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Population dynamics of the blue swimming crab (*Portunus pelagicus* Linnaeus, 1758) in Lasongko Bay, Central Buton, Indonesia

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Abstract. We studied the size structure and population dynamics of blue swimming crab (*Portunus pelagicus* Linnaeus 1758) in Lasongko Bay, Central Buton - Indonesia from April 2013 to March 2014. We assessed the size structure, growth parameters, recruitment, mortality, and rate of exploitation due to local fisheries. We collected crabs monthly by gillnets with mesh sizes of 1.5, 2.5 and 3.5 inches. The size structure of male and female crabs consisted of one to two groups, most of which were adults. The growth parameters of male and females crabs were CW_∞ = 152.04 mm and K = 0.93 year^{-1}, and $CW\infty$ = 173.04 mm and K = 0.68 year^{-1}, respectively. Total, natural, and fishing mortality of males were 2.80, 1.09 and 1.71, and 2.95, 0.86, and 2:09 for females, respectively. The exploitation rate of males and females were 0.61 and 0.71, respectively, which suggests overfishing.
Key Words: exploitation rate, mortality, overfishing, population growth, recruitment.

Introduction. Crustaceans as fishery resources have been focus on recent biological research in Indonesia, such as mantis shrimp (Wardiatno & Mashar 2010, 2011; Wardiatno et al 2012; Wardiatno & Mashar 2013), blue swimming crab (Hamid et al 2015a, b; Zairion et al 2014; Wiyono & Ihsan 2015; Zairion et al 2015a, b), mole crab/sand crab (Sarong & Wardiatno 2013; Wardiatno et al 2014; Mashar et al 2015; Santoso et al 2015; Wardiatno et al 2015a, b). Blue swimming crabs (*Portunus pelagicus* Linnaeus 1758) have high economic value and demand and are harvested intensively; in turn, this pressure may affect crab population dynamics and size structure. Crab population dynamic parameters include growth, recruitment, and mortality, and a change in any parameter will affect population size structure and the number of animals available for harvest. Therefore, data on crab population dynamic parameters are needed for effective management and conservation (Dineshbabu et al 2008; Sawusdee & Songrak 2009; Kamrani et al 2010; Kunsook 2011; Sugilar et al 2012).

Various studies on crab population dynamics have been carried out in the Persian Gulf (Kamrani et al 2010; Mehanna et al 2013; Safaie et al 2013), India (Sukumaran & Neelakantan 1996, 1997; Josileen & Menon 2007; Denishbabu et al 2008), Thailand (Sawusdee & Songrak 2009; Kunsook et al 2014), and Australia (Potter et al 2001), and indicate that crab population dynamics and exploitation rates vary among regions and between male and female crabs. Some studies [e.g. Sukumaran 1995; Sukumaran & Neelakantan 1996, 1997; Josileen & Menon 2007; Denishbabu et al 2008; Sawusdee & Songrak 2009; Kunsook et al 2014) have reported that the total mortality of male crabs is higher than that of females, but Kamrani et al (2010) found similar mortality in both males and females.

Research on crab population dynamics in Indonesia before 2010 was rare (Kembaren et al 2012). Now, studies have examined the population parameters of

Indonesian crabs in Brebes, Jawa (Sunarto 2012), Bone Bay, Sulawesi (Kembaren et al 2012), Pati, Jawa Pati (Ernawati 2013), and Pangkep, Sulawesi (Ihsan et al 2014), again showing that both population dynamics and exploitation rates vary by location. The first three studies found that male growth rates exceeded those of females (Sunarto 2012; Kembaren et al 2012; Ernawati 2013), while in Pangkep the opposite was true (Ihsan et al 2014).

Lasongko Bay, on Sulawesi Island in the east of Indonesia, has long hosted local crab fisheries. Crabs are intensively exploited, and the catch is in decline both in overall number and individual size (Hamid 2011). Thus, adequate management is needed, and information on crab population dynamics and exploitation rates is necessary to facilitate this. Our study aims to analyze crab population size structure, growth parameters, recruitment, mortality, and exploitation rates in Lasongko Bay, Central Buton - Indonesia.

Material and Method

Location and sampling. Research was conducted in Lasongko Bay, Central Buton - Indonesia (05°15'-05°27' S, 122°27'-122°33' E; Figure 1) from April 2013 to March 2014. Crab samples were caught monthly by gillnet (mesh sizes 1.5, 2.5, and 3.5 inches) at seven locations. All specimens were immediately preserved in 10% buffered seawater-formalin. In the laboratory, crabs were separated into males and females, and their carapace widths measured with calipers (Vernier Caliper 0–150 mm × 0.05) along the longest lateral on each side of the body (Sukumaran 1995).

