

## Short communication: Production, distribution and conservation analysis of *Cherax* crayfish endemic to Papua and West Papua Provinces, Indonesia

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Manuscript received: 22 March 2021. Revision accepted: 22 May 2021.

**Abstract.** Widyasari F, Sayuti M, Salampessy RBS. 2021. Short communication: Production, distribution and conservation analysis of *Cherax* crayfish endemic to Papua and West Papua Provinces, Indonesia. *Biodiversitas* 22: 3271-3276. Freshwater crayfish is a species from the Parastacidae family that is indigenous to Papua and West Papua Indonesia. This study analyzes the amount of production, economic value, distribution, and conservation of freshwater crayfish endemic to Papua and West Papua. The production data were obtained from *Stasiun Karantina Ikan or Fish Quarantine Inspection Agency* in Papua and West Papua, Indonesia. Data regarding the price of *Cherax* crayfish were determined based on interviews with freshwater crayfish sellers. Furthermore, the distribution of freshwater crayfish was explained based on a literature review, while the data of its conservation were retrieved from the IUCN Red List of Threatened Species. *Cherax* crayfish caught from wild populations in West Papua is known higher than in Papua. Increased sales revenue could support the economy of the local community. There have been 25 species of freshwater crayfish identified, nine of which were from West Papua and 16 from Papua. Three species were under Endangered (EN), Least Concern (LC), Vulnerable (VU) status, respectively. Four species were under Data Deficient (DD) status, while the rest were unidentified. Overfishing of *Cherax* crayfish causes decline *Cherax* crayfish stock in the wild, future researchers are expected to conduct more specific studies that include relevant stakeholders regarding the conservation of *Cherax* crayfish that are endemic to Papua and West Papua.

**Keywords:** *Cherax*, conservation, crayfish, IUCN red list, Papua, production

### INTRODUCTION

Freshwater crayfish found in New Guinea island has been studied by a number of researchers including (Holthuis 1949; Holthuis 1956; Holthuis 1958; Holthuis 1986; Holthuis 1996) as well as (Lukhaup and Pekny 2006; Lukhaup and Herbert 2008; Lukhaup and Pekny 2008; Lukhaup 2015; Lukhaup et al. 2015; Patoka et al. 2015a; Patoka et al. 2015b; Lukhaup et al. 2017; Patoka et al. 2017; Lukhaup et al. 2018 and Sedik et al. 2018). Species from genus *Cherax* crayfish generally traded as ornamental fish (Chucholl 2013; Papavlasopoulou et al. 2014; Patoka et al. 2014). *Cherax* crayfish from Papua are generally caught from nature then collected and sent to Java (Jakarta and Surabaya), and then exported by Indonesian wholesalers to Asia, the US, and Europe (Lukhaup and Herbert 2008; Patoka et al. 2015b), also been bred in aquariums or ponds as ornamental fish because *Cherax* crayfish not prone to stress and diseases (Iskandar 2003).

Seen from the technical aspects of breeding and market potential, *Cherax* crayfish can be widely bred to provide economic benefits for the community while its conservation can be maintained. Regarding its natural environment, Indonesia has enormous potential for *Cherax* crayfish breeding. The climate and seasonal cycles allow *Cherax* crayfish to be bred throughout the year. Red claws

(*C. quadricarinatus*) can lay eggs 4-5 times a year, while in Queensland, Australia, red claws can only lay eggs twice a year (Wiyanto and Hartono 2003). *Cherax* crayfish has an important ecological in freshwater ecosystem which one is as a component food chain, larvae *Cherax* crayfish serves as food for larger aquatic animals, while the adult of this *Cherax* crayfish has a cannibal when they lack food and when they live in a dense population (Abinawanto et al. 2018) although *Cherax* crayfish are generally active foraging at night (nocturnal) and also includes all-eating types (omnivores) (Wiyanto and Hartono 2003). This cannibal nature starts to appear since it is still young (Wiyanto and Hartono 2003), and *Cherax* crayfish will prey on other crayfish that are sick or moulting because they are in a weak condition and they secrete a lubricating hormone (pheromone) with a strong smell, making it easier for other *Cherax* crayfish to prey on them (Iskandar 2003). Young *Cherax* crayfish are usually only take a few seconds to molt, while *Cherax* crayfish are more mature takes about 3-4 minutes for molting (Wiyanto and Hartono 2003). *Cherax* crayfish will be more frequent molting for good growth (Lukito and Prayugo 2007).

