Egypt. J. Plant Prot. Res. Inst. (2020), 3 (1): 179 - 195

Egyptian Journal of Plant Protection Research Institute

www.ejppri.eg.net

Ecobiological studies on two land snail species at Sharkia Governorate

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ARTICLE INFO

Article History

Received: 28/ 1 / 2020

Accepted: 27/ 2 /2020

Keywords

Monacha cartusiana, *Succinea putris*, food consumption, aestivation and size frequency.

Abstract:

The present experiment was aimed to through light on some environmental parameters on two land snails, the glassy clover snail *Monacha cartusiana* (Müller) (Gastropoda: Hygromiidae) and the amber snail *Succinea putris* L. (Gastropoda: Succineidae). The laboratory experiments showed that daily food consumption of different shell height of *S. putris* snail arranged as follow: 13.20 mg by snails with shell height (8-10mm) < 13.33mg (6-8mm) < 15.34 mg (12-14mm) < 15.45mg (10-12mm) < 16.35mg (14-16mm). The favorite places of aestivation in four different directions site for *M. cartusiana* during year were: Western (231.8) snail > Southern (197.5) > Northern (134) > Eastern (131.8). While, the favorite places of rest for *S. putris* could be arranged as follows: South (207) snails > East (152.2) > North (136.2) > West (100.9) and it was not entered in aestivation. On the other hand, the size frequency of *S. putris* snails with shell height of 5-6, 7-8 and 9-10 mm and with shell width 3-4 and 4-5 mm were detected during all months from January to August 2016, while the size frequency of *M. cartusiana* snails with shell height 6-7 and 7-8 mm and with shell width 11-12 and 13-14mm were observed during February to August 2016.

Introduction

Terrestrial gastropods are most serious pests attacking agricultural crops around the world. They cause damage to field, vegetable crops and fruit trees, and ornamental plants (Godan, 1983). Succineidae are distributed almost everywhere in the world (Kerney and Cameron, 1979). In Egypt, the glassy clover snail *Monacha cartusiana* (Müller) (Gastropoda: Hygromiidae) and the amber snail *Succinea putris* L. (Gastropoda: Succineidae) are considered, the most abundant mollusks infesting and causing damage to the Egyptian clover fields and some filed crops especially in Sharkia and Ismailia Governorates (Ismail, 1997 and Lokma, 2013). Abdel-Aal (2001) showed that the one adult snail of *M. cartusiana* ate from

9.8 to 47.85 mg for 24 hours depending on the host plant.

Snails aestivate during the hot summer and hibernate during the cold winter (Kassab and Daoud, 1964). Block (1971) indicated that in the dry summer monthly many snails enter a period of suspended activity called aestivation, they remain firmly attached by hardened mucus to the bark of trees, to leaves, twigs and branches, often 2 to 4 m above the ground with the body with drawn into the shell. The succineidae snails were able to persist through dry periods in an aestivating state (Patterson, 1973). The degrees of temperature and the percentages of relative humidity are the factors inducing aestivation in *Achatina fulica* (Férussac) (Gastropoda: Achatinidae) of course, just at the onset of aestivation (Saydeedur Rahman and Raut, 2010). *Helicella vestalis* (Pfiffer) (Gastropoda: Helicidae) and *M. cartusiana* were observed aestivate in lower portion in the trunk of navel orange trees, under weeds on bits of irrigation canals, on weeds in orchards, on lower portion in border of the orchard (Mahrous *et al*., 2002).The terrestrial gastropods do not inhabit and cool environments but also habitat in which hot and dry conditions prevail. Snail species that can cope with such climatic conditions are thus expected to have developed multi-faceted strategies and mechanisms to ensure their survival and reproduction under heat and drought stress (Schweizer *et al*., 2019).

The aim of this study was to determining daily food consumption of *S. putris* under laboratory conditions and estimated some environmental parameters (the favorite direction to aestivation and size frequency) for *M. cartusiana* and *S. putris* snails under field condition.

Materials and methods

1. Laboratory experiment:

Laboratory experiment was carried out to estimate daily food consumption by *S. putris* snails.

1.1. Daily food consumption of different shell height for *Succinea putris*:

S. putris snails with different shell height were collected from highly infested field cultivated with Egyptian clover, located on El- Qurana village, Abo-Hammad district, Sharkia Governorate during April, 2016. Snails were transferred to laboratory in cloth bags contained Egyptian clover leaves. Once on laboratory, snails were put on rearing box 50×30×30 cm containing moister clay soil up to 7cm depth and supplied daily with cabbage leaves till 15 days for acclimatization. Snails were divided into five groups according to shell height (6-8), (8-10), (10-12), (12-14) and (14-16) mm. Five individuals from each group were put on plastic box without soil and covered with muslin clothes, each group were replicated four times. All snails group were starved for 24 hours prior to testing then two cabbage leaves discs were introduced to each box. The discs were weighted using digital balance with accuracy 0.001 g before and after testing and compared with control treatment without snails. Food consumption for each snail with different shell heights was calculated daily to a period of five days (Baur, 1993).

2. Field experiments:

2.1. Study area:

The experiments were carried out at El- Qurana village (31.71°N, 30.51°E), Abo-Hammad district, Sharkia Governorate. Study area occupies about 2 feddan cultivated with Egyptian clover during winter season and rice during summer season (Figure, 1).