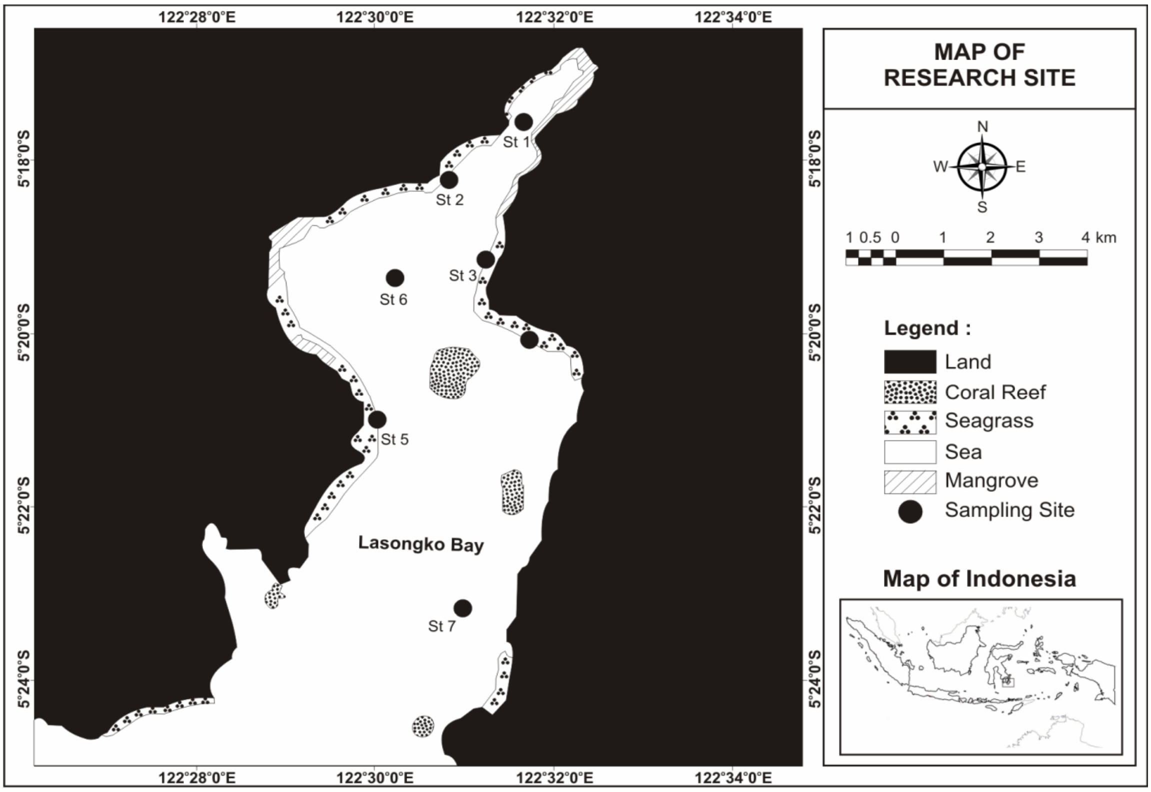

Figure 1. Map showing the location of the study site in Lasongko Bay, Sulawesi Island, Indonesia. Black dots indicate sampling sites.

Size class distribution. Carapace widths of male and female crabs from each collection period were tabulated to determine the size class frequency distribution in 5-mm class increments. These data were used to estimate population size structure, growth parameters, recruitment, and exploitation rates. The size structures for male and female crabs in each collection period were analyzed using the Bhattacharya method and calculated with FISAT II in the model progress analysis sub-program (Gayanilo et al 2005).

Growth parameter estimation. Using the carapace width parameters, we estimated male and female crab growth using the von Bertalanffy growth function in the FISAT II sub-program ELEFAN I (Sparre & Venema 1998). The von Bertalanffy growth function (VBGF) for crab carapace width is given by $CW = CW_\infty\ [1-e^{-K\ (t-to)}]$, where CW is the carapace width (mm), CW_∞ is the carapace width asymptote (mm), K is the von Bertalanffy growth coefficient (year $^{-1}$), t is the estimated age (years), and t_o is the theoretical age (years) as determined by Pauly's empirical equation (Pauly 1984); i.e., $\log{-t_o} = -0.3952 - 0.2752 \log CW_\infty - 1.038 \log K$. Pauly's growth performance index (Ø) (Pauly 1984) was used to distinguish between the growth performances of male and female crabs, and was determined by $Ø = \log K + 2 \log CW_\infty$.

