



Summary Stock Assessment of the Blue Swimming Crab (*Portunus pelagicus*) for Sustainable Management in 2016 - 2019



INTRODUCTION

Blue Swimming Crab (BSC) fishery has been playing as one of the commercial commodities until now. The blue swimming crab *Portunus pelagicus* (Linnaeus 1758) that locally called rajungan is an economically important commodity and is the the third rank of export of Indonesian fisheries after shrimps and tuna. Intensive crab fishing activities conducted since the 1990s in line with the increasing demand of international markets in the USA. USA as main country country exporter 90% of total export (Ministry of Marine Affairs and Fishery 2018).

Blue swimming crab are found along Indonesian waters. Sumiono (1997) and Sumiono et al. (2011) mentioned the main distribution of BSC in Indonesia occurred in the east coast of Sumatra, the north coast of Java and south Sulawesi, south and east Kalimantan. The Jakarta, Cirebon, Demak, Rembang and Madura have been the largest significant producers in north of Java.

Research of stock assessment of BSC has been carried out in 2014 onwards and were collected continuously as a cooperation network between Center for Fisheries Research and Development (Puslitbang Perikanan) and Indonesian Blue Swimming Crab Processing Association (APRI). Data collected for the status of the blue swimming crab (*Portunus pelagicus*) fishery was collected from important sites i.e. Madura, Gresik, Demak, Pati, Pemalang, Rembang, Cirebon, Jakarta in Java Sea (WPP 712) and in Kendari (WPP 713) in 2016 - 2019

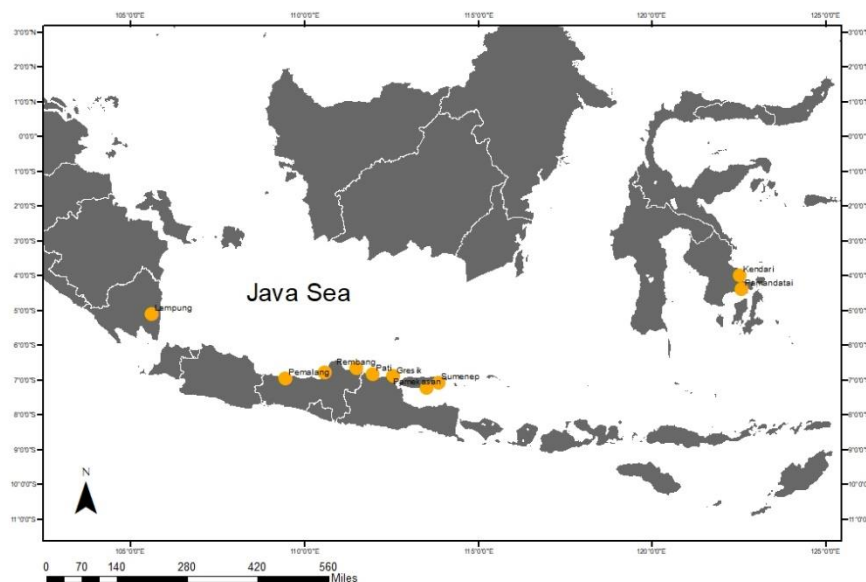


Figure 1. Sampling site for BSC research activities over period 2016 - 2019

METHODS

The enumerators have the duty to record landing report data, biological data collection, and Non Target Species (NTS).

Landing Report Data Collection, Including: fishing ground, landing report location, Fishing gear, Number of catch, and Arrest time.

Blue Swimming Crab Biological Data Collection, Including: Carapace Length (CL), Carapace Width (CW), Weight, Maturity Level, and Sex. Gonad maturity stages was determined using the scale of 3 level, immature, mature and berried females.

Meanwhile Non Target Species/Bycatch Data Collection, Including: Total Weight Retained and Total Weight Discards.

Data that has been collected will be analyzed to produce data namely Spawning Potential Ratio (SPR), LCCC (Length and Converted Catch Curve), Growth, Mortality Level, Size at first maturity level, size at first arrest, carapace width-weight relationship, Productivity and susceptibility analysis. These data will be used as a reference for conducting fisheries improvement programs.

RESULTS

KENDARI

The study in Kendari in 2016 until 2019 showed that the smallest size of BSC females caught were 20 mm and largest size was observed 248 mm. The smallest CW of BSC males found 31 mm and the largest size was 233 mm (Table 1).

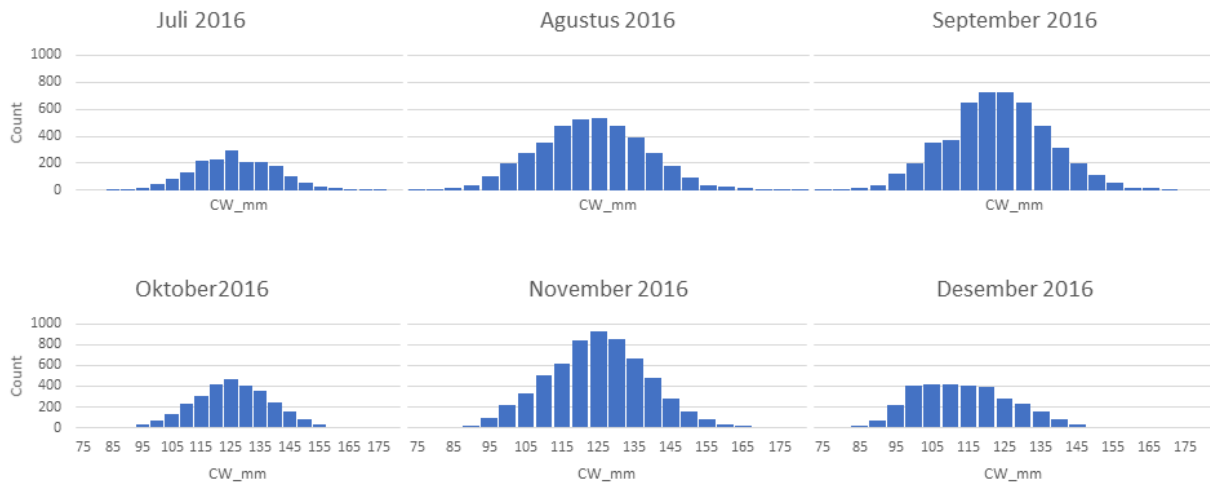
Table 1. Width Composition of male and female of BSC at Kendari (Southeast Sulawesi) in 2016 – 2019

Year	Female			Male				% MSL	% BF	
	n	min size	max size	average	n	min size	max size			average
2016, Jul - Dec	9683	46	239	119.96	10532	44	233	120.48	9.35	15.95
2017, Jan - Jun	9758	47	198	124.19	9141	41	196	119.77	15.42	16.87
2018, Jan - Dec	4299	20	176	88.49	3071	31	199	86.9	82.27	0.65
2019, Jan - Nov	5839	36	248	111.12	4343	31	209	95.41	63.19	4.86

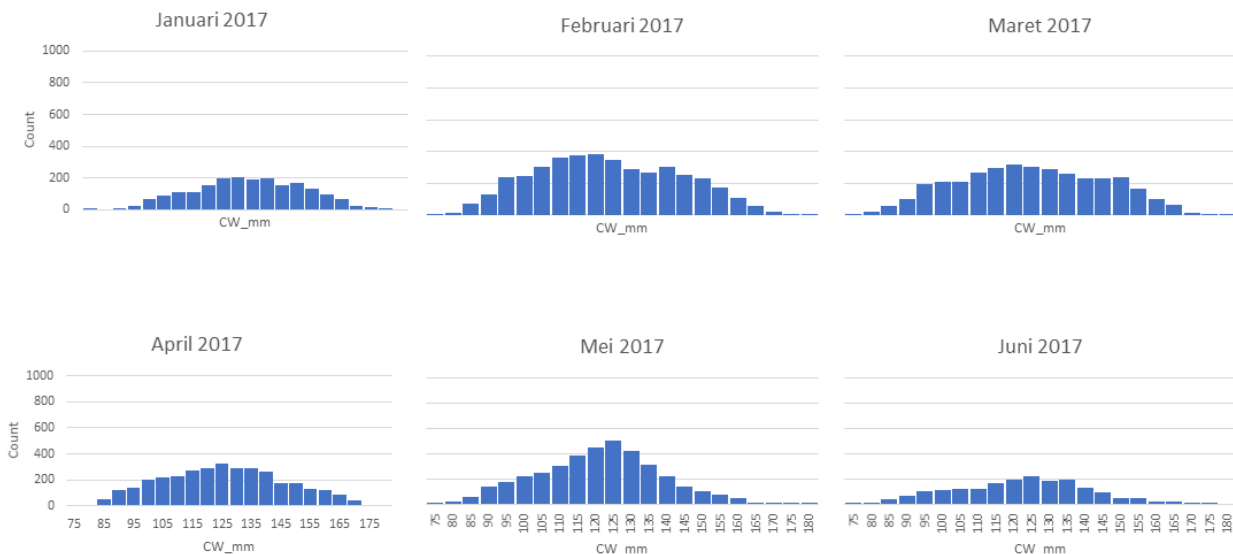
The MLS or under size crab (BSC <10cm in CW) from Kendari showed that only 2016 followed the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) found lowest in Kendari only 0.65 % (2018) and 4.86% (2019) of female crab.

