RESULTS : -

(A) BIOMETRICAL COMPARISON : -

(1A) Live weight : -

Table (1) indicates the changes in body weight of migratory birds just after their arrival in Egypt and during the recovery period.

Statistical analysis using F - test, revealed that there was a building up of weight after migration, and the arrival weights were significantly lower after capture in C.coturnix and S.turtur., 98.49 to 110.7 g and 126.17 to 157.17 g, respectively. On the other hand, a non significant variation in body weight was recorded in F.atra.

(2 A) Pectoral muscle weight : -

(i) Superficial pectoral muscle : -

As shown in table (2), the data indicated that, the highest value of superficial pectoral muscle weight was recorded on the first week of capture, while the lowest one was noted on the day of arrival in S.turtur species. (8.634 g at zero day and 24.88 g after one week of recovery).

(ii) Deep pectoral muscle : -

It was found that the lowest weight of the deep pectoral muscle was recorded at O - day of capture and then it increased during the two recovery weeks as shown in table (2). In C.coturnix, the weight rose from 2.91 g to 4.22 g, in F.atra from4.35 g to 6.29 g and in S.turtur from 2.04 g to 4.07 g.

(3 A) supracoracoideus muscle weight : -

A significant difference was noted among the weight of supracoracoideus muscle in the three migratory species of birds during the captured period and just after landing (table 3).The muscle weight was 0.2573 g and 0.2044 g on the day of arrival and then it increased to 0.4271 g and 0.4382 g on the 1st week after capture in F.atra and S.turtur respectively.

(4 A) Power weight ratio : -

As shown in table (4), the power - weight ratio ranging from 16.02 percent to 18.24 percent from the day of arrival and during the 1st week of capture in C.coturnix. with no significant difference .On the other hand , in both F.atra and S.turtur their power - weight ratio , reaching its lowest value at the day of arrival (14.49% , 8.62%) and increased during capture to 18.89% and 18.79% respectively . Data for nonmigratory birds showed no significant difference in their power - weight ratio during recovery period (table4)

(5 A) Wing length : -

As shown in table (5)the mean wing span for C.coturnix , F.atra and S.turtur were 38.8 cm , 50.03 cm , and 55.8 cm respectively .

Table (1) Changes in the weight of migratory and nonmigratory birds during recovery (live weight in grams).

Duration / species	O - DAY day of capture	RECOVERY	
		1 st week	2 nd week
C.coturnix	* 98.49 ± 0.91 F = 9.9	103.16 ± 0.99	110.7 ± 1.3
F.atra	225.3 ± 1.2 N.S	216.27 ± 0.99	215.96 ± 1.7
S.turtur	* * 126.17 ± 0.4 F = 22.6	156.34 ± 1.4	157.17 ± 1.9
G.domestica	1700.9 ± 0.9 N.S	1901.4 ± 0.2	1892.8 ± 1.8
C.livia	355.23 ± 0.3 N.S	359.8 ± 1.3	357.84 ± 1.9

* Significant $p < 0.05$
** Highly significant $p < 0.01$

N.S non - significant.
mean ± S.E.

Table (2) Changes in the pectoral muscle weight (g) of migratory and non migratory birds during recovery.

Duration / species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 cd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 cd week
C.coturnix	12.67 N.S ± 0.12	14.36 ± 0.03	12.95 ± 0.04	2.91 ± 0.02 F = 5.9	4.22 ± 0.1	3.94 ± 0.2
F.atra	28.04 ± 0.13	34.06 * ± 0.2 F = 41.87	30.89 ± 0.09	4.35 * ± 0.3 F = 56.9	6.38 ± 0.2	6.29 ± 0.07
S.turtur	8.634 * * ± 0.01 F = 434.3	24.88 ± 0.3	24.22 ± 0.7	2.04 * * ± 0.002 F = 253.6	4.07 ± 0.02	4.07 ± 0.01
G.domestica	70.411 N.S ± 0.3	70.393 ± 0.7	65.293 ± 0.02	20.577 ± 0.3	18.802 ± 0.1	23.921 ± 0.4
C.livia	30.413 N.S ± 0.9	28.493 ± 0.3	31.972 ± 0.1	5.317 ± 0.03	4.949 ± 0.01	5.667 ± 0.09

* Significant $p < 0.05$
** Highly Significant $p < 0.01$

N.S non - significant.
mean ± S.E.

Table (3) Changes in the supracoracoideus muscle weight (g) of migratory and non migratory birds during recovery.

Duration / Species	CARACOID MUSCLE WEIGHT		
		RECOVERY	
	O - DAY day of capture	1 st week	2 nd week
C.coturnix	0.2016 ± 0.002 N.S	0.2460 ± 0.003	0.2255 ± 0.007
F.atra	0.2573 ± 0.04 * F = 13.8	0.4271 ± 0.003	0.4123 ± 0.001
S.turtur	0.2044 ± 0.03 ** F = 36.8	0.4382 ± 0.002	0.4241 ± 0.07
G.domestica	0.8315 ± 0.01 N.S	0.7923 ± 0.03	0.9139 ± 0.04
C.livia	1.3091 ± 0.03	0.9937 ± 0.05	1.321 ± 0.06

* Significant $P < 0.05$

** Highly significant $P < 0.01$

N.S non significant

mean ± S.E.

Table (4) power - weight ratio for migratory and nonmigratory birds during recovery.

Species	0 - day of capture	RECOVERY	
		1st week	2nd week
C.coturnix	16.02% N.S	18.24%	15.46%
F.atra	14.49% *	18.89%	17.40%
S.turtur	8.62% *	18.79%	18.26%
G.domestica	5.42% N.S	4.69%	4.78%
C.livia	10.29% N.S	9.51%	10.77%

N.S. nonsignificant
* significant
$P<0.05$

Table (5) Wing length (cm) of the migratory and nonmigratory species.

Species	Wing length	S.E.	range
C.coturnix	38.8	±0.11	35.3 - 38.9
F.atra	50.03	±3.2	49.3 - 56.9
S.turtur	55.8	±0.03	53.1 - 55.9
G.domestica	63.2	±0.07	59.3 - 69.5
C.livia	65.3	±0.9	60.1 - 67.7

Table (6) Span loading of migratory and nonmigratory species during recovery.

Species	0 - day of capture	RECOVERY	
		1st week	2nd week
C.coturnix	2.53 ■ * T1=9237.1 T2=3921.2	2.65	2.85 N.S
F.atra	4.50 ■ T2=3755.1	4.32	4.31 N.S
S.turtur	2.26 ■ * T1=72.9 T2=3481.5	2.8	2.81 N.S
G.domestica	26.91	30.08	29.9 N.S
C.livia	5.44	5.51	5.48 N.S

N.S. nonsignificant. (during recovery period in each species)
T1 * significant $P<0.05$ (between migratory species and C.livia)
T2.■ significant $P<0.05$ (between migratory species and G.domestica)

(6 A) Span loading : -

The span loading in F.atra recorded the highest value than in C.coturnix and S.turtur being 4.5 , 2.53 and 2.26 respectively. There was no significant difference in span loading during capture in all the three migratory species as well as the nonmigratory birds .Among the nonmigratory birds , (table 6) the G.domestica recorded the highest value of span loading (26.91)

(B) BIOCHEMICAL ANALYSIS : -

(1 B) Glycogen : -

It was clear from the results recorded in table 7, A,B & C that there was a significant increase in glycogen content in both superficial and deep pectoral muscles towards the 2nd week of capture.

