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이학 석사 학위논문

First Records of Three Crabs
(Crustacea, Decapoda)
from Jejudo Island, Korea

2008년 2월

신라대학교 대학원

생명과학과

이 규 현

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지도교수 고 현 숙

이 논문을 이학 석사 학위논문으로 제출함

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이규현의 이학 석사
학위논문을 인준함

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제주도의 한국 미기록 계 (갑각강, 십각목) 3종

이 규 현

신라대학교 대학원

생 명 과 학 과

제주도에서 채집된 계류 3종(*Macromedaeus orientalis*, *Eriphia smithii*, *Ocypode cordimana*)을 한국 미기록종으로 보고한다. *M. orientalis*는 스쿠버 다이빙을 통해 20m 깊이와 하조대에서 채집되었다. 반면, *E. smithii*와 *O. cordimana*는 각각 *E. smithii*는 조하대 암반지대의 틈에서 채집되었고 *O. cordimana*는 상조간대의 모래해변의 굴에서 채집되었다. 현재 *E. smithii*는 *Eriphia*속의 유일한 종으로 보고되는 종이다. 이번에 보고되는 3종을 포함해 한국산 계류는 총 203종이 된다.

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INTRODUCTION

The List of Animals in Korea (Kim and Kim, 1997) [1] contained 188 species of crabs. Recently, 12 species of crabs have been reported, and they are one leucosiid, two majoid, two portunid, six xanthoid, and one grapsoid crabs (Ko and Takeda, 1999, 2000 [2, 3]; Yang and Ko, 2000 [4]; Ko, 2002a [5]; Lee and Ko, 2007 [6]; Lee and Kim, 2007 [7]). Thus, 200 species of crabs have been so far recorded from Korea. Among them, the xanthoid and ocypodoid crabs included 31 and 18 species, respectively.

Field work in various localities of Jejudo Island has revealed the presence of two xanthoid and one ocypodoid crabs, *Macromedaeus orientalis* (Takeda et Miyake, 1969) [8], *Eriphia smithi* MacLeay, 1838 [9], and *Ocypode cordimana* Latreille, 1818 [10], which have not been recorded in Korea. Therefore, these species are here redescribed.

Drawings were made with the aid of camera lucida. The abbreviation “cl” refers to carapace length from the front to the posterior dorsal margin of the carapace. In xanthoid crabs, the classification and the abbreviated terminology used for carapace regions generally follow those of Serène (1984) [11]. All the specimens are deposited in Silla University, Busan.

SYSTEMATICS

Superfamily Xanthoidea MacLeay, 1838

Family Xanthidae MacLeay, 1838

Subfamily Xanthinae MacLeay, 1838

Genus *Macromedaeus* Ward, 1942

¹**Macromedaeus orientalis* (Takeda et Miyake, 1969) [8]

작은꽃부채게(신칭) (Figs. 1, 4)

Microcassiope orientalis Takeda et Miyake, 1969, p. 201, figs. 2, 3. [8]

Macromedaeus orientalis: Yamaguchi et al., 1976, p. 37, fig. 2 [12]; Takeda, 1977, p. 84. [13]

Not *Macromedaeus orientalis*: Ko, 2002b [zoea = *M. distinguendus* (De Haan, 1835)] [14]

Material examined. 1 ♂ (cl 9.2 mm), Mosulpo (Jejudo Is.), 9 June, 2006 (H. S. Ko), by scuba diving in 20 m depth; 1 ♂ (cl 9.1 mm), Udo (Jejudo Is.), 14 June 2007 (H. S. Ko), at low tidal mark.

Description. Carapace (Fig. 1A) transversely ovoid; c. 1.5 times broader than long; slightly convex anteriorly and from side to side. Regions well defined, elevated, separated by strong furrows, with irregular transverse or oblique rows of strong bead-like granules; 1F and 2F clearly separated; 2M divided longitudinally over anterior one-thirds, inner lobe with long brush-like setae on anterior furrow, outer lobe broader; 1L to 5L not clearly separated; 5L with brush-like setae on anterior furrow; 6L distinct; 3M and 4M confused, posterolateral margins each with long brush-like setae; 1P and 2P not distinct, each posterior margin with granular rim; posterolateral margin oblique, more or less straight. Front c. 0.24 times carapace width; moderately projecting, double-rimmed, with median V-shaped notch, border with row of strong granules; pre-orbital granular projection. Anterolateral margins

regularly convex; with four teeth behind exorbital angle; teeth subequal, triangular, bluntly pointed; the second and third teeth larger; the greatest carapace width across the third pair.