The demands for *Cherax* crayfish for consumption come from Japan, Malaysia, Hong Kong, China, Taiwan, Korea and Singapore. In addition, people in the United States, Canada, France, the Netherlands, Germany,

Belgium, New Zealand and Australia also find *Cherax* crayfish a favorite cuisine believed healthier than seafood (Kurniasih 2008). Besides, the fat, cholesterol and salt contents are lower, so it is safe for consumption for everyone (Wiyanto and Hartono 2003). Some people believe that *Cherax* crayfish meat can boost vitality and sexual arousal in women. Rich zinc content can stimulate libido and increase sperm activities in men (Iskandar 2003).

With these benefits, the *Cherax* crayfish are high in demand globally at a high price. The selling price of *Cherax* crayfish in Jakarta market size young 5 cm up/ 2 inches up/ 2 months old up 0.17 USD with amount 100 heads up; 0.2 USD with amount under 100 heads; 0.34 USD with amount under 30 heads; size broodstocks (big) 1 set contains 5 females, 3 males 23.5 USD for size 10 cm/4 inches/4 months old; 33.5 USD for size 11.5 cm/4.5 inches/5 months old and 50 USD for size 12.5cm/5 inches/6 months old (BFC Farm 2021). The price of 2-inch ornamental crayfish around 2 USD (Setiawan 2006). Wiyanto and Hartono (2003) stated that the price of consumption *Cherax* crayfish in big cities in Indonesia ranged from 14-20 USD per kg, with 9-12 *Cherax* crayfish per kg.

Studies on *Cherax* crayfish endemic to Papua and West Papua have been widely carried out, but studies were still limited on its species and biological aspects. There is no factual data of the excessive exploitation of *Cherax* crayfish from nature originating from Papua and West Papua available, making its conservation status unclear. This study determined the production, economic value, distribution, and study the conservation of *Cherax* crayfish endemic to Papua and West Papua.

## MATERIALS AND METHOD

Data on the amount of production and economic value of *Cherax* crayfish were collected from Fish Quarantine Class II of Sorong for the West Papua region, Fish Quarantine Class II of Jayapura and Fish Quarantine of Merauke for the Papua region from 2016-2020. All Fish Quarantine is under Ministry of Marine Affairs and Fisheries of Republic Indonesia. The data on the selling price of *Cherax* crayfish obtained from interviews with sellers who arranged sales permits to the local Quarantine were used as the reference in calculating the estimated value of the product.

Data on the distribution of *Cherax* crayfish in Papua and West Papua were obtained through a literature review. The data were mapped with Arcgis program version 10.4 to provide information related to the existence of *Cherax* crayfish in Papua and West Papua.

The conservation status determination refers to the IUCN Red List, which is a categorization applied by the IUCN (International Union for the Conservation of Nature and Natural Resources) in classifying the conservation statuses of various species (IUCN 2021).

Conservation categories based on the IUCN Redlist Version 2021-1 include Extinct (EX; Extinct) is a conservation status given to a species proven that the last individual of the species is already dead; Extinct in the Wild (EW) is a conservation status labelled to species only found in captivity or outside their natural habitat; Critically Endangered (CR) is a conservation status for species at risk of extinction in the near future; Endangered (EN) is a conservation status for species that are at high risk of extinction in the wild in the future; Vulnerable (VU) is a conservation status for species at risk of extinction in the wild in the future; Near Threatened (NT) is a conservation status for species that may be in a threatened or near endangered state, even though they are not under threatened status; Least Concern (LC) is the category for species that have been evaluated but do not match any category; Data Deficient (DD) refers to a taxon defined as "information deficient" when the information is insufficient to estimate extinction risk based on population distribution and status; Not Evaluated (NE) refers to a taxon declared "not evaluated" when it is not evaluated for the above criteria.