Estimation of recruitment. We used data on carapace size class distribution for males and females combined, along with VBGF parameter values (K, CW∞ and t_o), to estimate recruitment. Recruitment was calculated theoretically using the FISAT II sub-program recruitment patterns (Gayanilo et al 2005). By entering the value for each VBGF parameter, we obtained the monthly proportion of crab recruitment.

Estimation of mortality and exploitation. We determined total mortality (Z) in FISAT II [18] using a length-converted fishing curve (Gayanilo et al 2005; Pauly 1984) according to the equation $\ln N/\Delta t = a + bt$, where N is the number of crabs in a particular size class, Δt is the time required to attain that class (years), t is the relative age (years), a is the intercept, and b is the regression coefficient (b = Z). Crab natural mortality (M) was estimated with Pauly's empirical equation (Pauly 1984): $\log M = -0.0066 - 0.279 \log CW_\infty + 0.6543 \log K + 0.4637 \log T$, where CW_∞ is the carapace width asymptote (mm), K is the VBGF coefficient (year^{-1}), and T is the average annual water temperature of Lasongko Bay (°C). The fishing mortality and exploitation rate (E) is determined with Pauly's equation (Pauly 1984; Sparre & Venema 1998); i.e., F = Z-M and E = F/Z. If E < 0.5, the exploitation rate is low; if E > 0.5, the exploitation rate is high (overfishing); and if E = 0.5, the exploitation rate is optimal (Pauly 1984).

Results

Size class distribution. We caught 1229 crabs during our study (594 males and 635 females). Male and female crabs generally comprised one or two size classes, but tended to be dominated by one. Crabs caught during the study comprised juvenile, adult, and old classes, but were dominated by the adult (sexually mature) group. Male crabs were smaller than females; average carapace widths were 89.00-124.48 mm and 89.80-139.80 mm, respectively (Table 1).

Growth parameters. The VBGF coefficient (K) and the theoretical age (t_o) of male crabs were greater than those of female crabs, while the male carapace width asymptote (CW_∞) was smaller than that of females (Table 2). This means that the growth rate of males exceeds that of females, and that the carapace width asymptote of males is faster. However, the growth performance index was similar between sexes, at about 4.3 (Table 2). The VBGF was $CWt = 152.04\ [1-e^{-0.93\ (t\ +\ 0963)}]$ for males and $CWt = 173.04\ [1-e^{-0.68\ (t\ +\ 0837)}]$ for females, and the growth curves of both sexes are shown in Figure 2.

The carapace width range was 49.80–147.70 mm for males and 52.10–166.20 mm for females. Crab ages were estimated with VBGF and carapace width for each sex. The age range of male crabs was 0.4221–3.819 years, and the age to reach maximum carapace width ($W_{max} = 0.95\ CW_\infty$) was about 3.21 years, while for females they were 0.5205–4.067 years and about 4.40 years, respectively.

Table 1

Number of classes, including mean and number in each group, for all male and female blue swimming crabs (*Portunus pelagicus*) size classes in the study

Month	*Number of group*		*Means (mm)*		*Number (individuals)*	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*
April 2013	1	1	107.09 ± 11.11	104.80 ± 12.47	61	52
		2		139.80 ± 12.35		7
May 2013	1	1	104.80 ± 12.80	107.39 ± 13.40	100	81
June 2013	1	1	96.00 ± 5.88	104.80 ± 14.76	28	58
	2		120.72 ± 9.09		31	
July 2013	1	1	104.80 ± 13.04	107.00 ± 16.81	43	52
August 2013	1	1	106.02 ± 8.77	106.41 ± 12.42	28	40
September 2013	1	1	97.30 ± 6.01	114.80 ± 13.89	14	36
	2		123.54 ± 6.72		7	
October 2013	1	1	119.10 ± 8.52	123.82 ± 8.66	38	46
November 2013	1	1	114.80 ± 11.92	118.45 ± 10.26	25	35
		2		139.80 ± 8.10		10
December 2013	1	1	97.00 ± 8.86	89.80 ± 10.45	23	12
	2	2	124.48 ± 8.94	125.49 ± 8.25	30	31
January 2014	1	1	89.00 + 8.74	97.54 ± 12.01	25	30
	2	2	116.49 ± 8.89	124.29 ± 8.52	57	45
February 2014	1	1	99.50 ± 13.09	111.77 ± 14.36	39	46
March 2014	1	1	104.80 ± 12.59	97.24 ± 10.71	45	21
		2		123.10 ± 14.73		33