Third maxilliped (Fig. 1B). Ischium subrectangular, length c. 1.5 times breadth; bearing setae on inner margin, distal surface minutely granulate. Surface of merus and carpus covered with strong granules.

Chelipeds (Fig. 1A, E). Noticeably unequal, robust; minor cheliped of similar form but more slender. Merus short and broad, outer surface granulate. Carpus with strong granulated tooth at inner angle; upper and outer surfaces granular, armed with several granulated tubercles. Outer surface of palm coarsely granular, with several granulated tubercles; towards inner surface granules gradually smaller and smaller; black color of fixed finger extending over at middle of inner border on palm. Fingers black colored, bluntly pointed, recurved; cutting margins of both fingers with molariform teeth of different size.

Ambulatory legs (Fig. 1A, F-I). Medium length; compressed; relatively stout; the fourth pair the shortest. All segments more or less granular, with long brush-like setae marginally except inner margin of carpus. Carpus with more or less granulated ridge on outer margin; row of granules forming crest on outer surface. Dactylus slender, straight, and flattened; covering with thick short setae; terminating in acute chitinous spine; subterminal spine on inner margin, the fourth one the largest.

Male abdomen (Fig. 1C). Relatively narrow; segments three to five fused; Segment three the widest. Segment six c. 1.3 times wider than long; telson length c. 0.6 times width, rounded. Surface smooth.

Gonopods (Fig. 1D). G1 relatively long, slender, curved, tip bluntly pointed; large, stout setae on inner margin reducing to small conical setae over distal third; small conical setae on outer margin subdistally.

Color. Dorsal carapace, chelipeds, and ambulatory legs reddish brown.

Habitat. Inhabits under stones from low tidal mark to 40 m in depth (Takeda, 1977). [13]

Remarks. There are now two species included in the genus *Macromedaeus* from Korea: *Macromedaeus orientalis* and *M. distinguendus*. *M. orientalis* is quite similar to *M. distinguendus*. The former species can be easily distinguished from the latter one according to Table 1.

Distribution. Japan (type locality, Fukuoka prefecture) and now Korea.

Table 1. Morphological differences between *Macromedaeus orientalis* and *M. distinguendus*

	<i>M. orientalis</i>	<i>M. distinguendus</i>
Bathymetric range	to 40 m	intertidal region
Carapace length (cl)	less than 10 mm	more than 10 mm
Front of carapace	moderately projecting, double-rimmed, with median V-shaped notch(Fig. 4A)	slightly projecting, straight, divided into two lobes by small notch(Fig. 4C)
Color of fixed finger of cheliped in male	extending ventrally more than 1/2 length of palm(Fig. 4B)	extending ventrally less than 1/2 length of palm(Fig. 4C, D)
Outer margin of carpus of ambulatory leg	not lobulate (Fig. 4A, B)	lobulate (Fig. 4C, D)
Subterminal spine of ambulatory leg	present	absent

Family Menippidae Ortmann, 1893

Subfamily Eriphiinae Alcock, 1898

Genus *Eriphia* Latreille, 1817

²**Eriphia smithi* MacLeay, 1838 [9] 성산부채게 (신칭)(Figs. 2, 5)

Eriphia smithii MacLeay, 1838, p. 60; Takeda, 1982, p. 184, fig. 544. [15]

Eriphia sebana smithii: Stimpson, 1907, p. 72 [16]; Guinot, 1964, p. 89 [17];

Sakai, 1935, p. 71. [18]

Eriphia smithi: Sakai, 1976, p. 478, pl. 172, fig. 3 [19]; Miyake, 1983, p. 131, pl. 44, fig. 3 [20]; Serène, 1984, p. 311, pl. XLVII, figs. 236, 237 [11]; Dai and Yang, 1991, p. 357, pl. 47; fig. 174. [21]

Material examined. 1 ♂ (cl 32.4 mm), 1 ♀ (cl 28.2 mm), Seongsanpo (Jejudo Is.), 21 August, 2006 (H. S. Ko).