The t - test was also applied to compare the results of migratory birds during capture with the corresponding data in the nonmigratory species. It was found that the glycogen contents were significantly higher in G.domestica and C.livia than the corresponding values of migratory birds in both superficial and deep pectoral muscles. At the day of capture glycogen contents were 4078.84 mg, 4302.48 mg and 4378.37 mg in migrating birds (C.coturnix, F.atra and S.turtur) respectively , while glycogen levels were 5801.46 mg and 5619.23 mg in nonmigratory birds (G.domestica and C.livia) in the superficial pectoral muscle. The same differences were also recorded in glycogen levels between the migratory birds(C.coturnix, F.atra and S.turtur, 4068.41 mg, 4336.32 mg and 5096.02 mg respectively) and the corresponding

Table (7-A) Changes in the content of pectoral muscle glycogen (mg / 100 g) of C.coturnix and non migratory species during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	4078.84 ± 12.2	3985.34 ± 7.9	5393.48 ± 8.4 * F = 48.9	4068.41 ± 10.9	4471.85 ± 9.4	5747.96 ± 7.2 * F = 99.6
control 1 G.domestica	5801.46 ■ ± 10.3 t = 14.0	6060.96 ■ ± 7.2 t = 14.99	5828.96 ± 5.7	5655.9 ■ ± 9.2 t = 7.81	5584.96 ■ ± 7.1 t = 8.97	6105.63 ± 6.9
control 2 C.livia	5619.23 ■ ± 5.4 t = 10.1	5454.06 ■ ± 6.6 t = 10.0	5550.7 ± 7.9	6220.06 ■ ± 9.3 t = 28.0	5953.71 ■ ± 10.4 t = 21.38	6039.31 ± 8.2

* Significant difference between data during zero day of capture, one and two weeks after capture, using F - test. $P < 0.05$

■ Significant difference between each stage in migrating birds with the corresponding two control groups respectively, using t - test. $P < 0.05$, mean ± S.E.

Table (7-B) Changes in the content of pectoral muscle glycogen (mg / 100 g) of F.atra and non migratory species during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	4302.48 ± 9.3	3256.44 ± 5.9	48824.9 * ± 7.2 F = 10.4	4336.32 ± 10.3	4306.11 ± 11.3	4866.41 * ± 7.4 F = 11.03
control 1 G.domestica	5801.46 ■ ± 10.3 t = 8.77	6060.96 ■ ± 7.2 t = 33.82	5828.96 ■ ± 5.7 t = 9.5	5655.9 ■ ± 9.2 t = 6.4	5584.96 ■ ± 7.1 t = 6.2	6105.63 ■ ± 6.9 t = 8.9
control 2 C.livia	5619.23 ■ ± 5.4 t = 6.82	5454.06 ■ ± 6.6 t = 22.7	5550.7 ■ ± 7.9 t = 8.0	6220.06 ■ ± 9.3 t = 15.1	5953.71 ■ ± 10.4 t = 9.33	6039.31 ■ ± 8.2 t = 14.5

* Significant difference between data during zero day of capture, one and two weeks after capture, using F - test. $P < 0.05$

■ Significant difference between each stage in migrating birds with the corresponding two control groups respectively, using t - test. $P < 0.05$, mean ± S.E.

Table (7-C) Changes in the content of pectoral muscle glycogen (mg / 100 g) of S.turtur and non migratory species during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
S.turtur	4378.37 * ± 13.3 F = 21.5	5185.35 ± 15.2	4785.27 ± 7.9	5096.02 * ± 11.7 F = 13.5	5449.18 ± 9.9	5726.8 * ± 10.3
control 1 G.domestica	5801.46 ■ ± 10.3 t = 10.6	6060.96 ■ ± 7.2 t = 8.99	5828.96 ■ ± 5.7 t = 6.5	5655.9 ■ ± 9.2 t = 7.3	5584.96 ± 7.1	6105.63 ■ ± 6.9
control 2 C.livia	5619.23 ■ ± 5.4 t = 7.7	5454.06 ± 6.6	5550.7 ± 7.9	6220.06 ■ ± 9.3 t = 8.3	5953.71 ± 10.4	6039.31 ■ ± 8.2

* Significant difference between data during zero day of capture, one and two weeks after capture, using F - test. $P < 0.05$

■ Significant difference between each stage in migrating birds with the corresponding control group respectively, using t - test. $P < 0.05$, mean ± S.E.

nonmigratory birds (5655.9 mg in G.domestica and 6220.06 mg in C.livia) in the deep pectoral muscle as shown in tables 7 A, B & C .

(2 B) Glucose : -

Serum glucose level was significantly increased to more than four fold after 2nd week of recovery in C.coturnix, (80.233 mg and 325.819 mg respectively)., and the level of glucose inC.coturnix (325.819 mg) was found to be 1.5 fold of the level in G.domestica but non - significant variation was found when compard to C.livia. On the other hand , a significant decrease in glucose level was recorded in C.coturnix (80.233 mg) as compared to that of the nonmigratory species (183.077 mg in G.domestica and 318.532 mg in C.livia) at zero day of capture. In F.atra, a non significant difference in glucose level at O - day of landing was recorded (181.099 mg) , in comparison to the corresponding value in nonmigratory birds (G.domestica, was 183.077 mg, while the serum glucose level in C.livia was three times more than its level in the F.atra at the first day of arrival).This difference sharply decreased at the end of the2nd week, but a significant difference was still recorded (282.037 mg ,173.099 mg and 316.391 mg respectively). (table 8).

The lowest level of glucose in S.turtur was obtained on the first day of arrival (102.037 mg) and significantly increased at the end of the 1 st week post capture. There was a significant decrease in serum glucose level at O - day of capture between S.turtur (102.037 mg) and C.livia (318.532 mg). This difference decreased at the end of the 2nd week after capture as shown in table (8).

Table (8) Changes in the level of serum glucose (mg / 100 ml) of migratory and non migratory birds during recovery.

Species	SERUM		
	0-DAY(day of capture)	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	* ■ ▲ 80.233 ± 1.3 F = 26.9 t1 = 11.6, t2 = 27.3	▲ 163.02 ± 1.9 t2 = 25.9	■ 325.819 ± 11.7 t1 = 19.6
F.atra	▲ 181.099 ± 2.3 t2 = 19.2	▲ 185.032 ± 0.9 t2 = 16.3	* ■ ▲ 282.037 ± 2.7 F = 12.6 t1 = 20.3, t2 = 9.9
S.turtur	* ■ ▲ 102.037 ± 2.7 F = 14.7 t1 = 10.3, t2 = 27.9	■ ▲ 288.491 ± 3.1 t1 = 23.2 t2 = 19.3	■ ▲ 288.112 ± 4.9 t1 = 12.5 t2 = 17.3
control 1 G.domestica	183.077 ± 2.1	195.023 ± 0.9	173.099 ± 1.1
control 2 C.livia	318.532 ± 27.3	312.026 ± 1.4	316.391 ± 0.9

* Significant difference concerning the data during zero day of capture, one and two weeks after capture in serum of migratory species using F - test , $P < 0.05$

■ , ▲ Significant difference comparing the results of each stage in migratory birds with the corresponding control (1) (non migratory species) G.domestica ■ and control (2) (non migratory species) C.livia, ▲ respectively, using t-test (t1, t2) respectively. $P < 0.05$

means ± S.E.

(3B) Inorganic phosphorus : -

(i) Serum : -

The circulating inorganic phosphorus was 20.44 mg, 24.42 mg and 16.84 mg in C.coturnix, F.atra and S.turtur respectively just after landing. It decreased to 12.57 mg and 16.65 mg after the 1 st week of recovery in C.coturnix and F.atra respectively, while the inorganic phosphorus in S.turtur decreased after the 2nd week of recovery (11.59 mg) (tables 9 A, B & C).

