



ERIOCHEIR HEPUENSIS DAI, 1991 (BRACHYURA, GRAPSOIDEA,
VARUNIDAE, VARUNINAE): REPORTING THE SOUTHERLY
DISTRIBUTION TO NORTHERN VIETNAM

BY

PAUL F. CLARK^{1,6}), VÃN TRÍ NGÔ²), NGAN KEE NG^{3,†}), LYDIA XINJIE GAN⁴),
SEYIT ALI KAMANLI⁵) and PETER K. L. NG⁴)

¹) Department of Life Sciences, The Natural History Museum, Cromwell Road, London SW7 5BD,
U.K.

²) National Key Laboratory, Institute of Tropical Biology, Vietnamese Academy of Sciences and
Technology, 9/621 Hanoi Highway, Thu Duc City, Ho Chi Minh City, Vietnam

³) Department of Biological Sciences, Faculty of Science, National University of Singapore, 10
Kent Ridge Crescent, Singapore 119260, Republic of Singapore

⁴) Lee Kong Chian Natural History Museum, Faculty of Science, National University of Singapore,
2 Conservatory Drive, Singapore 117377, Republic of Singapore

⁵) Department of Biology, Burdur Mehmet Akif Ersoy University, Burdur 15030, Türkiye
ORCID iDs: Clark: 0000-0001-6862-3982; Ngô: 0000-0002-0333-3092;

Ng: 0000-0003-1022-1600; Gan: 0000-0002-5845-6882; Kamanli: 0000-0002-9118-4591;
Ng: 0000-0001-5946-0608

ABSTRACT

Eriocheir hepuensis Dai, 1991, the Hepu mitten crab, is here formally reported from Thanh Hoa and Quang Ninh Provinces, northern Vietnam. Previous reports of “*E. sinensis*” and “*E. japonicus*” from “Cua lông”, Thai Binh Province, northern Vietnam, require clarification, are probably misidentifications of *E. hepuensis*, and highlight the problems of species identification within *Eriocheir*. The taxonomy of *E. hepuensis* is also discussed.

Key words. — Hepu mitten crab, northern Indo-China, southern China, male first gonopod morphology, taxonomy

RÉSUMÉ

Eriocheir hepuensis Dai, 1991, le crabe à mitaines de Hepu, est ici formellement identifié des provinces de Thanh Hoa et de Quang Ninh, Nord du Vietnam. Les mentions précédentes de

⁶) Corresponding author; e-mail: p.clark@nhm.ac.uk

[†]) Deceased.

“*E. sinensis*” et de “*E. japonicus*” de “Cua lông”, Thai Binh Province, Vietnam du Nord, demandent des clarifications, sont probablement des identifications erronées de *E. hepuensis*, et mettent en évidence les problèmes d’identification des espèces dans le genre *Eriocheir*. La taxonomie de *E. hepuensis* est aussi discutée.

Mots clés. — Crabe à mitaines de Hepu, Indo-Chine septentrionale, sud de la Chine, morphologie du premier gonopode mâle, taxonomie, taxonomy

INTRODUCTION

“Hairy” (colloquially Southeast and East Asia) or “mitten” (vernacular Europe) crabs are non-scientific names for species assigned to *Eriocheir* De Haan, 1835 (Brachyura: Grapsoidea: Varunidae). The genus comprises four species: *E. japonica* (De Haan, 1835), *E. sinensis* H. Milne Edwards, 1853, *E. hepuensis* Dai, 1991, and *E. ogasawaraensis* Komai, Yamasaki, Kobayashi, Yamamoto & Watanabe, 2006 (cf. Ng et al., 2008). These species are indigenous to China, the Korean Peninsula, Taiwan, Japan and north to Vladivostok, Russia. Taxonomic confusion at the genus and species levels, misidentifications and indifferent science have resulted in many incorrect records of mitten/hairy crab distribution.

This is particularly true regarding reports of *Eriocheir* species from around the Gulf of Tonkin along the border of southern China and northern Vietnam; with *E. hepuensis*, *E. japonica* and *E. sinensis* all reported from that area (NK Ng et al., 1998; Đỗ & Hoàng, 2004; Xu et al., 2009; Đỗ et al., 2021), and some arguing that the genus is present there only because of anthropogenic introductions (Hymanson et al., 1999).

Recently, mitten crabs collected by villagers from the Ba Che River in Quang Ninh Province, northern Vietnam, where the species is fished, were compared with older specimens identified as *E. hepuensis* from Chu River, Thanh Hoa Province, northern Vietnam as well as a paratype male of the species from Guangxi, southern China (fig. 1). The first male gonopods of these specimens were visualized using a confocal scanning microscope (fig. 2). The Vietnamese specimens are here confirmed to be *E. hepuensis* Dai, 1991, the Hepu mitten crab.

The purpose of this study is to report the current southernly limit of *E. hepuensis* from Chu River, Thanh Hoa Province, northern Vietnam, and confirm that the crabs are native to the area. This will hopefully encourage more studies and reports of the Hepu mitten as well as ascertain if this species occurs further south of Thanh Hoa Province.