Description. Carapace (Fig. 2A) transversely ovoid, c. 1.38 times broader than long; granular over half of surface anteriorly; with minute setae; convex anteriorly. slightly convex from side to side across postero-branchial regions. Regions not distinct; 1F, 2F, 1M and 2M fused, lateral margins of 2M distinct, 3M and 4M not distinct; lateral hepatic and branchial regions indistinct, 1L, 3L, 4L and 5L not clearly separated; 2L more or less separated, posterolateral margins of 2L markedly convergent; anterior margin of 1P with H-shaped depression. Front c. 0.45 times carapace width; border denticulate, with median V-shaped notch extending more or less backwards; with pre-orbital spinal projection. Anterolateral margin with 5-6 spines behind exorbital angle, gradually decreasing in size backwards.

Third maxilliped (Fig. 2B). Surface covered with small setae; ischium subrectangular, length c. 1.5 times breadth, bearing setae on inner margin.

Chelipeds (Fig. 2F). Noticeably unequal, left largest and stoutest. Merus short and broad, covered with setae on outer surface. Carpus and palm bearing strong granules and setae dorsally. Fingers black and tan colored,

bluntly pointed, recurved.

Ambulatory legs (Fig. 2A. G–J). Medium length; compressed, relatively stout, covered with short setae; first three pairs subequal, last pair the shortest.

Male abdomen (Fig. 2C). Relatively narrow, 7 segmented; segments 1 and 3 the widest; segment 6 the longest, posterolateral margins slightly convex; telson broadly rounded.

Gonopods (Fig. 2D, E). G1 median length, stout, outer margin with slightly produced, broad, tapering distally, tip bluntly pointed; small conical spines on subdistal inner margin. G2 long, slender, evenly curved; tip short, recurved, sharply pointed.

Color. Dorsal carapace, chelipeds, and ambulatory legs dark purple. Eyes red.

Habitat. Inhabits in crevices of the rocky beach; low tidal mark.

Remarks. Serène (1984) [11] reported that three species assigned the genus *Eriphia* existed in the Indian Ocean: *E. scabricula* Dana, 1982 [22], *E. sebana* (Shaw et Nodder, 1803) [23], and *E. smithi*. Among them, *E. smithi* is immediately distinguished from other two species by the dorsally granulated cheliped (Takeda, 1982) [15]. The present species coincides well with Serène and Takeda's ones. Its presence in Korean waters extends its range northward into the Pacific.

Distribution. Japan, Hawaii, Red Sea, South Africa (Sakai, 1976) [19], China (Dai and Yang, 1991) [21] and now Korea.

Superfamily Ocypodoidea Rafinesque, 1815

Family Ocypodidae Rafinesque, 1815

Subfamily Ocypodinae Rafinesque, 1815

Genus *Ocypode* Weber, 1795

³****Ocypode cordimana*** Latreille, 1818 [10] 하모달랑게 (신칭)(Figs. 3, 6)

Ocypode cordimana Latreille, 1818, p. 198; Miyake, 1983, p. 161, pl. 54, fig. 1 [20]; Wada, 1995, p. 413, pl. 117, fig. 2. [24]

Ocypode cordimana Desmarest, 1825, p. 121, pl. 58, fig. 230 [25]; Sakai, 1976, p. 599, pl. 206, fig. 4 [19]; Takeda, 1982, p. 206, fig. 611 [15]; Dai and Yang, 1991, p. 455, fig. 230, pl. 58. [21]

Ocypode cordimanus Latreille: Sakai, 2004, p. 1195. [26]

Material examined. 2♀ (cl 19.2, 20.1 mm), Mosulpo (Jejudo Is.), 15 June, 2007 (H. S. Ko).