Table 2

Parameters of VBGF, growth performance index (Ø), and maximum age (tmax) for the blue swimming crab (*Portunus pelagicus*) in Lasongko Bay, Central Buton-Indonesia

Sex	*Parameters of VBGF*			*Ø*	*tmax (year)*
	CW_∞ (mm)	*K (year^{-1})*	*t_o (year)*		
Male	152.04	0.93	-0.963	4.309	3.21
Female	173.04	0.68	-0.837	4.332	4.40

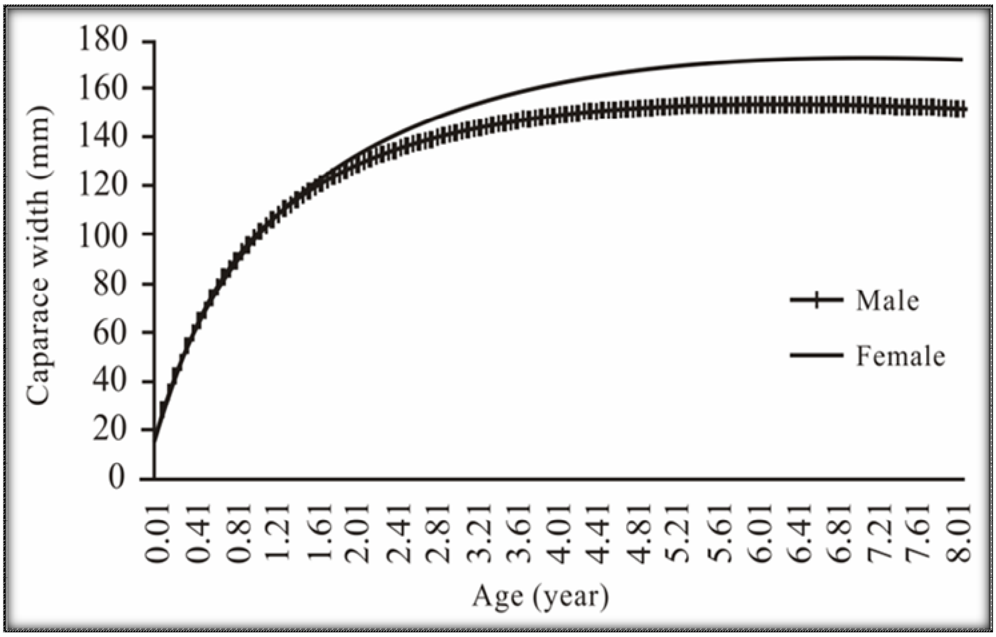

Figure 2. Growth curve for male and female blue swimming crabs (*Portunus pelagicus*) in Lasongko Bay, Central Buton - Indonesia.

Recruitment. Recruitment of crabs in Lasongko Bay takes place almost throughout the year, with the proportion ranging between 1.00% and 19.17%, and exhibiting only one peak (Figure 3). Most recruitment takes place during the five consecutive months from June to October. Recruitment is highest in July, and lowest in December and February. The recruitment was undetected at the end of research period (March).

