT-3'; Halanych *et al.* 1998). PCR products were sequenced bidirectionally with an ABI 3100 DNA sequencer (Applied Biosystems Inc., Foster City, CA), GenBank 18S rRNA sequences

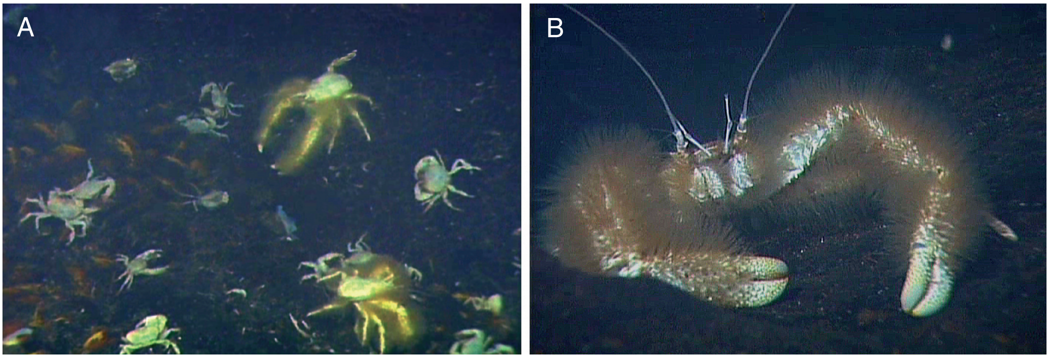

FIG. 2. — *Kiwa hirsuta* n. gen., n. sp., *in situ* observations; **A**, two specimens on vent site Annie's Anthill, with crabs *Bythograea* sp., on mussel bed *Bathymodiolus* sp.; **B**, one specimen on pillow lava, near the vent site Pâle Étoile. Photographs taken by the submarine *Alvin* in March 2004 (SEPR), copyright MBARI/PAR 5/B. Vrijenhoek.

(AF439381-AF439392, Z14062) were aligned with the yeti crab 18S rRNA (DQ219316) using ClustalX (Thompson *et al.* 1994) followed by manual checking. Secondary structure of rRNA (i.e. stems and loops) was inferred using the program GeneBee (Brodsky 1992). Bayesian inference of phylogeny was performed using MrBayes v3.0B4 (Huelsenbeck & Ronquist 2001) with data partitions using RNA secondary structure. Six chains were run simultaneously for 1100000 generations and trees sampled every 1000 generations. The first 1000 trees were discarded as "burn in" and Bayesian posterior probabilities were estimated on the 95% majority rule consensus.

SYSTEMATICS

Superfamily GALATHEOIDEA Samouelle, 1819

Family KIWAIDAE n. fam.

TYPE GENUS. — *Kiwa* n. gen.

ETYMOLOGY. — The name is derived from the type genus *Kiwa* n. gen.

DESCRIPTION

Body depressed, symmetrical. Carapace calcified, slightly convex, smooth. Rostrum well developed, triangular. Cervical grooves clearly distinct between gastric and anterior branchial regions and between anterior and posterior branchial regions; either side of mesogastric region with small sharply defined tip. Cardiac region small and depressed and separated from branchial regions by shallow grooves. Anterior branchial regions well delimited and separated by short median longitudinal groove; small W-shaped groove over this groove. Posterior branchial regions separated by median longitudinal groove. Intestinal region well circumscribed and separated from branchial regions by distinct grooves. Posterior half of pterygostomian flap with two longitudinal and subparallel carina. Abdominal segments smooth, not folded against thorax; telson folded beneath preceding abdominal somite, with a median transverse suture and a longitudinal suture in the posterior half of telson; uropods spatulate. Epistome unarmed. Sternal plate between third maxillipeds (sternite 3) well developed, strongly produced anteriorly; sternal plate between fifth pereopods (sternite 8) absent. Eyes strongly reduced to small soft tissue, not calcified, movable, without pigment, inserted near antennulae. Antennal peduncle 5-segmented, without antennal scale; flagellum of moderate length. Dense long plumose setae mainly on sternum and ventral surface of pereopods. Third maxillipeds with coxae having distal border strongly produced and denticulate, and each tooth with corneous margin; crista dentata in proximal half of ischium; epipods absent. Chelipeds (pereopod 1) strong, subequal, and greatly elongate, corneous tip of movable finger fitting between two corneous tips of fixed finger; walking legs (pereopods 2-4) stout, with claw-like dactyli bearing dense corneous spinules along flexor margin. Fifth pereopod chelated, inserted below sternite 7, insertion not visible ventrally.

Genus *Kiwa* n. gen.

TYPE AND ONLY SPECIES. — *Kiwa hirsuta* n. sp.

ETYMOLOGY. — The name refers to the goddess of the shellfish in the Polynesian mythology (*Kiwa*). The gender is feminine.

DIAGNOSIS. — Characters as for the family.

Kiwa hirsuta n. sp.
(Figs 3-8)

HOLOTYPE. — Male, CL 58.6 mm, 51.5 mm (without rostrum), TL 88.4 mm (MNHN-Ga 5310). The holotype was collected by the slurp gun of the submarine *Alvin*, dive 4088, 22.III.2005, at the vent site area SEPR named Annie's Anthill, 37°46.49'S, 110°54.72'W, 2228 m. On board, the left fifth pereopod and some seta were dissected and preserved in ethanol for DNA analyses by MBARI team. The specimen was fixed in formalin and transferred in ethanol 80° two days later.

ETYMOLOGY. — From the Latin, *hirsutus*, hairy, in reference to the abundance of setae on pereopods.

DESCRIPTION

Carapace, excluding rostrum, 1.3 times longer than broad, dorsal surface smooth and sparsely provided with fine uniramous setae. Gastric region extremely depressed, posteriorly separated from anterior branchial and cardiac regions by distinct depression; posterior gastric pit on either side. Cervical groove clearly distinct between gastric and anterior branchial regions; deep posterior branch of cervical groove between anterior and posterior branchial regions. Cardiac region small, depressed and separated from branchial regions by shallow grooves. Branchial regions slightly convex, separated by median longitudinal groove. Intestinal region well circumscribed and separated from branchial regions by distinct grooves. Median W-shaped incision between anterior branchial regions. Lateral margins carinated, convexly divergent posteriorly, unarmed. Front margin slightly oblique, with small tooth near rostrum; anterolateral angle rounded. Rostrum broadly triangular, horizontal, slightly concave dorsally, lateral borders granulated, with long uniramous setae; ventral side slightly carinated (Figs 3A; 6A).