Description. Carapace (Fig. 3A) quadrangular; c. 1.2 times broader than long; half of surface covered with small granules anteriorly; slightly convex anteriorly; with straight lateral margin. Regions ill defined; border between gastric and cardiac regions with H-shaped depression. Front narrow; orbits broad, occupying whole anterior margin of carapace. Eyestalks long, not extended beyond cornea, without horn; outerorbital tooth acute, directed inwards.

Third maxilliped (Fig. 3B). Merus c. 1.5 times longer than wide; exopod slender, concealed; palp articulating near distolateral angle of merus.

Chelipeds (Fig. 3A, D) unequal; carpus and palm granular; palm of large cheliped without stridulation organ on inner surface; fingers pointed.

Ambulatory legs (Fig. 3A, F-I) relatively slender, more or less fringed on anterior and posterior margins; carpus of each leg with row of tubercles on outer surface; fifth pair the shortest.

Female abdomen (Fig. 3C) 5 segmented; telson triangular.

Color. Dorsal carapace and ambulatory legs pale brownish grey. Cheliped bright ivory.

Habitat. Inhabits in deep burrows of the sand beach; supratidal mark.

Remarks. In Hamo sand beach of Mosulpo, two species of the *Ocypode* were collected: *O. cordimana* and *O. stimpsoni* Ortmann, 1897 [27]. They agreed well with Sakai (1976)'s key [19]: *O. cordimana* was without the stridulating organ on the inner surface of the palm of the large cheliped and with the outer orbital tooth directed inwards, whereas *O. stimpsoni* was with the stridulating organ and with the outer orbital tooth directed forwards. In sand beach, the authors found these two species living in somewhat different habitats. The former species occupied supratidal region near to grassy area. In contrast, the latter species occupied further down the habitat of the former species.

Distribution. Japan, Red Sea, South Africa, Tahiti (Sakai, 1976) [19], China, India (Dai and Yang, 1991) [21], Papua New Guinea (Sakai, 2004) [26], Australia (Poore, 2004) [28] and now Korea.