Size Distribution

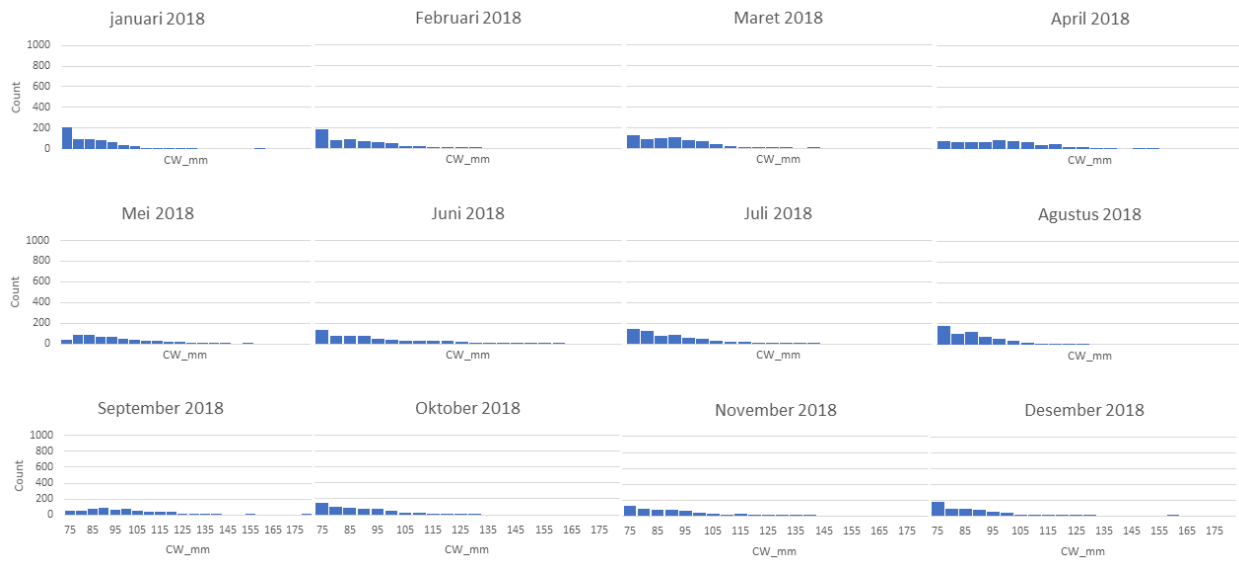
A



B



C



D

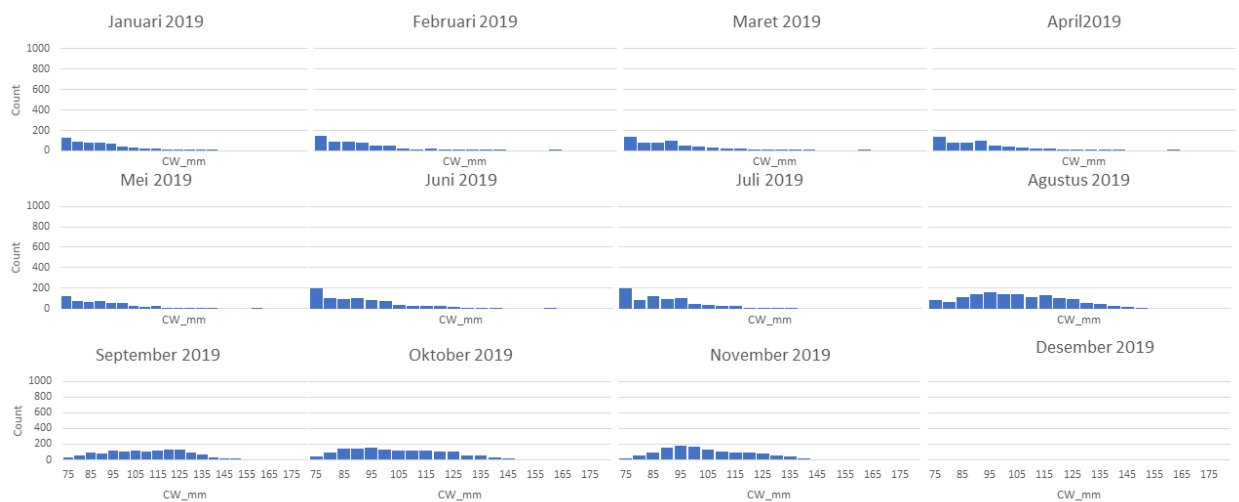


Figure 2. Monthly size frequency distribution for BSC in Kendari (A: 2016, B: 2017, C: 2018, D: 2019)

The results showed that in 2016 the Blue Swimming Crab were dominant caught ranged from 120 – 130 mm. However, in December many BSC caught on a smaller size that is 100 – 120 mm. Catches of Blue swimming crab increased in August to November (Figure 2A). In 2017, the BSC were dominant caught ranged from 115 – 130 mm and catches of BSC sedikit terjadi penurunan karena nelayan rajungan pada tahun 2017 semakin banyak menangkap rajungan dibawah 100 mm (Figure 2B). Meanwhile the size of the BSC caught in 2018 was smaller than the previous year, ranged from 75 – 85 mm (Figure 2C), tahun 2018 data size distribusi 2018 memperlihatkan semakin banyak nelayan yang menangkap rajungan dibawah 100 mm. data ini memperlihatkan adanya penurunan yang sangat besar terjadi pada stock penangkapan rajungan hal ini berlangsung sampai pertengahan tahun 2019. But in 2019 an increase in the size of the BSC in August to November (Figure 2D). Dapat dilihat dari grafik bahwa terjadi penurunan jumlah tangkapan pada 2018 dan 2019 dibanding tahun 2016 – 2017.

LAMPUNG

The study in Lampung showed that the smallest size of BSC females caught were 77 mm and largest size was observed 178 mm. The smallest CW of BSC males found 35 mm and the largest size was 230 mm.

