

Original scientific paper

UDC 595.3 : 639.28 (262)

**CRAB FISHERY OF THE EGYPTIAN WATERS
WITH NOTES ON THE BIONOMICS OF
PORTUNUS PELAGICUS (L.)**

RIBOLOV RAKOVA U VODAMA EGIPTA SA ZABILJEŠKAMA
O BIONOMIJI VRSTE *PORTUNUS PELAGICUS* (L.)

Fatma Aly Abdel Razeq

National Institute of Oceanography and Fisheries

Kayed Bay, Alexandria, Egypt

The marine shellfish production in Egypt from shrimps and crabs had been subjected to a sharp decline from about 20.8% of the total marine fish production (19.3% shrimps & 1.5% crabs) in the period 1962—1971 to 14.7% (10.1% shrimps & 4.6% crabs) from 1972 to 1983. The swimming red crab *Portunus pelagicus* (L) is considered to be dominant species in the catch collected from Abu-Kir and Maadia fishing centers.

The blue crab *Callinectes sapidus* (R.) appears only during the period from July-August each year. Another six small sized species were observed in the catch in very small amounts. By tracing, the increase of the carapace width distribution in the commercial catch for *P. Pelagicus* (L.) during one year, the average rate of growth was found to be 11.68 mm per month. It seems that the commercial catch of this species is dominated by one year class. Females of this species of all sizes are dominant all the year except in autumn when the males were abundant. The increase in weight of this species was found to be at a rate equal to or slightly less than the cube of its carapace width for both sexes.

INTRODUCTION

The shellfish industry has started to be of importance in the economy of Egypt within the last decade. Prawns & crabs used to constitute the main part in the shellfish production from the Mediterranean sea. However, a decline in their production has been observed, starting from the early 60's. This can be attributed to land reclamation in the northern delta lakes, and the decrease in the effect of the Nile flood after the construction of the High Dam. The

increase in the number of the motor trawlers working all the year round on the fishing grounds resulted into overexploitation of these areas.

During the period between 1962 & 1971 the average landing of the commercial marine crustaceans, was found to represent 20.8% of the total marine fish production (about 19.3% prawns & 1.5% crabs). This average decreased to 14.7% (10.1% prawns & 4.6% crabs) during the period between 1972 & 1983. A decline in crabs landed from brackish water in the delta lakes (mainly Manzalah and Edku) took place in the period 1966 & 1979 with a sharp decline by the end of that period (Table 1).

The reason for a decline might be due to the control measures taken by the fishery authorities (Banoub, 1963) on this species due to drastic effects, that was produced as a result of its abundance in the early sixties.

Ramadan & Dowidar (1972) suggested that this decline might be a result of the construction of High Dam, which produced some changes in the environment of Delta lakes.

Shellfish fisheries in Alexandria waters attracted by attention of various authors. Among these, I mention Balss (1936) who made an investigation on the crustacean decapod. Banoub (1963) made a survey of the crab *C. sapidus* in lake Edku, while Ramadan & Dowidar (1972) made an extensive survey on the Egyptian Mediterranean waters.

Crab fisheries, however, did not receive much attention in spite of its increasing importance in the landed catch. This makes it of interest to study the status of shellfish industry in Egyptian waters.

MATERIALS AND METHODS

Crabs were collected twice a week regularly from different areas east of Alexandria. These areas are as shown in the chart of the investigated area.