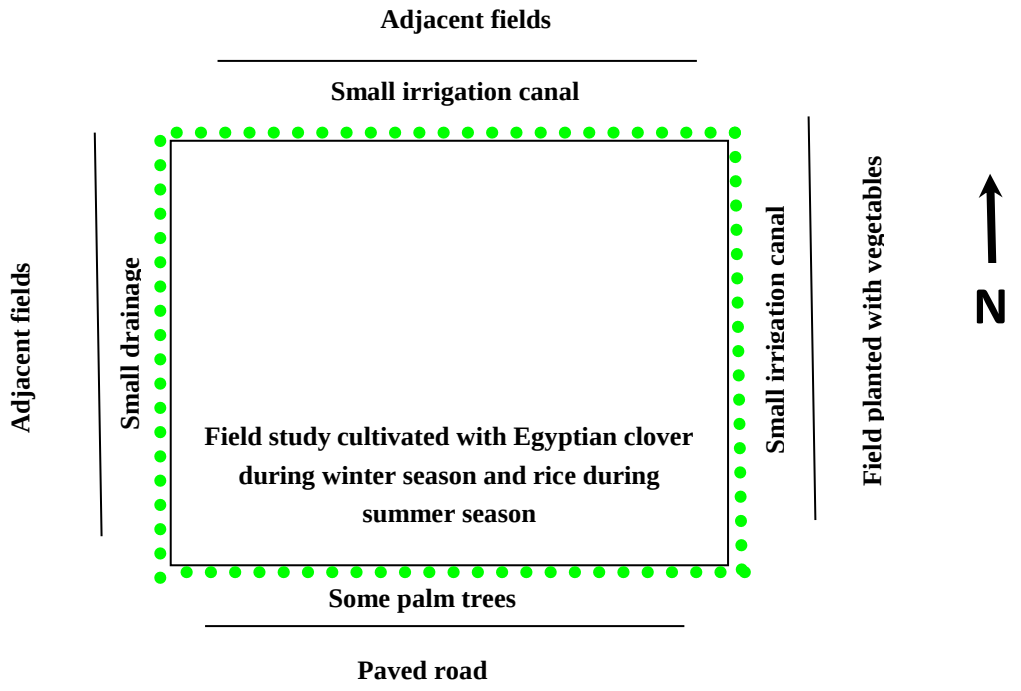


Figure (1): The field study and its borders.

2.2. Observation of aestivation for *Monacha cartusiana* and *Succinea putris* snails:

This trial were carried out in field cultivated with Egyptian clover in the winter and rice in the summer and infested with glassy clover snail, *M. cartusiana* and the amber snail, *S. putris* snail at El-Qurana village at Abou-Hammad district, Sharkia Governorate, during January to December 2016. Five replicates (50×50 cm) were chosen to each four direction North, South, East and West at different directions in the active and aestivation months. Selected of bermuda grass (*Cynodon daclylon* L.) grow on the inner belt of the irrigation canal. Number of all aestivated snails (active and epiphragmed) in each quadrate sample was counted biweekly intervals. Each sample was marked placing sticky label in the border of each quadrant. Moreover, epiphragmed snails were detected in aestivated places in each sample. *M. cartusiana* snail were counted as adult and Juvenile stages and number (different size) of large, medium and small size of *S. putris* (Lokma, 2013).

2.3. Size frequency distribution for *Monacha cartusiana* and *Succinea putris*:

This experiment carried out to estimate different shell growth of *M. cartusiana* and *S. putris* snails in the active and aestivation months. Snails were collected from the above-mentioned study field. Five quadrates replicates (50 X 50 cm) were chosen at four different directions (North, South, East and West) in aestivation location at the edge of field. Snails which found in the quadrates were collected monthly and 25 individuals were taken randomly in the early morning. The shell width and height of

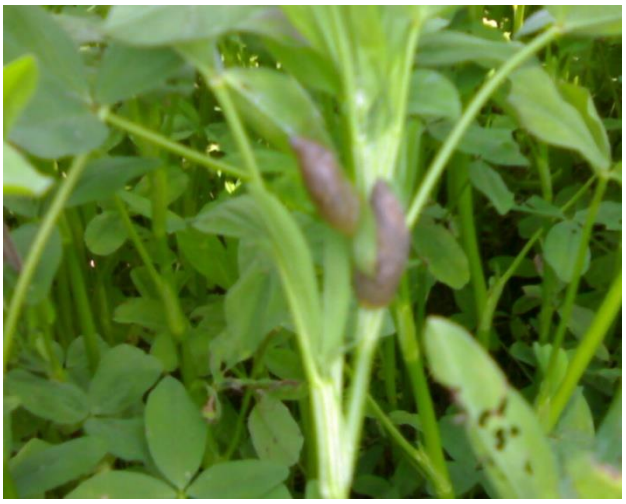
each snail was quantified using Vernier caliper with accurate to 0.02 mm during the period from January to December 2016 (Staikou and Lazaridou-Dimitriadou, 1990).

Results and discussion

1. Daily food consumption of different shell height for *Succinea putris* under laboratory conditions:

Manifestation caused by *S. putris* snail in field on some vegetable and field crops are illustrated in (Figure, 2). For this reason, the average daily food consumption of this snail was estimated. Daily food consumption by *S. putris* snails which have different shell height was measured under laboratory conditions (Table, 1). The highest value of daily food consumption by *S. putris* was 18.99 mg/snail recorded by the largest shell height (14-16 mm) at the 5^{th} days, while the lowest value was 9.45 mg/snail recorded by snails which have shell height (12-14mm) at 3^{rd} days. General mean of consumed leaves by different shell height were arranged as follow: 13.20 mg by snails (8-10 mm) < 13.33mg (6-8mm) < 15.34 mg (12-14 mm) < 15.45mg (10-12 mm) < 16.35mg (14-16mm). Lokma (1998) indicated that the average daily consumption values for. *M. cartusiana* on alfalfa leaves, date palm, pindans and hibiscus were 24.0, 7.8, 6.8 and 6.2 mg/individual, respectively. Snail did not approach leaves of washingtonia palm. Abdel-Aal (2001) reported that one adult snail of *M. cartusiana* ate from 9.8 to 47.85 mg for 24 hours depending on the host plant. The highest values were found with lettuce (47.85 mg) followed by guava (40.6 mg), while the lowest values were determined with mango, wheat and Egyptian clover with means of hours depending on the host plant. The highest values were found with lettuce (47.85 mg) followed by guava (40.6 mg), while the lowest values were determined with mango, wheat and Egyptian clover with means of 9.8, 10, and 10.3 mg, respectively. However, cabbage and broad bean showed intermediate values of 36.95 to 21.55 mg, respectively. Lokma (2013) studies the food consumption of snail, *Monacha cartusiana* on certain vegetable crops under laboratory conditions. The tested material can be arranged descending according to their suitability as follows: kidney bean 103.66 mg < watermelon 80.88 mg < strawberry succulent fruit 74.06 mg < tomato 60.60 mg < strawberry leaves 51.85 mg < strawberry green dead fruit 38.20 mg. Maduabuchi and Bede (2019) cleared that tested leafy vegetables can be successfully utilized as diets for rearing of *Archachatina marginata* (Swainson) (Gastropoda: Achatinidae) for farmers to achieve better result, the inclusion of fluted pumpkin leaf *Carica papya* and pawpaw leaves. *Vernonia amygdalina* in the diets of *A. marginata* is highly recommended in snail rearing businesses.