Pterygostomian flap finely granulose, without setae, deeply excavated directly below midlength of anterior branchial region, anteriorly produced; two longitudinal carina between median depression and posterior border (Fig. 6A).

Sternite between third maxillipeds (sternite 3) large, strongly produced anteriorly, slightly concave, each lateral border with strong tooth at midlength, posterior margins convergent. Sternite 4 (between chelipeds), anteriorly concave, anterior margin as wide as sternite 3. Sternite 6 slightly wider than sternite 5, fifth slightly wider than sternite 4. Sternite 7 slightly narrower than sternite 6. Sternites with scattered uniramous setae, more dense at lateral borders (Figs 4; 6E).

Abdominal somites smooth, spineless, and sparsely setose. Somites 2-6 with two transverse carina at each lateral side, close to anterior and posterior margin; somites 2-5 each with median part delimited by shallow longitudinal groove at each side. Somite 6 with posterior border rounded and produced, with median longitudinal, shallow groove (Figs 3A; 6A). Uropods well developed, smooth, margins of outer and inner rami with numerous plumose setae, a few uniramous setae scattered on dorsal surface; basal segment short, wide and moderately flattened. Telson as wide as long, median transverse suture dividing telson in anterior and posterior portions, notched on each lateral border at level of transverse suture; posterior portion symmetrically bilobed, divided by single longitudinal suture, nearly half as wide as anterior part. Numerous plumose setae along lateral and posterior borders. A few uniramous setae scattered on dorsal surface (Fig. 7A).

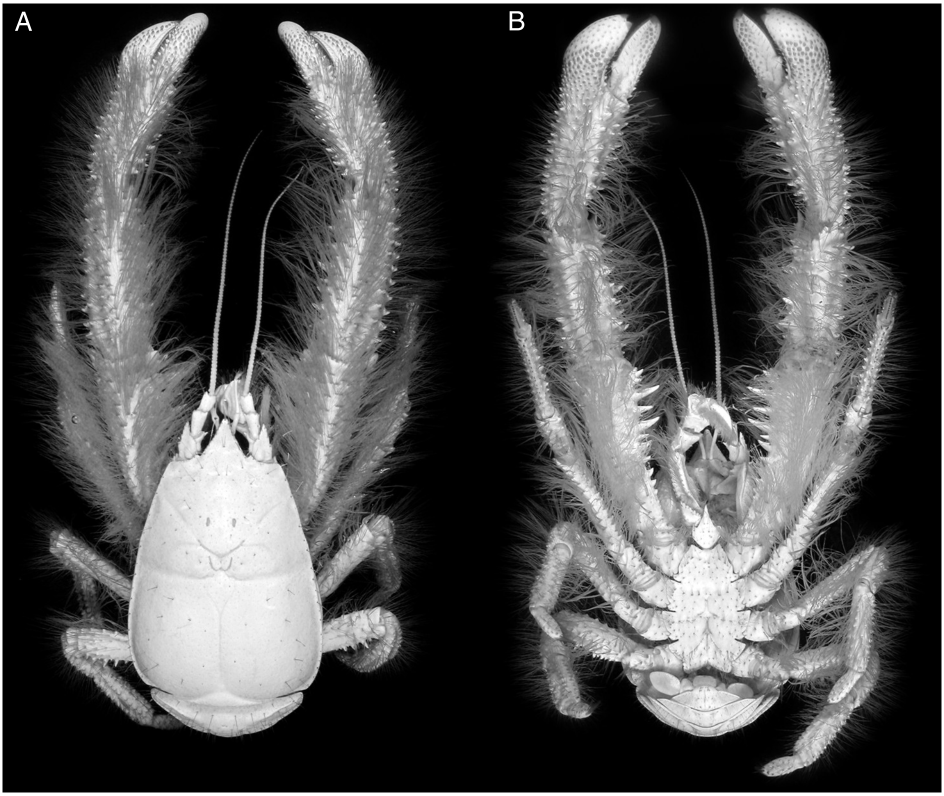

FIG. 3. — *Kiwa hirsuta* n. gen., n. sp. male holotype (MNHN-Ga 5310); **A**, dorsal view; **B**, ventral view.

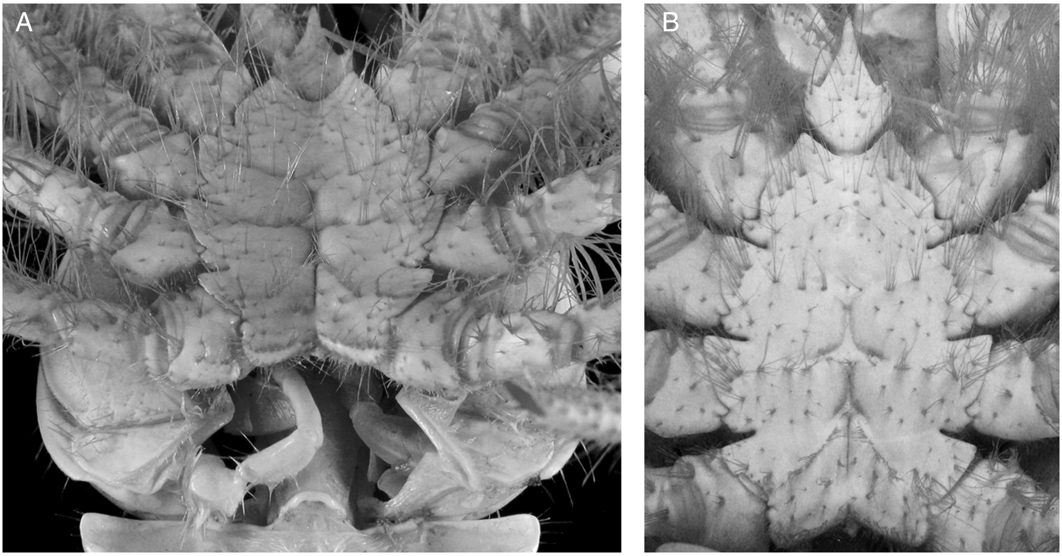

FIG. 4. — *Kiwa hirsuta* n. gen., n. sp. male holotype (MNHN-Ga 5310); **A**, sternal plastron, showing fifth pereopod; **B**, sternal plastron.

