SEASONAL ABUNDACE OF RHINOCEROS BEETLES CAPTURED IN LIGHT TRAP AT KASSASSEN DISTRICT, ISMAILIA GOVERNORATE

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Abstract

Seasonal abundance of Rhinoceros beetles, *Oryctes* spp. and *Phyllognathus excavatus.* were carried out under field conditions. Results obtained could be summarized as follows:-

1- Ecological studies on adult stage was carried out at kassassen district ,the following results were obtained

* The seasonal abundance of adult stage was carried out by using light trap during seasons 1997, 1998 and 1999.

The activity period of *Oryctes* spp. was extended from March/ April until December in all investigated seasons the highest activity numbers during October (1300individuals). Two times of activities at September (1187 individuals) and October (1300 individuals) the highest number of insects was trapped during season of 1997 followed by 1998 while the least was at 1999 with densities 1668, 1443 and 1271 individuals respectively. Activity period of *Ph. excavatus* extended from January until December in all investigated seasons the highest activity was recorded during October (860 individuals).Another activity period was at August (410 individuals). The highest number of insects captured in light trap was recorded during season 1997 followed by 1998 and the least at 1999 with densities of 1249, 915 and 726 individuals, respectively. male sex ratio of *Oryctes spp.* was 60.17 % in October, it increased to (65.76 %)in September ,while it was 58.81% for *Phyllognathus excavatus* in February but it increased to 60.85% in June. Simple correlation and partial regression values were positive and insignificant between *Oryctes* numbers and both minimum and maximum temperature where r value ranged (0.301 – 0.316 and 0.225 – 0.289 & b ranged (4.889 – 4.609 and 3.277 – 3.683) and E.v. % ranged (51.41 – 25.44 % and- 32.73 – 69.55 %) in all investigated seasons except during 1999, values were positive and significant effects where r ranged (0.459** - 0.490**), b ranged (4.096 – 4.381) and E.v. % ranged (91.5 – 34.61 %). While it was negative and insignificant for relative humidity, r = (0.068, - 0.116 and – 0.135), b = (2.694, - 2.247 and – 0.842) and E.v. % = (54.31 – 22.77 and 5.71 %).The explained variance percentage (E.v. %) on the number of captured insects was about 14.66 % for males while it was 21.93 % for female. In case of *Phyllognathus excavatus*, had positive and highly significant effects both Minimum and Maximum temperature where r value ranged (0.385**- 0.388**,-0.457** – 0.525*** and -0.526*** – 0.466** & b ranged (0.057 – 0.067, 0.119 – 0.163 and 0.202 – 0.187) and E.v. % ranged [19.1 – 12.25 %, – 83.9 – 23.24 % and 18.3 – (– 45.4 %)] on the numbers of captures in all investigated seasons. While it was negative and insignificant for relative humidity, r = (– 0.243, –

0.372* and 0.164), b = (– 0.036, – 0.062 and 0.068) and E.v. % =
(89.2, – 4 and 43.8 %).The explained variance percentage (E.v. %)
was about 22.6 % for males, while it was 25.43 % for females.

INTRODUCTION

Adults of black palm beetles *Oryctes spp. Phyllognathus excavatus* Forster and red palm weevil are large and widely distributed group of insects. In Egypt, first recorded in date palm plantations of Sharkia and Ismailia Governorates by Saleh (1993), Alfieri (1976) and Shalaby (1958) in the MOA collection, Plant Prot. Res. Institute.

Little work has been done on *Oryctes spp.* and *Phyllognathus spp.*, special stress, however has been laid by Hafez and Bishara(1961) in *Pentodon bispinosus*, Mohammed and Ibrahim (1988) on *Tropinota squalida*, El-Deeb (1992) on *T. squalida,* Hammad and Ramadan (1979) on *Oryctes elegans* and Okil *et al* (2000) on *Phyllognathus spp.* Although various studies have been conducted on *Oryctes spp.* and *Phyllognathus spp.* in other countries by authors such as Cherian and Anantanaraynan(1939) , Fleming (1955), Williams et al (1955), Lohar and Mecci(1985) and Eitan (1993) .

Therefore, it was found expecdient that a detailed study on ecology of adults of *Oryctes spp.* and *Phyllognathus spp.* under field conditions in newly reclaimed areas at kassassen district, Ismailia Governorate is necessary.

MATERIALS AND METHODS

The experiments were carried out in field area of 80 feddans during three successive seasons, 1997, 1998and 1999 in a heavily infested zone with both fruit stalk beetles and red palm weevils.

1. Seasonal abundance of rhinoceros beetles captured in light trap

Monitoring of adults *Oryctes* spp.and *Phyllognathus* spp.were performed at Sabri village, Kassassen district, Ismailia Governorate. during the period extended from 1997 to 1999.one light trap (Robinson light trap previously proposed by Williams (1923)) was placed on building at the height of 3 meters over areas of El- Kassassen district and fitted with a 2oo watt ultraviolet lamp (Mercury – vapor lamp) .it was operated daily from sunset to sunrise. Trap catch was weekly examined, identified, counted and sexed.