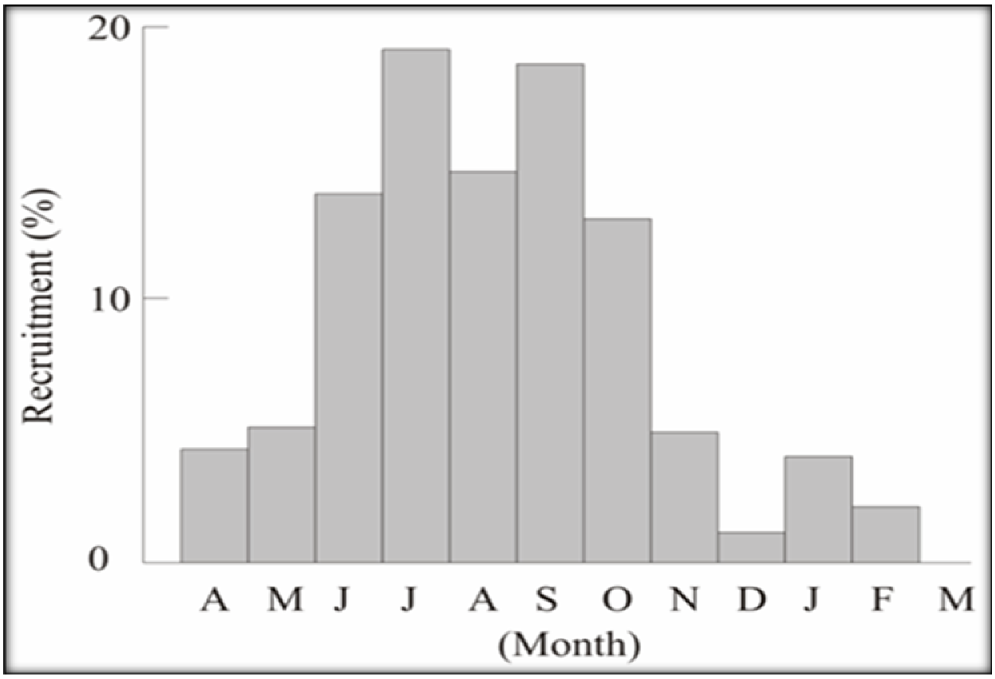

Figure 3. Recruitment pattern of blue swimming crab (*Portunus pelagicus*) in Lasongko Bay, Central Buton - Indonesia.

Mortality and exploitation rate. Total mortality and fishing pressure on male crabs were lower than those of female crabs, but male natural mortality exceeded that of female crabs. Overall, the exploitation rate for male crabs was lower than for female crabs (Figure 4). FISAT II analysis indicated that gillnetting had 25%, 50%, and 75% chances of capturing carapace widths of 97.20, 105.11 and 113.95 mm, respectively.

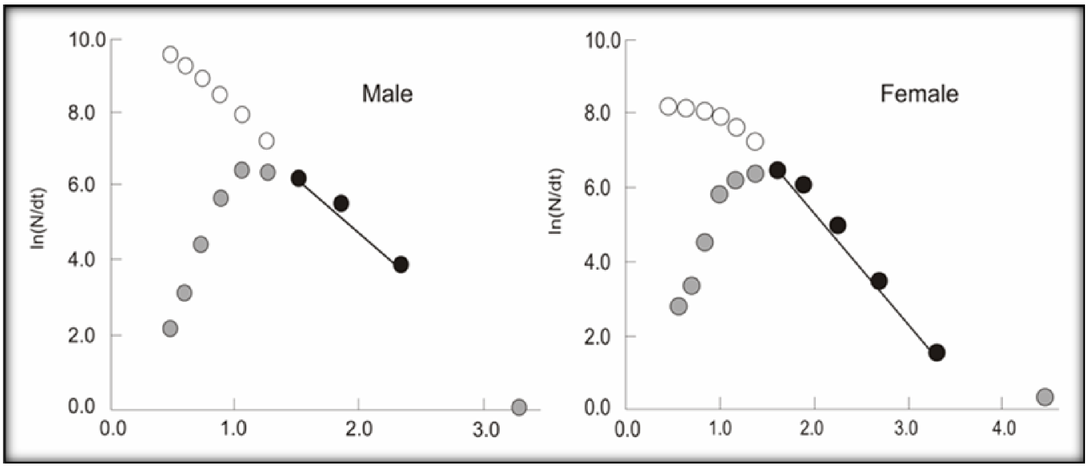

Figure 4. Total mortality of male and female blue swimming crab (*Portunus pelagicus*) in Lasongko Bay, Central Buton - Indonesia.

Discussion. Crab sizes in this study exceeded those in PGN Bay in East Lampung and Pati coast of Central Jawa, Indonesia (Ernawati 2013; Kurnia et al 20014) and Bardawil Lagoon, Egypt (Abdel-Razek et al 2006), but were smaller than those in Pangkep coastal waters of South Sulawesi, Indonesia [45.5–177.5 mm CW (Ihsan et al 2014)], as well as those on the southwest coast of Karnataka, India (Dineshbabu et al 2008), the Oman coast (Mehanna et al 2013), and the Mandapam coast, India (Josileen & Menon 2007). Carapace width on the Karnataka coast ranged between 56 and 165 mm for males and 61 and 170 mm for females (Dineshbabu et al 2008), and between 57 and 193 mm and 84 and 206 mm, respectively, for males and females on the Oman Coast (Mehanna et al 2013). Carapace width ranges on the Mandapam, India coast were 81–180 mm for males and 126–130 mm for females (Josileen & Menon 2007). In Bardawil Lagoon, Egypt the range was 40–150 mm for males and 50–120 mm for females (Abdel-Razek et al 2006).