Interviews using questionnaire with the community of Sawiyat Village, Sawiyat Sub-district, South Sorong District, where *Cherax* crayfish was often caught, resulted in data related to catches and responses related to the conservation plan.

## RESULTS AND DISCUSSIONS

### Production and product value of *Cherax* crayfish in Papua and West Papua Province

Based on the *Cherax* crayfish trade traffic data from Sorong Fish Quarantine Agency, Jayapura Fish Quarantine Agency and Merauke Fish Quarantine Agency, *Cherax* crayfish production and product value in Papua and West Papua are presented in Table 1.

**Table 1.** Data on the production and product value of *Cherax* crayfish from Papua and West Papua in 2016-2020

Years	Production of <i>Cherax</i> crayfish (individual)		Product value of <i>Cherax</i> crayfish (USD)	
	Papua	West Papua	Papua	West Papua
2016	19,466	60,250	16,976	68,709
2017	51,318	67,175	44,753	76,607
2018	25,350	60,910	22,107	69,462
2019	11,801	70,626	10,291	80,542
2020	13,504	32,850	11,776	37,462
Total	121,439	291,811	105,904	332,782

Table 1 shows data on *Cherax* crayfish production in Papua and West Papua, which fluctuates from year to year. All *Cherax* crayfish production data that enter to Fish Quarantine is only of the catch from nature. *Cherax* crayfish production in West Papua was more significant than in Papua. The lowest *Cherax* crayfish production in West Papua was found in 2016 with 60,250 heads, while the highest production occurred in 2019 with a total output of 70,626 heads. The lowest *Cherax* crayfish production in Papua was found in 2019 with 11,801 heads and the highest one in 2017 with 51,318 heads. Data on *Cherax* crayfish Production in Quarantine are only limited to one genus, namely *Cherax* crayfish No production data per species were available that the *Cherax* crayfish production per species in Papua and West Papua Provinces could not be determined.

There is only information about the number of breeders, while information on average size or weight of freshwater crayfish is not yet available from fish quarantine authorities. There was only one breeder of *Cherax* crayfish in 2016. The number changed increased to 11 in 2017 and 2018, decreased to 8 in 2019 and 6 in 2020. The selling price of *Cherax* crayfish in West Papua is approximately USD 1.14/individual, and the selling price of *Cherax* crayfish in Papua was around USD 0.87/individual. The different prices of *Cherax* crayfish due to different sellers and also different delivery destinations. Potential decline

associated with *Cherax* crayfish abundance can easily be overlooked due to trade which is not scientifically described and the quantity captured is not registered by the relevant authority (Patoka et al. 2015a). *Cherax* crayfish was advertised only under the trade name without a scientific species name (Patoka et al. 2014).

Data on the number of cultivators, catchers and processors of *Cherax* crayfish in either Papua or West Papua were unavailable, so it is requiring surveys to collect data related to the purpose of catching of *Cherax* crayfish in Papua and West Papua. Whereas, *Cherax* crayfish from Papua and West Papua is only distributed to domestic markets in some cities, including Jakarta, Denpasar, and Surabaya. *Cherax* crayfish is an essential commodity with a relatively higher price than other *Cherax* species (Kusrini et al. 2009; Dewi and Nugraha 2015).

**The distribution and conservation status of *Cherax* crayfish in Papua and West Papua**

Data on the distribution, conservation, and data released by the International Union for Conservancy Nature (IUCN 2021) regarding status of *Cherax* crayfish in Papua and West Papua showed that there were 25 species of *Cherax* crayfish in the Papua and West Papua regions as presented in Table 2.