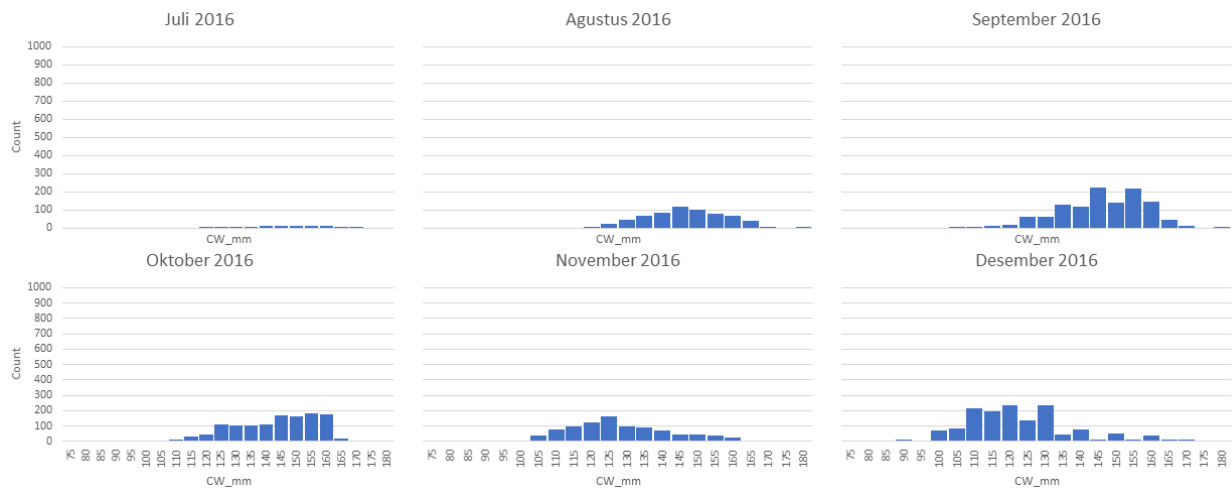
Table 2. Width Composition of male and female of BSC at Lampung in 2016 – 2017

Year	Female			Male			% MSL	% BF		
	n	min size	max size	average	n	min size			max size	average
2016, Jul - Dec	3117	80	178	138.06	2427	78	230	129.86	1.82	19.02
2017, Jan - Jun	5042	77	174	123.92	6142	35	180	123.42	4.33	11.34

The MLS or under size crab (BSC <10cm in CW) from Lampung showed that all time followed the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%.

Size Distribution

A



B

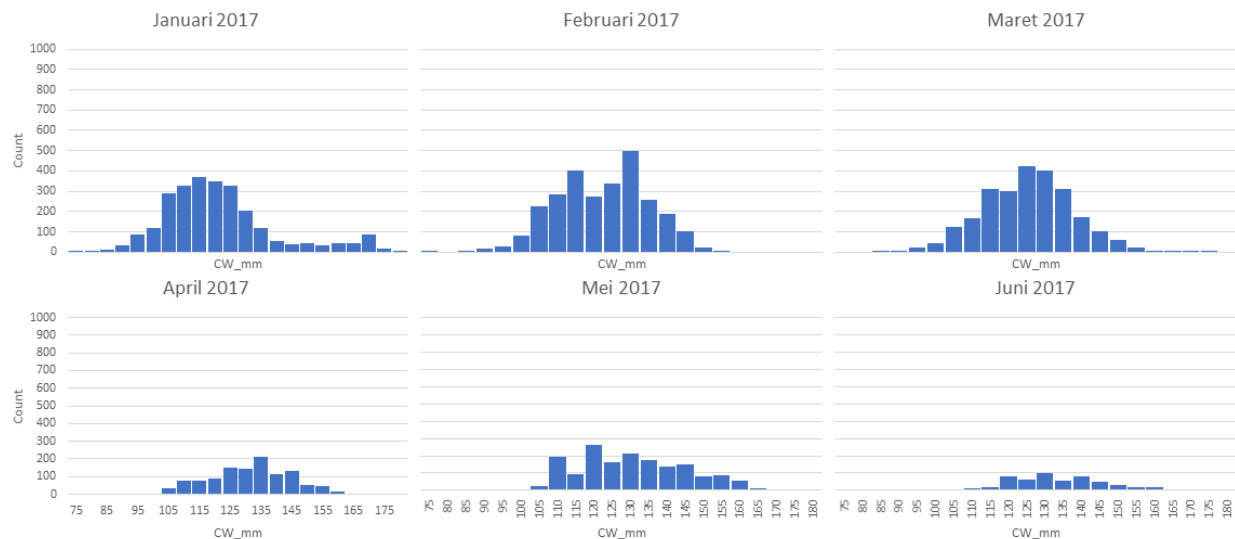


Figure 3. Monthly size frequency distribution for BSC in Lampung (A: 2016, B: 2017)

The results showed that in 2016 the Blue Swimming Crab were dominant caught ranged from 125-130 mm, pada Juli 2016 sangat sedikit dikarena enumerator baru saja mulai pengambilan data sehingga data tidak mencukupi dan pada tahun 2016 rajungan di Lampung terdiri dari rajungan besar itu bisa dilihat dari grafik yang terbentuk hamper tidak ada rajungan di bawah 100 mm yang tertangkap. (Figure 3A). In 2017, the BSC were dominant caught ranged from 100 – 130 mm and catches of BSC increased in January to March and a decreased in April to June (Figure 3B) walau terjadi penurunan terhadap ukuran rajungan dibandingkan pada tahun 2016 tetapi di tahun 2017 jumlah rajungan yang ditangkap semakin tinggi. Dapat dilihat dari grafik bahwa terjadi kenaikan jumlah tangkapan pada tahun 2017 dibanding tahun 2016.

MADURA

The study in Madura (Pamekasan and Sumenep) showed that the smallest size of BSC females caught were 60 mm and largest size was observed 198 mm. The smallest CW of BSC males found 61 mm and the largest size was 197 mm.

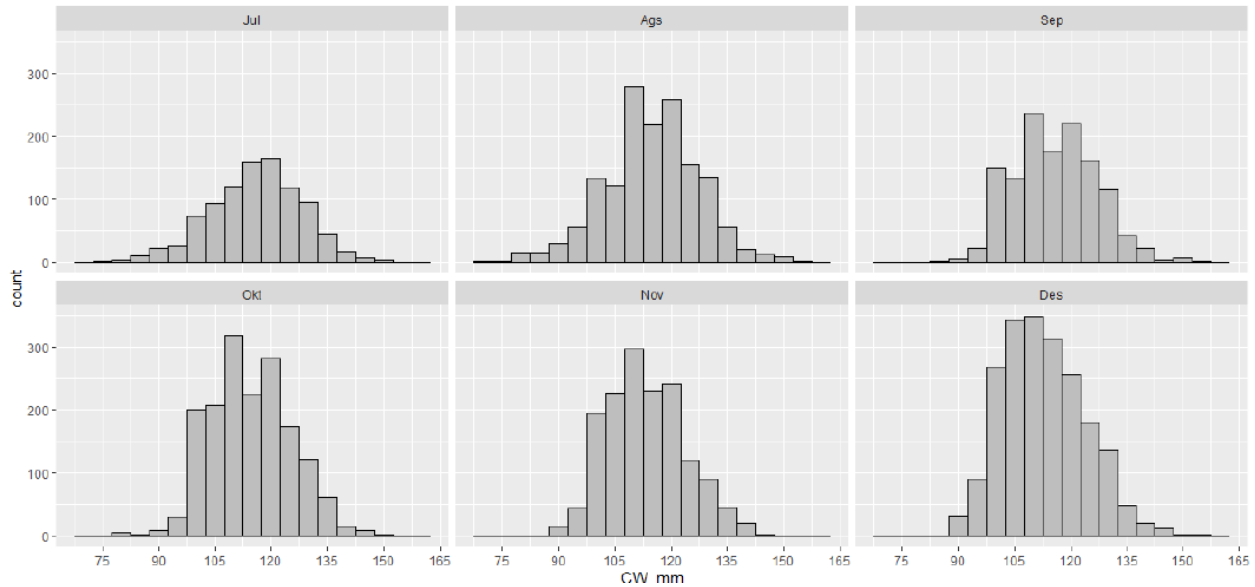
Table 3. Width Composition of male and female of BSC at Madura (East Java) in 2016 – 2019