The carapace width and size distributions of male and female crabs also varied among locations (Table 3). The size structure of male and female crabs in Lasongko Bay consisted of one or two size-classes in each collection period, mirroring the pattern found in Brebes coast off Central Jawa, Indonesia (Sunarto 2012). Crab carapace width in Bone Bay, South Sulawesi-Indonesia ranges between 32.5 and 147.5 mm and comprises three size classes (Kembaren et al 2012). The size structure of both male and female crabs in Pati coast, Central Jawa–Indonesia generally comprises four modes (Ernawati 2013), and that of crabs in East Lampung, Indonesia waters comprises two modes for males but only one for females (Kurnia et al 2014).

Table 3

Carapace width ofblue swimming crab (*Portunus pelagicus*) in various Indonesian waters

Location (Source)	*Sex*	*Carapace width (mm)*	
		Range	*mode*
Brebes coast, Central Jawa	Male	22 - 75[*)]	41.5
(Sunarto 2012)	Female	21 - 74[*)]	47.5
Pati coast, Central Jawa	Male	58 - 159.4[a)]	106
(Ernawati 2013)	Female	60.1 - 148.3[a)]	106
PGN Bay, East Lampung, Sumatera	Male	26.41 - 120.80	53.5 - 63.5
(Kurnia et al 2014)	Female	31.35 - 99.89	63.5
Lasongko Bay, Central Buton	Male	49.8 - 147.7	89.0 - 124.5
(This study)	Female	52.1 - 162.2	89.0 - 139.8

[a]) near coast; [*]) carapace length.

The carapace width of first-capture male and female crabs (CW_C 50%) in this study was 105.11 mm, which exceeds that in PGN Bay, East Lampung-Indonesia, 103.5 mm (Kurnia et al 2014), but is smaller than that in Kung Krabaen Bay, Thailand; i.e., 111.3 mm (Kunsook et al 2014), both of which were based on samples captured using gillnets. The CW_C 50% size of crab caught with traps in Kung Krabaen Bay, Thailand was only 69.0 mm (Kunsook et al 2014), and in Pati coast, Central Jawa-Indonesia was 108 mm (Ernawati 2013). The CW_C 50% size of trawled-caught crabs in Mandapam, India was 124.7 mm for males and 122.9 mm for females (Dineshbabu et al 2008).

Growth parameters of both male and female crabs vary among locations (Table 4), while male K values generally exceed those of females; our results match these general patterns. The largest K value for male and female crabs occurred in Koombana Bay, Australia (Potter et al 2001) while our study reports the smallest K. The largest CW_∞ values were reported from Mandapam for males (Josileen & Menon 2007) and Karnataka for females (Sukumaran 1995; Sukumaran & Neelakantan 1997) while the smallest CW_∞ value was reported from Koombana Bay, Australia (Potter et al 2001). Larger crabs tend to have larger K values.

Crab growth is influenced by a variety of factors, including temperature, salinity, dissolved oxygen, turbidity, and food availability (Kunsook 2011; Kamrani et al 2010; Kunsook et al 2014; Green et al 2014). Variation in these factors, coupled with exploitation rate, determines regional crab growth (Kunsook 2011; Kamrani et al 2010; Kunsook et al 2014; Green et al 2014), and both water temperature and food availability are especially important (Sugilar et al 2012; Green et al 2014). Water temperature can also affect other environmental variables such as food availability, predator activity, metabolic rate, and water clarity (Green et al 2014) which also affect crab growth. Water temperature also affects absolute growth, molting time, mating, spawning, and crab recruitment, and there by affects crab population dynamics (Green et al 2014).

The growth rate of crabs in Lasongko Bay is slower because the K values of both sexes is < 1 (Sparre & Venema 1998), and male crabs grow more rapidly than females. Differences in male and female crab growth are usually caused by differences in the use of energy derived from food to support metabolic processes, especially when female crabs near adulthood, as females may use energy for reproduction rather than for somatic growth (Sukumaran 1995; Josileen & Menon 2007; Kembaren et al 2012). The growth of juvenile crabs and lobsters is more rapid in warmer waters, but when mature their growth rate decreases, so that the asymptote of their carapace widths is smaller (Green et al 2014).

