

## Notes on the Current Trade in Land Hermit Crabs in Thailand

*Thanakhom Bundhitwongrut*<sup>1</sup>

Presently, there are 17 recognized species of terrestrial hermit crabs of the genus *Coenobita* (Coenobitidae) reported worldwide (McLAUGHLIN *ET AL.*, 2010; RAHAYU *ET AL.*, 2016), of which three, *Coenobita brevipanus*, *C. rugosus* and *C. violascens*, have been recorded from Thailand (McLAUGHLIN, 2002; BUNDHITWONGRUT *ET AL.*, 2014). Land hermit crabs in Thailand have been collected and sold for ornamental purposes or as pets over the last few decades but this trade has increased hugely in recent years (BUNDHITWONGRUT, 2018). Subsequent monitoring of the trade in hermit crabs in both physical and on-line markets conducted during November 2017 to February 2019 has revealed significant changes in trade patterns which are reported below.

Since the investigation on the trade in land hermit crabs in Thailand by BUNDHITWONGRUT (2018), the number of retailers has sharply increased in both street markets in many large provinces (including Bangkok) and in on-line markets (still mainly in Facebook: www.facebook.com). The largest wholesaler in Chatuchak Weekend Market (Fig. 1A in BUNDHITWONGRUT [2018]) has disappeared since October 2018. However, on-line markets are becoming increasingly popular since customers are now able to select and order crabs from home and the crabs are then sent via delivery companies. Thai names for these crabs currently used in the trade are “ปูเสฉวนบกตากลม” (*pu-say-chuan-bok-ta-klom*: land hermit crabs having subcylindrical eye stalks) for *Coenobita brevipanus*, “ปูเสฉวนบกแคริบเบียน” (*pu-say-chuan-bok-Caribbean*: land hermit crabs from Caribbean sea) for *C. clypeatus*, “ปูเสฉวนบกไลลา” (*pu-say-chuan-bok-lila*: light purple land hermit crabs) for *C. lila*, “ปูเสฉวนบกกำแหงฟัน” (*pu-say-chuan-bok-kam-taew-fun*: land hermit crabs having a row of stridulating ridges on the upper outer surface of the left cheliped) for *C. rugosus* and “ปูเสฉวนบกขาม่วง” (*pu-say-chuan-bok-ka-muang*: land hermit crabs having violaceous appendages) for *C. violascens*. For the largest species, *C. brevipanus*, large mature individuals are in great demand. The size is indicated by the left cheliped size (LCS: the curved width of the palm of the left cheliped) instead of the traditional measurement of the overall size of both the occupied shell and crab body when fully retracted into the shell, as reported in BUNDHITWONGRUT (2018). Mature crabs (4.0–5.0 cm LCS) are offered for sale at 1,500–4,500 baht/crab (32 baht/USD in 2018–2019).

An additional species, *Coenobita perlatus*, (Thai name: “ปูเสฉวนบกสตรอว์เบอร์รี่” [*pu-say-chuan-bok-strawberry*]), attractive because of its bright red coloration, is now being imported from Indonesia. It is native throughout the Indo-West Pacific region (NAKASONE, 1988) but not Thailand. The price was around 4,500–5,000 baht/crab in the first month of its appearance in the trade (February 2018) but has since declined to 450–3,500 baht/crab (March 2018 to February 2019). This species is roughly golf ball-sized or smaller (for criteria of crab size see BUNDHITWONGRUT [2018]). There is a danger that imported individuals of *C. perlatus* may be unintentionally released or escape from captivity and become invasive species and compete with or displace indigenous species, as suggested in the case of *C. clypeatus* by BROCKERHOFF & McLAY (2011) and YEO *ET AL.* (2011).

<sup>1</sup> Faculty of Fisheries, Kasetsart University, Bangkok 10900, Thailand.