In G.domestica, there was a non significant change in the level of inorganic phosphorus during caging, on the other hand, the circulating inorganic phosphorus in C.livia was significantly decreased after two weeks (from 18.61 mg to 11.68 mg).

Comparing the migratory and nonmigratory birds, it was noticed that, at zero - day of arrival, a significant increase in the level of inorganic phosphorus in C.coturnix was recorded compared to G.domestica, (20.44 mg and 15.57 mg respectively) but this variation was decreased at the end of the 2 nd week of recovery, 16.96 mg against 15.74 mg respectively, (table 9A). The opposite occurred between C.coturnix and C.livia, where there was a nonsignificant difference at the day of capture (20.44 mg and 18.61 mg respectively).After two weeks of recovery, the levels of inorganic phosphorus in C.coturnix was highly increased than in C.livia (16.96 mg and 11.68 mg respectively). S turtur , recorded nonsignificant changes between their circulating inorganic phosphorus and C.livia during the experiment.

The inorganic phosphorus in F.atra was significantly higher throughout the two recovery weeks than the levels in G.domestica

Table (9-A) Changes in the level of serum (mg / 100 ml) and pectoral muscle (mg / 100g) inorganic phosphorus of C.coturnix and non migratory species during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	* 20.44 ± 2.5 F= 45.5	12.57 ± 1.7	16.96 ± 3.3	* 396.46 ± 4.3 F=285.3	454.67 ± 2.5	649.40 ± 3.9	* 398.45 ± 5.9 F= 20.3	429.13 ± 3.7	444.98 ± 6.3
control 1 G.domestica	■ 15.57 ± 0.5 t= 6.9	14.97 ± 3.1	15.74 ± 1.1	346.54 ± 4.5	■ 349.23 ± 2.9 t=13.32	■ 393.87 ± 7.3 t= 16.99	■ 705.63 ± 9.2 t=46.47	■ 648.8 ± 3.3 t=19.05	■ 791.47 ± 7.9 t=13.32
control 2 C.livia	18.61 ± 0.5	■ 16.93 ± 1.3 t= 6.3	* ■ 11.68 ± 1.1 F= 30.1 t= 13.3	■ 253.41 ± 9.3 t= 18.7	■ 257.65 ± 7.5 t= 20.6	■ 252.75 ± 4.9 t= 23.9	■ 288.09 ± 8.9 t=13.57	■ 244.03 ± 3.9 t=13.92	* ■ 374.24 ± 12.1 F= 24.6 t= 6.46

* Significant difference between data during zero day of capture, one and two weeks after capture, using F-test , P < 0.05

■ Significant difference between each stage in migrating birds with the corresponding control group respectively, using t - test. P < 0.05 , ± S.E.

Table (9-B) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100g) inorganic phosphorus of F.atra and nonmigratory species during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	* 24.42 ± 3.9 F=51.93	16.65 ± 2.7	22.31 ± 1.9	* 341.64 ± 9.3 F= 15.6	478.4 ± 2.7	485.8 ± 7.4	* 363.48 ± 4.9 F=35.2	460.8 ± 2.4	464.47 ± 5.1
control 1 G.domestica	■ 15.57 ± 0.5 t=11.29	14.97 ± 3.1	■ 15.74 ± 1.1 t=10.69	346.54 ± 4.5	■ 349.23 ± 2.9 t=16.58	■ 393.87 ± 7.3 t=12.3	■ 705.63 ± 9.2 t=39.99	■ 648.8 ± 3.3 t=13.48	■ 791.47 ± 7.9 t=40.35
control 2 C.livia	■ 18.61 ± 0.5 t=7.85	16.93 ± 1.3	■* 11.68 ± 1.1 F= 30.1 t=5.83	■ 253.41 ± 9.3 t=22.17	■ 257.65 ± 7.5 t=23.4	■ 252.75 ± 4.9 t= 11.06	■ 288.09 ± 8.9 t= 7.71	■ 244.03 ± 3.9 t=12.57	* ■ 374.24 ± 12.1 F= 24.6 t=7 .77

* Significant difference between data during zero day of capture, one and two weeks after capture , using F - test , P<0.05 .

■ Significant difference between each stage in migrating birds with the corresponding control group repectively , using F - test , P < 0.05, ± S.E.

Table (9-C): Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100g). inorganic phosphorus of **S.turtur** and nonmigratory species recovery.

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	0-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
S.turtur	16.84 ± 3.11	17.47 ± 4.2	11.59 * ± 2.31 F= 23.3	370.43 * ± 2.91 F= 12.9	396.51 ± 7.31	392.09 ± 5.6	339.53 ± 8.32	346.49 ± 9.71	435.32 * ± 5.42 F=136.2
control 1 C.domestica	15.57 ± 0.5	14.97 ■ ± 3.1 t= 8.3	15.74 ■ ± 1.1 t= 9.1	346.54 ± 4.5	349.23 ± 2.9	393.87 ± 7.3	705.63 ■ ± 9.2 t=39.39	648.8 ■ ± 3.3 t=29.93	791.47 ■ ± 7.9 t=39.71
control 2 C.livia	18.61 ± 0.5	16.93 ± 1.3	11.68 * ± 1.1 F= 30.1	253.41 ■ ± 9.3 t=82.99	257.65 ■ ± 7.5 t=33.91	252.75 ■ ± 4.9 t= 12.13	288.09 ■ ± 8.9 t=14.91	244.03 ■ ± 3.9 t=14.35	374.24 * ■ ± 12.1 F= 24.6 t=10.32

* Significant difference between data during zero day of capture, one and two weeks after capture, using F-test, $P < 0.05$.

■ Significant difference between each stage in migrating birds with the corresponding control group repectively, using F-test, $P < 0.05 \pm$ S.E..

(table 9 B).

(ii) Pectoral muscle : -

The lowest value of inorganic phosphorus in both the superficial and deep pectoral muscles were demonstrated immediately after landing (being 396.46 mg, 341.64 mg and 370.43 mg in the superficial muscles and 398.45 mg, 363.48 mg and 339.53 mg in the deep pectoral muscles of C.coturnix, F.atra and S.turtur respectively). In the 1 st week during recovery the muscular content of the inorganic phosphorus was significantly elevated (tables 9 A, B & C).

The inorganic contents in the pectoral muscles (superficial and deep) of the migratory species were significantly higher than the nonmigratory C.livia .In S.turtur, there was a non significant difference in the inorganic phosphorus of the superficial muscle compared with that of G.domestica. (table 9 C). The deep pectoral muscle of G.domestica recorded a high value of inorganic phosphorus than the three migratory species during the experiment.

(4B) Creatine phosphate : -

The lowest C.P level was recorded on the first day of arrival in both superficial and deep pectoral muscles in the three migratory species C.coturnix, F.atra and S.turtur, being 465.98 mg, 645.95 mg, 1691.12 mg, 1763.96 mg, 6000.48 mg and 5747.5 mg in both superficial and deep pectoral muscle for the three species respectively (tables 10 A, B & C).

However the highest concentration of C.P was recorded after the 2nd week of recovery.

Table (10-A) Changes in the level of pectoral muscle creatine phosphate (mg/100g) of C.coturnix and nonmigratory birds during recovery.