2. Effect of certain climatic factors on the insect population

The prevailing means of air temperature (C^o), relative humidity (R.H. %) were obtained from the central laboratory for Agriculture Meteorology, Agricultural Research Center, Ministry of Agriculture in Giza.

The simple and multiple correlation values (r.) and partial regression values (b) and explained variance (E.v. %) were calculated for relationship between the flight activity of counted adults and such weather factors.

Statistically analyzed using statistical program of costat. All the obtained data were statistically analyzed according to Duncans (1955) and little and Hills (1975).

RESULTS AND DISCUSSION

1. Seasonal abundance of rhinoceros beetles captured in light trap

1.1. *Oryctes* spp

The results presented in Table (1) revealed that the activity period of *Oryctes* spp. was extended from March /April until December in all investigated seasons with highest activity recorded during October (1300 individuals): Two times of activities, at September (1187 individuals) and October (1300 individuals). In Table (2) the highest trapped number of the insect was recoded in 1997 followed by 1998 and the least at 1999 with densities 1668, 1443 and 1271, respectively., while in Table (1)the percentage of sex ratio of males was 60.17% and it was increased gradually from the beginning of season and reached its maximum in September (65.76 %). The total number of males was (2639), it was about 1.5 times more than females (1743). However, Eitan (1993) found that *Oryctes agamemnon* adult activity began in early May, peaks were during June – July and in September.

1.1.1. Effect of weather factors

The results obtained in Table (4) show that the simple correlation and partial regression values were positive and insignificant for both minimum and maximum temperature during 1997 and 1998 seasons. E.v. were 51.41% and 25.44% for mini.and max.temperature in 1997 respect. And -32.73%&69.55% in 1998 .while in 1999, the previously mentioned factors had appositive and significant effects, where r ranged (0.490**-0.459**), b ranged (4.096 – 4.381) and E.v. % ranged (91.5 – 34.61 %).while the correlation was negative and insignificant for relative humidity ,r= r = (0.068, - 0.116 and – 0.135), b = (2.694, - 2.247 and – 0.842) and E.v. % = (54.31 – 22.77 and 5.71 %) in the three tested seasons,respectively.The explained variance percentage (E.v%) on the number of captured insects was about 14.66 % for males while it was 21.93 % for females while El- Deeb (1992) , mentioned that the correlation between flight activity of adults of *T. squalida* and both of day

temperature and light intensity was positive and highly significant, While it was negative and highly significant with day relative humidity. The population increased gradually by increasing both temperature & light intensity and by decreasing relative humidity. For example, the highest accumulated numbers on three hosts occurred at 2 p.m. with about 14.64 beetles / m^2 and relative percentage, 19.09 % during the highest degree of temperature 29ºC. and 82.000 lux light intensity, accompanied with the lowest relative humidity 54 % R.H.

1.2. *Phyllognathus excavatus* Forester

Data in Table (1) reveal that the activity period of *Ph. excavatus* extended from January until December in all investigated seasons with highest activity during October (860 individuals). Two times of activity were noticed during August (410 individuals) and October (860 individuals). in Table (2) the highest number captured insects by light trap was recorded during season 1997 (1249 individuals) followed by 1998(915 individuals) while the least was at 1999 with density of (726 individuals),while in Table (1) the general percentage of sex ratio of males was 58.81% throughout the all period of study of season until its maximum the highest percentage of males was in June (60.85%).Okil *et al* (2000) found that the seasonal cycle of *Ph. excavatus* beetles consisted of an activity period lasted about 9.5 – 10.5 months from March to late December or January of the next year, followed by an inactive period (1.5 – 2.5 months) during February, March and / or January. The accumulative total number of beetles emerged during the whole year round reached 446, 504 and 543 beetles at the end of December 1996, 1997 and 1998, respectively. Beetle infestation increased to 2.13 and 3.35 times during one and two years, respectively.

1.2.1. Effect of weather factors

Results of statistical analyses shown in Table (4) reveal that the simple correlation and partial regression values were positive and highly significant for both Minimum and Maximum temperature where r values ranged (0.388** – 0.385**, 0.457** – 0.525*** and 0.526*** – 0.466** & b ranged (0.057 – 0.067, 0.119 – 0.163 and 0.202 – 0.187) and E.v. % ranged [19.1 – 12.25 %, – 83.9 – 23.24 % and 18.3 – (– 45.4 %)] in 1997,1998 and 1999 seasons respectively . while it was negative and insignificant for relative humidity the explained variance percentage (E.v. %) was about 22.6 % for males, while it was 25.43 % for females . Okil *et al* (2000) studied the direct effects ("r" correlation values) of mean maximum and minimum temperature and relative humidity in new reclaimed lands (Giza governorate) on population activity of *Ph. excavatus* during study showed significantly positive effect with the maximum and minimum temperature, while the effect of maximum relative

humidity was significantly negative. The combined effect of the tested weather factors on beetles activity in Giza was highly significant, where the calculated "F" values were 4.32, 6.05 and 10.76 in 1996, 1997 and 1998 and % explained variance were 47.6, 56.0 and 69.4, respectively.