MATERIAL AND METHODS

The left first male gonopod (G1) was dissected from the Vietnam specimen and an *Eriocheir hepuensis* paratype. The distal setae of both G1s were denuded

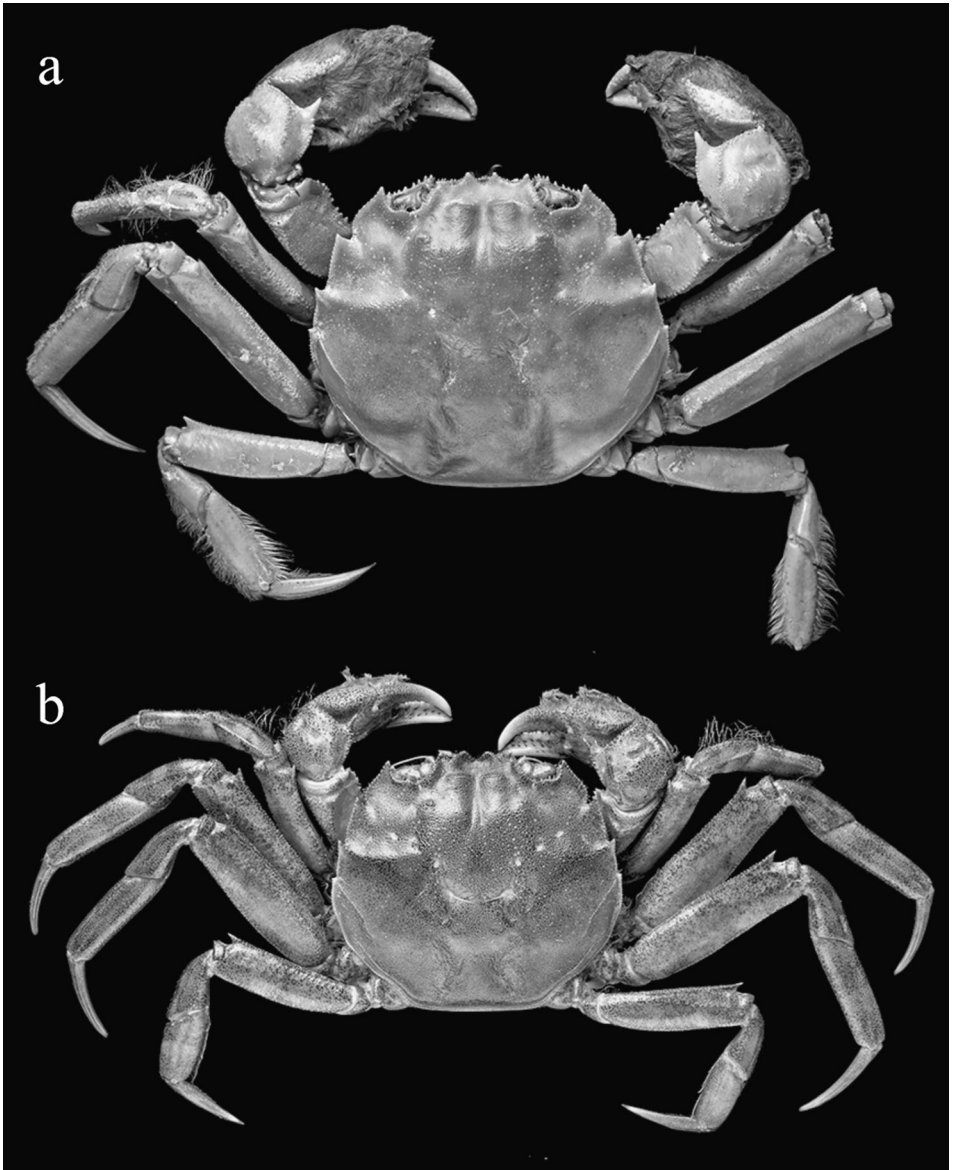


Fig. 1. *Eriocheir hepuensis* Dai, 1991. Overall dorsal habitus. A, Paratype male (64.4 × 60.5 mm), Guangxi, southern China, ZRC 2012.1090; B, male (46.5 × 41.9 mm), Ba Che River, Ba Che District, Quang Ninh Province, northern Vietnam, ZRC 2022.0053. Images taken by Kevin Webb (NHM photographic unit).

to expose the morphology, cleaned using a fine paint brush, placed in separate Petri dishes filled with deionised water and stained with Congo red (Fisher Scientific, Loughborough, U.K.) overnight at room temperature (ca. 20°C) following