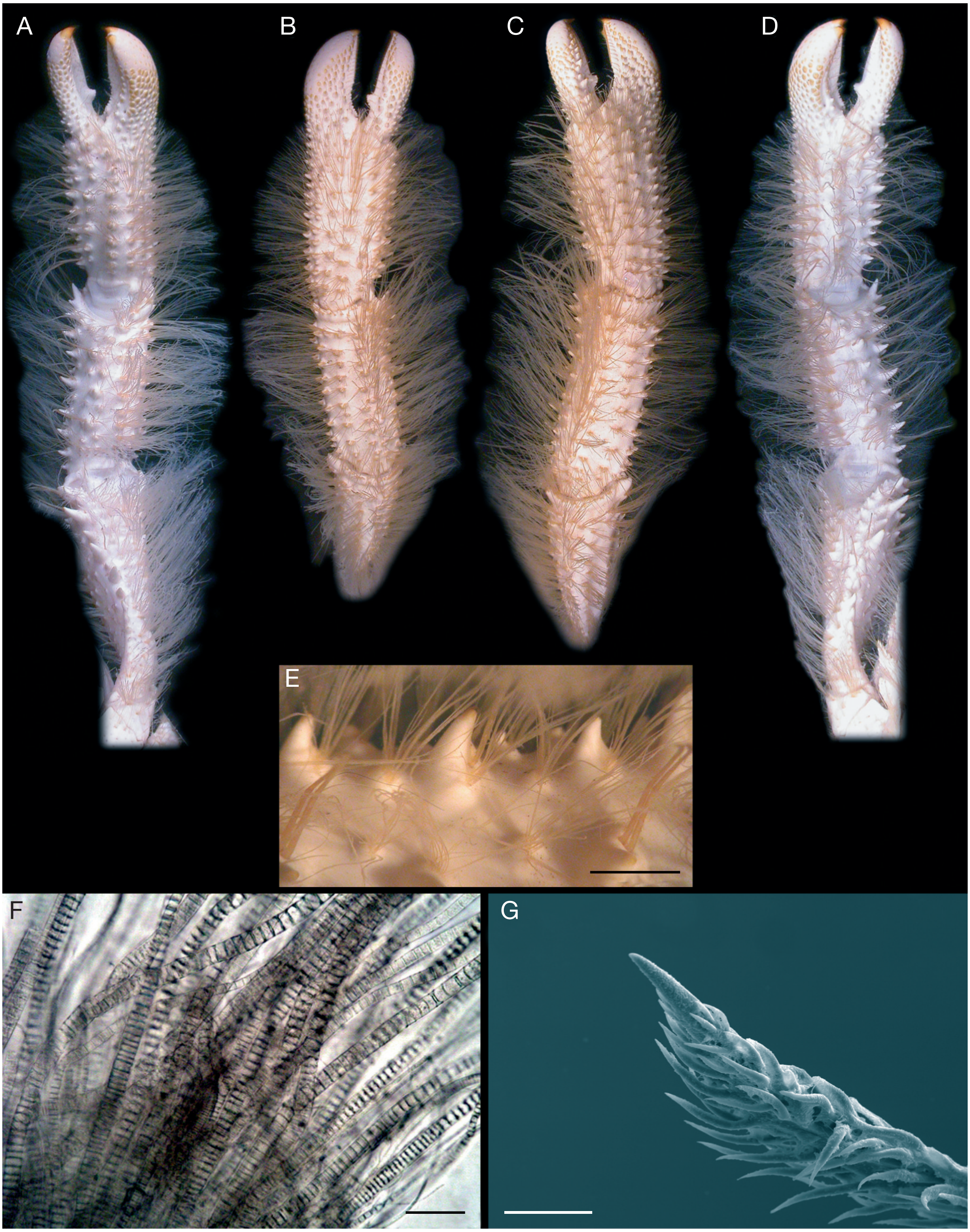

FIG. 5. — *Kiwa hirsuta* n. gen., n. sp. male holotype (MNHN-Ga 5310), chelipeds; **A**, left, mesial view; **B**, left, lateral view; **C**, right, mesial view; **D**, right, lateral view; **E**, spines of the carpus, with flexible setae and two pairs of rigid setae located on the left and on the right; **F**, filamentous bacteria fixed on a flexible seta (microscope picture); **G**, apical part of a rigid seta showing barbula (SEM picture). Scale bars: E, 3 mm; F, 20 µm; G, 100 µm.