Area 1. Maadia and Abu-Kir fishing centers, east of Alexandria. Here, the product is obtained by trawlers working in close deep waters (maximum depth

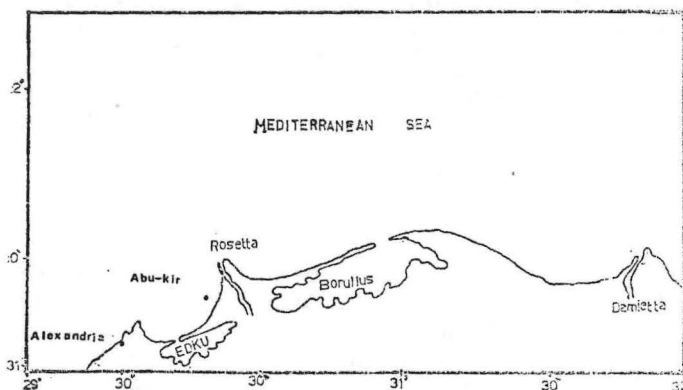


Chart of the study area

is 50 m). Samples of about seven kg each were taken at random from the landed catch.

Area 2. Samples from the lake proper during the period 1975—1979 were also collected from professional fishermen. Each sample was sorted according to species. Numbers and weights of individuals for each species were recorded.

Area 3. Some samples were collected from lake Borolluse during autumn 1977.

Beside these areas of sampling experimental fishing using a trawler with hired professional fishermen were operated at the sea lake connection together with some observations taken during 1984—1985.

For each individual the following measurements were taken:

- Carapace width, which is the length between the two lateral spines of the carapace to the nearest mm.
- Total body weight to the nearest 0.1 g.
- Sex-ratio.

RESULTS

Species composition and succession

The important Brachyuran crab species of the fishery catch at studied centers belonged to four families, namely family Portunidae which was represented by five species, *Callinectes sapidus* (Rathbun 1896), *Carninus maenas* (L.), *Macropipus vernalis* (Risso, 1816), *Portunus pelagicus* (Linnaeus, 1758), and *Talamita* sp.; family Xanthidae, which was represented by *Eriphia verrucosa* (Forsk., 1775); family Leucosiidae, represented by *Myra fugax* (Fabricius, 1798); and family Majidae by presence of *Maja glotziana*.

Their local distribution and geographical origin were studied by Ramadan and Dowidar (1972).

The crab fishery Abu-Kir, Maadia areas and other Egyptian fishery centers starts in September—October. Fig. 1, shows the relative magnitude of the fishery of each crab species obtained from the inshore collection (Area 2) and their succession during the whole period of study. *Portunus pelagicus* (L) started to dominate in the catch in September 1977 and continued to exist in large quantities till June 1978. Meanwhile June—July and August 1978 are considered to be the peak months of occurrence for *C. sapidus* (R) which then disappeared, while *Portunus pelagicus* (L) continued to exist.

The dominance of *P. pelagicus* all the year round in the crab catch during entire period of sampling is of great interest since it is considered to be of economic value and is commercially exploited together with *C. sapidus*. Collected samples for lake Borolluse show the same trend of abundance of *C. sapidus*, observed in lake Edku.

Banoub (1963) in his study about the fisheries of *C. sapidus* stated that this was limited to the period April to November. According to this author *C. sapidus* occurred in very small amount in the catch during the rest of the year due to its hibernation habit.