Duration	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
Species	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	465.98 * ± 9.2 F= 54.3	931.64 ± 3.7	1270.1 ± 10.4	645.95 * ± 2.7 F= 102.3	9715.53 ± 7.9	9241.64 ± 8.9
control 1 G.domestica	6045.36 ■ ± 6.6 t= 11.2	6019.15 ■ ± 7.1 t= 65.0	5990.24 ■ ± 7.2 t= 37.5	5819.51 ■ ± 7.9 t= 51.7	5598.8 ■ ± 9.7 t= 7.4	5945.72 ■ ± 5.9 t= 7.8
control 2 C.livia	8359.5 ■ ± 8.2 t= 59.6	7693.4 ■ ± 6.9 t= 16.4	8553.9 ■ ± 5.4 t= 26.9	6068.6 ■ ± 9.3 t= 66.9	6070.78 ■ ± 7.2 t= 15.2	6455.99 ■ ± 8.9 t= 13.7

* Significant difference (F - test) between C.P values of migratory species during the duration of the experiment. $P < 0.05$

■ Significant difference (t-test) between each stage of migratory and nonmigratory species., $P < 0.05$

± .S.E.

Table (10-B) Changes in the level of pectroal muscle creatine phosphate (mg/100g) of F.atra and nonmigratory birds during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	1691.12 ± 11.9	1584.43 ± 15.9	2026.23 * ± 12.3 F= 10.8	1763.96 ± 17.2	1539.08 ± 19.4	1760.53 ± 12.3
control 1 G.domestica	6045.36 ■ ± 6.6 t= 8.6	6019.15 ■ ± 7.1 t= 13.8	5990.24 ■ ± 7.2 t= 20.7	5819.51 ■ ± 7.9 t= 20.4	5598.8 ■ ± 9.7 t= 17.9	5945.72 ■ ± 5.9 t= 15.9
control 2 C.livia	8359.5 ■ . 8.2 t= 59.9	7693.4 ■ . 6.9 t= 42.5	8553.9 ■ . 5.4 t= 26.8	6068.6 ■ . 9.3 t= 24.0	6070.78 ■ . 7.2 t= 11.9	6455.99 ■ . 8.9 t= 18.7

* Significant difference (F - test) between C.P. values of migratory species during the duration of the experiment. $P < 0.05$.

■ Significant difference (t - test) between migratory and non migratory species. $P < 0.05$. ± S.E.

Table (10-C) Changes in the level of pectoral muscle creatine phosphate (mg/100g) of S.turtur and nonmigratory birds during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 cd week
S.turtur	6000.48 * ± 7.1 F= 50.3	11517.96 ± 5.6	14105.78 ± 11.2	5747.5 * ± 7.3 F= 19.2	8227.22 ± 8.1	9054.9 ± 9.0
control 1 S.domestica	6045.36 ± 6.6	6019.15 ■ ± 7.1 t= 13.9	5990.24 ■ ± 7.2 t= 11.9	5819.51 ± 7.9	5598.8 ■ ± 9.7 t= 9.51	5945.72 ■ ± 5.9 t= 19.6
control 2 C.livia	8359.5 ■ ± 8.2 t= 15.0	7693.4 ■ ± 6.9 t= 15.3	8553.9 ■ ± 5.4 t= 12.5	6068.6 ± 9.3	6070.78 ■ ± 7.2 t= 6.21	6455.99 ■ ± 8.9 t= 34.1

* Significant difference (F - test) between C.P. values of migratory species during the duration of the experiment. $P < 0.05$.

■ Significant difference (t - test) between migratory and non migratory species. $P < 0.05$. ± S.E.

Immediately after landing, the C.P content in the superficial pectoral muscles of all the migratory species were found to be significantly lower than the non flying and nonmigratory G.domestica, and C.livia. After two weeks of recovery, this decrease was changed to a highly significant increase in C.P in the migratory birds as compared with the nonmigratory species. (tables 10 A, B & C), being 1270.1 mg, 2026.23 mg and 14105.78 mg corresponding to 5990.24 mg and 8553.9 mg respectively.

In the deep pectoral muscle, the C.P in C.coturnix and S.turtur after the 2nd week of recovery, recorded a highly significant increase (9241.64 mg in C.coturnix, 9054.9 mg in S.turtur as compared to 5945.72 mg in G.domestica and 6455.99 mg in C.livia) (tables 10 A & C). On the other hand, the deep pectoral muscle content of C.P in F.atra was significantly lower throughout the duration of the experiment as compared with G.domestica and C.livia, being 1760.53 mg, 5945.72 mg, and 6455.99 mg after the 2nd week of recovery respectively, as shown in table (10 B).

(5B) Adenosine triphosphate (ATP) : -

Muscular ATP levels in C.coturnix, F.atra and S.turtur were 249.27 mg, 339.23 mg and 710.81 mg in the superficial pectoral muscles immediately after arrival and increased to 437.0 mg, 568.15 mg and 1190.5 mg after the 2 nd week of recovery. Also the ATP level in the deep pectoral muscles was raised from 388.53 mg, 212.53 mg and 498.76 mg to 527.86 mg, 471.11 mgand 1268.92 mg respectively. (tables 11 A, B & C).

Table (11-A) changes in the concentration of pectoral muscle adenosine triphosphate (mg/100g) of C.Coturnix and nonmigratory birds during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	249.27 ± 5.3	279.37 ± 3.3	437.0 * ± 2.9 F= 150.1	388.53 ± 6.1	527.99 ± 2.3	527.86 * ± 5.4 F= 162.7
control 1 G.domestica	147.8 ■ ± 1.4 t= 29.4	136.81 ■ ± 2.3 t= 10.5	145.36 ■ ± 0.1 t= 26.7	127.11 ■ ± 1.1 t= 14.3	128.24 ■ ± 2.1 t= 19.4	133.59 ■ ± 0.4 t= 43.0
control 2 C.livia	144.46 ■ ± 2.7 t= 10.7	144.94 ■ ± 3.4 t= 10.0	137.7 ■ ± 0.9 t= 31.7	533.7 ■ ± 1.5 t= 12.9	544.77 ± 3.2	544.87 ± 0.7

* Significant difference between data of the migratory species within the duration of the experiment (F - test) $P < 0.05$.

■ Significant difference between levels in the migratory species and the nonmigratory species (t - test). $P < 0.05$.

±.S.E.

Table (11-B) Changes in the concentration of pectoral muscle adenosine triphosphate (mg/100g) of F.atra and non migratory birds during recovery.

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	339.23 ± 3.4	484.28 ± 5.2	568.15 ± 3.2 * F= 457.0	212.53 ± 1.5	256.79 ± 0.9	471.11 ± 0.4 * F= 134.7
control 1 G.domestica	147.8 ± 1.4 ■ t= 23.5	136.81 ± 2.3 ■ t= 39.8	145.36 ± 0.1 ■ t= 7.6	127.11 ± 1.1 ■ t= 9.9	128.24 ± 2.1 ■ t= 10.5	133.59 ± 0.4 ■ t= 11.8
control 2 C.livia	144.46 ± 2.7 ■ t= 25.8	144.94 ± 3.4 ■ t= 39.8	137.7 ± 0.9 ■ t= 8.3	533.7 ± 1.5 ■ t= 9.1	544.77 ± 3.2 ■ t= 17.4	544.87 ± 0.7

* Significant difference between data of the migratory species within the duration of the experiment (F - test), $P < 0.05$.

■ Significant difference between levels in the migratory species and the non-migratory species (t - test). , $P < 0.05$.

±.S.E.