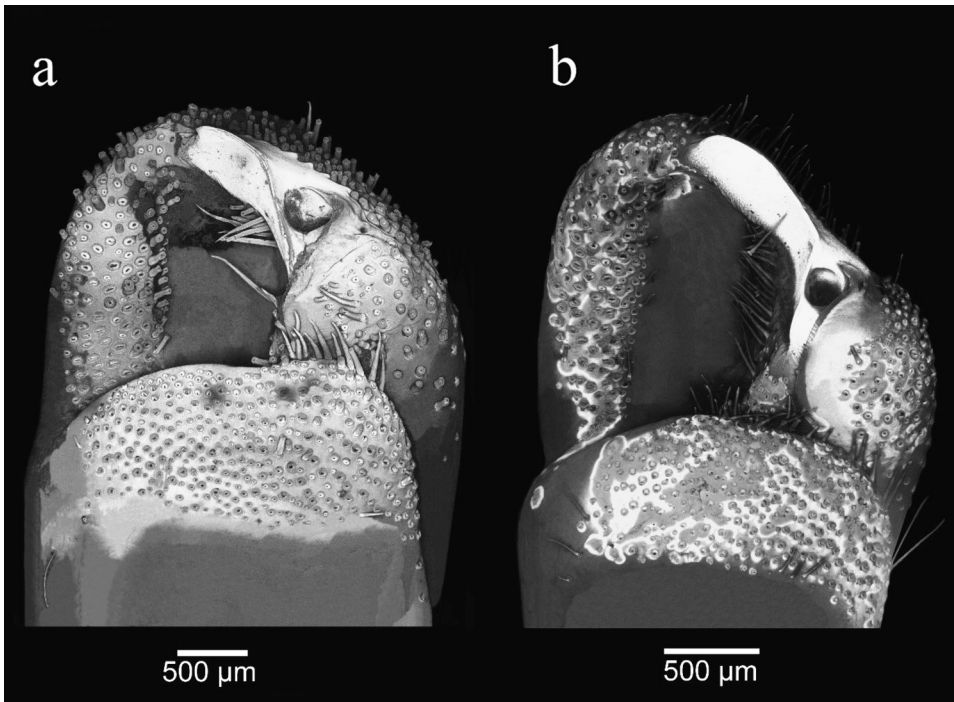


Fig. 2. Confocal laser scanning microscopy images of denuded G1 distal tip of *Eriocheir hepuensis* Dai, 1991. A, Paratype male (64.4 × 60.5 mm), Guangxi, southern China, ZRC 2012.1090; B, male (46.5 × 41.9 mm), Ba Che River, Ba Che District, Quang Ninh Province, northern Vietnam, ZRC 2022.0053. Images taken by Kevin Webb (NHM photographic unit).

the method described by Kamanli et al. (2017). Stained specimens were rinsed in deionised water for about 15 minutes to prevent stain releasing during Confocal Laser Scanning Microscopy imaging. Each G1 was then placed into the embedding platform filled with 100% glycerine to scan using confocal microscopy as described by Palero et al. (2022).

The gonopods were then scanned using a Zeiss LSM 800 inverted laser scanning confocal microscope. A 10× dry objective (EC Plan-Neofluar 10×/0.30 M27) with a numerical aperture of 0.30 was used to scan the specimens together with the “large images” option of the confocal software (Kamanli et al., 2017; Palero et al., 2022). Four lasers, at wavelengths of 401, 488, 543 and 592 nm, were used to produce the stitching orthogonal maximum intensity projections. Twenty-five tiles were required to scan the distal end of the paratype sample, whereas 12 tiles were adequate for the Vietnamese specimen. The Zeiss imaging software, ZEN lite, was used to obtain the stitched images and Adobe Photoshop was applied to remove unwanted particles, to provide a black background and to convert RGB (Red-Green-Blue) images into monochrome illustrations.

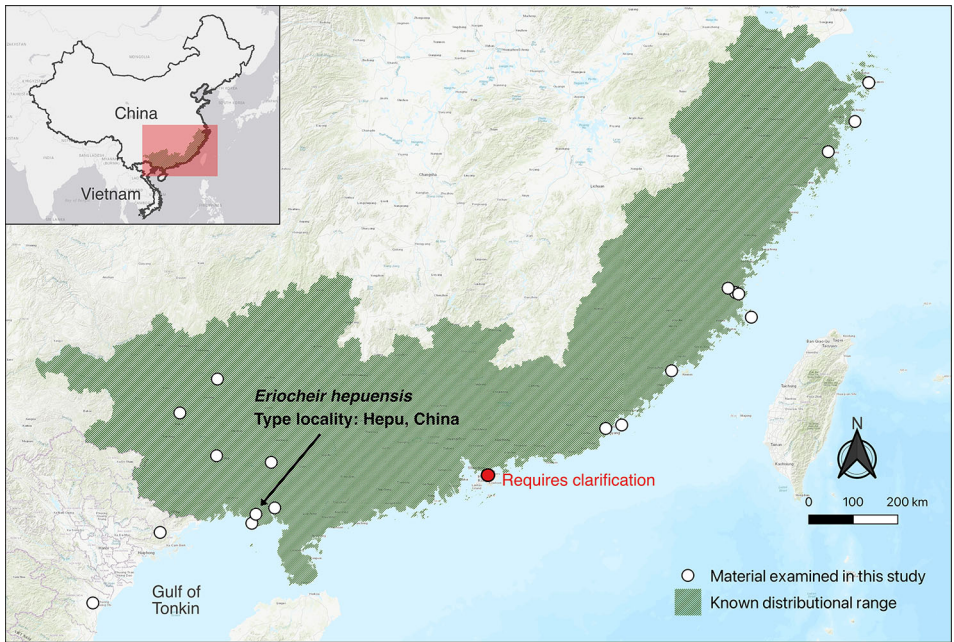


Fig. 3. *Eriocheir hepuensis* Dai, 1991. Native distribution.