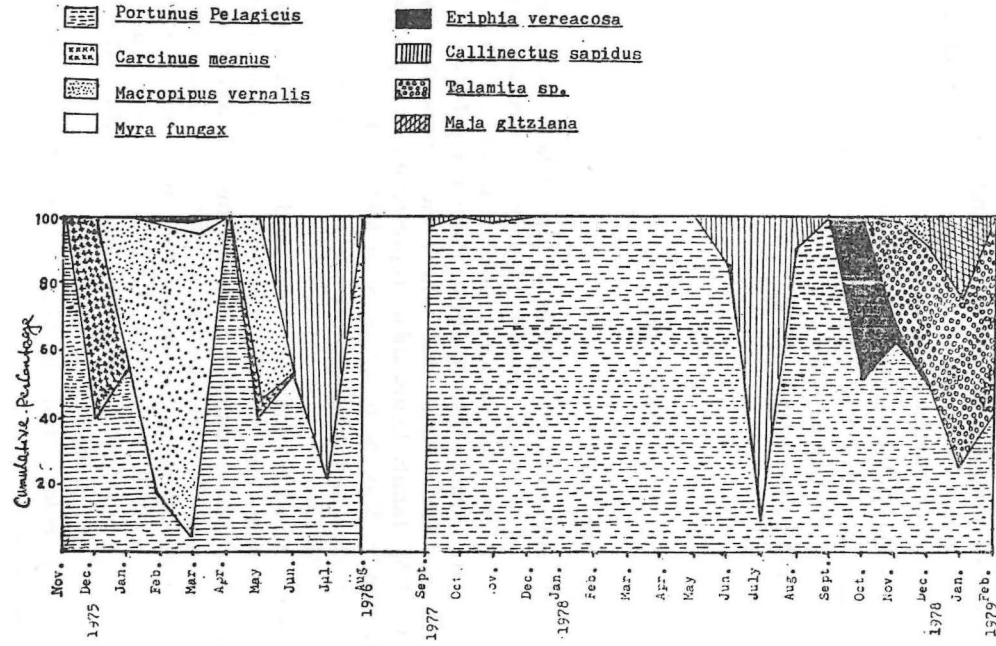


Fig. 1. Abundance and succession of different species of crabs in the commercial catches at Abu-Kir and Maadia centers in 1975—76, 1977—80 to 1978—1979

On the other hand, the small brachyuran crab species were recorded during the present study occasionally, and there was no regularities for their occurrence. This needs further study to give the reasons. This phenomenon is well illustrated in case of *Macropipus vernalis* as is shown in Fig. 1.

It appeared in the catch in January—March 1975 after which it disappeared and occurred again in May. In November and December 1979 it was of low abundance. *Carcinus maenas* formed a minor portion of catch of this area, *Myra fungax* appeared in February—March 1976 only.

During the period from November 1978 until next February *Talamita* sp. formed a considerable part of the catch, while *Eriphia verucosa* was poorly recorded during February—March, 1976 and October—November, 1978.

Samples collected from area 1, Maadia and Abu-Kir, showed nearly the same picture, *P. pelagicus* constitutes by far major component of the catch. *C. sapidus* showed also with a poor amount during its migration to the sea for spawning. The smaller crab species appeared frequently in the catch. This may be due to the selectivity of the trawl used in fishing operations, hence, these crab species cannot be considered as an important part of the marine catch.

The general picture of species distribution in the area of study (Fig. 1), shows that *P. pelagicus* (L) can be considered the main species constituting crabs fishery in Alexandria waters.

The occurrence of *C. sapidus* in the catch during certain months (June, July—August) is due to the drastic decline in its lake fishery (Table 1).

Table 1. Crab yield (in tons) in comparison with that of prawns and the total catch from the south eastern part of the Mediterranean sea in the period 1962—1983. (Fishery statistics of Alexandria Institute of Oceanography and Fish.)

Year	Sea Fisheries			Lakes Fisheries			
	Total catch (tons)	Prawn catch Tons	%	Crab catch Tons	%	Crab catch in tons	
						Edku	Manzalah
1962	37832	7237	19.4	93	0.25	5.0	45
1963	32909	8547	27.0	267	0.81	59	17
1964	25975	3184	14.8	670	2.6	262	215
1965	24686	4990	22.0	453	1.8	261	146
1966	15046	3733	26.1	200	1.3	171	165
1967	12213	2882	24.6	123	1.0	36	448
1968	13586	3135	25.0	245	1.8	2.0	34
1969	8521	1128	14.0	72	0.82	0.4	16
1970	8119	833	12.0	124	1.5	—	7
1971	10540	967	10.6	149	1.4	0.1	8
1972	10301	983	11.6	214	2.0	—	0.5
1973	6695	653	10.9	74	1.1	—	0.4
1974	6849	784	14.7	224	3.3	—	0.1
1975	5407	749	16.1	119	2.2	—	4.0
1976	7142	1064	22.5	541	7.6	—	7.0
1977	7325	771	12.6	151	2.1	—	1.0
1978	11765	962	9.3	136	1.2	—	0.5
1979	19937	1630	13.4	1040	5.2	—	—
1980	17466	1901	16.6	1001	5.7	—	5.0
1981	17789	1255	10.0	529	3.0	—	—
1982	11208	1121	18.1	911	8.1	—	27
1983	11254	1263	11.2	1079	9.6	4.1	73.5

However, it should be noted that there was no segregation between the blue crab *C. sapidus* (R) and the swimming crab *P. pelagicus* (L.) in the official statistical data of the catch, during early sixties.