Table (11-C) changes in the concentration of pectoral muscle adenosine triphosphate (mg/100g) of S.turtur and nonmigratory birds during recovery

Duration / Species	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
S.turtur	710.81 ± 5.3	664.22 ± 7.1	1190.5 * ± 11.2 F= 50.9	498.76 ± 3.4	534.46 ± 5.1	1268.92 * ± 8.9 F= 113.3
control 1 G.domestica	147.8 ■ ± 1.3 t= 28.4	136.81 ■ ± 2.3 t= 27.6	145.36 ■ ± 0.1 t= 80.3	127.11 ■ ± 1.1 t= 25.3	128.24 ■ ± 2.1 t= 24.1	133.59 ■ ± 0.4 t= 11.8
control 2 C.livia	144.46 ■ ± 2.7 t= 30.4	144.94 ■ ± 3.4 t= 27.3	137.7 ■ ± 0.9 t= 89.3	533.7 ■ ± 1.5 t= 12.1	544.77 ± 3.2	544.87 ■ ± 0.7 t= 19.3

* Significant difference between data of the migratory species within the duration of the experiment (F - test)., P < 0.05 .

■ Significant difference between levels in the migratory species and the non-migratory species (t - test)., P < 0.05 .

± .S.E.

The superficial muscle content of ATP in the three migratory species was always higher than the nonmigratory and non flying species. In the deep pectoral muscle, the same result was noted between the migratory species and the non flying G.domestica. On the other hand, the ATP level in C.livia was higher than the level in the migratory species C.coturnix, F.atra and S.turtur at zero day of capture, being 533.7 mg, 388.53 mg, 212.53 mg and 498.76 mg respectively. After two weeks of recovery, this difference between the nonmigratory C.livia and migrating C.coturnix and F.atra declined and tended to be the same as shown in (tables 11 A & B). While in S.turtur, the ATP level was elevated to more than twice the value in C.livia (table 11 C).

(6B) Total lipids :-

(i) Serum :-

As shown in tables 12 A, B & C a significant increase in the circulating total lipids was noticed from 0-day of arrival till the end of the 2nd week after capture in the three migratory species (755.58mg, 651.89mg and 1229.13mg, increased to 1154.23mg, 2104.0mg and 2056.74mg, in C.coturnix, F.atra and S.turtur respectively) .

Statistical analysis using t-test, indicated that, the total serum lipids in C.cotrurnix and S.turtur species were significantly elevated compared to the nonmigratory species on the first day of arrival until the end of the 2nd week of recovery. (tables 12 A,B & C).

(ii) Pectoral muscle :-

In C.coturnix, F.atra and S.turtur, the sperficial pectoral

muscle total lipids concentrations were 9751.76mg, 9505.64mg and 12264.1mg on the first day of landing, increased to 31507.87mg, 14651.11mg and 51723.26mg by the end of the 2nd week during capture, respectively.

Comparing the total lipids in migratory and nonmigratory birds, statistical analysis indicated that, the total lipids levels in migratory birds C.coturnix were significantly higher than that in the nonmigratory G.domestica and C.livia (31507.87mg, 11705.56mg and 12915.68mg respectively). In F.atra there was a significant difference in total lipids than that in nonmigratory at zero day of capture, but this difference dropped at the end of the 2nd week (9505.64mg, 11994.4mg, 13748.34mg at zero day of arrival, reached to 14651.11mg, 11705.56mg and 12915.68mg after the 2nd week for F.atra, G.domestica and C.livia respectively), (tables 12 A,B & C).

On the other hand, the superficial pectoral muscle total lipids content in S.turtur increased to more than four fold the total lipids in G.domestica and C.livia at the end of the 2nd week after arrival (51723.26mg, 11705.56mg and 12915.68mg respectively).

The deep pectoral muscle total lipids content was raised from 9111.37mg, 11789.8mg and 10790.83mg to 40622.53mg, 7983.71mg and 11862.2mg in C.coturnix, F.atra and S.turtur respectively just after capture, till the end of the 1st week of capture.

It is clear from table (12A) that, there was a significant difference in total lipids in the deep pectoral muscle of C.coturnix and the nonmigratory G.domestica, and C.livia. On the other hand both migratory species F.atra and S.turtur had a

Table (12-A) changes in the concentration of serum (mg/100 ml) and pectoral muscle (mg/100 g) total lipids of C.coturnix and nonmigratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
C.coturnix	755.58 ± 3.3	837.81 ± 5.2	* 1154.23 ± 11.3 F= 337.4	* 9751.76 ± 15.7 F= 3385.6	49373.7 ± 13.9	31507.87 ± 17.8	* 9111.37 ± 14.4 F=700.8	40622.5 ± 25.9	32118.7 ± 30.3
control 1 G.domestica	■ 381.47 ± 4.2 t= 66.4	■ 466.11 ± 3.7 t= 13.58	■ 390.4 ± 4.9 t= 31.94	11994.4 ± 11.5	■ 13314.4 ± 25.3 t=22.37	■ 11705.56 ± 22.7 t= 12.77	9470.81 ± 13.4	■ 9816.06 ± 10.3 t= 31.8	■ 9740 ± 9.7 t=11.74
control 2 C.livia	■ 565.43 ± 3.2 t= 13.0	■ 668.37 ± 5.7 t=7.05	■ 697.32 ± 5.6 t= 53.81	■ 13748.3 ± 13.7 t=22.81	■ 13731.2 ± 15.4 t=25.04	■ 12915.68 ± 24.3 t= 13.85	■ 12660.3 ± 23.7 t= 20.3	■ 11453.7 ± 21.9 t=27.66	■ 13844.9 ± 19.8 t= 8.73

* Significant difference between data during day of arrival and the first two weeks after capture, using F - test. $P < 0.05$.

■ Significant difference between each stage in migrating birds with the corresponding control using t - test. $P < 0.05$.

± S.E.

Table (12-B) Changes in the concentration of serum (mg/100 ml) and pectoral muscle (mg/100 g) total lipids of F.atra and non migratory birds during recovery.

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	651.89 ± 4.2	643.56 ± 5.4	2104.0 * ± 11.3 F= 197.6	9505.64 * ± 13.7 F=29.97	14938.6 ± 25.4	14651.11 ± 22.2	11798.8 ± 15.9	7983.71 * ± 10.4 F=10.36	13266.3 ± 13.4
control 1 G.domestica	381.47 ± 4.2 t= 9.28	466.11 ± 3.7 t=13.7	390.4 ± 4.9 t= 11.4	11994.4 ± 11.5	13314.4 ± 25.3	11705.56 ± 22.7	9470.81 ± 13.4 t= 12.7	9816.06 ± 10.3	9740 ± 9.7 t= 9.3
control 2 C.livia	565.43 ± 3.2	668.37 ± 5.7	697.32 ± 5.6 t= 36.95	13748.3 ± 13.7 t= 7.91	13731.2 ± 15.4	12915.68 ± 24.3	12660.3 ± 23.7	11453.7 ± 21.9 t= 9.31	13844.9 ± 19.8

* Significant difference between data during day of arrival and the first two weeks after capture, using F - test., $P < 0.05$.

■ Significant difference between each stage in migrating birds with the corresponding control using t - test., $P < 0.05$.

± S.E.

Table (12-C) Changes in the concentration of serum (mg/ 100 ml) and pectoral muscle (mg/100 g) total lipids of S.turtur and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFECIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
S.turtur	1229.13 ± 7.9	1198.5 ± 11.7	2056.74 * ± 13.9 F= 411.2	12264.1 ± 25.9	11603.5 ± 32.7	51723.26 * ± 23.3 F= 782.1	10790.8 ± 13.9	11862.2 ± 25.3	11889.2 ± 17.9
control 1 G.domestica	381.47 ■ ± 4.2 t= 23.9	466.11 ■ ± 3.7 t=9.69	390.4 ■ ± 4.9 t= 13.8	11994.4 ± 11.5	13314.4 ± 25.3	11705.56 ■ ± 22.7 t= 26.37	9470.81 ■ ± 13.4 t= 14.6	9816.06 ■ ± 10.3 t= 7.9	9740 ■ ± 9.7 t= 8.3
control 2 C.livia	565.43 ■ ± 3.2 t= 13.6	668.37 ■ ± 5.7 t= 17.39	697.32 ■ ± 5.6 t= 39.3	13748.3 ± 13.7	13731.2 ± 15.4	12915.68 ■ ± 24.3 t= 33.53	12660.3 ± 23.7	11453.7 ± 21.9	13844.9 ± 19.8

* Significant difference between data during day of arrival and the first two weeks after capture, using F - test. $P < 0.05$.