The map (fig. 3) was constructed based on new material on hand as well as the specimens examined of *E. hepuensis* in Guo et al. (1997). Unfortunately, many of the specimens collected in the Fujian district and areas north of Hong Kong are based on juveniles or females only, and they will need to be re-examined in the future, if possible, to confirm their identities (see discussion later). In addition, none of these records provide habitat data, so it is uncertain if they were just reports from local markets.

Abbreviations used: carapace measurements taken in millimetres; coll., collected; NHM, Natural History Museum, London; ovig., ovigerous; reg, registration number; ZRC, Lee Kong Chian Natural History Museum, National University of Singapore.

TAXONOMY

Superfamily GRAPSOIDEA MacLeay, 1838
 Family VARUNIDAE H. Milne Edwards, 1853
 Subfamily VARUNINAE H. Milne Edwards, 1853

***Eriocheir hepuensis* Dai, 1991 (figs. 1-3)**

Eriocheir japonicus hepuensis Dai, 1991: 63, figs. 1-11; Dai, 1993: 17.

- Eriocheir hepuensis* — Guo et al., 1997: 460, figs. 4, 6b, e, 7b, 8, 9, tabs. 1, 2; NK Ng et al., 1998: 493; 1999: 154; Chu et al., 2003: 738; Sun et al., 2003: 592; Tang et al., 2003: 309; 2004: 255; Chan et al., 2005: 457; Apel & Bishop, 2006; PKL Ng et al., 2008: 228 (list); Naser et al., 2012: 75, figs. 4, 5b, 6b, 7b, 8, 9, 10; Hayer et al., 2019: 3, figs. 1, 2; Naderloo, 2014: 1-3, figs. 1-4; 2017: 7, 358, 363, figs. 32.1, 32.6.
- Eriocheir sinensis* — Chan et al., 1995: 301 (part.), fig. 3D; Hymanson et al., 1999: 26; Đỗ & Hoàng, 2004, tab. 1; Clark et al., 2006: 51, figs. 2-3; Hashim, 2010: 32-33, fig. 2; Naser et al., 2011: 120; Đỗ et al., 2021: 109.
- Eriocheir japonica* — Đỗ & Hoàng, 2004, tab. 1 (not *Grapsus (Eriocheir) japonicus* De Haan, 1835).
- Eriocheir rectus* — Xu et al., 2009: 54 (part) (not *Eriocheir rectus* Stimpson, 1858).
- Paraeriocheir hepuensis* — Sakai, 2013: 1105, 1106, 1124, figs. 1D, 4A, B, tab. 1.

Material examined.— Type material: Paratype 1 ♂ (64.4 × 60.5 mm), Hepu, Guangxi, southern China, coll. 18 November 1989; ZRC 2012.1090. Non-type material: 2 ♂♂ (38.5 × 35.6 mm, 35.9 × 31.5 mm), 2 ♀♀ (58.5 × 54.4 mm, 39.9 × 35.6 mm) (ZRC 2008.467), Chu River, Thanh Hoa Province, northern Vietnam, collected local fishermen, November 2006; 1 ♂ (46.5 × 41.9 mm), 1 ♀ (43.9 × 39.8 mm) (ZRC 2022.0053), Ba Che River, Ba Che District, Quang Ninh Province, northern Vietnam, coll. local villagers through V. T. Ngo, 7 March 2022; 1 ♀ (47.8 × 45.9 mm) (NHM reg. 2006.98), Shatt-Al, Basrah Canal, 30°15'41.25"N 47°48'56.91"E, coll. Ibtsam Abdul-Sahib, 20 June 2005, det. originally as *E. sinensis* by P. Clark; 2 ♂♂ (66.6 × 62.6-70.6 × 66.4 mm), 1 ♀ ovig. (68.6 × 65.9 mm), NHM reg. 2011.8035-8037, Shatt Al-Basrah canal near the dam at 30°24'33.75"N 47°46'32.32"E, coll. M. Naser, 30 November 2010.

Distribution.— Native from around the Gulf of Tonkin. Northern Vietnam: Ba Che River, Ba Che District, Quang Ninh Province and Chu River, Thanh Hoa Province. China: Hepu, Gongguan, Changluo, Beihai, Nanning, Tongxing, Changle, Gongguan, Guangxi Province; Gongguan, Guangxi Province; Fuzhou City, Chongwen, Mawei, Fuzhou, Xiamen, Fujian Province; Tongtou, Tongtoudao, Putuo, Haimen, Zhejiang Province; Lianhuashan, Guangzhou Province. Records north of Hong Kong require clarification (fig. 3).