Banoub (1963) considered that the blue crab constituted the main crab catch from different delta lakes, *P. pelagicus* does not enter the lakes, since it is strictly marine.

He also showed that *C. sapidus* migrates in its early life stages to the estuaries and brackish waters for a certain time to feed. After that it returns to the sea when it reaches sexual maturity.

Size distribution and growth of Portunus pelagicus (L)

Fishing season of the swimming crab *Portunus pelagicus* (L) in areas of study started usually from September and extended to the end of winter (February—March). This period coincided with the appearance of a new brood. The monthly size distribution during the period between September 1977 until August 1978 was recorded and illustrated in Fig. 2. It is obvious that in September, three length groups dominated the sample with range of carapace width from 40 mm to 150 mm. During this month these modal lengths are represented by the peak 45—55 mm (a), 65—85 mm (b) and more than 100 mm (c).

In the following months, the mode (a) shifted to the right (with a larger carapace width) and reached 95—105 mm in December. The peak (b) moved from 65—85 mm in September to 115—125 mm in December of the same year. It is expected that the individuals of the groups (a) and (b) may belong to the brood of the same year as the breeding season of the species was found to extend throughout the year with peak beginning from December until April and during July-August (Abdel-Razeq, unpublished data). This is in accordance with the findings of Al-Kholy and El-Hawary (1970) who found females carrying eggs from January until April.

Probably, this modal group may represent the crabs of the previous year. After December, the peaks (a) and (b) shifted to the right in January making a wide peak of carapace range from 95 mm to 135 mm and remained stationary during February, March and April with a length mode of 135—145, as shown in Fig. 2.

A new modal group of small individuals appeared during February forming modal size (a'). This modal group and the one which appeared in the following May, June may represent the same newly recruited group. So, from May and the following months the modal lengths (a & b) nearly disappeared and the catch was composed of other small individuals of modal lengths 75—85 mm, 85—95 mm and 115—125 mm in May, June, and August respectively.

By tracing the monthly increase in the smaller modal length groups, the general trend of monthly growth rate in *P. pelagicus* (L) can be expected. The modal length group 45—55 mm in September 1977 became 95—105 mm by December.

Using this example, the rate of growth can be estimated as 16.7 mm per month. The same group reached 135—145 mm modal length by the following April, with a growth rate of 10.0 mm per month.