E-mail: thanakhom@hotmail.com

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Some traders and keepers have launched campaigns for releasing land hermit crabs to wild places, ostensibly for conservation (e.g. THAI-LAND HERMIT CRAB FANCY, 2018). However, their actual objective may well be to advertise their shops and to sell the crabs rather than conserve them. Some hermit crab fanciers may be misled and even purchase such crabs from these dealers in order to take part in such releases. The likely result is crab relocation, leading to unpredictable impacts by adding such crabs into new areas. Additionally, collectors and wholesalers have started to export land hermit crabs to foreign countries such as the U.S.A. and China. The quantity of such exports is unknown, but possibly high due to the insatiable demand of the pet trade. A large-scale export trade would soon directly influence crab numbers in the wild.

The status of land hermit crabs in Thailand is of great concern because continuous over-exploitation without any legal restraint will soon heavily affect natural populations. Land hermit crabs play a vital role as generalist scavengers in coastal ecosystems by accelerating nutrient recycling and energy transfer in food chains (LAIDRE, 2013). Consequently, decrease in crab populations caused by human exploitation may disrupt trophic networks (BUNDHITWONGRUT, 2018). Therefore, the regulation by related government agencies is urgently needed to control and mitigate the impact of the trade. Otherwise, these crabs may soon disappear from the wild of Thailand. BUNDHITWONGRUT (2018) provided all possible conservation measures for land hermit crabs in Thailand without prioritization. Most urgent and important steps are suggested as follows. In order to convince Department of Fisheries (DOF) to issue legislation for regulating the trade, the first and most needed information is the evidence on decline of natural abundance of crabs affected from the trade by surveying exploited populations compared with those in protected areas. This information, as well as the trade data, should be sent to authorities of the enforcement section of the DOF for consideration to issue an announcement to control the trade by registering traders and collectors (similar to the case of introduced crayfish; see DOF [2016]). Weekly or monthly collection quotas, and perhaps size limits, should be set as done in Australia (DOEE, AUSTRALIAN GOVERNMENT, 2012). Thus, traders and collectors have to show their licenses and permission for allotted quotas to the authorities at their shops or to government staff at quarantine and inspection units at airports, or other gates throughout the country, before exporting the crabs. Simultaneously, data on the numbers of collected crabs and their original locations declared by crab collectors need to be recorded. Ideally, we should be able to continuously monitor natural populations at particular areas exposed to crab exploitation. If the natural abundance of the crabs at any sites is declining, related government agencies (e.g. Department of Marine and Coastal Resources [DMCR], Department of National Parks, Wildlife and Plant Conservation [DNP]) should stop crab collection in order to allow populations to recover.

Additionally, because shells for crabs to live in are an indispensable resource for hermit crab life (GREENAWAY, 2003), the availability of shells in crab habitat should be monitored along with population size. If such shell resources in particular crab populations are in short supply, addition of shells of native gastropod species may be a good measure for the crab conservation in order to promote crab growth and/or reproduction, as reported in other hermit crabs by BERTNESS (1981). Moreover, further research on land hermit crabs in the country is needed to better understand their biology and ecology (BUNDHITWONGRUT, 2018), particularly in aspects of life history (e.g. HAMASAKI *ET AL.*, 2017c; OSAKA AND TAKEMURA, 2019), distribution: such as meta-population relationship (e.g. HAMASAKI *ET AL.*, 2017a, b) and dispersion and sympatry (e.g. HSU *ET AL.*, 2018), behavior (e.g. SASAZUKA *ET AL.*, 2019; VALDES & LAIDRE, 2019), and impact of habitat

modification by humans (e.g. NAKAZA *ET AL.*, 1999, 2000). If changes in the numbers and biology of the three species are found, appropriate conservation measures should be applied.

Trade information should also be sent to IUCN for consideration of the status of land hermit crabs in the IUCN Red List for Threatened Species, and to CITES for possible listing. For sustainable conservation, other measures proposed in BUNDHITWONGRUT (2018), such as campaigns to prevent collection of empty gastropod shells in nature, should be implemented to achieve the supreme goal of preserving these crabs for future generations.

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