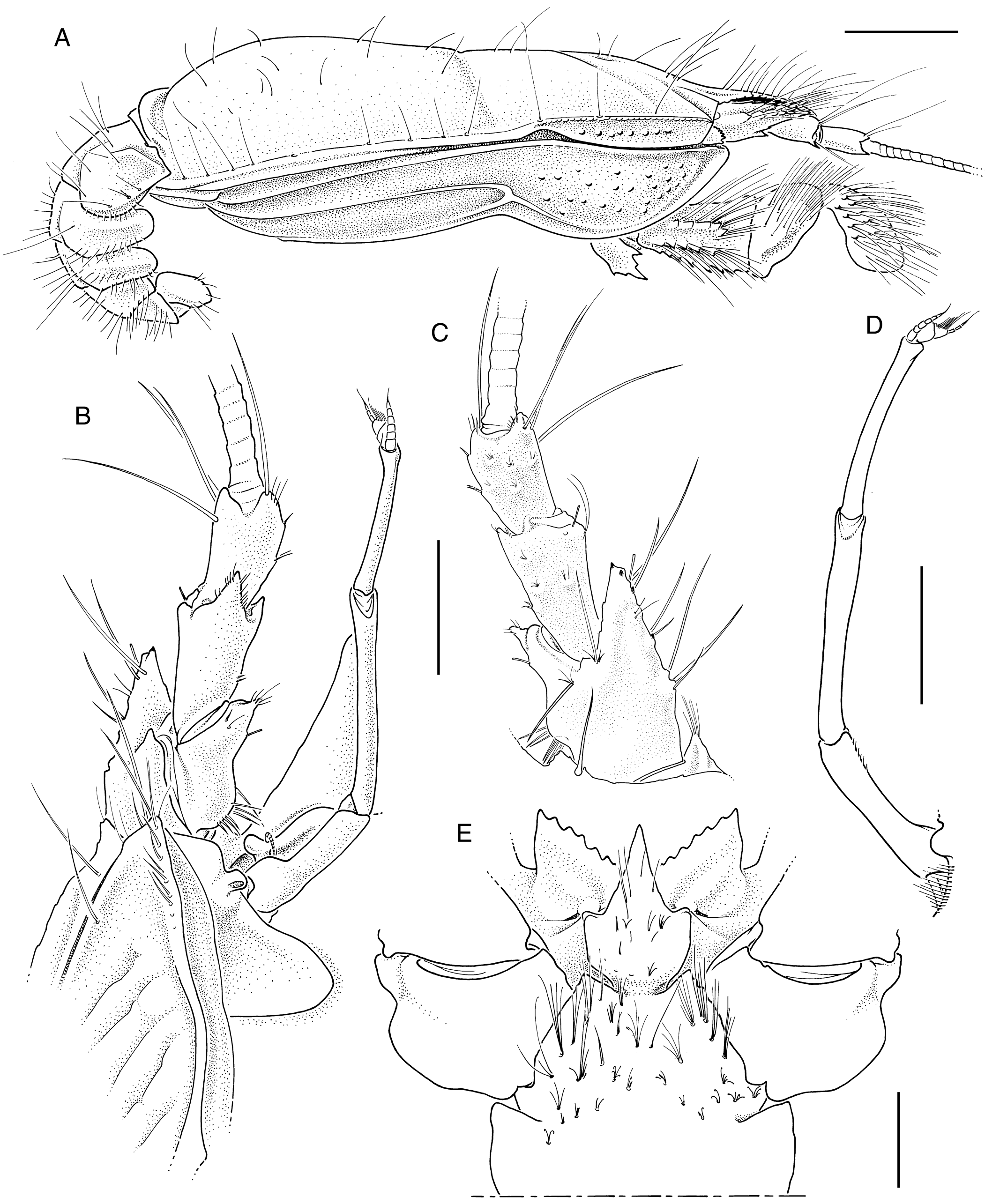

FIG. 6. — *Kiwa hirsuta* n. gen., n. sp. male holotype (MNHN-Ga 5310); **A**, carapace and abdomen, lateral view; **B**, antennule and antenna, right, and anterior part of pterygostomian flap included, ventral view; **C**, right antenna, dorsal view; **D**, right antennula, dorsal view; **E**, sternal plastron, third and fourth sternites. Scale bars: A, 10 mm; B-E, 5 mm.

Eyes strongly reduced, membranous remains, without pigment (Fig. 6B).
Antennule with slender, proximally inflated basal segment, articles 2 and 3 slender, basal segment slightly longer than article 2 and subequal to article 3. Dorsal and ventral flagella short, subequal in length, 0.5 time shorter than article 3; ventral flagellum with six segments, dorsal flagellum with two large basal segments and four small segments in terminal portion (Fig. 6B, D).
Antennal peduncle without scaphocerite. Basal article unarmed; article 2 with strong lateral projection reaching midlength of article 4, dentate on distal portion, with additional distoventral spine; article 3 with distomesial spine; article 4 with two distomesial spines (dorsal and ventral), slighly longer than article 2 (without lateral projection); article 5 slightly shorter than preceding one, with three distal spines. Flagellum as long as carapace without rostrum (Fig. 6B, C).
Mandible with chitinous teeth on incisor process; palp 2-segmented (Fig. 8E). Maxillule with well developed endopod, with numerous setae; distal endite fringed with simple and plumose setae; proximal endite large with numerous simple and plumose setae (Fig. 8G). Maxilla with slender endopod, having several simple setae; distal endite bilobated, proximal lobe larger than distal; proximal endite bilobated, proximal lobe much larger than distal; both endites with numerous simple and plumose setae; scaphognathite large and flattened, margins with numerous single and plumose setae (Fig. 8F). First maxilliped with large bilobated exopod (Fig. 8D). Second maxilliped with exopod slightly longer than endopod; articles of endopod densely covered with simple and plumose setae, dactylus much longer than combined length of propodus and carpus (Fig. 8A). Third maxilliped well developed, with numerous long plumose setae, mostly in ventral and lateral sides of articles; coxae with distal border strongly produced and denticulate, each tooth with corneous margin; basis and ischium fused, triangular, with ventral and lateral margins tuberculate; crista dentata in proximal half of ischium, with 24 small denticles on mesial ridge; merus and carpus triangular, similar in length; propodus 0.5 time length of carpus, with numerous plumose setae in distoventral border; dactylus moderately depressed, with dense plumose setae in distal portion (Fig. 8B, C).
Chelipeds (P1) and walking legs (P2-4) with numerous rows of spines, each spine with yellow corneal tip and tuft of long and dense plumose setae, only absent in cheliped fingers, setae denser and longer in mesial and ventral sides than in lateral and dorsal sides. Chelipeds nearly symmetric, slightly more than twice as long as carapace including rostrum; spines stronger in mesial and ventral sides than in lateral and dorsal sides. Merus and carpus subcylindrical, palm somewhat depressed. Ischium with some short but sharp distomesial spines. Merus 0.7 time carapace length, including rostrum, with additional row of strong spines along mesial margin. Carpus slightly shorter than merus, and 2.5 times longer than broad. Palm somewhat broadened distally, 0.8 length of carpus and 1.7 times as long as greatest width. Fingers somewhat triangular, 0.75 time length of palm, without setae, having numerous spines decreasing in size distally, distal areas of fingers unarmed; slightly gapping, and distally spoon-shaped; movable finger with proximal large denticulate tooth followed by cutting margin bordered with smooth, low, corneous scales, ending in acute corneous point; fixed finger with some proximal small teeth, followed by cutting edge similar to movable finger and ending in acute corneous point, additional row of mesial granules ending in acute corneous point; fingers distally crossing, corneous tip of movable finger crossing between two corneous tips of fixed finger (Fig. 5A-E).
P2-4 slender, slightly compressed laterally, decreasing in size posteriorly. P2 1.2 times carapace length including rostrum, merus half as long as carapace, more than four times longer than wide; carpus half as long as merus, slightly shorter than propodus. Propodi with row of 16 (P2), 11 (P3), 11 (P4) corneous movable spinules along flexor border. Each dactylus 0.6-0.7 time length of propodus, gently curving, flexor margin with 14 corneous movable spinules on P2, 14 on P3, 16 on P4, last spinule very close to corneous tip of terminal claw. Merus of P3 0.8 that of P2