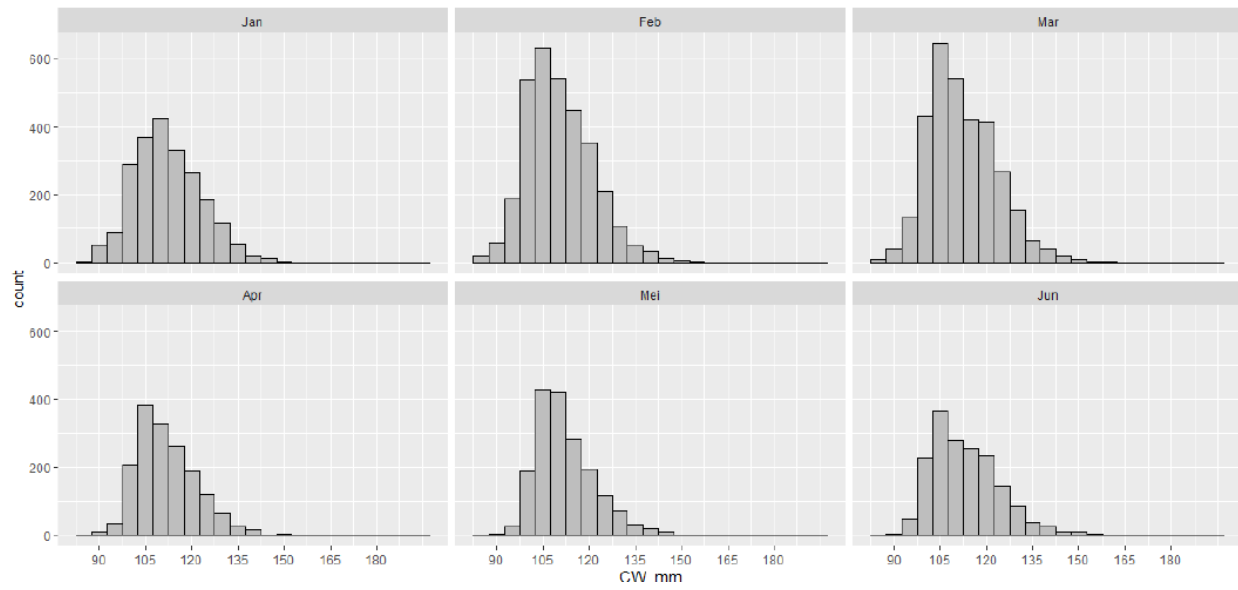
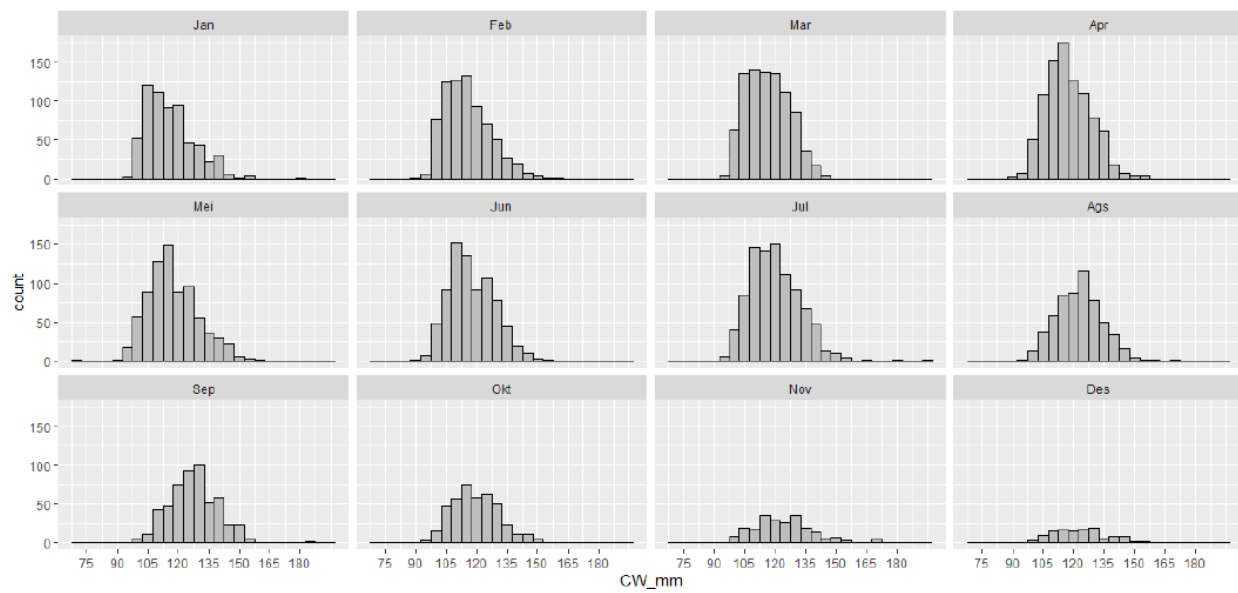
Year	Female			Male			% MSL	% BF		
	n	min size	max size	average	n	min size			max size	average
2014, Jan - Dec	2156	77.2	143.8	114.90	2360	75.6	148	116.00		
2016, Jul - Dec	4536	72	159	115.35	4476	77	155	113.06	11.22	5.16
2017, Jan - Jun	6699	85	161	111.81	7154	86	197	111.61	12.37	4.94
2018, Jan - Dec	3942	72	197.1	119.30	3582	72.4	187.4	118.31	2.79	4.72
2019, Jan - Nov	8031	60	198	121.18	4698	61	180	119.03	4.62	12.38

The MLS or under size crab (BSC <10cm in CW) from Madura showed that only 2018 and 2019 followed the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) in Madura showed the low value for all time.

Size Distribution

A



B**C**

D

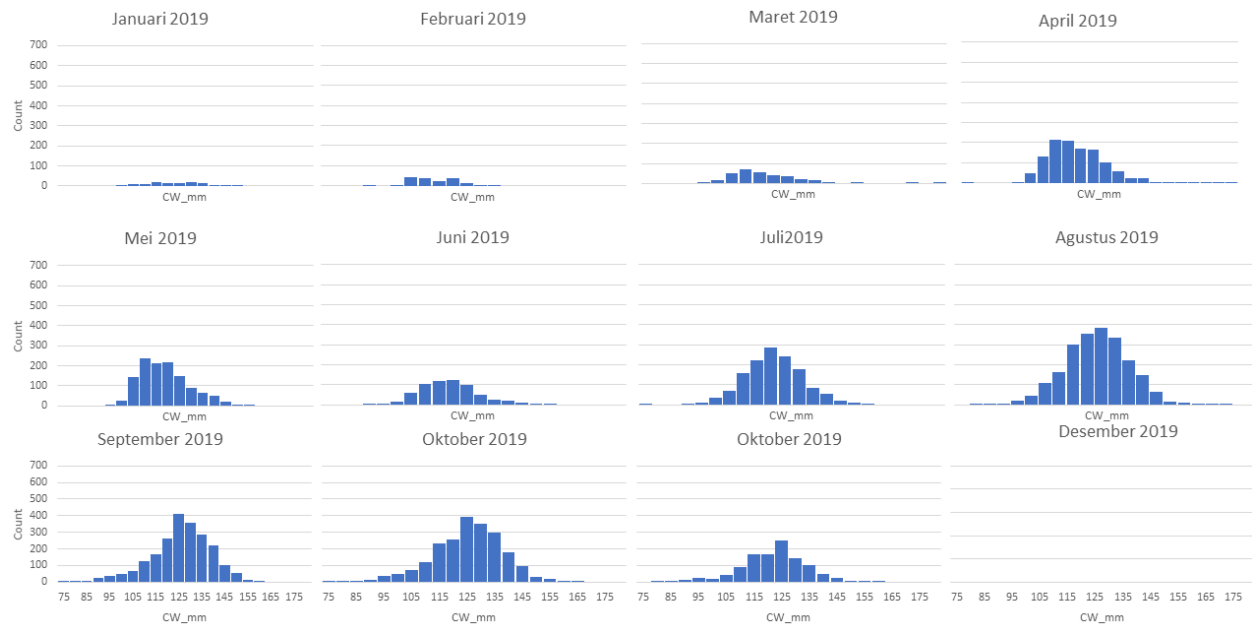


Figure 4. Monthly size frequency distribution for BSC in Madura (A: 2016, B: 2017, C: 2018, D: 2019)

The results showed that in 2016 the Blue Swimming Crab were dominant caught ranged from 110 – 125 mm. Catches of Blue swimming crab increased in August to December, and a decreased in July (Figure 4A). In 2017 the BSC were dominant caught ranged from 100 – 115 mm, and catches of BSC increased in February to March (Figure 4B). In 2018 the BSC were dominant caught ranged from 100 – 120 mm in January to July, and CW gets larger in October to December ranged from 120 – 130 cm (figure 4C). Meanwhile the size of the BSC caught in 2019 ranged from 105 - 120 mm and CW gets larger in August to October ranged from 120 – 135 cm (Figure 4D). Dapat dilihat dari grafik bahwa jumlah tangkapan banyak didapat pada tahun 2017 dan menurun pada tahun 2018.