Rice (*Oryza sativa* L.)



Egyptian clover (*Trifolium alexandrium* L.)

Tomato (*Solanum lycopersicum* L.)

Cabbage (*Brassica oleracea* Liver. capitata)

Figure (2): Manifestation caused by the amber snail *Succinea putris* on some field and vegetable crops under field conditions.

Table (1): Daily food consumption (mg) on cabbage leaves per one snail of different shell height for *Succinea putris* under laboratory conditions.

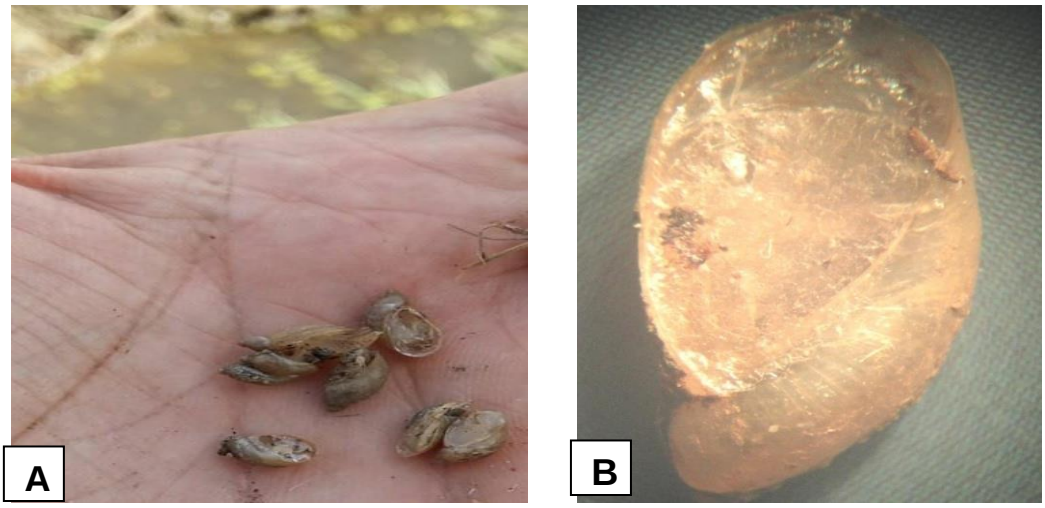
Days	Different shell height (mm)					Mean
	(6-8)	(8-10)	(10-12)	(12-14)	(14-16)	
1 day	10.80	15.78	17.03	17.55	18.12	15.86
2 day	15.37	12.60	14.39	16.58	18.17	15.42
3 day	10.74	10.71	11.77	9.45	12.20	10.98
4 day	14.25	12.68	15.68	17.35	14.25	14.84
5 day	15.49	14.25	18.37	15.75	18.99	16.57
Mean	13.33	13.20	15.45	15.34	16.35	

2. Determining the favorable direction location to aestivation for *Succinea putris* and *Monacha cartusiana* in Egyptian clover field:

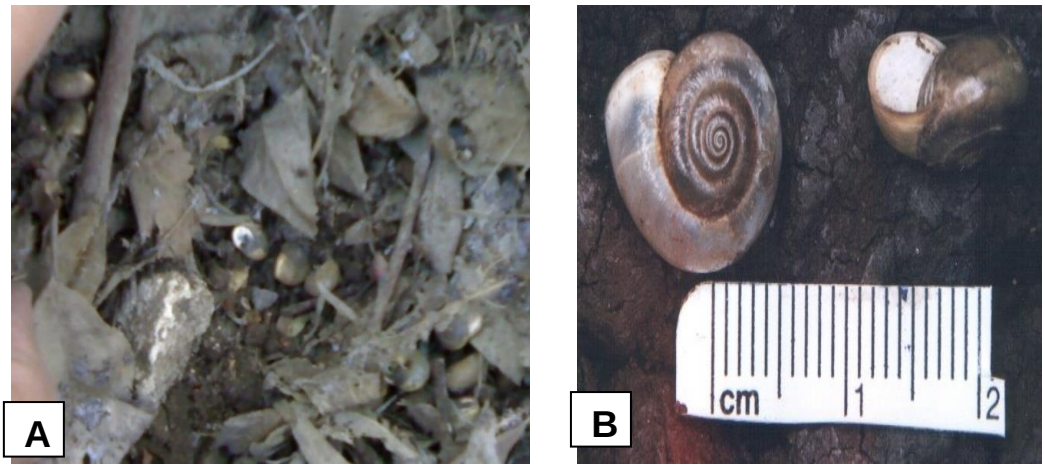
This study was placed in Egyptian clover field heavy infesting with *S. putris* and *M. cartasiana* in Abou-Hammad district, Sharkia Governorate. Snails were observed aestivating under damp habitats either under the Bermuda grasses in edge of the irrigation canals and in soil cracks (Figure, 3).

2.1. Observation on the favorite direction location to rest for *Succinea putris*:

Results in (Table, 2) showed that the Southern direction in edge of the irrigation canals of Egyptian clover field were highly number of individuals snail *S. putris* in the beginning of January with value 5.8 snails in 50×50 cm. While, in February in Northern direction of aestivation place were highly with numbers of snails 7.2 snails compared by other directions with values 6.4, 4.7 and 1.8 snails to South, North and West direction of aestivation place, respectively. Number of snails were increasing in April reached to highly number in Southern direction was 81.2 while in different direction with values 76.4, 61.6 and 43.8 snails at 50×50cm for Eastern, Northern and Western, respectively. However, in summer and autumn months number of snails was decreasing gradually until to November month, where number of snails were 1.8, 0.4 and 8.8 snails four different direction of resting places North, South and West, respectively. Grand total of *S. putris* snails in different directions places could be arranged as follows: South (207) snails 50×50 cm > East (152.2) >North (136.2) > West (100.9). It was noticed that in April and May only that amber snail *S. putris* resting by closing their shell by a thin transparent epiphragm, with low number of snails with value (3) snails in west direction and it was not entering in aestivation. Its importance to mentioned that in summer months when the rice grown some few of individuals of *S. putris* snails were seen active in rice plant in the beginning and middle of June with values 2.5 & 2.8 snail, mean of 5 replicates in 50×50 cm (Figure, 1) and the temperature degree were highly in this period. Also, in the half of September *S. putris* snails were mating in resting sites and the new hatching were appeared in the beginning of December.