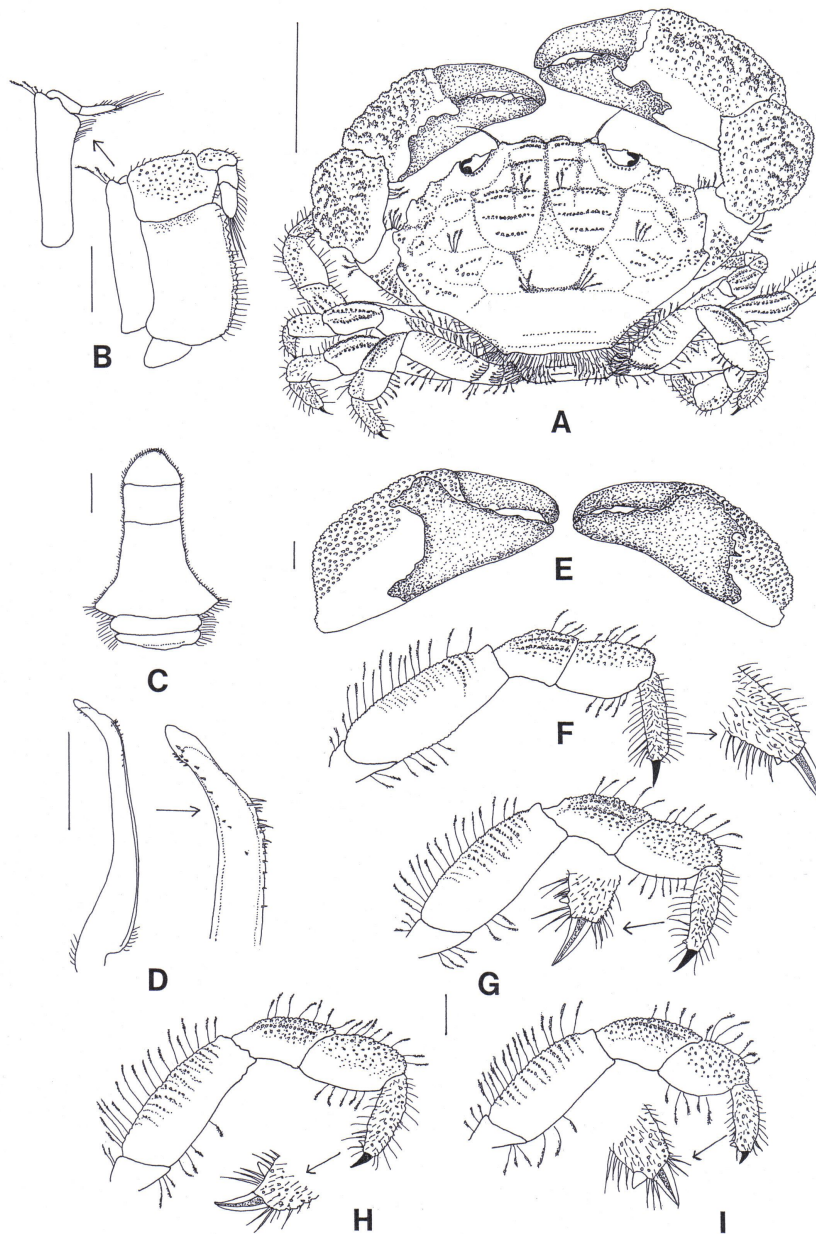


Fig. 1. *Macromedaeus orientalis*, male. A. dorsal view; B. third maxilliped; C, abdomen; D. first gonopod and enlargement of tip; E. chelipeds, frontal view; F-I. first to fourth ambulatory legs, enlargement of tip. Scale bars = 5 mm (A), 1 mm (B-I).