Table 4

Comparison of growth parameters, mortality and exploitation rates of blue swimming crab (*Portunus pelagicus*) in Lasongko Bay, Central Buton – Indonesia with those from other locations

Location (Source)	*Sex*	*VBGF Parameter*		*Mortality*			*E*
		K (year^{-1})	*CW_∞ (mm)*	*Z*	*M*	*F*	
Bandar Abas, Persian Bay, Iran (Kamrani et al 2010)	Male	1.2	168.0	2.48	1.21	1.27	0.512
	Female	1.1	177.9	2.44	1.13	1.31	0.536
Oman coast, Oman (Mehanna et al 2013)	Male	1.85	102.83*)	7.85	3.15	4.7	0.60
	Female	1.68	109.57*)				
Persian Gulf & Oman Gulf, Iran (Safaie et al 2013)	Male	1.7	191.0	5.97	1.47	4.50	0.75
	Female	1.6	185.0	3.94	1.42	2.52	0.64
Karnataka Coast, South-west India (Sukumaran 1995)	Male	1.14	211.0	5.6	1.7	3.9	0.53
	Female	0.97	204.0	4.9	1.6	3.2	
Karnataka Coast, South-west India (Dineshbabu et al 2008)	Male	1.3	116.9	6.20	2.20	4.10	0.65
	Female	1.4	170.0				
Mandapam Coast, India(Josileen & Menon 2007)	Male	0.95	223.0	4.54	2.76	2.45	0.54
	Female	1.00	195.1	3.03	2.11	1.57	0.52
Koombana Bay, Western Australia (Potter et al (2001)	Male	3.11	119.1	-	-	-	-
	Female	2.60	124.7	-	-	-	-
Tang Coast, South Thailand (Sawusdee & Songrak 2009)	Male	1.5	179.0	9.23	1.61	7.62	0.83
	Female	1.6	171.0	8.85	1.61	7.24	0.82
Kung Krabaen Bay, Thailand (Kunsook 2011)	Male	2.75	142.6	8.15	3.98	4.53	0.556
	Female	1.13	167.3	6.95	2.07	4.88	0.702
Brebes coast, Central Jawa, Indonesia (Sunarto 2012)	Male	1.20	81.38*)	2.52	1.53	0.98	0.391
	Female	0.78	81.10*)				
Bone Bay, Sulawesi, Indonesia (Kembaren et al 2012)	Male	1.27	159.0	9.21	1.33	7.88	0.86
	Female	1.08	154.0	6.90	1.21	5.69	0.82
Pati coast, Central Jawa, Indonesia (Ernawati 2013)	Male	1.26	185	6.24	1.27	4.97	0.80
	Female	1.13	187	6.19	1.18	5.01	0.81
Pangkep coast, Sulawesi, Indonesia (Ihsan et al 2014)	Male	1.2	173.78	2.53	1.44	1.09	0.43
	Female	1.5	186.38	3.22	1.27	1.95	0.60
Lasongko Bay, Central Buton, Indonesia (This study)	Male	0.93	152.04	2.80	1.09	1.71	0.61
	Female	0.68	173.04	2.95	0.86	2.09	0.71

*) Carapace length; -: no data.

Age and life span of crabs is associated with their stock (Kangas 2000; Safaie et al 2013), and especially with population size structure and recruitment. The maximum age of male and female crabs in Lasongko Bay is longer than those in Pati coast of Central Jawa, Indonesia [2.38 and 2.65 years, respectively (Ernawati 2013)], the northwest coast of Karnataka, India [~ 2.5 years (Sukumaran 1995; Sukumaran & Neelakantan 1996, 1997)], Queensland, Australia (Kangas 2000), the Mandapam coast, India (Dineshbabu et al 2008), and the southern coast of Karnataka, India (Josileen & Menon 2007) (~ 3 years). However, the maximum ages of males and females in this study were lower than those in Brebes coast of Central Jawa, Indonesia [5.66 and 5.63 years, respectively (Sunarto 2012)]. Both water temperature and harvesting pressure can reduce maximum life span (Safaie et al 2013; Green et al 2014).