Invasive. Northern Persian Gulf; Iran, Iraq, Kuwait (Apel & Bishop, 2006; Naser et al., 2012, fig. 3; Naderloo, 2017, fig. 32.6).

Remarks.— Results of the confocal laser scanning microscopy images (fig. 2) of denuded G1 distal tip of male *E. hepuensis* paratype from Guangxi, southern China, and the mitten crab from Quang Ninh and Thanh Hoa Provinces in northern Vietnam, present a comparable morphology. This, together with the other morphological characters diagnosed by Guo et al. (1997), confirms the identification of these Vietnamese specimens as the Hepu mitten crab, *E. hepuensis*. The present images of the G1 (fig. 2) compare extremely favourably with those *E. hepuensis* illustrations by Naser et al. (2012, fig. 9) and Palero et al. (2022, fig. 5b).

As for *Eriocheir* taxonomy, Sakai (2013) argued that on the basis of the G1 structure, a new genus, *Paraeriocheir*, should be recognized for *E. sinensis* and *E. hepuensis*. He ignored, however, compelling genetic data (see Naser et al., 2012, for review) indicating that the constituent species in *Eriocheir* and *Paraeriocheir* belong in one clade. The available morphological and DNA

evidence (see discussion in Guo et al., 1997; Naser et al., 2012) is that *Eriocheir* De Haan, 1835 and *Paraeriocheir* Sakai, 2013 are subjective synonyms. Consequently, this classification is followed here.

The distribution of *E. hepuensis* requires discussion. According to the review by Hymanson et al. (1999), *E. sinensis* is endemic to the east coast of China and coastal areas of Korea with a native range extending from Hong Kong (approximately 22°N) to the southern border with North Korea (approximately 40°N latitude). These authors also state that this species has been introduced into Vietnam, extending its range southwards in Asia. This most southerly incursion into Vietnam also appears to be supported by the report of Đỗ & Hoàng (2004, tab. 1) and Đỗ et al. (2021: 109) of *E. sinensis* from Tien Hai mangroves in Thai Binh province, northern Vietnam. Xu et al. (2009, fig. 1) further compounds the East Asian mitten crab distribution by implying that species “EJC (*E. japonicus* China?)” was reported from Hepu, China in the south, northwards to the Sumjin River to Tongan to Oujiang River, Shanghai. Accordingly, “EJC”, however, overlaps with *E. sinensis* from Tongan in the south to Oujiang River. The distribution map of East Asia showing sampling localities and dispersal of the four *Eriocheir* lineages (Xu et al., 2009, fig. 1) is redrawn by Hayer et al. (2019) but with “EJC” replaced by *E. hepuensis*. Naser et al. (2012, fig. 1) produced a distribution map and the material identified by them as *E. hepuensis*, is a much closer representation of the Hepu mitten crab distribution around the Gulf of Tonkin with records of this species north of Hong Kong requiring possible discussion. Wong et al. (2021) reported *E. japonica* and *E. hepuensis* from Hong Kong, and their figures of the two species (Wong et al., 2021, text-figs. 11, 100, pl. 19A, B) agree well with what is now regarded as this species (cf. Guo et al., 1997). Wong et al. (2021: 65), however, also discussed the apparent discrepancy between the genetic data (see, for example, Li et al., 1993; Chu et al., 2003; Sun et al., 2003; Tang et al., 2003; Xu et al., 2009; Naser et al., 2012; Ji et al., 2014; Hayer et al., 2019), but note that the external morphology easily separates them and that *E. japonica* is not uncommon in Hong Kong but *E. hepuensis* is rare (see also Wong et al., in press). In addition, the reports of *E. sinensis* and *E. japonicus* from northern Vietnam by Đỗ & Hoàng (2004, table 1) and Đỗ et al. (2021: 109) are unclear as no figures were provided, the specimens were from markets, and no discussion was provided. Consequently, the validity of *E. sinensis* and *E. japonicus* from northern Vietnam is questionable and highlights the problems of misidentification within *Eriocheir*. Although NK Ng et al. (1998) mentioned that *E. hepuensis* was present in Vietnam in passing, they did not elaborate. The Vietnamese specimens of “*E. sinensis*” and “*E. japonica*” reported by Đỗ & Hoàng (2004, table 1) and Đỗ et al. (2021: 109) were from Thai Binh Province. This locality is between the provinces of Thanh Hoa (to the south) and Quang Ninh (to the north), where material from the present study was collected, suggesting that

their material is probably misidentified *E. hepuensis*. Additional surveys should be undertaken to ascertain if the Hepar mitten crab occurs further south of Thanh Hoa Province.