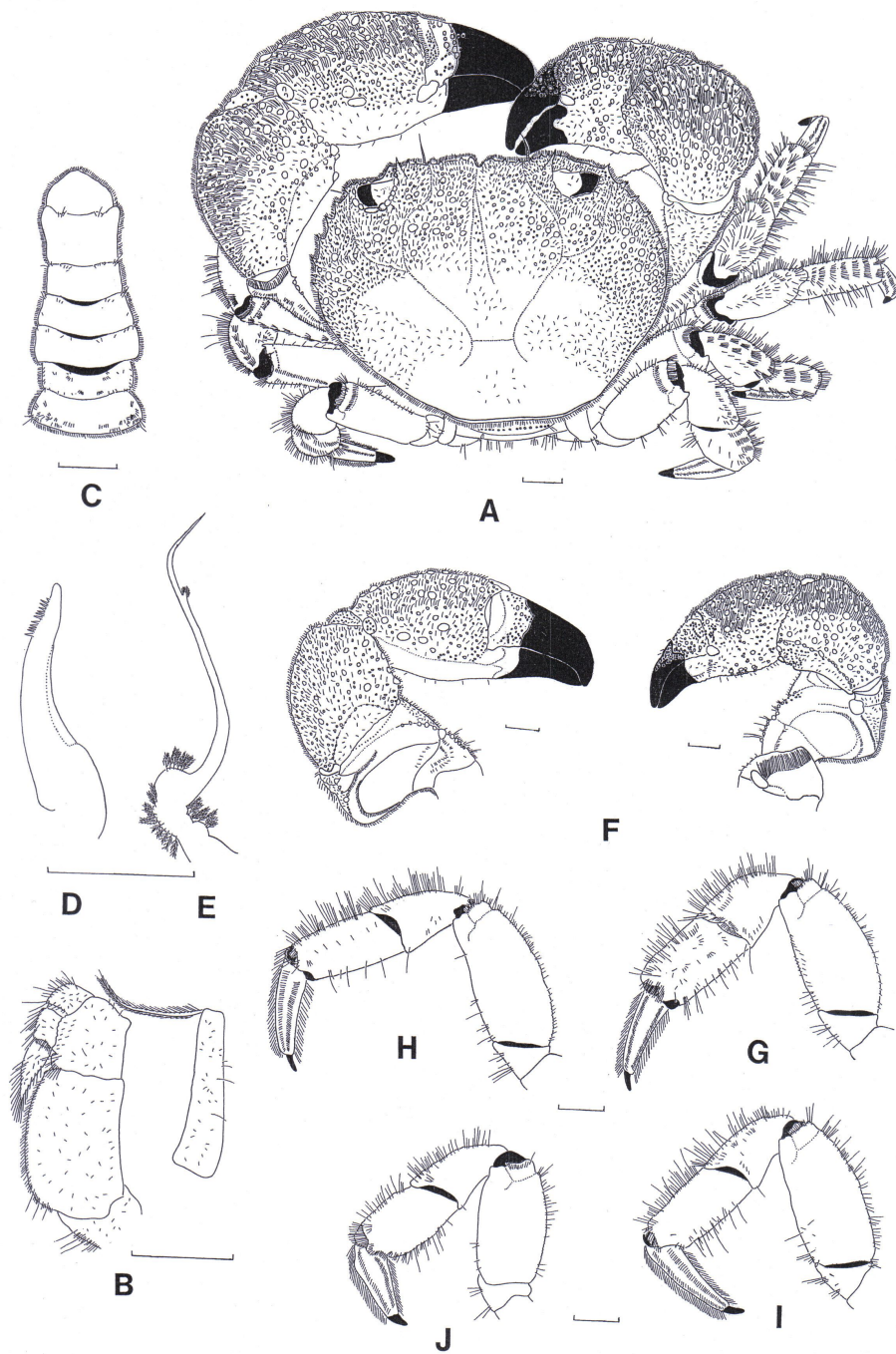


Fig. 2. *Eriphia smithi*, male. A. dorsal view; B. third maxilliped; C. abdomen; D. first gonopod; E. second gonopod; F. chelipeds, dorsal view; G-J. first to fourth ambulatory legs. Scale bars = 5 mm (A-J).