Crab recruitment in Lasongko Bay takes place almost throughout the year, and matches that found on the coast of Dar es Salaam, Tanzania (Chande & Mgaya 2003), in Kung Krabaen Bay, Thailand (Kunsook 2011; Kunsook et al 2014) and in Brebes coast of Central Jawa, Indonesia (Sunarto 2012). Crab recruitment in these locations has two peaks, whereas Lasongko Bay exhibited only one peak (Figure 3). Recruitment in Lasongko Bay is higher than in Pangkep coast of South Sulawesi, Indonesia, 17.45% (Ihsan et al 2014) or in Kung Krabaen Bay, Thailand, i.e., 0.22–17.32% (Kunsook 2011; Kunsook et al 2014), but lower than in Brebes coast of Central Jawa, Indonesia, i.e, 0.11–21.24% (Sunarto 2012).

The use of FISAT II to detect the recuritment seemed to have a disadvantage. At the end of study period, the ecruitment was undetected. The same results were showed by Kunsook (2011), Sunarto (2012), Sugilar et al (2012) and Kunsook et al (2014).

Crab recruitment is influenced by the composition of male and female parents, growth rate, predation, and disease (Green et al 2014), as well as by fishing pressure and water characteristics such as temperature, salinity, dissolved oxygen, current turbidity, and velocity (Caputi et al 2010; Sugilar et al 2012; Green et al 2014). Switching fishing methods from gillnet to trap can also increase pressure on the crab population and potentially reduce recruitment, harming the stock of potential crab parents (Johnston et al 2011). Over the past seven years traps have proliferated in Lasongko Bay, increasing fishing pressure.

Male and female crab mortality varied among locations (Table 4) due to differences in habitat and water quality, competition and predation, exploitation rates, and fishing gear (Sugilar et al 2012; Kunsook et al 2014; Green et al 2014). The total mortality of male and female crabs in Trang coast, Thailand (Sawudee & Songrak 2009), Bone Bay, Sulawesi–Indonesia (Kembaren et al 2012) and Kung Krabaen Bay, Thailand (Kunsook 2011; Kunsook et al 2014) is relatively high, but relatively low in Bandar Abas, the Persian Gulf (Kamrani et al 2010), and in Lasongko Bay and Pangkep coast of South Sulawesi, Indonesia (Ihsan et al 2014) (Table 4).

Total and fishing mortality of female crabs in Lasongko Bay exceed those of males, matching the results from Pangkep coast of South Sulawesi, Indonesia (Ihsan et al 2014). In contrast, studies in a variety of locations have found that total, natural, and fishing mortality of male crab generally exceeded those of female crabs. Natural mortality of males in Lasongko Bay exceeded that of females, matching the results of previous studies (Table 4).

The fishing mortality of male and female crabs in this study exceeded the natural mortality, matching results from Indonesia and elsewhere (Table 4). The highest crab natural mortality occurred between the hatching and juvenile stages, as might be expected in an organism that does not care for its young. Crab natural mortality is highest in the larval stage, (Z-4) reaching 99% (Caputi et al 2010), but also high when they begin benthic life (Kunsook 2011; Kunsook et al 2014), and after 20 months as fishing and natural mortality begin to take their toll (Potter et al 2001). The mortality of juvenile crabs in the early stages determines the crab population structure (Kunsook 2011; Kunsook et al 2014).

The exploitation rate of crabs varies among locations (Table 4), and amounts to overfishing, except for males in Brebes coast of Central Jawa, Indonesia (Sunarto 2012) and Pangkep coast of South Sulawesi, Indonesia (Ihsan et al 2014). The exploitation rate in Lasongko Bay also amounts to overfishing, but is still lower than that in Pati coast of Central Jawa, Indonesia (Ernawati 2013) or Bone Bay, Sulawesi–Indonesia (Kembaren et al 2012). The change from gillnets to traps increased fishing pressure on the crab population of Cockburn Sound, Australia (Johnston et al 2011), and this same transition also explains the overfishing in Lasongko Bay. The number of traps used for catching crabs in Lasongko Bay from 2006 to 2014 increased by approximately 600%. Management efforts in Lasongko Bay should focus on reducing the number of traps and the overall fishing intensity during peak spawning season, and on harvesting only crabs with carapaces > 105.11 mm CW.

Conclusions. The population size structure of male and female crabs in Lasongko Bay varied among catching periods, and consisted of one to two size groups dominated by adults. The growth of male crabs in these waters was faster than that of female crabs, while recruitment took place every month, with peaks in July and September. The exploitation rate of crabs in these waters amounts to overfishing, and the pressure on females is higher than that on males.

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