Shell aperture of *Succinea putris* sealed with transparent layer of epiphragm, A: In field, B: In laboratory.



Shell aperture of *Monacha cartusiana* sealed with white layer of epiphragm, A: In field, B: In laboratory.

Figure (3) : Aestivation shell shape of land snail *Succinea putris* and *Monacha cartusiana*.

Table (2): Number of *Succinea putris* snails with different size and directions in border of Egyptian clover field.

Date	Snail size	North		South		East		West	
		Mean	Total	Mean	Total	Mean	Total	Mean	Total
Jan.	L	-	2.4	-	5.8	0.2	0.5	0.2	1.2
	M	0.8		1.2		0.2		-	
	S	1.6		4.6		0.1		1.8	
Feb.	L	3	7.2	0.4	6.4	-	1.8	1.8	4.7
	M	2.6		1.8		1.6		1	
	S	1.4		4.2		0.2		1.6	
Mar.	L	5.4	16	1.2	13.2	0.8	8.4	2.6	18
	M	2.6		1.8		3.2		12.8	
	S	8		10.2		4.4		2.6	
Apr.	L	15	61.6	9	81.2	10.8	76.4	11.8	43.8
	M	25.2		7.6		25.4		16.4	
	S	21.4		64.6		40.2		15.6	
May	L	8.2	24	3.2	60	3.8	40.6	4	14.6
	M	8.4		22.2		28.6		5	
	S	7.4		3.8		8.2		5.6	
Jun.	L	-	12.4	9	31.2	3.5	19.7	0.4	5.4
	M	5.8		15.2		8.8		2.6	
	S	6.6		7		7.4		2.4	
Jul.	L	0.8	5.4	1.2	5.4	-	-	0.2	3
	M	2.4		3		-		2.6	
	S	2.2		1.2		-		0.2	
Aug.	L	-	1.4	-	-	-	3.8	-	-
	M	0.2		-		0.2		-	
	S	1.2		-		3.6		-	
Sep.	L	-	0.8	-	1.6	-	-	-	-
	M	0.6		-		-		-	
	S	0.2		1.6		-		-	
Oct.	L	-	1.6	-	1.2	-	-	-	-
	M	-		1.2		-		-	
	S	1.6		-		-		-	
Nov.	L	-	1.8	-	0.4	-	-	5.4	8.8
	M	0.4		0.2		-		3	
	S	1.4		0.2		-		0.4	
Dec.	L	0.2	1.6	-	0.6	0.2	1	0.2	1.4
	M	1.4		0.6		0.6		-	
	S	-		-		0.2		1.2	
Grand total			136.2		207		152.2		100.9

L: Large; M: Medium; S: Small

2.2. Observation on the favorite direction location to aestivation for *Monacha cartusiana*:

Data in (Table, 3) showed that *M. cartusiana* take different direction of selected aestivation sites during the period from January to December 2016, where a relatively low numbers in January without epiphragmed layers gradually to April month, number of snails in different direction in January were 1.4, 5, 0.8 and 0.6 snail/50×50 cm in Northern, Southern, East and West directions, respectively. In the beginning of April number of aestivated snails with epiphargmed was appeared and gradually increasing in all directions with values 3.6 and 10.8 snails in Northern and East direction only, aestivated snails were in adult stages. In May month the maximum numbers of aestivated snails were counted, and the west was most favorable direction with values 77.6 epiphargmed snails in 50×50 cm followed by Southern, East and Northern direction with values 57.4, 33 and 0.8 epiphargmed snails, respectively. Also, non-individual of Juvenile stages was seen aestivated in

four different directions in all examined months. Grand total of aestivated snails for *M. cartusiana* in four different directions during year were: western (231.8) snail > southern (197.5) > northern (134) > eastern (131.8). Kassab and Daoud (1964) showed that the openings of snails (shell aperture) remain close with a white liquid secreted from the mantle from the end of November to the end of February, this liquid forms a mucus sheet, which soon hardens to the epiphragm. Block (1971) indicated that in the dry summer monthly many snails enter a period of suspended activity called aestivation, they remain firmly attached by hardened mucus to the bark of trees, to leaves, twigs and branches, often 2 to 4 m above the ground, with the body and drawn into the shell. In the cool of the evening, when dew falls, the snails reemerge and feed. In long period of continuous dryness, this resting stage is uninterrupted, in this case the case the mouth of the shell is closed by several layers of dried mucus and each separated from the next by an air-filled space. Pollard (1975) observed seasonal migratory patterns in *H. pomatia*, indicating that they return to traditional hibernating sites. Most Stylommatophran snails can aestivate over periods of unfavorable conditions, with the animal into the shell and the shell aperture sealed with one or more epiphragms (Riddle, 1983). On the other hand, Mahrous *et al.* (2002) and Mortada (2002) they reported that land snails aestivate during summer months where temperature and relative humidity are not suitable for their growth and development.