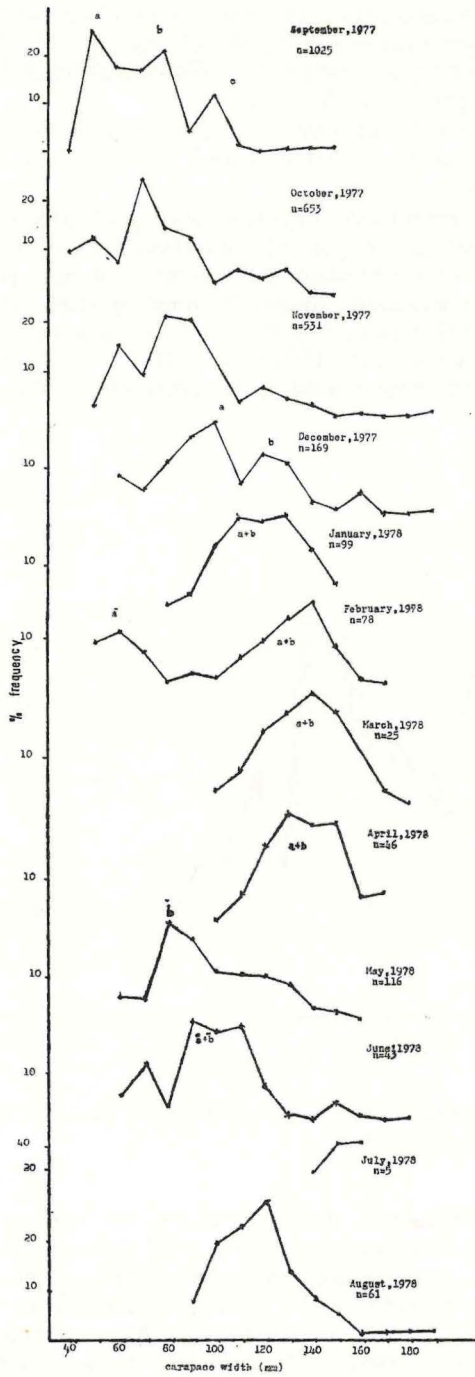


Fig. 2. Carapace width frequency

By tracing the length group (b) from September 1977 until the following December, there is an increase from 65—85 mm to 115—125 mm with a rate of growth 15 mm per month. During the following April it became 135—145 mm with a monthly increase about 5.0 mm.

So, it can be concluded that the rate of growth in case of *Portunus pelagicus* (L), varies between 5.0 mm and 16.7 mm with an average growth rate of 11.68 mm per month.

This result is in accordance with the findings obtained from the laboratory experimental observations on reared crab specimens of *P. pelagicus* in which the average growth rate obtained was about 12.0 mm per month (Abdel Razeq, in press). In addition, the results may be attributed partly to the fact that the rate of growth diminished with the increase in size of the animals as the population presented from December 1977 to April 1978 were of bigger sizes than those of the first period from September 1977 to December of the same year.

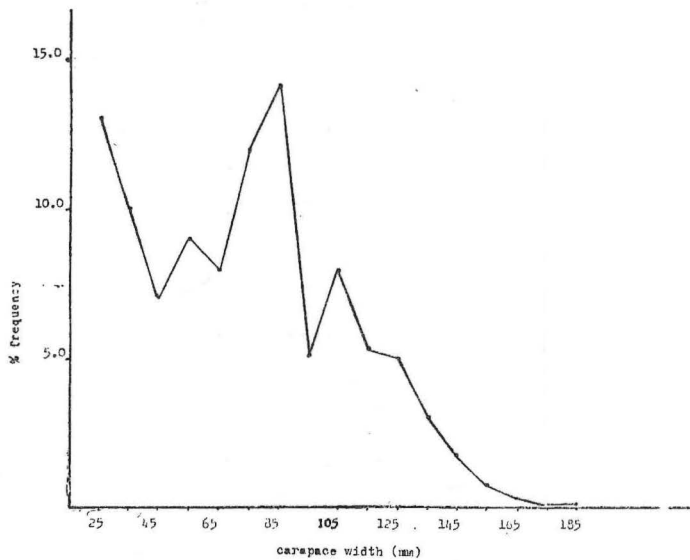


Fig. 3. Percentage frequency of the total catch of *Portunus pelagicus* (L.)

The total size frequency distribution for all samples, collected during the different periods starting from 1975 until 1984—1985, had been plotted in Fig. 3. The curve shows a single prominent mode, at 80—90 mm. By taking into account the growth rate of the species ranging from 5.0 to 16.7 mm per month this group may not be more than 7 or 8 months old. Hence it may be concluded that one year group is represented in the catch collected and the fishery of the centers studied is mostly supported by this age.