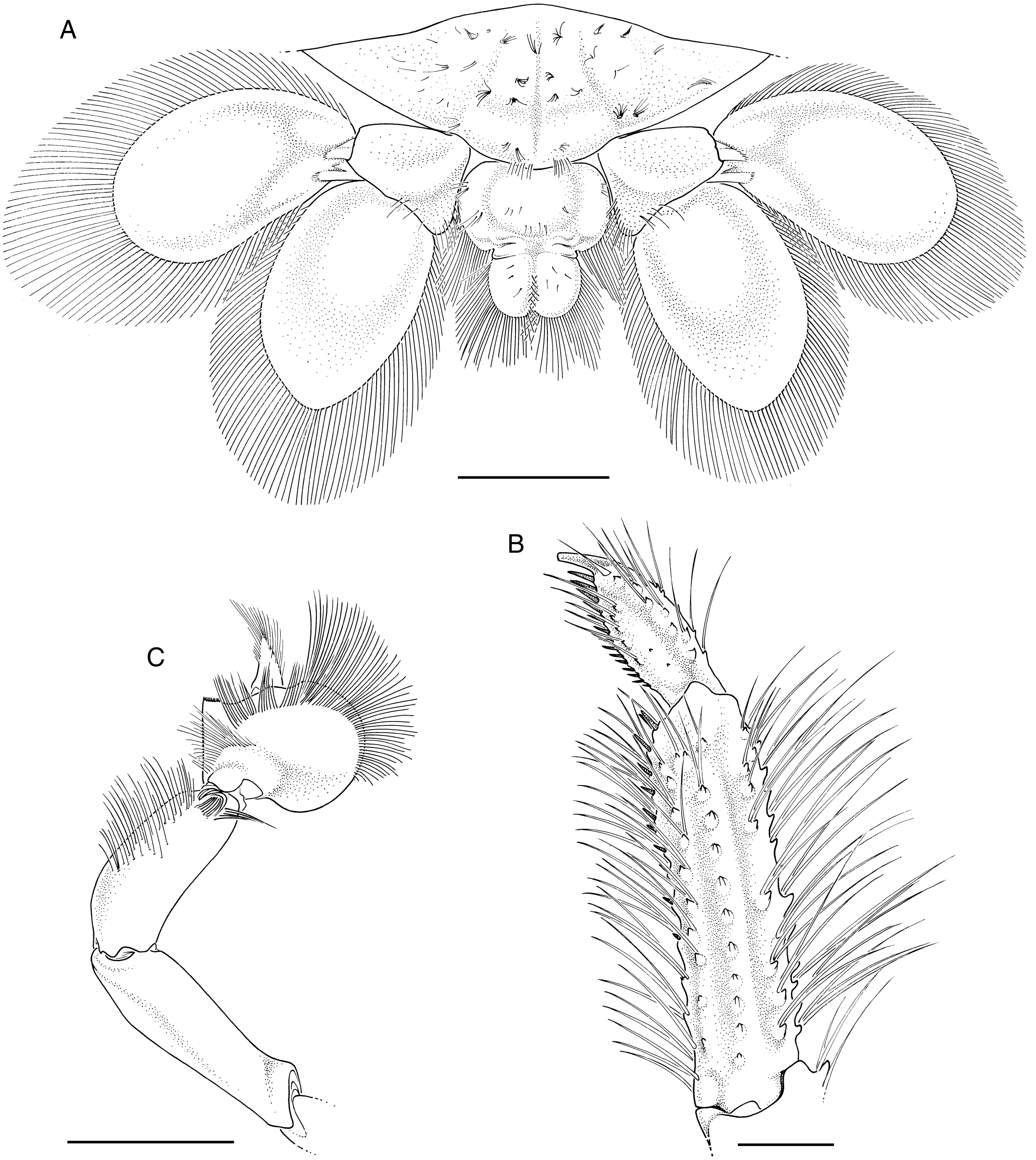

FIG. 7. — *Kiwa hirsuta* n. gen., n. sp. male holotype (MNHN-Ga 5310); **A**, sixth segment of abdomen, telson and uropods, dorsal view; **B**, dactylus and propodus, left P2; **C**, right P5. Scale bars: 5 mm.

and 1.5 that of P4 (Figs 3; 7B). P5 chelated, inserted below sternite 7, base not visible ventrally; hand and fixed finger strongly modified, flattened, as long as broad and clearly broader than carpus; fixed finger short; numerous and dense setae on extensor margins of palm and movable finger (Figs 4A; 7C). Paired pleopods present.

Setae: the pereopods, and in particular the chelipeds, are densely covered with flexible setae (*c.* 15 mm, Fig. 5E) having clusters of filamentous bacteria, mainly at distal part. The Figure 5F shows several morphotypes of probably sulfo-oxydizing bacteria, characterized by the presence of sulphide-like granulations. Other rigid chitinous setae (*c.* 13 mm; Fig. 5E) are barbed in the distal part, ending in a rigid spine (Fig. 5G), and they are regularly inserted in pairs mainly on the merus of the chelipeds. They are deprived of bacteria.

HABITAT AND DISTRIBUTION

The new species occurs at densities of one to two individuals per 10 m^2, more or less regularly spaced on the zone of pillow basalt surrounding active hydrothermal vents (Fig. 2). The species co-occurs with galatheid squat lobsters (genus *Munidopsis* Whiteaves, 1874), crabs (genus *Bythograea* Williams, 1980), vent mussels (genus *Bathymodiolus* Kenk & Wilson, 1985) and buccinid gastropods. Specimens of *Kiwa hirsuta* n. gen., n. sp. were also observed on extinct chimneys and at the base of black smokers, among vent mussels, where shimmering milky water emanates. Like other vent decapod crustaceans *Kiwa hirsuta* n. gen., n. sp. is probably omnivorous. Specimens were observed *in situ* consuming tissues of mussels damaged by submersible sampling activities. The "Yeti" crab was observed on three hydrothermal sites distributed on nearly 1.5 km along the Pacific-Antarctic Ridge segment (Fig. 1): Sebastian's Steamer (37°47.48'S, 110°54.85'W, 2204 m), Pâle Étoile (37°47.36'S, 110°54.85'W, 2215 m) and Annie's Anthill (37°46.49'S, 110°54.72'W, 2228 m), 1.2 km northern. This site is the northern boundary known of the "Yeti" crab.