Table (3): Number of *Monacha cartusiana* snails aestivated and un aestivated with different stages and direction in borders of Egyptian clover field

Date	Snails	North			South			East			West		
		Epi	Non epi	Total	Epi	Non epi	Total	Epi	Non epi	Total	Epi	Non epi	Total
Jan.	A	-	-	1.4	-	-	5	-	-	0.8	-	-	0.6
	J	-	1.4		-	5		-	0.8		-	0.6	
Feb.	A	-	1.4	8.4	-	0.3	5.9	-	0.6	5	-	0.4	7.2
	J	-	7		-	5.6		-	4.4		-	6.8	
Mar.	A	-	19	33.4	-	5.2	8.8	-	3.4	8.4	-	6.6	12
	J	-	14.4		-	3.6		-	5		-	5.4	
Apr.	A	3.6	22.6	46.6	-	15.4	23.2	10.8	11.8	25	-	2.8	2.8
	J	-	20.4		-	7.8		-	2.4		-	-	
May.	A	0.8	3.8	5.0	57.4	39	96.6	33	9.2	43	77.6	99.2	176.8
	J	-	0.4		-	0.2		-	0.8		-	-	
Jun.	A	15	12.6	27.6	31.8	18	49.8	16.6	2	18.6	18.8	3	21.8
	J	-	-		-	-		-	-		-	-	
Jul.	A	7.4	3.6	11.0	3.6	2.2	5.8	-	-	-	5.4	4.2	9.6
	J	-	-		-	-		-	-		-	-	
Aug.	A	0.4	-	0.4	2.4	-	2.4	18.4	12.4	30.8	-	-	-
	J	-	-		-	-		-	-		-	-	
Sep.	A	-	-	-	-	-	-	-	-	-	-	-	-
	J	-	-		-	-		-	-		-	-	
Oct.	A	-	-	-	-	-	-	-	-	0.2	-	-	-
	J		-		-	-		0.2	-		-	-	
Nov.	A	-	-	-	-	-	-	-	-	-	-	0.6	0.6
	J	-	-		-	-		-	-		-	-	
Dec.	A	-	0.2	0.2	-	-	-	-	-	-	-	-	-
	J	-	-		-	-		-	-		-	-	
Grand total				134			197.5			131.8			231.8

A: Adult; J: Juvenile; Epi: Epiphargmed snails; Non epi: Non epiphargmed snails

Lokma (2007) studies the aestivation of *M. cartusiana* in Egyptian clover fields, snails aestivate, during summer month under plants grown in the irrigation canals. Sugar cane was the most preferable one followed by elephant grass, while Bermuda grass was the least one in this respect, general means of aestivated snails in 50×50 cm² under the plants were 207.57, 168.62 and 70.67 snails, respectively. The terrestrial gastropods do not inhabit cool environments but also habitat in which hot and dry conditions prevail. Snail species that can cope with such climatic conditions are thus expected to have developed multi-faceted strategies and mechanisms to ensure their survival and reproduction under heat and desiccation stress (Schweizer *et al.*, 2019).

2. Size frequency distribution for *Monacha cartusiana* and *Succinea putris*:

2.1. Size frequency of *Succinea putris*:

The size frequency distribution for *S. putris* was conducted at monthly intervals during the growing season of Egyptian clover at El-Qurana village, Abo-Hammad district, Sharkia Governorate. Data in (Figure, 4) declare that the newly hatched juveniles of shell height less than 5 mm were found during January and February 2016 only. However, snails with shell height of 5-6, 7-8 and 9-10mm were detected in all months from January to August 2016. While, snails with shell height 14-16 mm recorded during February to May. It was noticed that the highest number of individuals during all months from January to August 2016 were with shell height 7-8 mm except in March and May was with shell height 9-10 mm. Data in (Figure, 5) reveal that the shell width of *S. putris* 2-3, 3-4, 4-5, 5-6 and 6-7mm found in January were 5, 9, 5, 4 and 2 snail/sample, respectively, while the snails with shell width of 2-3, 3-4, 4-5, 5-6, 6-7, 7-8 and 8-9 mm were 4, 5, 5, 1, 5, 4 and 1snail/sample, respectively during February 2016. It was noticed that during March the snail with shell width of 3-4, 4-5, 5-6, 6-7 and 7-8 mm were 6, 8, 6, 3 and snail/sample, respectively, but the snail with shell width of 2-3, 3-4, 4-5, 5-6, 6-7and 7-8 mm were 2, 4, 6, 4, 3 and 6 snail/sample, respectively during April 2016. It is worthy to indicate that the snails with shell width of 2-3, 3-4, 4-5 and 5-6 mm were 1 and 3, 11 and 6, 11 and 10 and 2 and 6 snail/sample during May and June, respectively. While, the snails with shell width of 2-3, 3-4 and 4-5 recorded in July and August 2016 only.