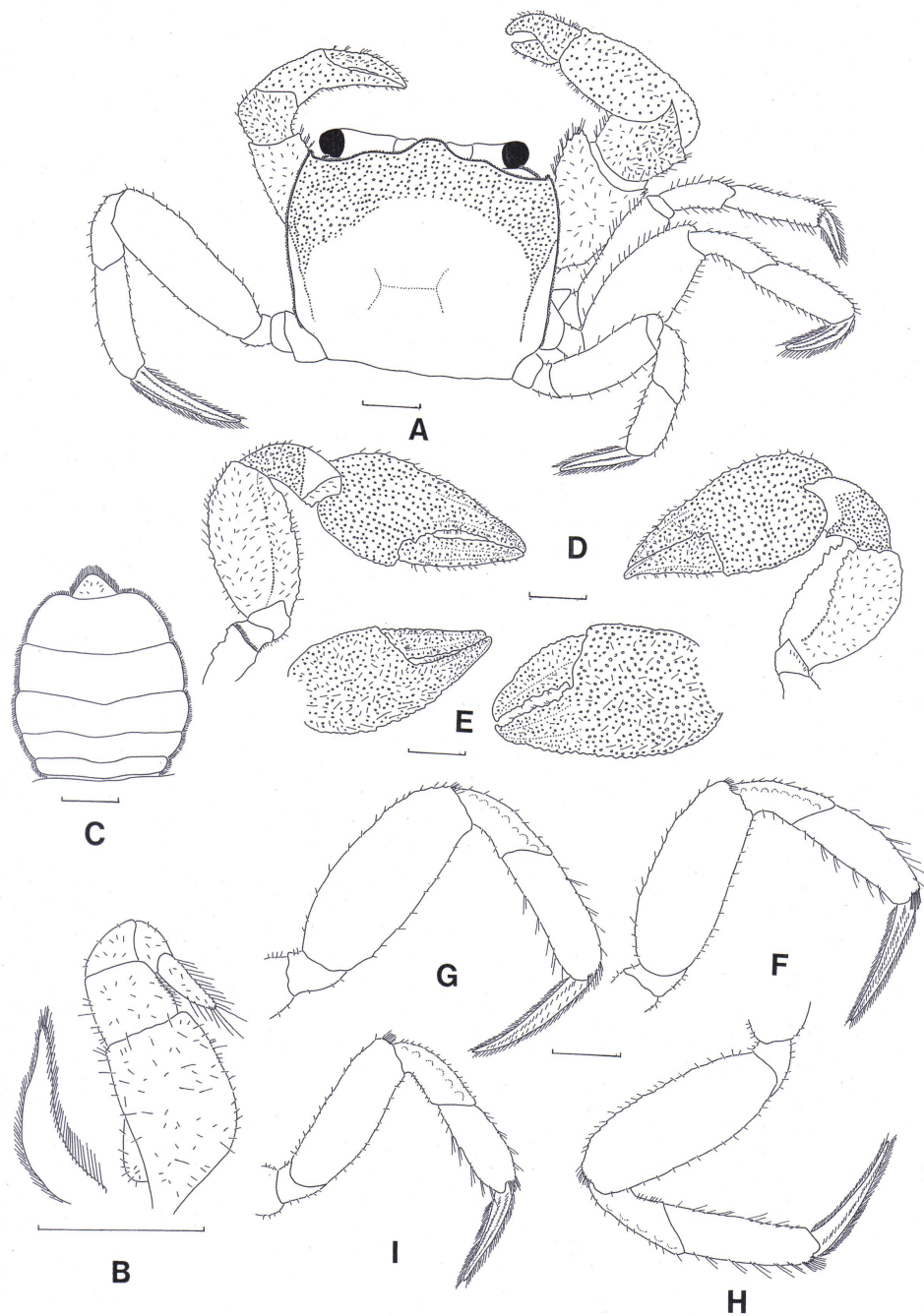


Fig. 3. *Ocypode cordimana*, female. A. dorsal view; B. third maxilliped; C. abdomen; D. chelipeds, dorsal view; E. chelipeds, ventral view; F-I. first to fourth ambulatory legs. Scale bars = 5 mm (A-I).

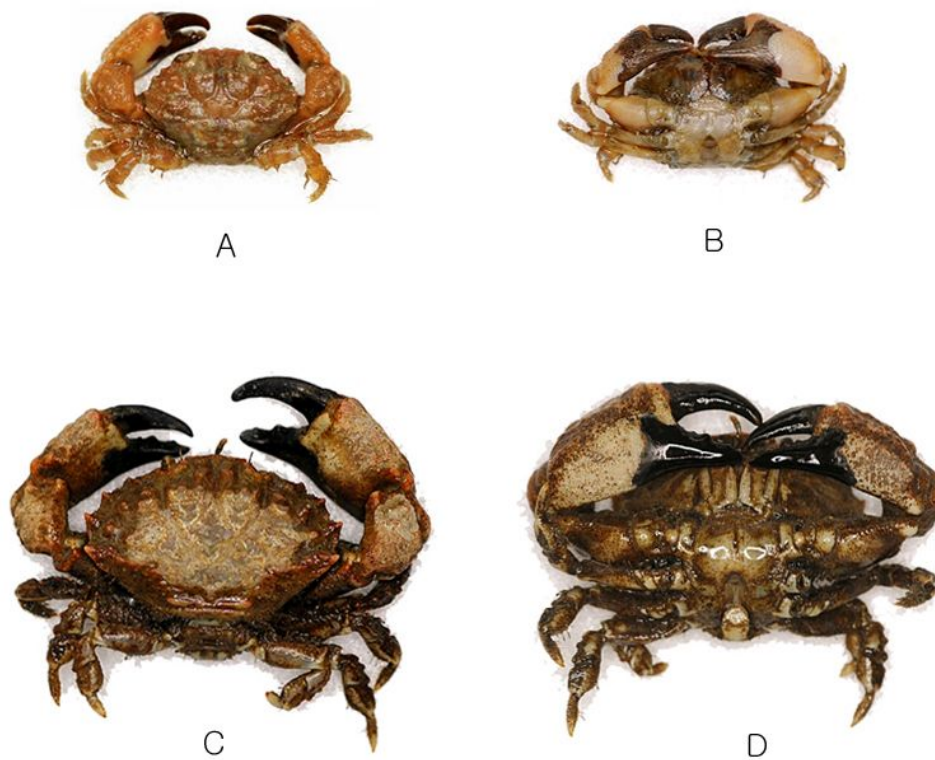


Fig. 4. A. B. *Macromedaeus orientalis*, male, dorsal and ventral views; C. D. *Macromedaeus distinguendus* (cl 17.1 mm, from Gadeokdo Island, Busan), male, dorsal and ventral views.