Despite the assertions of Hymanson et al. (1999) that the northern Vietnamese populations of *Eriocheir* are anthropogenic introductions, they did not provide any evidence. Considering that the type locality of *E. hepuensis* is from Hepar County in southernmost China, which is just north of the border, it is not surprising that *Eriocheir* is native to northern Vietnam. In 2011, the second author interviewed local fishermen and ethnic collectors in Ba Che and Tiên Yên rivers, which flow into Tiên Yên Bay where the Đồn Rúi mangrove forest, Quang Ninh Province, is located. They confirmed that *E. hepuensis* is a native species. Local collectors there noted that they have been living there for the last 40-50 years and have been trapping these crabs since that time. The fishermen know it is a “migratory species”, that the crabs normally live in small ponds and rocky parts of the river, sometimes reaching much further inland at higher elevations to Dinh Lap Town, Lang Son Province; and in the rainy season (May to September), they migrate downstream to the brackish water in the estuary. They observe that larger specimens can reach 0.3 kg in weight, and the crabs are sometimes caught for sale in local markets and restaurants, although they are not common. Overfishing, however, has reduced the sizes of crabs caught in recent years. Unlike in China, where the crabs are individually tied up by string or vine for sale. In Vietnam markets, however, *E. hepuensis* are displayed free in small net basket

ACKNOWLEDGEMENTS

The authors would like to thank Prof. Dr. Onur Koyuncu, Head of the Central Research Laboratory Application and Research Centre (ARUM) of Eskisehir Osmangazi University (ESOGÜ), Lecturer Tayfun Şengel and all the technical staff of ESOĞÜ, ARUM for providing access to Zeiss LSM 800 confocal microscope and their support. We thank Kevin Webb, NHM photographic unit for the images taken in figure 1.

REFERENCES

- APEL, M. & J. M. BISHOP, 2006. First record of the non-indigenous Chinese mitten crab *Eriocheir hepuensis* Dai, 1991 from the Arabian Gulf with remarks on potential impacts. Presentation at the 1st International AEHMS Conference, on the state of the Gulf-Ecosystem: Future and Threats, Al-Ain, UAE, March 5-7, 2006.
- CHAN, T.-Y., M.-S. HUNG & H.-P. YU, 1995. Identity of *Eriocheir recta* (Stimpson, 1858) (Decapoda: Brachyura), with description of a new crab from Taiwan. *Journal of Crustacean Biology*, **15**(2): 301-308. DOI:10.2307/1548957.

- CHAN, T.-Y., P. K. L. NG & N. K. NG, 2005. The nomenclature and taxonomy of *Eriocheir formosa* Chan, Hung & Yu, 1995 (Brachyura, Varunidae) from Taiwan: a rebuttal of Tang et al. (2003, 2004). *Crustaceana*, **78**(4): 457-464. DOI:10.1163/1568540054473459.
- CHU, K. H., H. Y. HO, C. P. LI & T.-Y. CHAN, 2003. Molecular phylogenetics of the mitten crab species in *Eriocheir*, sensu lato (Brachyura: Grapsidae). *Journal of Crustacean Biology*, **23**(3): 738-746. DOI:10.1651/C-2347.
- CLARK, P. F., I. M. ABDUL-SAHIB & M. S. AL-ASADI, 2006. The first record of *Eriocheir sinensis* H. Milne Edwards, 1853 (Crustacea: Brachyura: Varunidae) from the Basrah Area of Southern Iraq. *Aquatic Invasions*, **1**(2): 51-54, figs. 1-8. DOI:10.3391/ai.2006.1.3.7.
- DAI, A.-Y., 1991. Studies on the subspecies differentiation of the genus *Eriocheir* (Decapoda: Brachyura). *Scientific Treatise on Systematic and Evolutionary Zoology*, **1**: 61-71, pl. 4. (in Chinese).
- DAI, A.-Y., 1993. Systematic and biological studies on *Eriocheir japonica hepuensis* Dai, 1991. *International Senckenberg Symposium Crustacea Decapoda*. Frankfurt, 18-22 October 1993: 12.
- DE HAAN, W., 1835. *Crustacea. Fauna Japonica, sive Descriptio animalium, quae in itinere per Japoniam, jussu et auspiciis superiorum, qui summum in India Batava imperium tenent, suscepto, annis 1823-1830 collegit, notis, observationibus et adumbrationibus illustravit P. F. de Siebold. Conjunctis studiis C. J. Temminck et H. Schlegel pro Vertebratis atque W. de Haan pro Invertebratis elaborata Regis auctoris edita. I. P. F. v. Siebold. Leiden, Lugundi-Batavorum. Decas, II: 25-64, pls 9-15, 17, C, D.* (For dates see Sherborn & Jentink, 1895; Holthuis, 1953; Holthuis & T. Sakai, 1970).
- ĐỖ, V. N. & N. K. HOÀNG, 2004. Preliminary data of Brachyura in the mangrove of the estuarine zone of the Red River. *Tạp chí Sinh học [Academia Journal of Biology]*, **26**(4): 13-19. [In Vietnamese.]
- ĐỖ, V. N., D. H. TRAN, D. H. NGUYEN & N. H. CHAN, 2021. Community structure and ecological distribution of benthic animals in Tien Hai mangrove forest, Northern Vietnam. *Tạp chí Sinh học [Academia Journal of Biology]*, **43**(3): 95-112.
- GUO, J. Y., N. K. NG, A.-Y. DAI & P. K. L. NG, 1997. The taxonomy of three commercially important species of mitten crabs of the genus *Eriocheir* de Haan, 1835 (Crustacea: Decapoda: Brachyura: Grapsidae). *Raffles Bulletin of Zoology*, **45**: 445-476.
- HASHIM, A. A., 2010. Occurrence of the Chinese mitten crab *Eriocheir sinensis* (H. Milne Edwards) in South Iraq. *Mesopotamian Journal of Marine Science*, **25**: 31-36.
- HAYER, S., D. BRANDIS, G. B. HARTL & C. EWERS-SAUCEDO, 2019. First indication of Japanese mitten crabs in Europe and cryptic genetic diversity of invasive Chinese mitten crabs. *NeoBiota*, **50**: 1-29, figs. 1-6. DOI:10.3897/neobiota.50.34881.
- HOLTHUIS, L. B., 1953. On the dates of publication of W. de Haan's volume on the Crustacea of P.F. Von Siebold's "Fauna Japonica". *Journal of the Society for the Bibliography of Natural History*, **3**: 36-47. DOI:10.3366/jsbnh.1953.3.Part_1.36.
- HOLTHUIS, L. B. & K. SAKAI, 1970. Ph.F. von Siebold and Fauna Japonica. A history of early Japanese zoology: i-xviii + part I, 1-132 [in English]; + part II, 207-323 [in Japanese]; + pls. I-XXXII. (Academic Press of Japan, Tokyo).
- HYMANSON, Z., J. WANG & T. SASAKI, 1999. Lessons from the home of the Chinese mitten crab. *Interagency Ecological Program Newsletter*. California Department of Water Resources, Sacramento, **12**(3): 25-32.
- Ji, Y. K., A. WANG, X.-L. LU, D.-H. SONG, Y.-H. JIN, J.-J. LU & H.-Y. SUN, 2014. Mitochondrial genomes of two brachyuran crabs (Crustacea: Decapoda) and phylogenetic analysis. *Journal of Crustacean Biology*, **34**(4): 494-503. DOI:10.1163/1937240X-00002252.
- KAMANLI, S. A., T. C. KIHARA, A. D. BALL, D. MORRITT & P. F. CLARK, 2017. A 3D imaging and visualisation workflow, using confocal microscopy and advanced image processing for brachyuran crab larvae. *Journal of Microscopy*, **266**(3): 307-323. DOI:10.1111/jmi.12540.