DEMAK

The study in Madura (Pamekasan and Sumenep) showed that the smallest size of BSC females caught were 40.4 mm and largest size was observed 195 mm. The smallest CW of BSC males found 44 mm and the largest size was 226 mm.

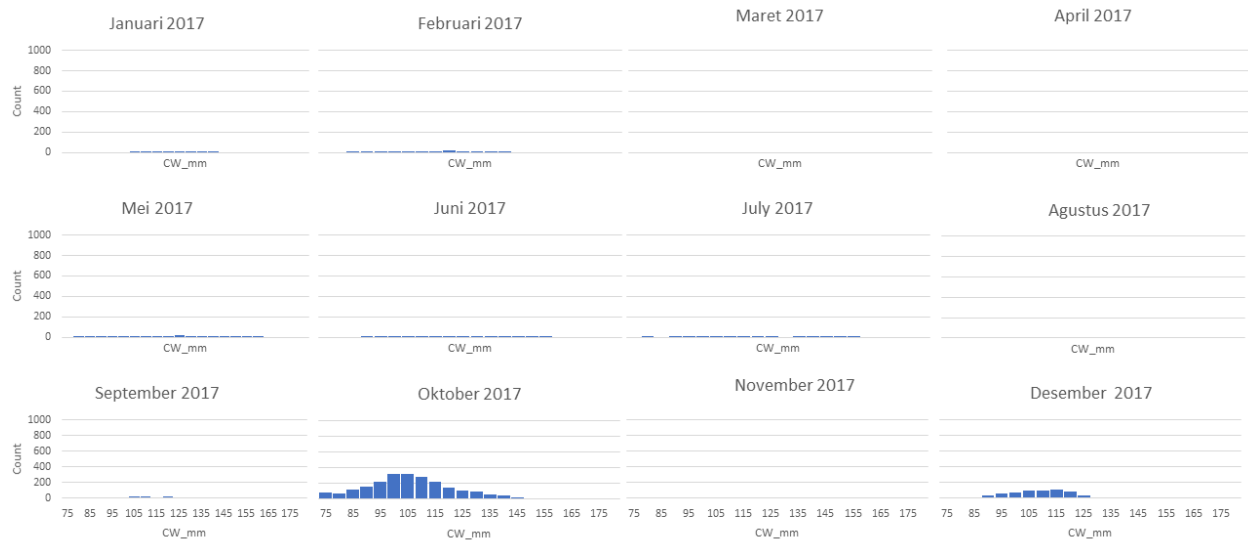
Table 4. Width Composition of male and female of BSC at Demak (Central Java) in 2017– 2019

Year	Female				Male				% MSL	% BF
	n	min size	max size	average	n	min size	max size	average		
2014, Jan - Dec	1433	40.4	166.1	112.60	1536	58.8	168.4	110.40		
2017, Jan - Jun	2805	54	195	107.24	2671	45	226	106.30	33.16	16.22
2018, Jan - Nov	11360	51	195	110.00	8920	44	177	106.32	51.62	18.39
2019, Jan - Nov										

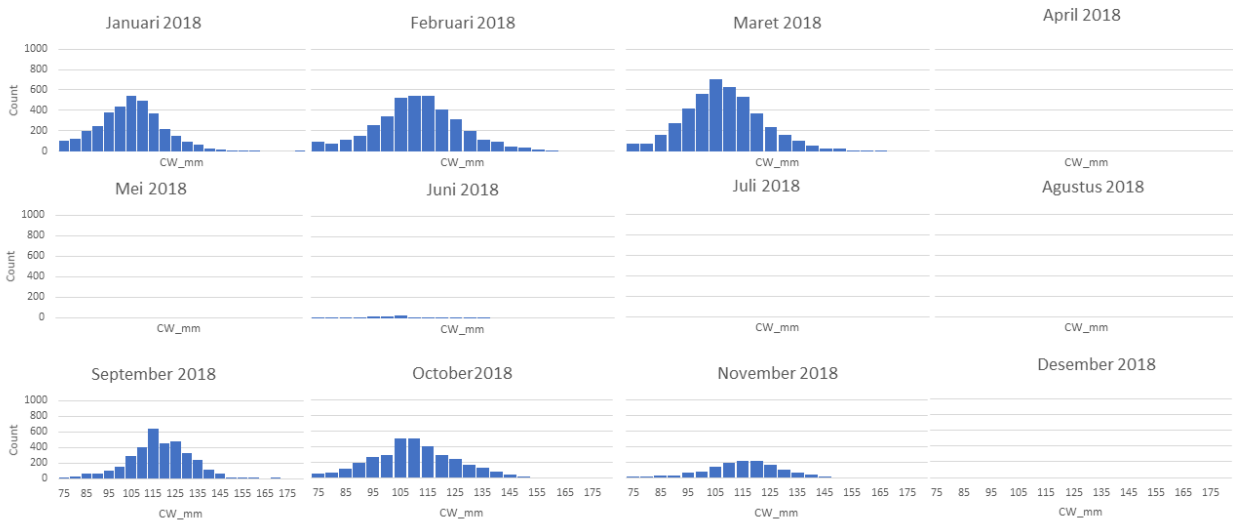
The MLS or under size crab (BSC <10cm in CW) from Demak showed that all time higher than the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) in Demak showed the high value for all time.

Size Distribution

A



B



C

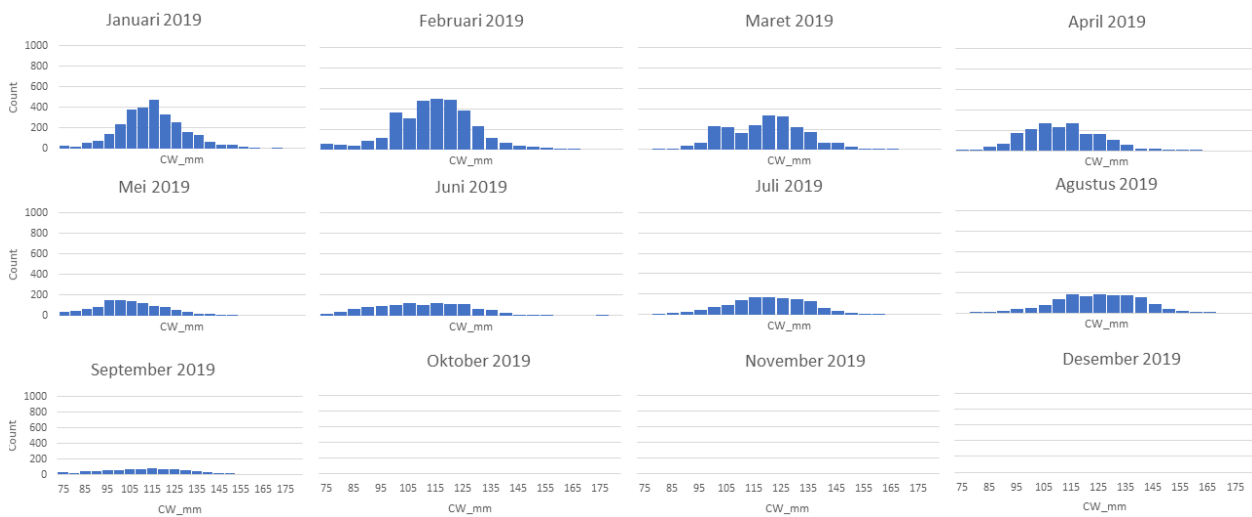


Figure 5. Monthly size frequency distribution for BSC in Demak (A: 2017, B: 2018, C: 2019)

The results showed that in 2017 jumlah tangkapan rajungan sangat kecil, tangkapan rajungan tinggi terdapat di bulan Oktober dan Desember dengan CW berkisar antara 100 – 110 mm (figure 5A). In 2018 the BSC were dominant caught ranged from 100 – 115 mm, and catches of BSC increased in January to March. Catches of Blue swimming crab increased in January to March, and a decreased in April to August (Figure 5B). In 2019 the BSC were dominant caught ranged from Mm. Catches of Blue swimming crab increased in January to April, and a decreased in May to December (figure 5C). Dapat dilihat dari grafik bahwa jumlah tangkapan terendah terjadi pada tahun 2017, dan mengalami peningkatan pada tahun 2018 dan 2019 dengan jumlah tangkapan yang besar di awal tahun dan menurun di akhir tahun.