Table 1. Monthly average number of captured adults of Rhinoceros beetles *Oryctes* spp. and *Phyllognathus excavatus* cited at El-Gala farm, El- Kassassen district, Ismailia Governorate during three successive seasons, 1997, 1998 and 1999.

Date	*Oryctes spp.*				*Phyllognathus excavatus*			
	Male	Female	Total	Sex ratio % of males	Male	Female	Total	Sex ratio % of males
Jan.	0	0	0	0	1	1	2	16.66
Feb.	0	0	0	0	46	32	78	58.81
March	2	1	3	22.22	70	50	120	58.37
April	104	74	178	58.81	109	95	204	53.51
May	212	194	406	50.64	129	120	249	53.04
June	236	185	421	56.73	137	88	225	60.85
July	180	159	339	53.43	168	131	299	56.06
Aug.	308	211	519	58.24	209	201	410	51.03
Sep.	781	406	1187	65.76	187	191	378	49.34
Oct.	799	501	1300	60.17	462	398	860	52.73
Nov.	12	9	21	59.25	31	28	59	53.35
Dec.	5	3	8	41.66	6	0	6	33.33
Total	2639	1743	4382	60.22	1555	1335	2890	53.8

Table 2. The total number of Oryctes spp. and Phyllognathus excavatus. Captured in light traps cited at El-Gala farm, El- Kassassen district, Ismailia Governorate during three successive seasons, 1997, 1998 and 1999.

season \ spp	*Oryctes* spp	*Phyllognathus* excavatus
1997	1668	1249
1998	1443	915
199	1471	726
Total	4382	2890

Table 3. Monthly mean max., mini. Temp°C and R.H. % at El-Gala farm, El-Kassassen district, Ismailia Governorate during three successive seasons, 1997, 1998 and 1999.

Date	1997			1998			1999		
	Max. Temp°C	Mini. Temp°C	R.H. %	Max. Temp°C	Mini. Temp°C	R.H. %	Max. Temp°C	Mini. Temp°C	R.H. %
January	20.62	7.59	64.15	20.54	8.15	55.67	21.18	8.36	56.53
February	20.56	8.08	65.21	21.83	9.38	56.60	23.83	9.60	55.35
March	22.94	9.78	65.09	22.91	9.03	52.50	23.67	10.45	52.74
April	27.05	12.99	60.82	29.15	12.84	49.88	27.67	12.82	48.62
May	34.70	17.105	57.74	31.92	17.37	50.25	32.83	16.36	49.05
June	35.09	20.245	58.48	34.50	19.84	49.57	35.57	21.33	52.46
July	37.06	21.83	51.04	37.15	21.59	48.91	36.30	21.88	53.28
August	37.89	23.48	52.12	39.05	23.94	51.03	37.62	23.56	51.43
September	36.66	21.67	55.695	37.69	22.82	51.32	· 35.78	20.80	59.46
October	33.22	18.16	55.72	33.80	18.33	51.88	33.03	18.80	62.57
November	27.27	13.88	55.14	28.37	14.39	55.28	30.27	13.90	61.42
December	22.46	9.26	56.45	23.65	11.19	54.28	23.55	9.18	63.08

Max. Temp. °C. = maximum temperature.

Mini. Temp. °C. = minimum temperature.

R.H. % = relative humidity percentage

Table 4. Multiple & simple correlation, partial regression and (E.v. %) values between population of *Oryctes* spp and *Phyllognathus excavatus* and each of mini, max. Temp°C and mean of R.H. %.at El- Gala farm, El- Kassassen district, Ismailia Governorate during 1997, 1998 and 1999.