DISCUSSION

The new genus and species is sufficiently different from all other galatheoid families to justify the establishment of a new family. The 18S rRNA phylogeny confirms the clear difference between anomuran families, placing the new taxa closer to the families Chirostylidae, Galatheidae and Porcellanidae than to Aeglidae (Fig. 9). The new taxon has a superficial resemblance to Chirostylidae in having the antennal peduncle with five articles, the third maxilliped without epipod, the abdomen folded up against itself, the telson with a transverse suture, folded beneath the preceding abdominal somite, and the sternum without a plate on the last thoracic somite (between the last pair of pereopods). The new family also exhibits a few affinities with Aeglidae in having the thoracic sternite between the third maxillipeds with a conical sclerite, but they are clearly distinguished by the presence of weakly calcified lines dividing the carapace into discrete regions in Aeglidae, whereas these lines or sutures are absent in Kiwaidae n. fam. (see Borradaile 1907; Balss 1957; Martin & Abele 1986, 1988; Baba 1990; Poore 2004, for the definition of the families of the superfamily Galatheoidea). The new family may be differentiated from the family Chirostylidae by the following characters:
– insertion of the fifth pereopod not visible and situated beneath the sternal plastron in the new family, whereas the base of this pereopod is clearly visible in Chirostylidae;
– the sternite between the third maxillipeds is large, strongly produced anteriorly in Kiwaidae n. fam., being small and not produced anteriorly in Chirostylidae;
– the eyes are strongly reduced and the antennal scale is absent in Kiwaidae n. fam., whereas the eyes are usually well developed and the antennal scale is usually present in Chirostylidae.

Furthermore, the new family may be also differentiated from the family Chirostylidae by the presence: 1) of grooves on the dorsal carapace surface; 2) of carinae on the posterior half of the pterygostomian flap; 3) of longitudinal suture in the telson; and 4) of coxae and crista dentata of the third maxilliped; additionally, the cephalothorax, is ventrally clothed with numerous setae in the new family, as well as the chelipeds and walking legs.

Unfortunately the carapace and the pterygostomian region of the unique type specimen are strongly calcified, and the study of the branchial arrangement was not possible as it involves dissection. Consequently, the number of arthrobranchs, used to separate the families of Galatheoidea (Borradaile 1907; Balss 1957; Martin & Abele 1986), will have to be considered when additional material is available.

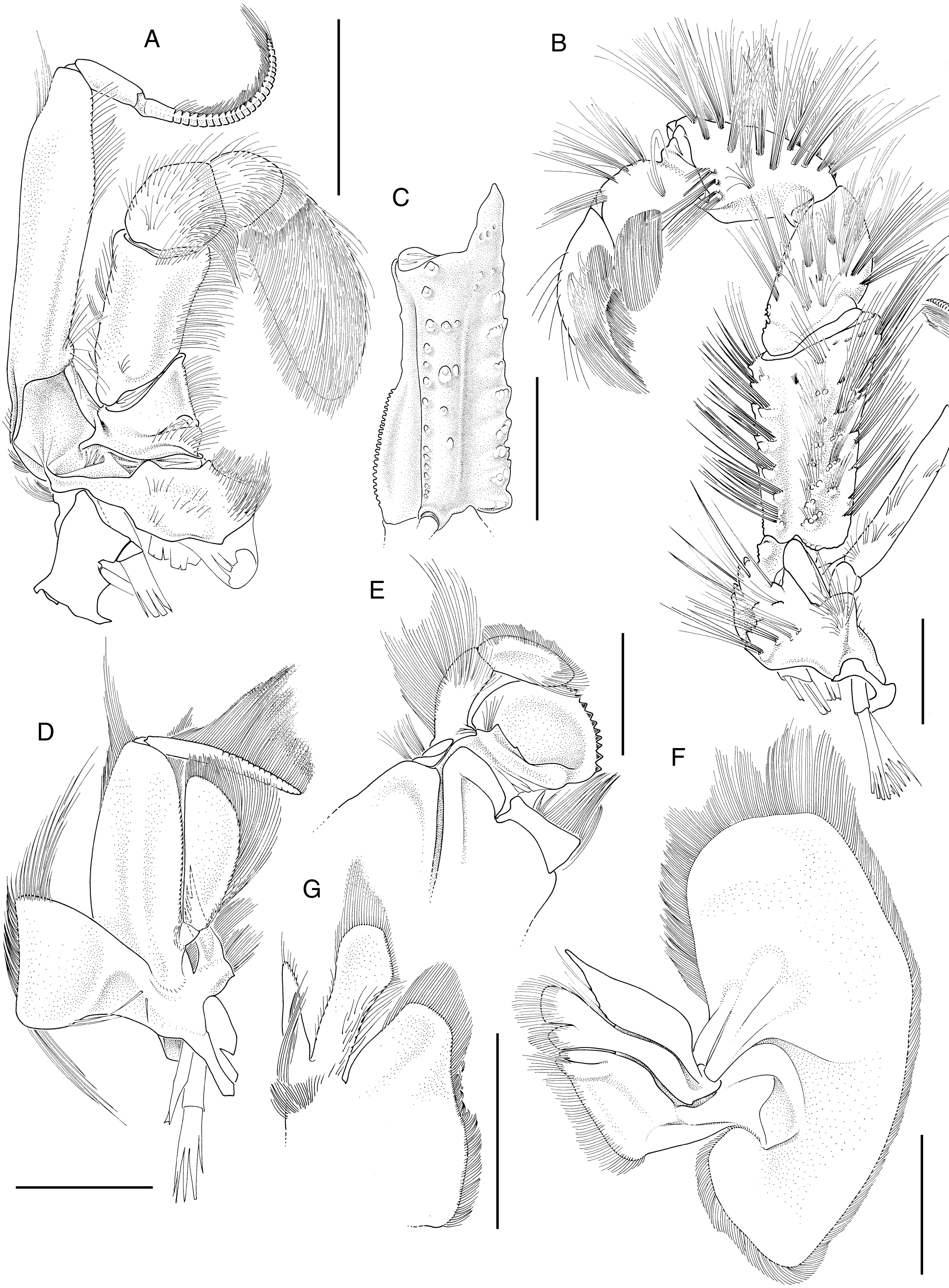

FIG. 8. — *Kiwa hirsuta* n. gen., n. sp. male holotype (MNHN-Ga 5310), left mouthparts; **A**, second maxilliped, ventral view; **B**, third maxilliped, ventral view; **C**, basis-ischium of third maxilliped, mesial view; **D**, first maxilliped, ventral view; **E**, mandible, ventral view; **F**, maxilla, ventral view; **G**, maxillule, ventral view. Scale bars: A-D, F, G, 5 mm; E, 2 mm.