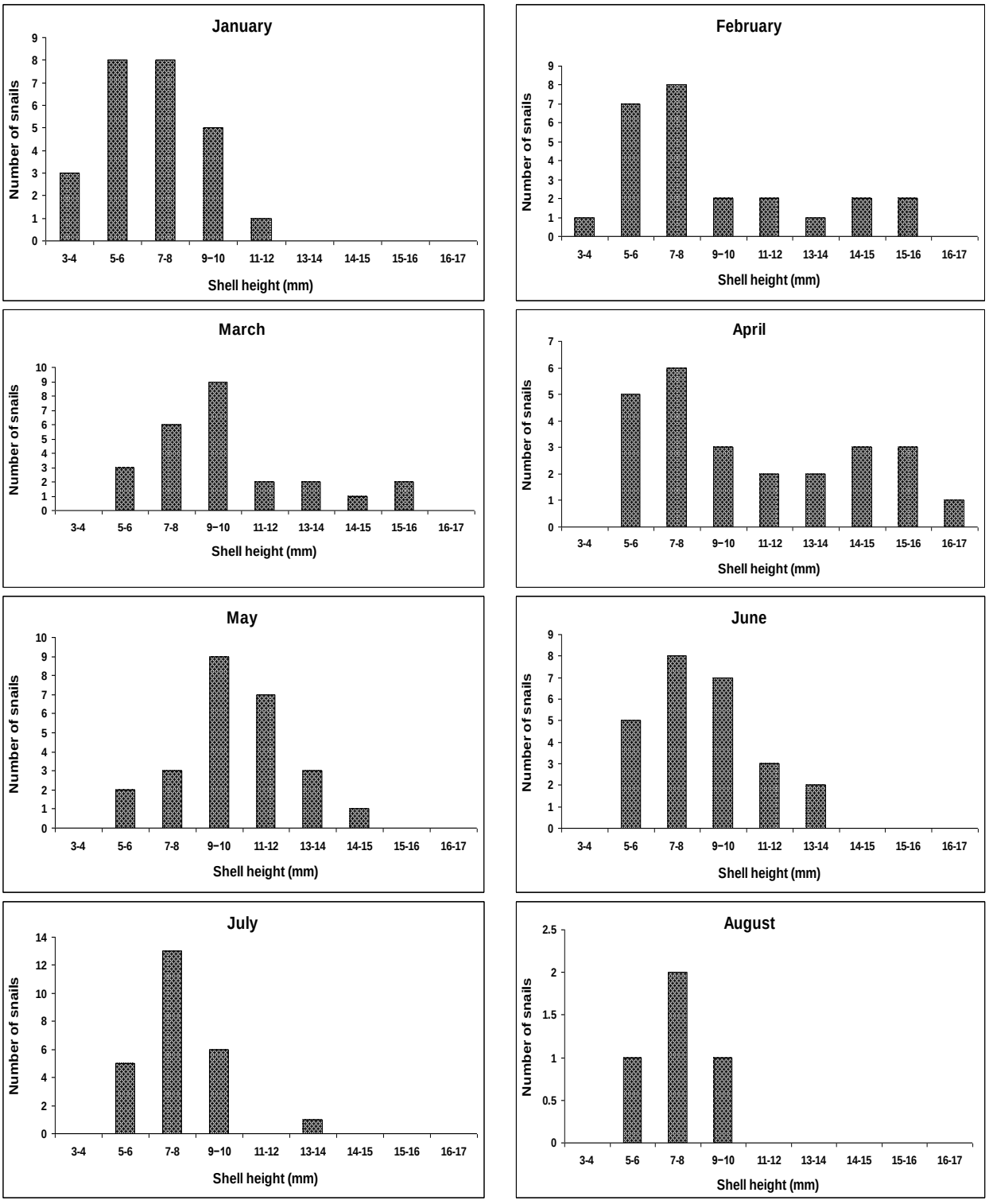


Figure (4): Size frequency histogram (shell height) of *Succinea putris* on Egyptian clover at El-Qurana village, Abo-Hammad district, Sharkia Governorate during the period from January to August 2016.

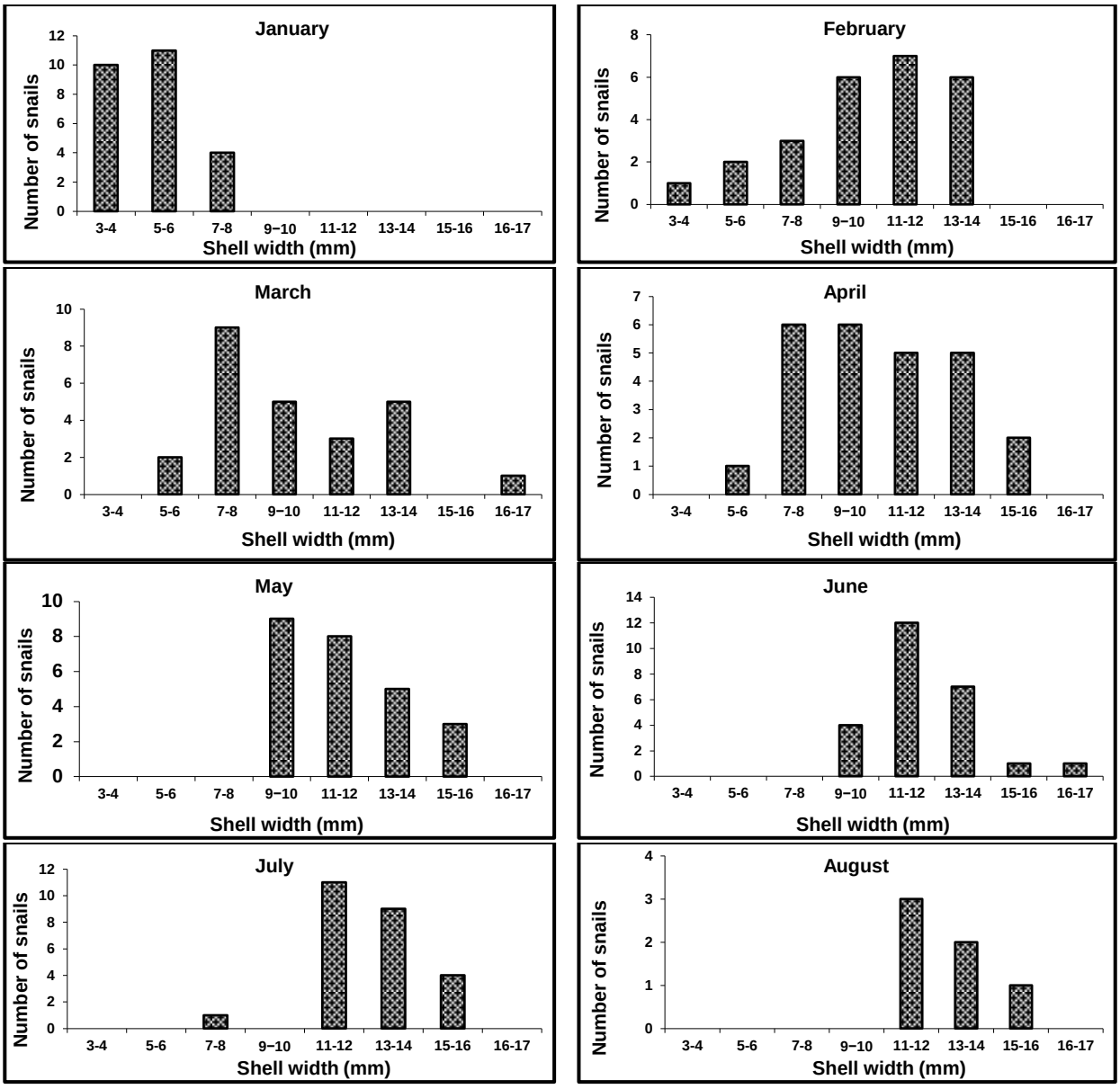


Figure (5): Size frequency histogram (shell width) of *Succinea putris* on Egyptian clover at El-Qurana village, Abo-Hammad district, Sharkia Governorate during the period from January to August 2016.