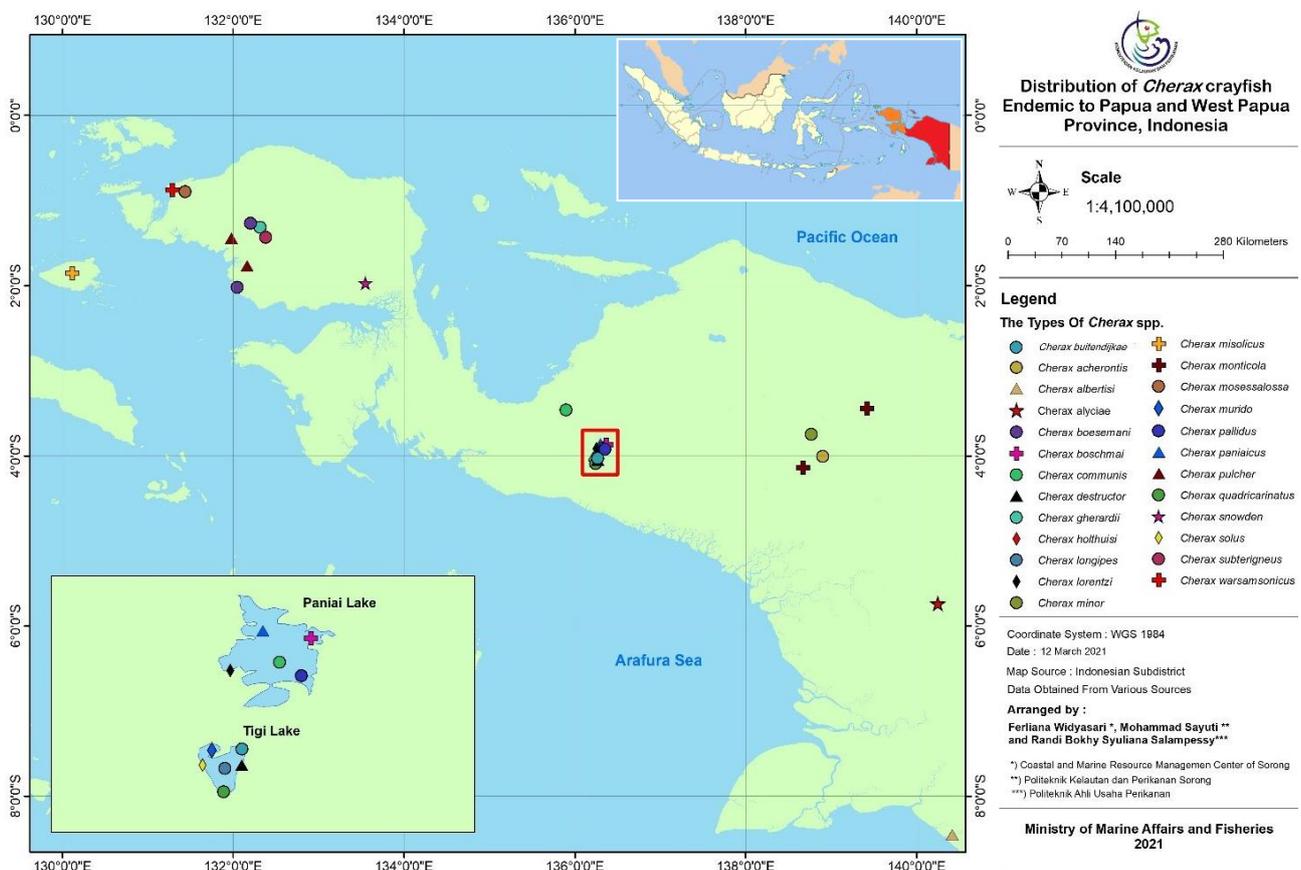


Figure 1. Distribution of *Cherax* crayfish in Papua and West Papua, Indonesia

**Table 2.** Distribution and conservation status of *Cherax* crayfish in Papua and West Papua, Indonesia

Species	Authors	Distribution	Conservation status
<i>Cherax acherontis</i>	(Patoka et al. 2017)	Jayawijaya District (Papua Province)	Not Evaluated (NE)
<i>Cherax albertisi</i>	(Blaha et al. 2016; Sugianti and Satria 2017)	Merauke (Papua Province)	Not Evaluated (NE)
<i>Cherax alyciae</i>	(Lukhaup et al. 2018)	Unnamed creek, Boven Digoel District (Papua Province)	Not Evaluated (NE)
<i>Cherax boesemani</i>	(Lukhaup and Pekny, 2008; Blaha et al. 2016)	Amajaru Lakes, Kais River Drainage (West Papua Province)	Data deficient (DD)
<i>Cherax boschmai</i>	(Holthuis 1949; Blaha et al. 2016; Crandall and De Grave 2017)	Paniai Lake (Papua Province)	Not Evaluated (NE)
<i>Cherax buitendijkae</i>	(Holthuis 1949; Crandall and De Grave 2017)	Paniai Lake (Papua Province)	Not Evaluated (NE)
<i>Cherax communis</i>	(Yogi et al. 2007; Blaha et al. 2016; Crandall and De Grave 2017)	Paniai Lake, Nabire District (Papua Province)	Not Evaluated (NE)
<i>Cherax destructor</i>	(Lekatompessy and da Costa 2019)	Tigi Lake, Deiyai District (Papua Province)	Vulnerable (VU)
<i>Cherax gherardii</i>	(Patoka et al. 2015a; Blaha et al. 2016; Sedik et al. 2018)	Maybrat (West Papua Province)	Not Evaluated (NE)
<i>Cherax holthuisi</i>	(Lukhaup and Pekny 2006; Blaha et al. 2016)	Aitinjo Lake (West Papua Province)	Data deficient (DD)
<i>Cherax longipes</i>	(Holthuis 1949; Blaha et al. 2016; Lekatompessy and da Costa, 2019)	Tigi Lake, Deiyai District, (Papua Province)	Not Evaluated (NE)
<i>Cherax lorentzi</i>	(Holthuis 1949; Holthuis 1956; Blaha et al. 2016; Crandall and De Grave 2017)	Painai Lake (Wissel Lake) Papua Province	Data deficient (DD)