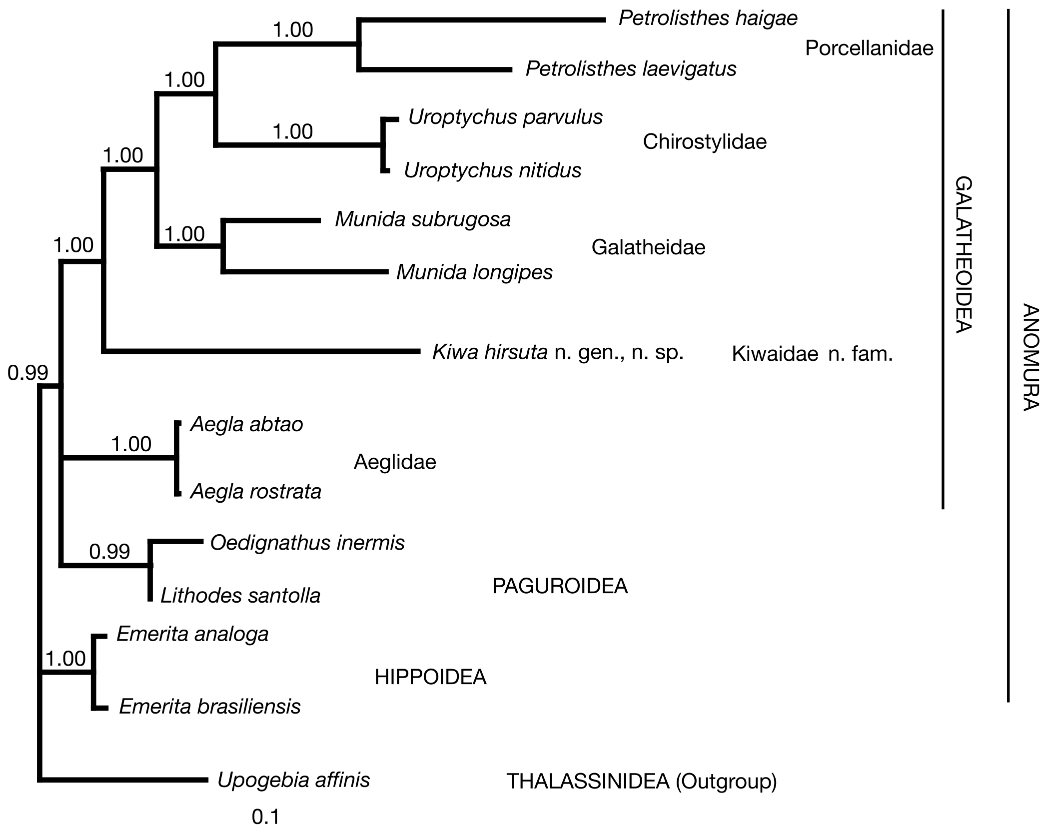

FIG. 9. — Bayesian phylogenetic tree based on 2035 base-pairs of 18S rRNA, rooted using *Upogebia affinis*. Numbers at nodes on the tree represent posterior probabilities (p). All nodes with $p < 0.95$ were collapsed into basal polytomies. Scale bar indicates percent sequence divergence.

KEY TO FAMILIES OF GALATHEOIDEA

The key provided by authors (see above) can be modified to accommodate Kiwaidae n. fam. as follows:

1. Weakly calcified lineage/sutures dividing carapace into discrete regions ...... Aeglidae
— Carapace without lineage/sutures 2

2. Abdomen folded up against thorax; body crab-like; chelipeds moderately elongate, stout or flattened .... Porcellanidae
— Abdomen folded up against itself (not against thorax); body shrimp-like; chelipeds greatly elongate, usually slender 3

3. Sternal plate on last thoracic somite, between last legs, well developed; telson without a transverse suture and not folded beneath the preceding abdominal somites with the tailfan; third maxilliped with epipod .... Galatheidae

— Sternal plate on last thoracic somite, between last legs, absent; telson with a transverse suture (sometimes difficult to see) and folded beneath the preceding abdominal somites with the tailfan; third maxilliped without epipod 4

4. Insertion of fifth pereopod clearly visible ventrally; sternite between third maxillipeds small, not produced anteriorly; eyes well developed; usually with antennal scale .... Chirostylidae

— Insertion of fifth pereopod not visible ventrally and situated beneath sternal plastron; sternite between third maxillipeds large, strongly produced anteriorly; eyes strongly reduced; antennal scale absent .... Kiwaidae n. fam.

The unexpected occurrence of this new family on the Pacific-Antarctic Ridge raises several questions, in particular that of the geological barriers likely to limit the distribution of the hydrothermal species. For the moment we can suggest that the Juan Fernandez Microplate (Fig. 1) constitutes such a limit to the northern distribution of *Kiwa hirsuta* n. gen., n. sp. The presence on the legs of dense bacteriophoran setae colonized by mats of probably sulfo-oxidizing bacteria, makes it possible to regard this species as an obligate associated to the hydrothermal vents. These bacteria could serve as a nutritional resource. It is probably also the case of the pagurid *Paragiopagurus ventilatus* Lemaitre, 2004 from shallow vents of northeastern Taiwan, and the galatheid crab, *Shinkaia crosnieri* Baba & Williams, 1998, from Edison Seamount, 1483 m and Okinawa Trough, 1330 m (back-arc basins of west Pacific).

Only a southern exploration will bring precision on the extent of the distribution area of this species. However, this knowledge will be improbable because the use of the submarines under these high latitudes will be limited by the difficult climatic conditions.

Acknowledgements

The authors thank R. Vrijenhoek, Chief scientist of the PAR 5 Cruise, and the crew of RV *Atlantis*, and DS *Alvin*, for collecting specimen. We thank also J.-F. Dejouannet (IRD/MNHN), for the illustrations, S. Duperron (Ifremer), for the microscope picture, P. Crassous (Ifremer) for the SEM picture, V. Martin (Ifremer) for preparing the Figure 1 (map). We are indebted to A. Crosnier (MNHN), M. Hendrickx (Smithsonian Institution, Washington), and K. Baba (Kumamoto University, Japan) for reviewing the manuscript. The cruise PAR 5 was funded by grants from the US National Science Foundation to R. C. Vrijenhoek (OCE-0241613) and to C. L. Van Dover (OCE-0350554).