- KOMAI, T., I. YAMASAKI, S. KOBAYASHI, T. YAMAMOTO & S. WATABE, 2006. *Eriocheir ogasawaraensis*, a new species of mitten crab (Crustacea: Decapoda: Brachyura: Varunidae) from Ogasawara Islands, Japan, with notes on the systematics of *Eriocheir* De Haan, 1835. *Zootaxa*, **1168**: 1-20. DOI:10.11646/ZOOTAXA.1168.1.1.
- LI, G., Q. SHEN & Z. XU, 1993. Morphometric and biochemical genetic variation of the mitten crab, *Eriocheir*, in southern China. *Aquaculture*, **111**: 103-115.
- MACLEAY, W. S., 1838. On the Brachyurous Decapod Crustacea. Brought from the Cape by Dr. Smith. Illustrations of the Zoology of South Africa; consisting chiefly of figures and descriptions of the objects of natural history collected during an expedition into the interior of South Africa, in the years 1834, 1835, and 1836; fitted out by "The Cape of Good Hope Association for Exploring Central Africa;" together with a summary of African Zoology, and an inquiry into the geographical ranges of species in that quarter of the globe, Published under the Authority of the Lords Commissioners of Her Majesty's Treasury, Invertebratæ: [1849] **IV**: 1853-1871, pls. 1842, 1843. (A. Smith. Smith, Elder and Co., London). [For dates of publication see Waterhouse, 1880.]
- MILNE EDWARDS, H., 1853. Mémoire sur la famille des Ocypodiens. *Annales du Science Naturelles, Zoologie*, (Série 3), **20**: 163-228, pls. 6-11.
- NADERLOO, R., 2014. Invasive Hepu mitten crab, *Eriocheir hepuensis* (Crustacea: Decapoda: Brachyura: Varunidae) from the Iranian marshland in the northern Persian Gulf estuarine system. *Marine Biodiversity Records*, **7**: e23, figs. 1-4. DOI:10.1017/S1755267214000219.
- NADERLOO, R., 2017. Atlas of crabs of the Persian Gulf: i-xxii, 1-444, figs. 1.1-38.4. (Springer, Cham). DOI:10.1007/978-3-319-49374-9.
- NASER, M. D., T. J. PAGE, N. K. NG, M. APEL, A. G. YASSER, J. M. BISHOP, P. K. L. NG & P. F. CLARK, 2012. Invasive records of *Eriocheir hepuensis* Dai, 1991 (Crustacea: Brachyura: Grapsoidea: Varunidae): implications and taxonomic consideration. *BioInvasions Records*, **1**(1): 71-86. DOI:10.3391/bir.2012.1.1.15.
- NASER, M. D., M. O. SON & A. G. YASSER, 2011. Assessing the risks of invasions of aquatic invertebrates in the Shatt Al-Arab River. *Russian Journal of Biological Invasions*, **2**(2-3): 120-125.
- NG, N. K., A.-Y. DAI, J. GUO & P. K. L. NG, 1998. The complete larval development of the southern Chinese mitten crab, *Eriocheir hepuensis* Dai, 1991 (Decapoda, Brachyura, Grapsidae) reared under laboratory conditions. *Crustaceana*, **71**(5): 493-517. DOI:10.1163/156854098X00400.
- NG, N. K., J. GUO & P. K. L. NG, 1999. On the generic affinities of *Eriocheir leptognathus* Rathbun, 1913, and *Eriocheir formosa* Chan, Hung and Yu, 1995, with description of a new genus (Crustacea: Grapsidae: Varuninae). *Journal of Crustacean Biology*, **19**(1): 154-170. DOI:10.2307/1549557.
- NG, P. K. L., D. GUINOT & P. J. F. DAVIE, 2008. Systema Brachyurorum: part I. An annotated checklist of extant brachyuran crabs of the world. *Raffles Bulletin of Zoology*, (Supplement), **17**: 1-286.
- PALERO, F., I. FERER-MATEU, B. WRAY, R. HUGHES, D. MORRITT, M. LEPAGE, M. KOTTERMAN, M. VAN DER MEER, M. TATE, S. A. KAMANLI, L. SMITH, J. LLEWELLYN-HUGHES & P. F. CLARK, 2022. Presence of a second *Eriocheir* species in Europe is confirmed by molecular and morphological data. *Aquatic Invasions*, **17**(3): 374-392, figs. 1-8. DOI:10.3391/ai.2022.17.3.03.
- SAKAI, K., 2013. A review of the genus *Eriocheir* De Haan, 1835 and related genera, with the description of a new genus and a new species (Brachyura, Grapsoidea, Varunidae). *Crustaceana*, **86**(9): 1103-1138, figs. 1-4, tabs. 1, 2. DOI:10.1163/15685403-00003185.
- SHERBORN, C. D. & J. A. JENTINK, 1895. On the dates of the parts of Siebold's 'Fauna Japonica' and Giebel's 'Allgemeine Zoologie' (first edition). *Proceedings of the Zoological Society of London*, **1895**: 149-150. DOI:10.1111/j.1469-7998.1895.tb07888.x.