Fig. 5. *Eriphia smithi*, female.



Fig. 6. *Ocypode cordimana*, female.

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ABSTRACT

First Records of Three Crabs (Crustacea, Decapoda) from Jejudo Island, Korea

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Three species of crabs, *Macromedaeus orientalis*, *Eriphia smithi*, and *Ocypode cordimana*, from Jejudo Island are recorded for the first time in Korea. *M. orientalis* was collected under the rocks by SCUBA diving in 20 m and at low tidal mark. However, *E. smithi* and *O. cordimana* were collected in crevices of the rock at low tidal mark and in a burrow of sand beach at supra tidal mark, respectively. At present, *E. smithi* is the only species of the genus represented in Korean waters. Including the new records in this study, the established brachyuran crab fauna in Korea now stands at 203 species.

Key words: Crabs, *Macromedaeus orientalis*, *Eriphia smithi*, *Ocypode cordimana*, Korea

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대학원에 들어와 지낸 2년간의 시간을 정리하며 한편의 논문을 완성하기 까지 많은 격려와 지도를 아끼지 않으셨던 고현숙 교수님께 머리 숙여 깊은 존경과 감사를 드립니다. 또한 대학 생활과 대학원 생활을 함에 있어 항상 웃음과 격려를 아끼지 않으시고, 저 자신의 나태함을 바로 잡아 주신 고진복 교수님, 박종범 교수님, 김창호 교수님, 최인순 교수님, 박인석 교수님, 홍상식 교수님, 박선미 교수님, 김동균 교수님, 김은희 교수님께 감사드립니다. 야외채집과 실습을 통해 수많은 생물의 다양성과 생명의 존엄성을 일깨워 주신 이충언 교수님과 창원대학교의 이지훈 교수님께도 감사드립니다.

항상 옆에서 친누나처럼 많은 것을 돌봐주시고 논문의 완성에 힘이 되어 주신 옥세진 선생님과 다이빙을 지도해주신 권준철 강사님께도 감사의 마음을 전합니다. 동물학 실험실에 들어와서 만난 많은 실험실부원들 영탁씨, 현수, 혜진, 호영, 지숙, 현정, 희정, 준태와 친구 재한이와 WISE 부산 Center의 최별님 선생님에게 고마움을 전합니다. 대학원 생활에 많은 격려를 아끼지 않았던 친구들 중 태환, 효준, 창환, 태현, 주백, 은영이, 준엽이형, 대학원 선배 준호형에게 또한 고마움을 전합니다. 부산대학교에서 대학원 공부 중에도 항상 친동생 챙기듯 걱정과 조언을 아끼지 않으셨던 정현기 선배님께 감사의 마음 전합니다. 학부행정업무로 바쁜 와중에 틈틈이 신경써준 행정조교 장희영 선생님과 공동기기실의 진지영 선생님에게도 고마움을 전합니다. 좀 더 많이 노력하고 학업에 매진하는 모습으로 그들의 격려와 사랑에 보답하고자 합니다.

지금 이 자리에 올수 있었던 것은 지식의 길로 인도해주신 주님과 아들을 믿고 큰 사랑과 보살핌, 걱정으로 모든 것을 희생해 오신 부모님과 동생 호석이가 저의 곁에 있었기 때문입니다. 부모님과 동생에게 사랑과 감사의 마음을 전합니다.

실험조교로서 제대로 이끌어 주지 못한 여러 학부생들에게 사죄의 말을 전합니다. 학부생들과 공감하고 도와줘야하는 입장에 있던 조교로서 지도한 부분 보다 배운 부분이 더 많았던 뜻 깊은 시간이었습니다. 부족한 점 많은 저와 2년이라는 긴 시간 동안 대학원이라는 울타리 안에서 같이 공부하며 웃고, 힘들어하

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