REFERENCES

BALSS H. 1957. — Decapoda. VIII. *Systematik. Bronns Klassen und Ordnungen des Tierreichs*, Band 5, Abteilung 1, Buch 7, Lieferung 12: 1505-1672.

BABA K. 1990. — Chirostylid and galatheid crustaceans of Madagascar (Decapoda: Anomura). *Bulletin du Muséum national d'Histoire naturelle*, Paris, sér. 4, sect. A, 11: 921-975 (dated 1989, published 1990).

BABA K. 2005. — Deep-sea Chirostylid and Galatheid crustaceans (Decapoda. Anomura) from the Indo-Pacific, with a list of species. *Galathea Report* 20: 1-317.

BABA K. & WILLIAMS A. B. 1998. — New Galatheoidea (Crustacea, Decapoda, Anomura) from hydrothermal systems in the West Pacific Ocean: Bismarck Archipelago and Okinawa Trough. *Zoosystema* 20 (2): 143-156.

BORRADAILE L. A. 1907. — On the classification of the decapod crustaceans. *Annals and Magazine of Natural History* 19: 457-486.

BRODSKY L. I., IVANOV V. V., KALAIDZIDIS Y. A. L., LEONTOVICH A. M., NIKOLAEV V. K., FERANCHUK S. I. & DRACHEV V. A. 1995. — GeneBee-NET: Internet-based server for analyzing biopolymers structure. *Biochemistry* 60 (8): 923-928.

CHEVALDONNÉ P. & OLU K. 1996. — Occurrence of anomuran crabs (Crustacea: Decapoda) in hydrothermal vent and cold-seep communities: a review.

Proceedings of the Biological Society of Washington 109: 286-298.

DANA J. D. 1852. — Crustacea, *in United States Exploring Expedition, During the Years 1838, 1839, 1840, 1841, 1842, Under the Command of Charles Wilkes, U.S.N.*, 13 (1). C. Sherman, Philadelphia, 685 p.

HALANYCH K. M., LUTZ R. A. & VRIJENHOEK R. C. 1998. — Evolutionary origins and age of vestimentiferan tubeworms. *Cahiers de Biologie marine* 39: 355-358.

HENDERSON J. R. 1888. — Report on the Anomura collected by H.M.S. *Challenger* during the years 1873-76. *Report on the Scientific Results of the Voyage of H.M.S.* Challenger *During the Years 1873-76, Zoology*, 27: i-vi + 1-221, 21 pls.

HEY R., BAKER E., BOHNENSTIEHL D. W., MASSOTH G., KLEINROCK M., MARTINEZ F., NAAR D., PARDEE D., LUPTON J., FEELEY R., GHARIB J., RESING J., RODRIGO C., SANSONE F. & WALKER S. 2004. — Tectonic/volcanic segmentation and controls on hydrothermal venting along the Earth's fastest seafloor spreading system, EPR 27°-32°S. *Geochemistry, Geophysics, Geosystems* 5 (12): 1-32.

HUELSENBECK J. P. & RONQUIST F. 2001. — MrBayes: Bayesian inference of phylogenetic trees. *Bioinformatics* 17 (8): 745-755.

KENK V. C. & WILSON B. R. 1985. — A new mussel (Bivalvia, Mytilidae) from hydrothermal vents in Galapagos Rift zone. *Malacologia* 26: 253-271.

LEMAITRE R. 2004. — Discovery of the first hermit crab (Crustacea: Decapoda: Parapaguridae) associated with hydrothermal vents. *Cahiers de Biologie marine* 45: 325-334.

MACPHERSON E. & SEGONZAC M. in press. — Species of the genus *Munidopsis* (Crustacea, Decapoda, Galatheidae) from the deep Atlantic Ocean, including cold-seep and hydrothermal vent areas. *Zootaxa*.

MARTIN J. W. & ABELE L. G. 1986. — Phylogenetic relationships of the genus *Aegla* (Decapoda: Anomura: Aeglidae), with comments on anomuran phylogeny. *Journal of Crustacean Biology* 6: 576-616.

MARTIN J. W. & ABELE L. G. 1988. — External morphology of the genus *Aegla* (Crustacea: Anomura: Aeglidae). *Smithsonian Contributions to Zoology* 453: 1-46.

MARTIN J. W. & HANEY T. A. in press. — Decapod crustaceans from hydrothermal vents and cold seeps: a review. *Zoological Journal of the Linnean Society*.

ORTMANN A. 1892. — Die Decapoden-Krebse des Strassburger Museums IV. Die Abtheilungen Galatheidea und Paguridea. *Zoologische Jahrbücher, Abteilung für Systematik, Geographie und Biologie der Thiere* 6: 241-326.

POORE G. C. B. 2004. — *Marine Decapod Crustacea of Southern Australia. A Guide to Identification.* CSIRO Publishing, Collingwood, 517 p.

SAINT LAURENT M. DE & MACPHERSON E. 1997. — Une nouvelle espèce du genre *Paralomis* White, 1856, des sources hydrothermales du Sud-Ouest Pacifique (Crustacea, Decapoda, Lithodidae). *Zoosystema* 19 (4): 721-727.

SAMOUELLE G. 1819. — *The Entomologist's Useful Compendium; or an Introduction to the Knowledge of British Insects*. Thomas Boys, London, 496 p.

SMITH S. I. 1882. — Report on the Crustacea. Part I. Decapoda. Reports on the dredging, under the supervision of Alexander Agassiz, on the east coast of the United States, during the summer of 1880, by the U.S. Coast Survey Steamer *Blake*, commander J. R. Barlett U.S.N., commanding. *Bulletin of the Museum of Comparative Zoology, Harvard College* 10: 1-108.

THOMPSON J. D., HIGGINS D. G. & GIBSON T. J. 1994. — CLUSTAL W: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position specific gap penalties and weight matrix choice. *Nucleic Acids Research* 22: 4673-4680.

WHITEAVES J. F. 1874. — On recent deep-sea dredging operations in the Gulf of St Lawrence. *The American Journal of Science* ser. 3, 7: 210-219.

WILLIAMS A. B. 1980. — A new crab family from the vicinity of submarine thermal vents on the Galapagos Rift (Crustacea: Decapoda: Brachyura). *Proceedings of the Biological Society of Washington* 93: 443-472.

WOLFF T. 2005. — Composition and endemism of the deep-sea hydrothermal vent fauna. *Cahiers de Biologie marine* 46: 97-104.

Submitted on 3 October 2005;
accepted on 25 October 2005.