seasonal	Weather factors			*Oryctes* spp.	*Phyllognathus excavatus*
1997	Mini. Temp°c	Simple correlation	20	0.301	0.388**
		Partial regression	b.	4.889	0.057
		E.v.%	$R^2 \times 100$	51.41%	19.1%
	Max. Temp°c	Simple correlation	20	0.316	0.385**
		Partial regression	b.	4.609	0.067
		E.v.%	$R^2 \times 100$	25.44%	12.25%
	Mean R.H. %	Simple correlation	20	0.068	-0.243
		Partial regression	0	2.694	-0.036
		E.v.%	$R^2 \times 100$	54.31%	89.2%
1998	Mini. Temp°c	Simple correlation	20	0.225	0.457**
		Partial regression	b.	3.277	0.119
		E.v.%	$R^2 \times 100$	-32.73%	-83.9%
	Max. Temp°c	Simple correlation	20	0.289	0.525***
		Partial regression	b.	3.683	0.163
		E.v.%	$R^2 \times 100$	69.55%	23.24%
	Mean R.H. %	Simple correlation	20	-0.116	-0.372*
		Partial regression	b.	-2.247	-0.062
		E.v.%	$R^2 \times 100$	22.77%	-4%
1999	Mini. Temp°c	Simple correlation	20	0.459**	0.526***
		Partial regression	b.	4.096	0.202
		E.v.%	$R^2 \times 100$	91.5%	18.3%
	Max. Temp°c	Simple correlation	20	0.490**	0.46**
		Partial regression	b.	4.381	0.187
		E.v.%	$R^2 \times 100$	34.61%	-45.4%
	Mean R.H. %	Simple correlation	20	-0.135	0.164
		Partial regression	b.	-0.842	0.068
		E.v.%	$R^2 \times 100$	5.71%	43.8%
Mean	Male			14.66%	22.6%
	Female			21.93%	25.43%

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الوفرة الموسمية لخنافس الجعال المصادة بالمصيدة الضوئية بمنطقة القصاصين محافظة الإسماعيلية

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تمت هذة الدراسات بمزرعة الجلا بمنطقة القصاصين محافظة الإسماعيلية خلال مواســم تواجد الحشرة ١٩٩٧-١٩٩٨-١٩٩٩م وكانت النتائج كما يلى :-

١- قيـاس التقلبـات الموسـمية لحـشرتي. *Phyllognathus excavatus and Oryctes spp* باستخدام المصائد الضوئية:-

بدأ ظهور الحشرة الكاملة لل *Oryctes* spp المصادة بالمصائد الضوئية خلال مارس /ابريل حتى ديسمبر وكانت ذروة النشاط في أكتوبر(١٣٠٠) بفترتين نشاط في سـبتمبر (١١٨٧) وأكتـوبر (١٣٠٠) مع أعلـى تعـداد مـصاد فـى موسـم ١٩٩٧ يليـة ١٩٩٨ واقلهـم ١٩٩٩م بكثافـات ١٦٦٨،١٤٤٣،١٢٧١ على التوالى ولكن في حشرة *Phyllognathus excavatus* بدأ ظهور الحشرة خلال يناير /ديسمبر وكان ذروة النشاط في أكتوبر (٨٦٠) بفترتين نـشاط فـى أغـسطس (٤١٠) وأكتوبر (٨٦٠) مع أعلى تعداد مصاد فى موسـم ١٩٩٧ يليـة ١٩٩٨ واقلهـم ١٩٩٩م بكثافـات ١٢٤٩،٩١٥،٧٢٦والنسبة الجنسية لل*Oryctes* spp كانت فى أكتوبر (٦٠,١٧%) زادت فى سبتمبر إلى (٦٥,٧٦%) ولكن في ,*Phyllognathus excavatus* كانت فى فبراير (٥٨,٨١%) وزادت فـى يونية الى (٦٠,٨٥%).

٢- تأثير العوامل الجوية:-

لحشرة *Oryctes* spp موجب وغير معنوي لكلا من درجتي الحرارة الصغرىو العظمـى حيث كان معامل الارتبـاط (r) (٠,٣٠١ – ٠,٣١٦ ،٠,٢٢٥ – ٠,٢٨٩)، معامـل الانحـدار (b) (٤,٨٨٩ – ٤,٦٠٩ ،٣,٢٧٧ – ٣,٦٨٣) معامـل الاخـتلاف (E.v. %) (٥١,٤١ – ٢٥,٤٤، – ٣٢,٧٣ – ٦٩,٥٥ %) اعلى تعداد الاصطياد في كل مواسم الإصابة ماعدا ١٩٩٩م .

اما على حشرة *Phyllognathus excavatus* موجبة ومعنوية عالية لكـلا مـن درجتـي الحرارة الصغرى والعظمى حيث كان معامـل الارتبـاط (r) (٠,٣٨٨**-٠,٣٨٥***،٠,٤٥٧**- ٠,٥٢٥***،٠,٥٢٦****-٠,٤٦٦***) ومعامـل الانحـدار (b) (٠,٠٥٧-٠,١١٩،٠,٠٦٧- ٠,٢٠٢،٠,١٦٣-٠,١٨٧)، معامـل الاخـتلاف (E.v.%) (١٩,١-١٢,٢٥%، ٨٣,٩- ٢٣,٢٤%١٨,٣، – ٤٥,٤%) أعلى تعداد الاصطياد في كل مواسم الإصابة .