- STIMPSON, W., 1858. Crustacea Ocypodoidea. Prodromus descriptionis animalium evertibratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit. Pars V. Proceedings of the Academy of Natural Sciences of Philadelphia, **10**: 93-110.
- SUN, H., K. ZHOU & X. YANG, 2003. Phylogenetic relationships of the mitten crabs inferred from mitochondrial 16S rDNA partial sequences (Crustacean, Decapoda). Acta Zoologica Sinica, **49**: 592-599.
- TANG, B., K. ZHOU & D. SONG, 2004. A neotype of *Eriocheir recta* (Crustacea, Decapoda). Acta Zootaxonomica Sinica, **29**: 255-259.
- TANG, B., K. ZHOU, S. SONG, S. YANG & A. DAI, 2003. Molecular systematics of the Asian mitten crabs, genus *Eriocheir* (Crustacea: Brachyura). Molecular and Phylogenetics Evolution, **29**: 309-316. DOI:10.1016/S1055-7903(03)00112-X.
- WATERHOUSE, F. H., 1880. On the dates of publication of the parts of Sir Andrew Smith's 'Illustrations of the Zoology of South Africa'. Proceedings of the Zoological Society of London, **1880**: 489-491.
- WONG, K. J. H., P. K. L. NG, H.-T. SHIH & B. K. K. CHAN, in press. The brachyuran crabs (Crustacea: Decapoda) of Hong Kong: a historical review and catalogue. Zoological Studies.
- WONG, K. J. H., S.-R. TAO & K. M. Y. LEUNG, 2021. Subtidal crabs of Hong Kong: Brachyura (Crustacea: Decapoda) from benthic trawl surveys conducted by the University of Hong Kong, 2012 to 2018. Regional Studies in Marine Science, **48**: 102013, pp. 1-74. DOI:10.1016/j.rsma.2021.102013.
- XU, J., T.-Y. CHAN, L. M. TSANG & K. H. CHU, 2009. Phylogeography of the mitten crab *Eriocheir sensu stricto* in East Asia: Pleistocene isolation, population expansion and secondary contact. Molecular Phylogenetics and Evolution, **52**(1): 45-56. DOI:10.1016/j.ympev.2009.02.007.

First received 10 January 2023.

Final version accepted 21 March 2023.

Published online 17 May 2023.