PEMALANG

The study in Pemalang showed that the smallest size of BSC females caught were 56 mm and largest size was observed 243.5 mm. The smallest CW of BSC males found 40.8 mm and the largest size was 185.2 mm.

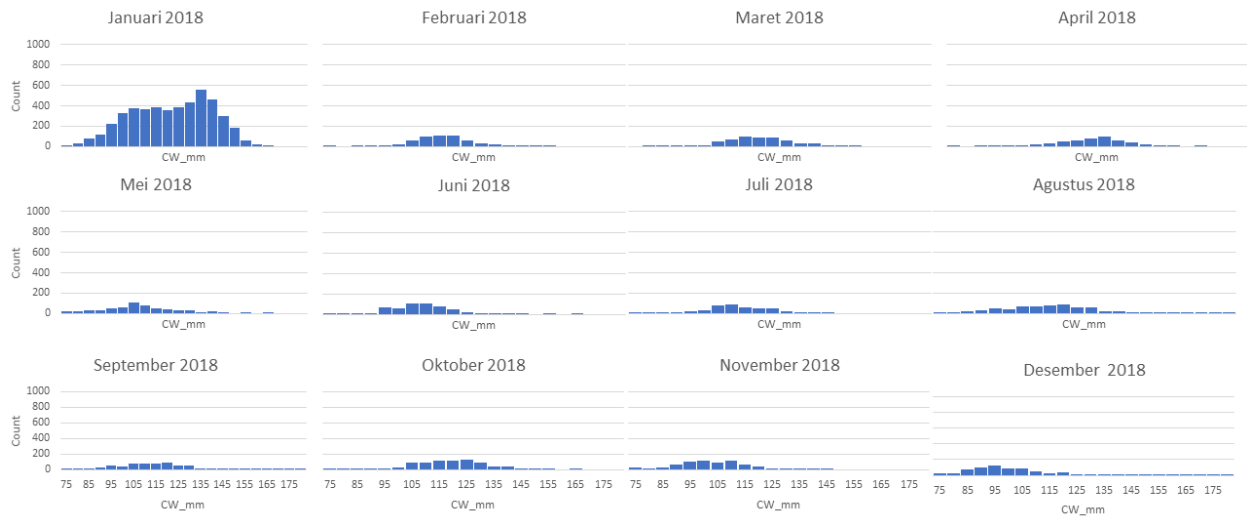
Table 5. Width Composition of male and female of BSC at Pemalang (Central Java) in 2018– 2019

Year	Female				Male				% MSL	% BF
	n	min size	max size	average	n	min size	max size	average		
2018, Jan - Dec	3430	56	243.5	110.04	3742	40.8	185.2	108.22	26.93	0.03
2019, Jan, Aug- Nov	3126	67	164	124.73	1167	66	163	112.45	15.30	18.17

The MLS or under size crab (BSC <10cm in CW) from Pemalang showed that all time higher than the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) found lowest in Pemalang only 0.03% in 2018 of female crab.

Size Distribution

A



B

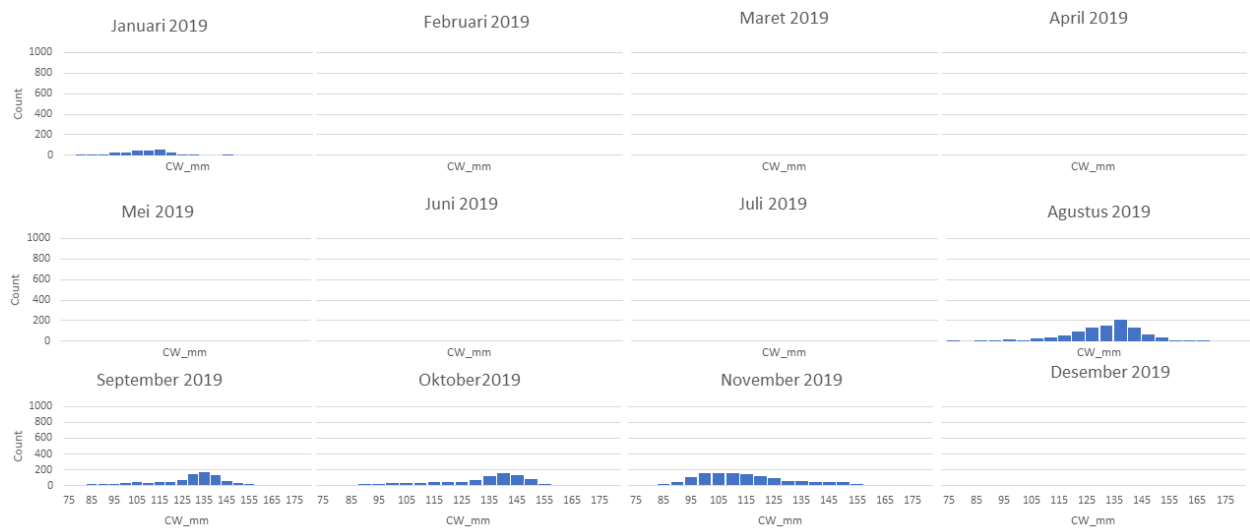


Figure 6. Monthly size frequency distribution for BSC in Pemalang (A: 2018, B: 2019)

The results showed that in 2018 the number of crab catches is very small, **tangkapan rajungan tinggi terdapat di bulan Januari dengan CW berkisar antara 100 – 135 mm**. Catches of Blue swimming crab a decreased in February to December (Figure 6A). Tahun 2019 **dari bulan Februari-Juli tidak ada pengambilan data dan memulai lagi pengambilan data dari bulan Agustus, jumlah tangkapan rajungan pada bulan August to November dengan CW berkisar antara 130 – 140 mm** (Figure 6B). Dapat dilihat dari grafik bahwa tangkapan rajungan di daerah Pemalang rendah dibandingkan dengan daerah lain.

REMBANG

The study in Rembang showed that the smallest size of BSC females caught were 71 mm and largest size was observed 181 mm. The smallest CW of BSC males found 68 mm and the largest size was 174 mm.

Table 6. Width Composition of male and female of BSC at Rembang (Central Java) in 2016 and 2019

Year	Female			Male			% MSL	% BF	
	n	min size	max size	average	n	min size			max size
2014, Jan - Dec	1995	75.4	165.6	116.40	1679	70.4	159.20	115.30	
2016, May - Nov	1095	80.67	163.7	125.61	1204	80.81	164.31	121.66	
2019, Jan - Nov	2492	71	181.0	124.17	1929	68	174.00	122.09	5.77 13.83

The MLS or under size crab (BSC <10cm in CW) from Rembang showed that **all time higher than the** Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) found lowest in Rembang **only 0.03% in 2018 of female crab.**