2.2. Size frequency of *Monacha cartusiana*:

Data in (Figures, 6 and 7) illustrate the size frequency distribution for *M. cartusiana* was conducted at monthly intervals on Egyptian clover at El-Qurana village, Abo-Hammad district, Sharkia Governorate. It is clear from the data in (Figure, 6) that the newly hatched juveniles of shell height less than 4 mm were found during January and February 2016 only. However, snails with shell height of 4-5 mm were recorded in three months from January to March, while, snails with shell height 5-6 mm were found in all months from February to June 2016. It was noticed that snails with shell height 6-7 and 7-8 were detected during all months from February to August, but snails with shell height 8-9 were found from April to August 2016. Data in (Figure, 7) indicated that the shell width of *M. cartusiana* 3-4 mm found in January and February were 10 and 1

snail/sample, respectively, while the snails with shell width of 5-6 and 7-8 mm were detected during January to April 2016. It is worthy to indicate that snails with shell width of 9-10 mm were found during February to June, also, snails with shell width 11-12 and 13-14 were observed during February to August. However, snails with shell width 15-16 were recorded during April to August; also, snails with shell width 16-17 were detected in Mach 2016 only.

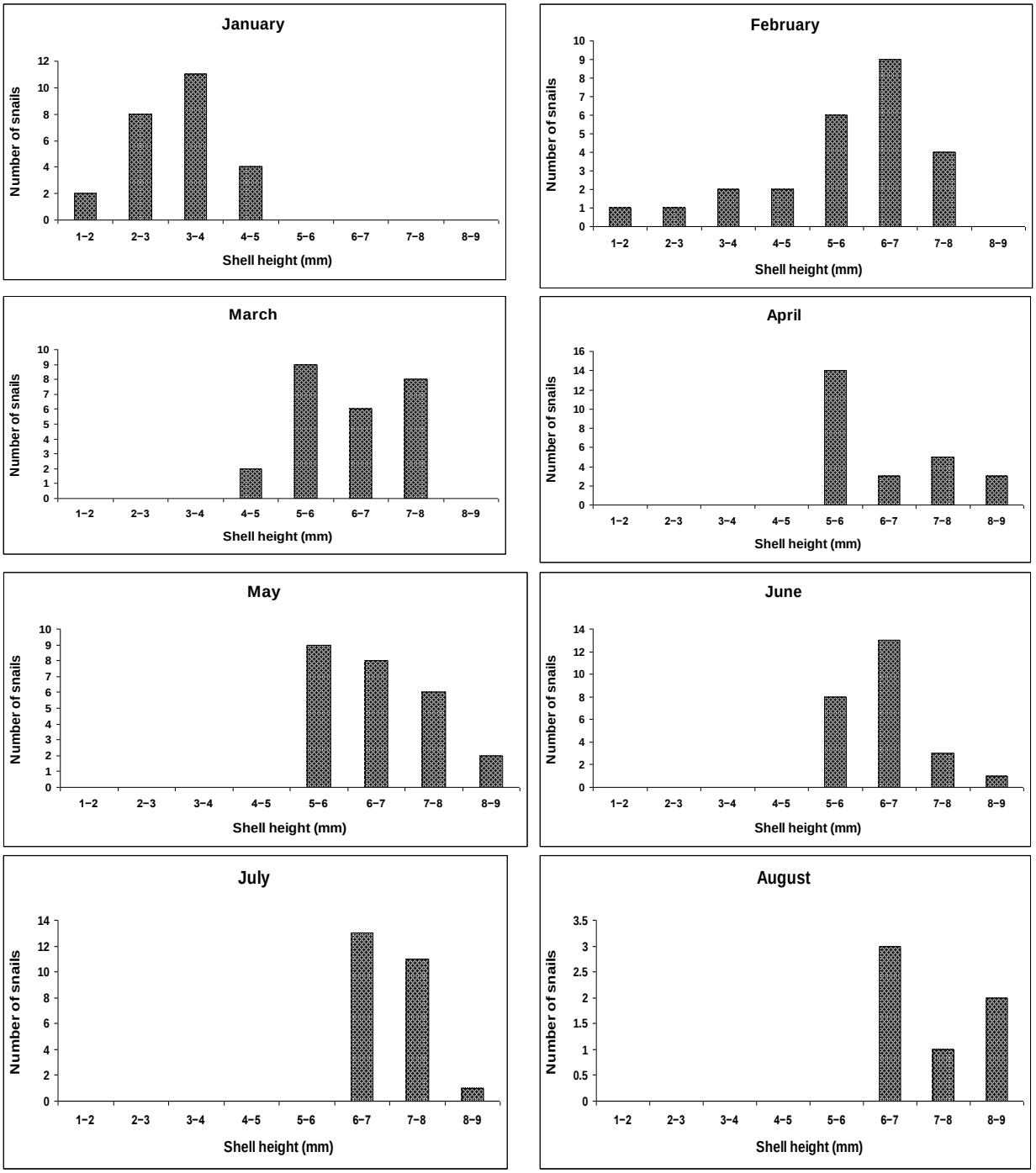


Figure (6): Size frequency histogram (shell height) of *Monacha cartusiana*on Egyptian clover at El-Qurana village, Abo-Hammad district, Sharkia Governorate during the period from January to August 2016.