■ Significant difference between each stage in migrating birds with the corresponding control using t - test. $P < 0.05$.

± S.E.

nonsignificant difference with C.livia (tables 12 B & C).

(7B) Chopesterol : -

(i) Serum : -

The cholesterol value in the serum obtained immediately after capture and during recovery in the migratory species (C.coturnix, F.atra and S.turtur) was compared with the nonmigratory species (G.domestica and C.livia) as shown in tables (13 A, B & C).

The serum cholesterol level was significantly affected on the day of capture. In C.coturnix, F.atra and S.turtur, the cholesterol levels were 157.32 mg, 82.54 mg and 292.4 mg just after landing, and increased to 416.7 mg, 603.19 mg and 443.63 mg at the end of 2 nd week of recovery respectively. In addition, there was a significant variation of each parameter in the migratory species when compared with G.domestica after two weeks of recovery.

The non flying G.domestica had a nonsignificant variation in cholesterol levels, on the other hand, C.livia, had a significant increasing circulating cholesterol at the end of recovery (being 135.47 mg at O - time, increased to 486.81 mg at the end of the 2nd week).

(ii) Pectoral muscle : -

The cholesterol level in the superficial and deep pectoral

Table (13-A) changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) total cholesterol of C.coturnix and non migratory birds during recovey.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
C.coturnix	157.32 ± 1.3	174.91 ± 3.2	* 416.7 ± 1.5 F= 7.9	* 820.6 ± 5.3 F=222.8	2.11 ± 0.01	5.45 ± 0.03	625.13 ± 7.2	604.77 ± 8.3	* 5.65 ± 2.1 F=128.7
control 1 G.domestica	■ 55.08 ± 1.3 t= 13.2	■ 51.06 ± 2.7 t=15.4	■ 47.29 ± 1.9 t= 25.4	■ 8.73 ± 0.1 t= 17.9	■ 8.92 ± 1.2 t= 7.9	7.8 ± 0.4	■ 7.86 ± 1.3 t= 23.9	■ 8.36 ± 0.5 t= 19.6	9.24 ± 0.7
control 2 C.livia	135.47 ± 2.1	162.38 ± 3.9	* 486.81 ± 2.9 F= 578.0	710.43 ± 7.2	■ 645.47 ± 5.5 t= 32.9	■ 635.63 ± 3.7 t= 45.7	511.56 ± 3.3	528.94 ± 4.9	■ 590.26 ± 6.9 t= 54.5

* Significant difference between parameter during zero - time, 1 st and 2 nd weeks of recovery using F - test., $P < 0.05$.

■ Significant difference between parameter of migratory species and non-migratory species respectively using t - test., $P < 0.05$.

± S.E.

Table (13-B) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) total cholesterol of F.atra and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
F.dtra	82.54 ± 1.7	73.3 ± 1.7	* 603.19 ± 5.3 F= 598.7	* 1512.91 ± 11.3 F=468.7	6.61 ± 2.1	7.69 ± 0.3	512.01 ± 7.4	528.75 ± 5.5	* 6.01 ± 0.02 F=793.5
control 1 G.domestica	■ 55.08 ± 1.3 t= 5.24	■ 51.06 ± 2.7 t=5.88	■ 47.29 ± 1.9 t= 10.05	■ 8.73 ± 0.1 t=17.72	8.92 ± 1.2	7.8 ± 0.4	■ 7.86 ± 1.3 t= 29.0	■ 8.36 ± 0.5 t= 27.9	9.24 ± 0.7
control 2 C.livia	■ 135.47 ± 2.1 t= 8.2	■ 162.38 ± 3.9 t=20.1	* ■ 486.81 ± 2.9 F= 578.0 t= 23.8	■ 710.43 ± 7.2 t= 9.3	■ 645.47 ± 5.5 t= 17.6	■ 635.63 ± 3.7 t= 29.54	511.56 ± 3.3	528.94 ± 4.9	■ 590.26 ± 6.9 t=29.32

* Significant difference between parameter during zero - time, 1 st and 2 nd weeks of recovery using F - test., $P < 0.05$.

■ Significant difference between parameter of migratory species and non migratory species respectively using t - test., $P < 0.05$.

± S.E.

Table (13-C) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) total cholesterol of S.turtur and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
S.turtur	* 292.4 ± 6.6 F=183.6	478.71 ± 8.3	443.63 ± 5.6	* 1169.0 ± 11.3 F=977.6	5.56 ± 0.01	6.65 ± 0.4	5.58 ± 0.1	4.91 ± 0.7	6.67 ± 1.1
control 1 G.domestica	■ 55.08 ± 1.3 t= 27.9	■ 51.06 ± 2.7 t=36.8	■ 47.29 ± 1.9 t= 35.4	■ 8.73 ± 0.1 t=28.3	8.92 ± 1.2	7.8 ± 0.4	7.86 ± 1.3	8.36 ± 0.5	9.24 ± 0.7
control 2 C.livia	■ 135.47 ± 2.1 t= 18.2	■ 162.38 ± 3.9 t=14.0	* 486.81 ± 2.9 F= 578.0	■ 710.43 ± 7.2 t= 10.3	■ 645.47 ± 5.5 t= 17.6	■ 635.63 ± 3.7 t= 29.0	■ 511.56 ± 3.3 t=33.46	■ 528.94 ± 4.9 t=21.2	■ 590.26 ± 6.9 t=29.2

* Significant difference between parameter during zero - time, 1 st and 2 nd weeks of recovery using F - test., $P < 0.05$.

■ Significant difference between parameter of migratory species and non migratory species respectively using t - test., $P < 0.05$.

± S.E.

muscles, in C.coturnix and F.atra was significantly elevated immediately after landing (being 820.6 mg, 1512.91 mg in the superficial and 625.13 mg and 512.01 mg in the deep pectoral muscles respectively). These levels were significantly lowered at the end of the 2nd week of recovery in the two muscles. (tables 13 A, B & C).

The levels of cholesterol in G.domestica had a significant variation compared with the migratory species, except after the 2nd week of recovery, while where was a nonsignificant difference.

In C.livia, the cholesterol level was significantly higher than the levels in the three migratory species at the end of the 2nd week of recovery (635.63 mg and 590.26 mg in the superficial and deep pectoral muscles of C.livia corresponding to 5.45 mg and 5.65 mg in C.coturnix, 7.69 mg and 6.01 mg in F.atra and 6.65 mg and 6.67 mg in S.turtur at the end of the 2nd day of recovery in the superficial and deep pectoral muscles respectively (tables 13A, B & C).

(8B) Triglyceride : -

(i) Serum : -

There was a progressive increase in the serum triglyceride concentration during the recovery period in all the three migratory species, 194.82 mg, 104.82 mg and 205.8 mg on the first day of landing and increased to 361.84 mg, 236.84 mg and 405.9 mg after the 1 st week of capture in C.coturnix, F.atra and S.turtur, respectively as shown in tables 14 A, B & C .