Size Distribution

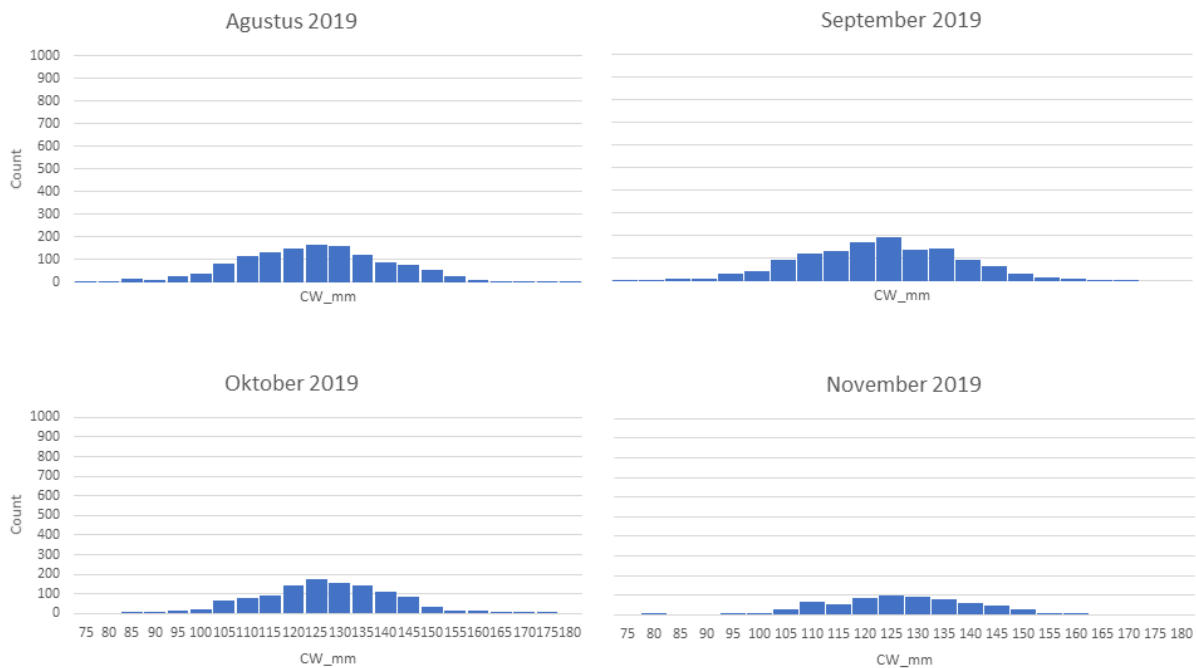


Figure 7. Monthly size frequency distribution for BSC in Rembang 2019

The results showed that in 2019 the Blue Swimming Crab were caught ranged from 115 – 135 mm. Catches of Blue swimming crab increased in August to September, and a decreased in November **itu bisa disebabkan karena angin musim timur yang terjadi pada wilayah Rembang**(Figure 7A)

PATI

The study in Pati showed that the smallest size of BSC females caught were 50 mm and largest size was observed 171 mm. The smallest CW of BSC males found 70 mm and the largest size was 160 mm.

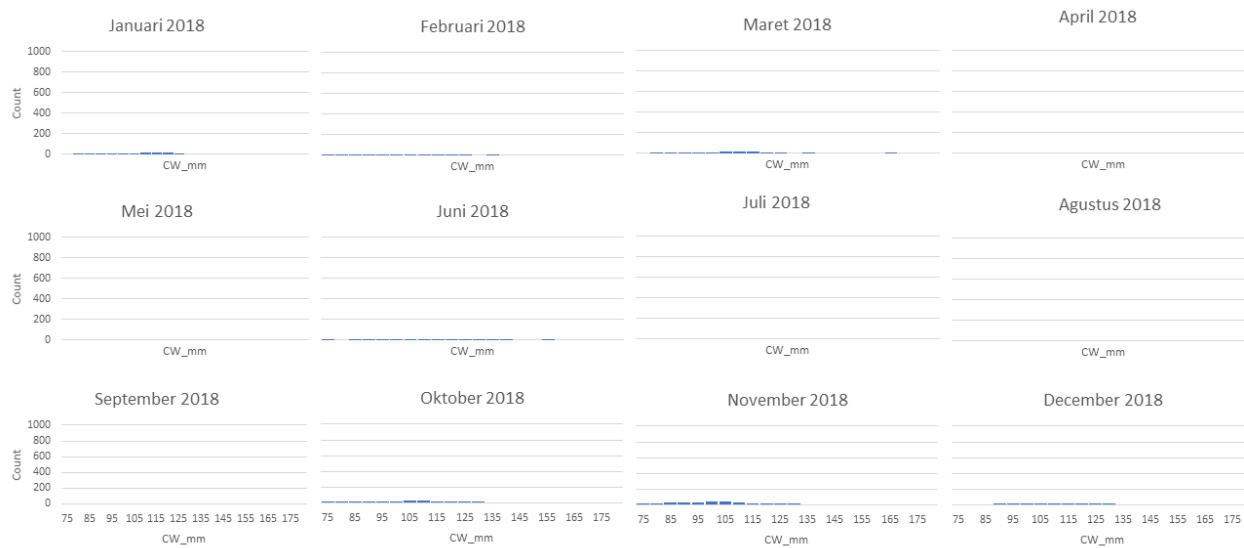
Year	Female				Male				% MSL	% BF
	n	min size	max size	average	n	min size	max size	average		
2018, Jan - Dec	408	50	160.4	101.94	399	70	140	106.47	37.55	6.37
2019, Jan - Nov	3167	75	171	115.46	2977	74	160	113.51	14.66	13.83

Table 7. Width Composition of male and female of BSC at Pati (Central Java) in 2018– 2019

The MLS or under size crab (BSC <10cm in CW) from Pati showed that all time higher than the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) found lowest in Pati 6.37% in 2018 of female crab.

Size Distribution

A



B

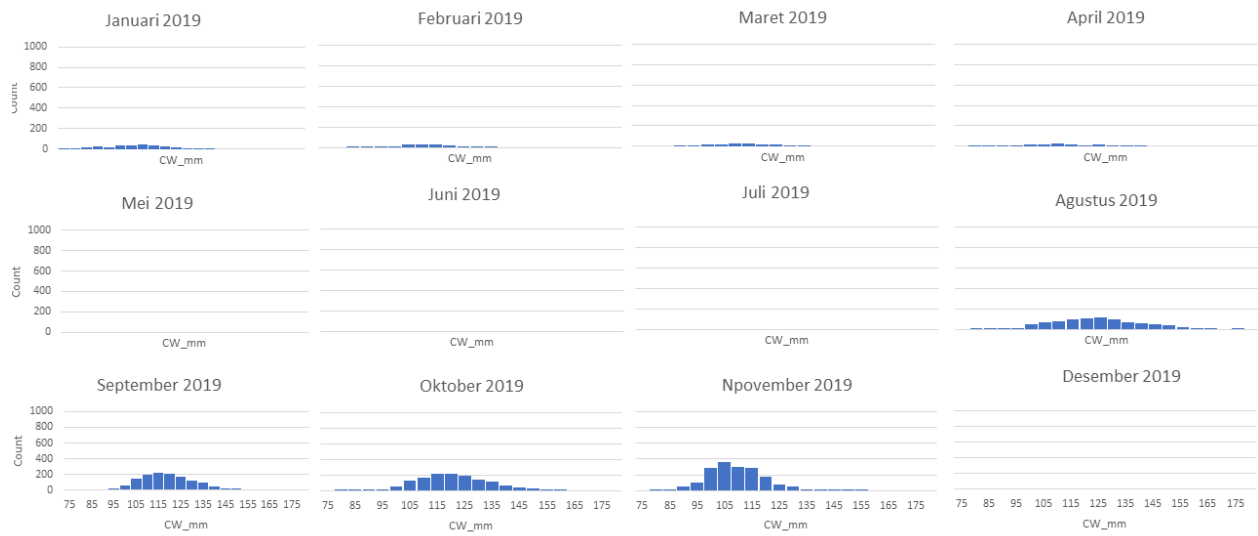


Figure 8. Monthly size frequency distribution for BSC in Pati (A:2018, B: 2019)

The results showed that in 2018 the number of crab catches is very small, **gatau harus bahas apa dan gimana** (Figure 8A). Begitu juga dengan tahun 2019, **jumlah tangkapan rajungan tinggi hanya terdapat pada bulan September to November dengan CW berkisar antara 105 – 125 mm** (Figure 8B). Dapat dilihat dari grafik bahwa tangkapan rajungan di daerah Pati sangat rendah dibandingkan dengan daerah lain.

GRESIK

The study in Gresik showed that the smallest size of BSC females caught were 87 mm and largest size was observed 160 mm. The smallest CW of BSC males found 83 mm and the largest size was 167.1 mm.