<i>Cherax minor</i>	(Holthuis 1996; Blaha et al. 2016)	Eragayam (ex. Wurigelebur) Jaya Wijaya District (Papua Province)	Not Evaluated (NE)
<i>Cherax misolicus</i>	(Holthuis 1949; Blaha et al. 2016; Lukhaup et al. 2017)	Misool Island, Raja Ampat, (West Papua Province)	Not Evaluated (NE)
<i>Cherax monticola</i>	(Holthuis 1956; Blaha et al. 2016; Gan et al. 2016)	Habbema Lake and Balim River Camp on Balim River, East of Habbema Lake, Baliem River, Wamena (Papua Province)	Data deficient (DD)
<i>Cherax mosessalossa</i>	(Lukhaup et al. 2018)	Klademak Creek, Sorong City (West Papua Province)	Not Evaluated (NE)
<i>Cherax murido</i>	(Holthuis 1949; Blaha et al. 2016; Lekatompessy and da Costa, 2019)	Tigi Lake, Deiyai District, (Papua Province)	Not Evaluated (NE)
<i>Cherax pallidus</i>	(Holthuis 1949; Blaha et al. 2016)	Wissel Lakes (Paniai, Tage and Tigi) (Papua Province)	Endangered (EN)
<i>Cherax paniaicus</i>	(Holthuis 1949; Fransen et al. 1997; Blaha et al. 2016)	Lake Paniai, Tage dan Tigi (Papua Province)	Not Evaluated (NE)
<i>Cherax pulcher</i>	(Lukhaup, 2015; Blaha et al. 2016)	Hoa Creek (Teminabuan) , Sorong Selatan (West Papua Province)	Not Evaluated (NE)
<i>Cherax quadricarinatus</i>	(Blaha et al. 2016; Lekatompessy and da Costa 2019)	Tigi Lake, Deiyai District (Papua Province)	Least Concern (LC)
<i>Cherax snowden</i>	(Lukhaup et al. 2015; Lukhaup et al. 2018)	Oinsok (Ainsok River Drainage) and Sawiat Sub-district, West Papua Province	Not Evaluated (NE)
<i>Cherax solus</i>	(Lukhaup and Herbert 2008; Blaha et al. 2016)	Tigi Lake (Papua Province)	Not Evaluated (NE)
<i>Cherax subterigneus</i>	(Patoka et al. 2015b; Blaha et al. 2016)	Aitinjo Lake (West Papua Province)	Not Evaluated (NE)
<i>Cherax warsamsonicus</i>	(Lukhaup et al. 2017)	Warsamson River, Sorong (West Papua Province)	Not Evaluated (NE)