Comparing the triglyceride level in migratory birds with the

nonmigratory, the statistical analysis indicated that its level in C.coturnix, F.atra and S.turtur significantly differs from the nonmigratory G.domestica. Also C.coturnix and S.turtur showed a significant difference in their triglyceride levels on the arrival day and during recovery than in the nonmigratory C.livia. On the other hand, the migrating F.atra revealed a nonsignificant difference in its triglyceride values in comparison to its level in C.livia in the 1 st and 2 nd week of recovery (236.84 mg, 240.14 mg in F.atra and 276.9 mg and 299.15 mg in C.livia in the 1 st and 2 nd weeks) (tables 14 A, B & C).

(ii) Pectoral muscle : -

The concentration of triglyceride in the superficial pectoral muscle was significantly increased to more than two fold the O - day value in the two migratory species as shown in tables (14A & B) (1621.74 mg , 1566.79 mg) increase to 3634.02 mg, 3606.32 mg after one week of recovery in C.coturnix, and F.atra respectively.

The triglyceride levels in the superficial pectoral muscles of the three migratory species was still significantly higher than the levels in the nonmigratory species, especially after the first week of recovery (in C.coturnix the triglyceride level was 3634.02 mg corresponding to 1360.69 mg and 2121.58 mg in G.domestica and C.livia respectively) at the end of the 1st week of recovery. (table 14 A).

The level of triglyceride in the deep pectoral muscles of the migratory species, C.coturnix and F.atra, also increased and reached its peak at the end of the 1 st week after arrival (in C.coturnix, 1140.46 mg at the first day of landing to 4883.03 mg after one week of recovery) as shown in table 14, A . On the

Table (14-A) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) triglyceride of C.coturnix and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	* 194.82 ± 1.62 F= 1306.9	361.84 ± 14.3	345.1 ± 3.7	* 1621.74 ± 12.01 F=127.0	3634.02 ± 17.19	4391.91 ± 3.7	* 1140.46 ± 11.7 F= 2263.3	4883.03 ± 24.7	3819.58 ± 80.3
control 1 G.domestica	167.54 ± 2.3	. 156.4 ± 1.3 t=23.5	. 187.21 ± 3.1 t= 11.0	1163.67 ± 14.72	. 1360.69 ± 12.9 t=19.01	. 1098.68 ± 21.4 t= 8.91	1131.23 ± 13.3	. 1314.94 ± 18.3 t=38.91	. 1283.91 ± 20.1 t= 25.6
control 2 C.livia	. 281.98 ± 3.1 t=11.11	. 276.9 ± 2.19 t= 9.9	. 299.15 ± 1.14 t= 8.3	1942.61 ± 23.5	. 2121.58 ± 17.3 t= 11.7	. 1896.27 ± 12.9 t= 6.5	1252.01 ± 31.01	. 1347.98 ± 19.9 t=33.79	. 1371.71 ± 15.6 t=22.95

* Significant difference between data during day of arrival and the first two weeks after capture, using F - test., $P < 0.05$.

. Significant difference between each stage in migrating birds with the corresponding control using t - test., $P < 0.05$.

± S.E.

Table (14-B) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) triglyceride of F.atra and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
F.atra	* 104.82 ± 3.2 F=130.9	236.84 ± 2.11	240.14 ± 1.7	* 1566.79 ± 19.3 F= 127.04	3606.32 ± 25.6	3089.92 ± 17.9	* 966.21 ± 4.3 F= 2263.3	2155.31 ± 7.9	2043.51 ± 13.2
control 1 G.domestica	167.54 ± 2.3	. 156.4 ± 1.3 t=15.7	. 187.21 ± 3.1 t= 14.2	. 1163.67 ± 14.72 t=13.28	. 1360.69 ± 12.9 t= 9.68	. 1098.68 ± 21.4 t= 28.91	1131.23 ± 13.3	. 1314.94 ± 18.3 t=38.9	. 1283.91 ± 20.1 t= 25.6
control 2 C.livia	. 281.98 ± 3.1 t= 9.2	276.9 ± 2.19	299.15 ± 1.14	1942.61 ± 23.5	. 2121.58 ± 17.3 t= 11.7	. 1896.27 ± 12.9 t= 16.5	. 1252.01 ± 31.01 t= 11.3	. 1347.98 ± 19.9 t= 33.7	. 1371.71 ± 15.6 t= 22.9

* Significant difference between data during day of arrival and the first two weeks after capture, using F - test., $P < 0.05$.

. Significant difference between each stage in migrating birds with the corresponding control group respectively using t - test., $P < 0.05$.

± S.E.

Table (14-C) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) triglyceride of S.turtur and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
S.turtur	* 205.8 ± 3.01 F= 76.6	405.9 ± 1.92	541.94 ± 2.35	* 2361.16 ± 13.72 F= 7.9	2977.41 ± 19.21	2804.66 ± 15.91	1367.5 ± 25.3	1641.78 ± 13.3	* 3122.68 ± 17.3 F=333.6
control 1 G.domestica	167.54 ± 2.3	. 156.4 ± 1.3 t=15.7	. 187.21 ± 3.1 t= 9.7	. 1163.67 ± 14.72 t= 8.4	. 1360.69 ± 12.9 t= 7.5	. 1098.68 ± 21.4 t= 147.0	1131.23 ± 13.3	1314.94 ± 18.3	. 1283.91 ± 20.1 t= 24.5
control 2 C.livia	. 281.98 ± 3.1 t= 7.8	. 276.9 ± 2.19 t= 8.9	. 299.15 ± 1.14 t= 8.3	1942.61 ± 23.5	. 2121.58 ± 17.2 t= 8.57	. 1896.27 ± 12.9 t= 16.96	1252.01 ± 31.01	1347.98 ± 19.9	. 1371.71 ± 15.6 t= 21.9

* Significant difference between data during day of arrival and the first two weeks after capture, using F - test., $P < 0.05$.

. Significant difference between each stage in migrating birds with the corresponding control group respectively using t - test. , $P < 0.05$.

± S.E.

other hand, the triglyceride reached its peak in the deep pectoral muscles at the end of the 2 nd week after recovery in S.turtur where the value of 1367.5 mg was increased to 3122.68 mg.

The triglyceride level in the migratory species, C.coturnix and S.turtur, was significantly increased to more than twice the G.domestica and C.livia levels at the end of the 2nd week of recovery, (3819.58 mg and 3122.68 mg in C.coturnix and S.turtur corresponding to 1283.91 mg and 1371.71 mg in G.domestica and C.livia respectively) as recorded in tables (14 A & C). In F.atra the triglyceride level was 1.5 times higher than the value in the nonmigratory species (2043.51 mg in F.atra and 1283.9 mg, 1371.71 mg in G.domestica and C.livia respectively at the 2nd week of recovery. (table 14, B).

(9B) Phospholipid : -

(i) Serum : -

Serum phospholipid was significantly increased after the 2nd week of recovery compared to the level on the day of arrival in C.coturnix, F.atra and S.turtur. The phospholipid level was 18.53 mg, 17.3 mg and 11.61 mg at zero day of theirarrival, and increased to 430.3 mg, 319.98 mg and 323.5 mg after two weeks of recovery.

The circulating phospholipid in the migratory birds on the zero - day of landing, was lower than its level in the nonmigratory species. At the end of the 1st week of recovery, this difference was depleted. On the other hand, at the end of the 2nd week, the phospholipid level in the migratory species become significantly higher than its level in G.domestica and insignificant from C.livia (except for C.coturnix, its phospholipid remained significantly higher than both G.domestica and C.livia). (table 15 A).