Sex ratio

The percentage of males and females in the commercial catch of *Portunus pelagicus* measuring more or less than 10.0 cm carapace width had been calculated separately for each season during the 1977-1978 (Table 2). Both sexes are differently present throughout the year. A significant rise in the number of females was observed during spring and summer seasons in all size groups. In autumn the male dominated with carapace width less than 10.0 cm. In inshore collections the male dominated during November and December while during the other period females were found in greater ratios. The dominance of the females of all size groups during spring and summer may probably be due to the spawning season and to the selective fishing gear.

It is worth noting that the smallest mature female of *P. pelagicus* observed was of 10.0 cm carapace width (Abdel Razek, in press).

Table 2. Percentage males and females of *Portunus pelagicus* in specified groups

	Up to 10.0 cm			Over 10.0 cm			All sizes		
	Sample size	Males	Ratio	Sample size	Males	Ratio	Sample size	Males	Ratio
Autumn	1647	843	51.2	183	84	45.9	1830	927	50.7
Winter	116	58	50	224	112	50	240	170	50
Spring	99	38	38.4	128	65	50.8	227	103	45.4
Summer	54	21	39	80	32	40	134	53	39.6

	1978-1979			1984-1985		
	Sample size	Males	Ratio	Sample size	Males	Ratio
September	170	134	49.6	756	381	50.4
October	160	64	31	550	272	49.5
November	123	72	58.5	243	224	50.6
December	120	65	54	136	78	57.4
January	100	47	47	101	41	40.6

Length-weight relationship

Length-weight relationship in *P. pelagicus* (L.) was determined in freshly caught specimens of 1378 females and 288 males ranging in carapace width from 35 mm to 190 mm.

The carapace width range was divided into 15 size groups with a class interval of 10.0 mm. The mean weights per length group were calculated.

Fig. 4. shows that this relation can be represented by the formula $W = aL^b$ (where »W« is the weight and »L« carapace width of the crab and »a«, »b« are constants).

The formula was found to be $W = 0.056775 L^{3.03469}$ for females and $W = 0.084936 L^{2.9134}$ for males.

From the above formulae the theoretical value of »W« for every group length was calculated.

The calculated and observed values for »W« when plotted against their respective values of »L« indicated a close agreement between them Fig. 4. The

increase in weight of the crabs was found to be at or slightly less than the cube of its carapace width for the females and males respectively as found in many shrimp species according to Subrahmanyam, 1963.

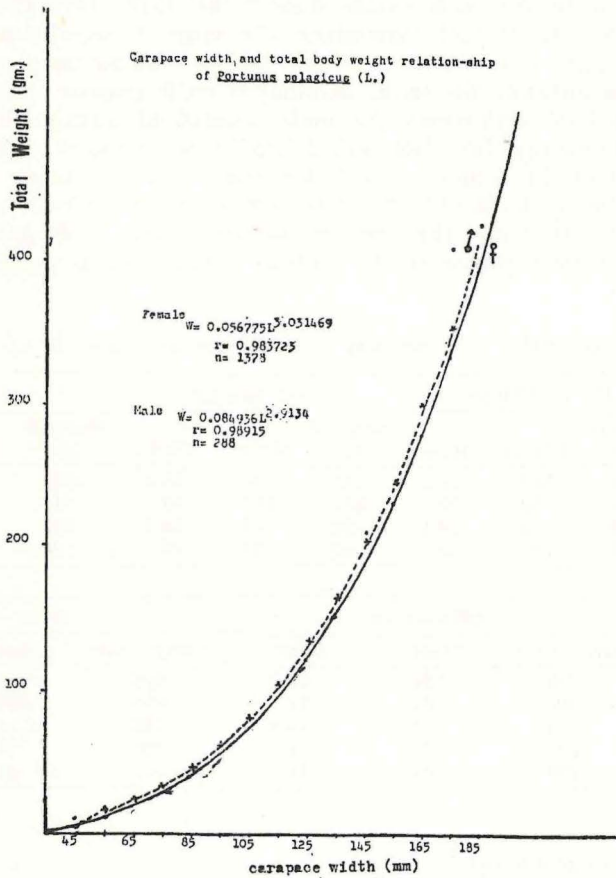


Fig. 4. Carapace width and total body weight relationship of *Portunus pelagicus* (L.)