Table 2 and Figure 1 shows the distribution of sixteen (16) species *Cherax* in Papua and nine (9) species in West Papua. *Cherax* crayfish was distributed in Nabire, Boven Digoel, Deiyai, Wamena, Merauke, Jayawijaya, Painai District of Papua. Meanwhile, in West Papua Province, *Cherax* crayfish was distributed in Maybrat, Amajaru, South Sorong, Raja Ampat, Aitinjo, Sorong and Sorong City District. The Papua regions dominate the distribution of *Cherax* crayfish but the number of *Cherax* crayfish production is highest in the West Papua regions. The

request for freshwater crayfish for Jakarta market reaches 2-3 tons per month, while at the national level it is estimated that the request for freshwater crayfish is between 6-8 tons per month with restaurants as the main absorber (Setiawan 2006). One of the aquarium trading commodities in Surabaya is *Cherax quadricarinatus* (Indrawati et al. 2016).

Table 2 shows 25 species of *Cherax* crayfish endemic to Papua and West Papua with different conservation status. There is one species with Endangered (EN) status,

namely *Cherax pallidus*. One species, namely *Cherax quadricarinatus*, is under the Least Concern (LC). Four *Cherax* species are included in Data Deficient (DD) status, including *Cherax boesemani*, *Cherax monticola*, and *Cherax holthuisi*. The other 18 species are not evaluated (NE) due to lack of information.

*Cherax* crayfish has been used by local communities for consumption and as an ornamental crayfish commodity (Tanjung 2013). The community in Kampung Sawiyat, Sawiyat Sub-district, South Sorong District started catching *Cherax* crayfish in 2015. In that year, *Cherax* crayfish was still easy to catch, and they could catch 20-30 in one night, and they sold them at the price of USD 0.2/individual. Buyers or collectors of *Cherax* crayfish were mostly entrepreneurs from Sorong City. In 2020, anglers found it challenging to catch *Cherax* crayfish due to habitat damage and inappropriate fishing methods, and mining activities of humans. *Cherax* crayfish preys on one another, and it also eats scavengers and detritus in the waters. Excessive exploitation of *Cherax* crayfish in nature will have an impact on the food chain. The food chain will be disrupted if one of its components is endangered (Rahmi et al. 2016). The population of *Cherax* crayfish is being threatened in nature (Sari et al. 2011).

The literature review carried out in this study showed that it is necessary to maintain the population of *Cherax* crayfish in its natural habitat. Efforts to manage and protect *Cherax* crayfish need to be taken by considering the aspects of *Cherax* crayfish conservation. In contrast, the community's economic aspect *Cherax* crayfish for living should be concerned as well.

In conclusion, there are 25 species of *Cherax* crayfish endemic to Papua and West Papua Provinces found in Nabire, Boven Digoel, Deiyai, Wamena, Merauke, Jayawijaya, Painai, Maybrat, Amajaru, South Sorong, Raja Ampat, Aitinjo, Sorong and Sorong District. Only data on the use of *Cherax* crayfish at the Genus level are available. West Papua Province dominated *Cherax* crayfish production from 2016-2020. IUCN Red List website page showed one species of *Cherax* is under the Endangered (EN) status. One *Cherax* species is also categorized as Least Concern (LC), one is under Vulnerable (VU) status, and four species are under Data Deficient (DD) status. Currently, the community has started to catch *Cherax* crayfish from its natural habitat.

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