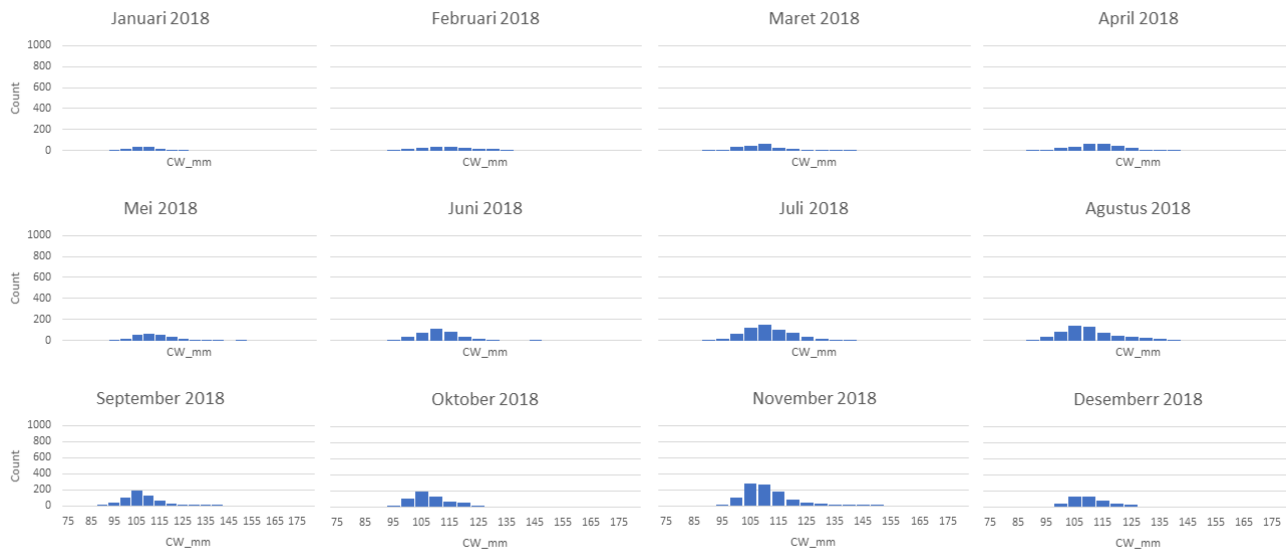
Table 8. Width Composition of male and female of BSC at Gresik (East Java) in 2018– 2019

Year	Female				Male				% MSL	% BF
	n	min size	max size	average	n	min size	max size	average		
2018, Jan - Dec	1057	88	148	110	4243	86	148	107.73	15.17	16.46
2019, Jan - Nov	1723	87	160	118.12	6379	83	167.1	109.88	17.40	27.92

The MLS or under size crab (BSC <10cm in CW) from Gresik showed that all time higher than the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) in Gresik showed the high value for all time.

Size Distribution

A



B

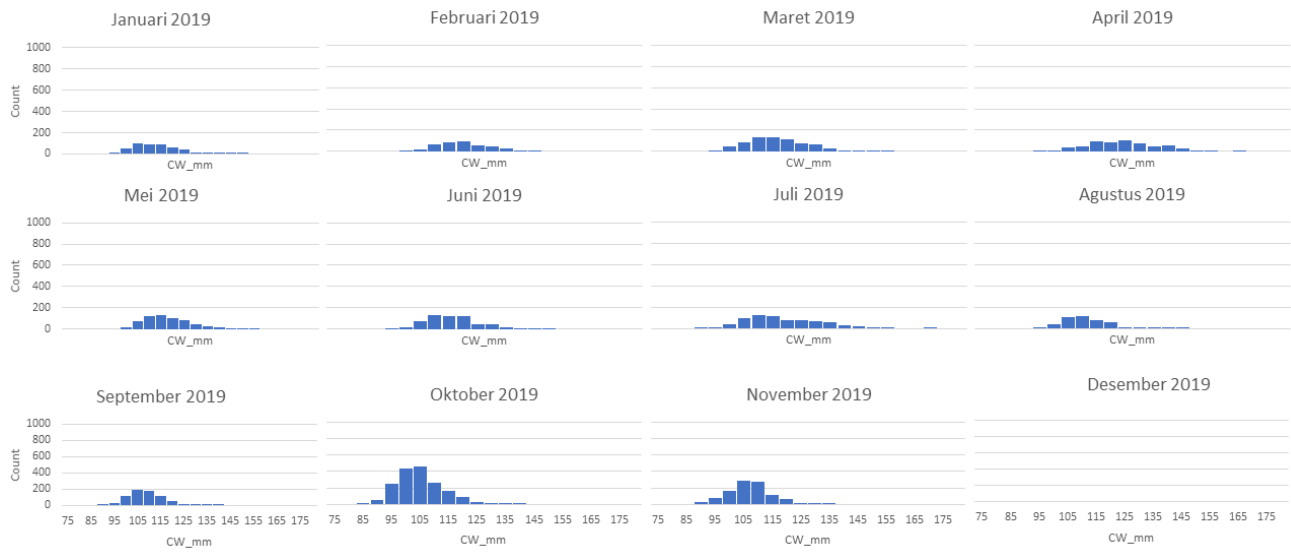


Figure 9. Monthly size frequency distribution for BSC in Gresik (A: 2018, B: 2019)

The results showed that in 2018 the Blue Swimming Crab were dominant caught ranged from 100 – 115 mm. Catches of Blue swimming crab increased in July to November, and a decreased in January to June (Figure 9A). In 2019, the BSC were dominant caught ranged from 100 – 110 mm and catches of BSC increased in September to November and a decreased in January to August (Figure 9B). **Dapat dilihat dari grafik bahwa terjadi kenaikan jumlah tangkapan pada tahun 2019 dibanding tahun 2018**

TELUK TIWORO

The study in Teluk Tiworo, Southeast Sulawesi showed that the smallest size of BSC females caught were 8.8 mm and largest size was observed 220 mm. The smallest CW of BSC males found 46 mm and the largest size was 230 mm.

Table 9. Width Composition of male and female of BSC at Teluk Tiworo (Southeast Sulawesi) in 2018–

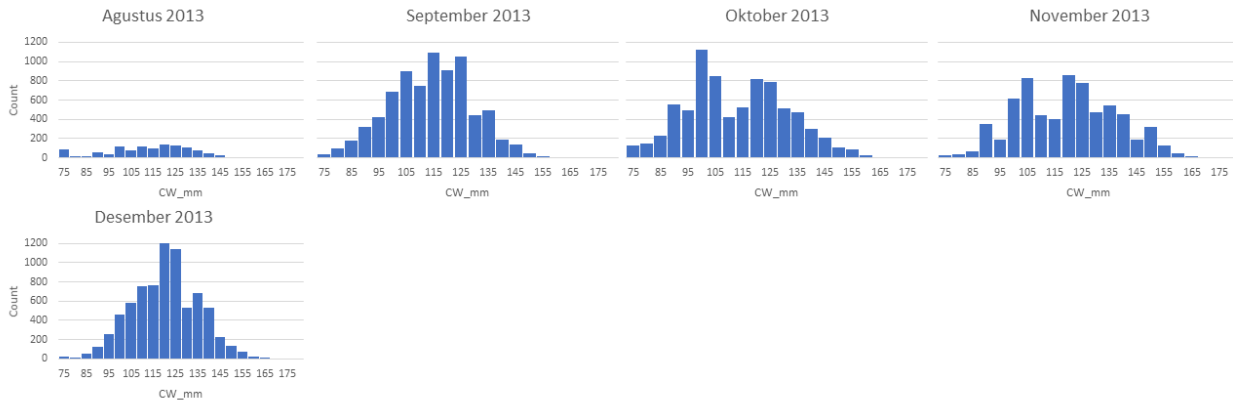
Year	Female			Male			% MSL	% BF		
	n	min size	max size	average	n	min size			max size	average
2013, Aug - Dec	28520	8.8	220	110.36	21035	46	214	117.64	11.79	26.41
2014, Jan - Dec	77581			111.76	33313	72	230	119.98	18.60	25.32
2015, Januari	2931	87	166	114.55	1842	92	177	113.16	15.06	7.88

2019

The MLS or under size crab (BSC <10cm in CW) from Teluk Tiworo showed that all time higher than the Ministry Decree of KKP No. 2 tahun 2015 for harvesting crab higher than 10cm in CW for less than 10%. Berried female (BF) found lowest in Teluk Tiworo 7.88% in 2015 of female crab.

Size Distribution

A



B