CONCLUSION

This study dealt with the crab fishery and some aspects of the bionomics of the commercial species *Portunus pelagicus* (L.). The brachyura crab fishery at Abu-Kir and Maadia areas is probably unique in having a wide range of species supporting crab fishery. From September onwards *Portunus pelagicus* (L.) supported an important fishery at this area and continued to exist in large quantities till the end of the year. While *C. sapidus* showed a significant appearance only during a fixed period of the year, the magnitude of occurrence of different species in off-shore and in-shore catches showed some variations during the period of the study.

Based on the carapace width frequency studies, the average rate of growth in *Portunus pelagicus* is about 11.68 mm per month and the fishery is constituted by the one year group class. The difference in the growth rates of the sexes is also elucidated. The sex-ratio in the collected catches was studied and the percentage of males and females in specified sizes was calculated with estimation of seasonal pattern of distribution in both sexes. The length weight relationship showed the normal pattern according to the formula $W = 0.056775 L^{3.031496}$ for female and $W = 0.084936 L^{2.9134}$ in males.

ACKNOWLEDGEMENT

I am grateful to Prof. Dr. A. Ezzat for her interest in the work and for her kindly going through the manuscript and suggesting improvements.

REFERENCES

- Al-Kholy, A. A. and M. M. El-Hawary. 1970. The biology of *Lupa pelagica* (Linnaeus). Biol. Inst. Ocean. Fish., 1: 397—423.
- Bals, H. 1936. The Fishery ground near Alexandria. VII Decapoda. Note Mem. Fish. Res. Direct. Egypt, 15, 67 pp.
- Banoub, M. W. 1963. Survey of the blue crab *Callinectes sapidus* (Rath.) in Lake Edku in 1960. Note Mem. Inst. Hydrob. Egypt.
- Ramadan, A. H. E. and N. M. Dowidar. 1972. Brachyura (Decapoda, Crustacea) from the Mediterranean. Thal. Yugosl., 8: 127—139.
- Subrahmanyam, C. B. 1963. Notes on the bionomics of the Penaeid *Metapenaeus affinis* (MILNE EDWARDS) of the Malabar coast. Ind. J. Fish., 10 (1A): 11—22.

Accepted: November 20, 1987

RIBOLOV RAKOVA U VODAMA EGIPTA SA ZABILJEŠKAMA O BIONOMIJI VRSTE *PORTUNUS PELAGICUS* (L.)

Fatma Aly Abdel-Razek

Nacionalni institut za oceanografiju i ribarstvo, Kayed Bey,
Aleksandrija, Egipat

KRATKI SADRŽAJ

Ovaj rad se bavi ribolovom rakova i nekim vidovima bionomije komercijalne vrste *Portunus pelagicus* (L.). Ribolov brahiuranih rakova u području Abu-Kir i Maadia vjerojatno je jedinstveno po tome što obuhvaća veliki broj različitih vrsta. Od rujna dalje *Portunus pelagicus* (L.) daje velike prinose u ovom području a velike količine ove vrste javljaju se sve do kraja godine. Dok se *C. sapidus* javlja u znatnim količinama samo u određeno doba godine.

Količine ostalih vrsta rakova lovljenih i na otvorenom moru i u obalnom dijelu varirale su u toku istraživanja.

Na osnovu izučavanja frekvencija širina preko karapaksa, prosječna stopa rasta vrste *Portunus pelagicus* iznosi oko 11.68 mm mjesečno. Lovine se sastoje od rakova prve godine starosti. Pokazana je razlika u stopi rasta između spolova. Izučavan je također i odnos spolova u uzorcima lovina te je izračunat postotak mužjaka i ženki određenih veličina i određena sezonska distribucija veličine prema formuli $W = 0.05677L^{3,031469}$ za ženke i $W = 0,08493L^{2,9134}$ za mužjake.