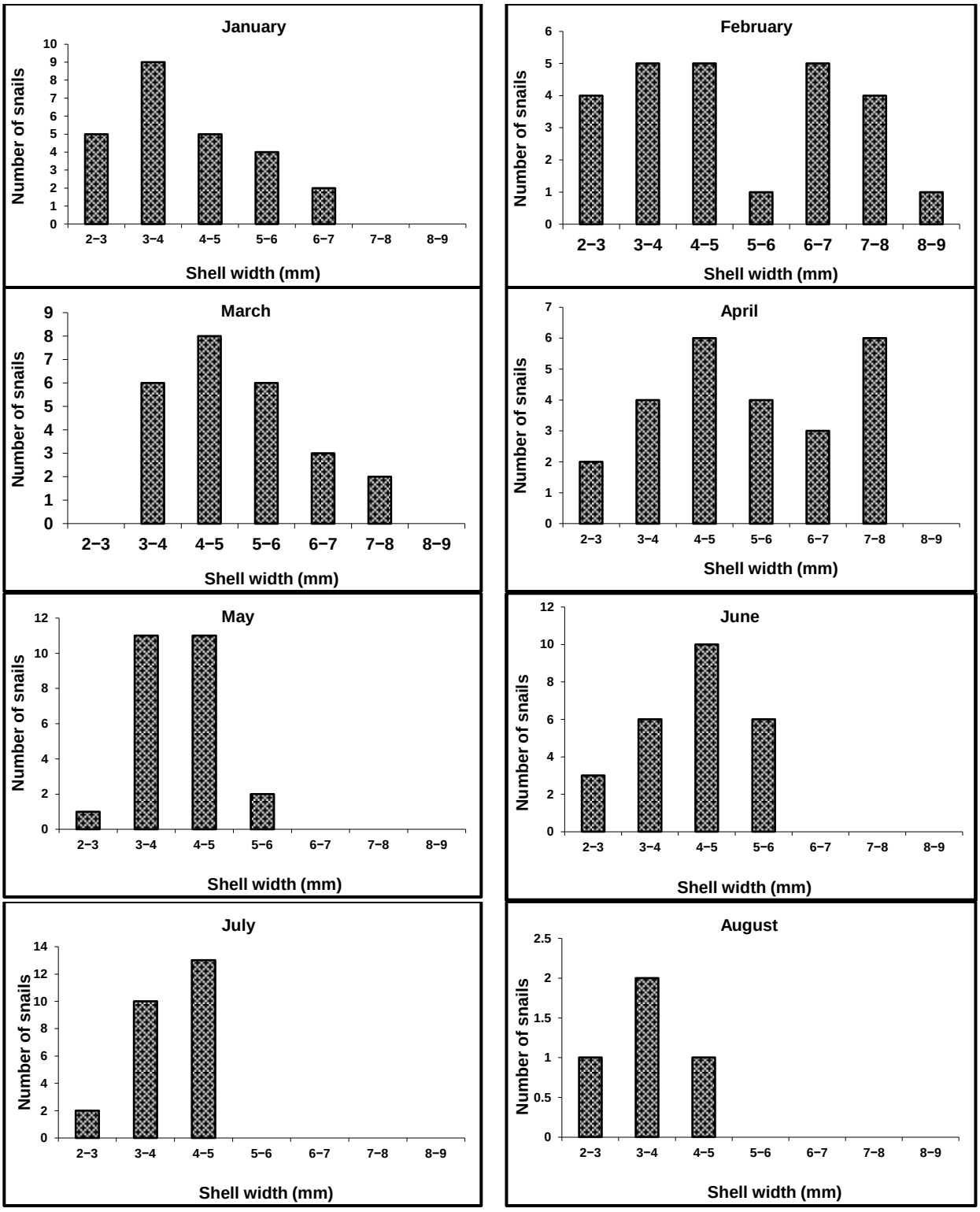


Figure (7): Size frequency histogram (shell width) of *Monacha cartusiana*on Egyptian clover at El-Qurana village, Abo-Hammad district, Sharkia Governorate during the period from January to August 2016.

In Greece, Staikou and Lazaridou-Dimitridou (1990) reported that *M. cartusiana* snails reached maturity within one year at a size of 8-10 mm. They could be lay eggs immediately upon maturation, died soon afterwards, while most of a population reached maturity and laid eggs two years after hatching. Adult snails were died after the productive period. Villalobos *et al*. (1997) showed that the neotropical terrestrial snail *succinea contarieana* had become a quarantenary pest in ornamental plants *(Dracaena marginata*, Dracaenaceae), they reached a density of 282900 individuals/ha. In field, reproduction it contained (as is rain fall) and eggs, young and copulation pairs are found mainly under moist litter. Ismail (1997) mentioned that feeding *Monacha cartusiana* on lettuce and cabbage leaves gave the highest growth in shell diameter after six months of the feeding on lettuce leaves and shell diameter were 8.8 and 8.6 mm for lettuce and cabbage, respectively. Carlos and Julian (2004) studied the yearly body size distribution of *Succinea costaricana* von Martens (Gastropoda: Succineidae) on an ornamental plant. Body size distribution (measured in the shells) indicated a capacity to produce year- round with a peak when pluviosity decrease in December. At this time of year, the population was dominated by snail under 4mm in shell length (longest individual: 12.06 mm). However, the yearly vain fall pattern does not correlate with shell, length width or width/length ratio than remain that rainfall alone is not the most important factor affecting population dynamics. Abed (2011) studied the relation between shell diameter and number of eggs of *M. cartusiana* during the breeding season. Result revealed that the clutch size of *M. cartusiana* snail as influenced by shell diameter of the three tested snail shell diameters descending as follows: 12mm ×10mm (22.9) and 10×10mm (16.9) eggs/ one pair snail, respectively. Lokma (2013) noticed that during April the number of *S. putris* snail in Egyptian clover filed was 5& 11 snail/sample of size frequency 2-3 and 3-4mm respectively. No snails with shell diameter less than 3-4mm were detected, while the snails with shell diameter of 3-4, 5-6 and 6-7mm were 8.8 and 10 and 5 snails/sample during May & June 2008, respectively. Moreover, the amber snail *S. putris* aestivated during summer months, closing their shell aperture by a thin, transparent epipharagm, snails were observed aestivating under damp habitats either under the grasses or edging of the irrigation canals and in soil cracks under masses, leaves in upper layers of soil.

It is concluded that *S. putris* consumed different amount of cabbage leaves, which increasing gradually with increasing shell highest under laboratory conditions. This snail was favorite the southern direction in the field to resting and appeared as active in different locations in all months during year and it was not enter in aestivation, while *M. cartusiana* snails were aestivated as adult stage with sealed white layer of epiphragm in the beginning of April until November and western direction was the favorite place to aestivation. The most size frequency of *S. putris* was ranged between 5-10 mm shell highest, but *M. cartusiana* was ranged between 11-14 mm shell width.

Acknowledgement

We thank Prof. Dr. Shehata Ahmed Ali Ismail for providing helpful discussion.

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