(ii) Pectoral muscle : -

Results of tissue analysis were shown in tables (15 A, B & C). Statistical analysis on the zero - day of landing indicated a significantly lower phospholipid content when compared with the values after two weeks postmigrant. In C.coturnix, F.atra and S.turtur, the phospholipid values were 1478.56 mg, 48.21 mg and 80.29 mg in the superficial pectoral muscle and 1703.56 mg, 353.57 mg and 658.92 mg in the deep pectoral at zero - day of landing. These increased to 22525.7 mg, 1128.57 mg and 1707.14 mg in the superficial pectoral muscle and 24910.71 mg, 392.85 mg and 1243.21 mg in the deep pectoral muscle, one week postmigrant, respectively.

On the zero day of capture, the phospholipid of the migratory species in the superficial pectoral muscle was significantly lower than the values of the two nonmigratory species. At the end of recovery (2nd week), the values of phospholipid in the migratory species,C.coturnix F.atra and S.turtur, became significantly higher than the levels in the non flying G.domestica, while the nonmigratory C.livia phospholipid contents remained even higher. In C.coturnix, the concentration of phospholipid after one week of recovery significantly higher than the values noted in both G.domestica and C.livia. (22525.7 mg, 253.76 mg and 2995.72 mg respectively) table (15 A).

The phospholipid content in the deep pectoral muscle of migratory and nonmigratory species was lower than the values recorded in all groups in the superficial muscle. During the 1st week of recovery, the concentration of phospholipids was highly increased than levels determined at the zero - day of capture, except in F.atra where a nonsignificant difference in the phospholipid content was recorded (table 15 - B).

Table (15-A) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) phospholipid of C.coturnix and non migratory birds during recovery.

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 cd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 cd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 cd week
C.coturnix	* 18.53 ± 1.2 F= 22.3	380.84 ± 3.9	430.3 ± 3.2	1478.56 ± 9.3	* 22525.7 ± 7.2 F= 16.4	1896.42 ± 6.9	1703.56 ± 6.1	* 24910.7 ± 10.3 F= 31.2	1546.42 ± 8.2
control 1 G.domestica	. 116.21 ± 0.9 t= 17.9	. 116.96 ± 1.2 t=31.2	. 119.11 ± 2.1 t= 29.3	. 232.14 ± 1.9 t= 39.7	. 253.76 ± 2.1 t= 57.2	. 252.3 ± 0.9 t= 30.1	. 116.07 ± 0.7 t= 29.7	. 119.92 ± 0.2 t= 51.3	. 126.37 ± 1.1 t= 23.2
control 2 C.livia	. 398.76 ± 1.3 t= 15.3	330.36 ± 2.1	. 353.97 ± 1.9 t= 12.9	. 3112.49 ± 3.2 t= 19.3	. 2995.72 ± 5.9 t= 25.2	. 3139.7 ± 6.2 t= 21.3	. 232.14 ± 7.1 t= 69.3	. 250.23 ± 1.1 t= 80.3	. 230.92 ± 2.2 t= 59.4

* Significant difference between parameter in migratory birds at zero day of arrival and two weeks after capture using F - test, $P < 0.05$.

. Significant difference between data in migratory species and the corresponding non migratory, non flying, control using t - test., $P < 0.05$.

± S.E.

Table (15-B) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) Phospholipid of F.atra and non migratory birds during recovery.

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	* 17.3 ± 0.3 F= 29.9	319.43 ± 2.1	319.98 ± 2.9	* 48.21 ± 0.5 F=110.2	1128.57 ± 7.9	1157.14 ± 9.2	353.57 ± 2.5	392.85 ± 3.6	392.142 ± 2.5
control 1 G.domestica	. 116.21 ± 0.9 t= 15.7	. 116.96 ± 1.2 t=33.1	. 119.11 ± 2.1 t= 31.9	. 232.14 ± 1.9 t= 19.3	. 253.76 ± 2.1 t= 51.3	. 252.3 ± 0.9 t= 22.9	. 116.07 ± 0.7 t= 12.7	. 119.92 ± 0.2 t= 16.3	. 126.37 ± 1.1 t= 12.9
control 2 C.livia	. 398.76 ± 1.3 t= 17.3	330.36 ± 2.1	353.97 ± 1.9	. 3112.49 ± 3.2 t= 23.7	. 2995.72 ± 5.9 t= 15.3	. 3139.7 ± 6.2 t= 17.7	. 232.14 ± 7.1 t= 10.9	. 250.23 ± 1.1 t= 12.3	. 230.92 ± 2.2 t= 16.2

* Significant difference between parameter in migratory birds at zero day of arrival and two weeks after capture using F - test., $P < 0.05$.

. Significant difference between data in migratory species and the corresponding non-migratory, non flying control using t - test., $P < 0.05$.

± S.E.

Table (15-C) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) phospholipid of S.turtur and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
S.turtur	11.61 ± 0.04	19.56 ± 0.5	323.5 * ± 3.3 F= 44.2	80.29 * ± 1.3 F= 51.3	1707.14 ± 12.3	1216.07 ± 6.7	658.92 * ± 2.7 F= 20.3	1243.21 ± 4.5	1192.86 ± 6.9
control 1 G.domestica	116.21 . ± 0.9 t= 18.9	116.96 . ± 1.2 t=18.2	119.11 . ± 2.1 t= 30.2	232.14 . ± 1.9 t= 15.9	253.76 . ± 2.1 t= 30.1	252.3 . ± 0.9 t= 20.2	116.07 . ± 0.7 t= 10.9	119.92 . ± 0.2 t= 35.2	126.37 . ± 1.1 t= 29.9
control 2 C.livia	398.76 . ± 1.3 t= 19.2	330.36 . ± 2.1 t=21.3	353.97 ± 1.9	3112.49 . ± 3.2 t= 27.3	2995.72 . ± 5.9 t= 16.2	3139.7 . ± 6.2 t= 15.3	232.14 . ± 7.1 t= 11.9	250.23 . ± 1.1 t= 31.2	230.92 . ± 2.2 t= 33.3

* Significant difference between parameter in migratory birds at zero day of arrival and two weeks after capture using F - test., $P < 0.05$.

. Significant difference between data in migratory species and the corresponding non-migratory, non flying control using t - test., $P < 0.05$.

± S.E.

The phospholipid of the deep pectoral muscles in the three migratory species was significantly higher than the non flying G.domestica and non migratory C.livia (tables 15 A, B & C).

(10B) Total protein : -

(i) Serum : -

The total protein level was shown in tables 16 A, B & C for the three migratory species. There were nonsignificant variations in the total protein level at O - day of landing and during the two weeks of recovery.

In C.coturnix and F.atra, there was nonsignificant difference in the circulating total protein level, and in the nonmigratory species, G.domestica and C.livia, being 9392.2 mg, 13388.8 mg corresponding to 13143.66 mg and 11147.26 mg respectively. On the other hand, the total protein level in the migratory S.turtur was significantly lower than those in the nonmigratory species, (6309.1 mg in S.turtur, 13143.66 mg in G.domestica and 11147.26 mg in C.livia after the 2 nd week of recovery).

(ii) Pectoral muscle : -

As shown in tables 16 A, B & C the superficial and deep pectoral muscles content of total protein showed nonsignificant variations throughout the experiment.

Yet, the total protein level in the superficial pectoral muscle of C.coturnix and F.atra was significantly higher than those in the nonmigratory G.domestica and C.livia (tables 16 A

Table (16-A) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) total portein of C.coturnix and non migratory birds during recovery.

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	9981.20 ± 11.3	12249.4 ± 25.3	9392.2 ± 17.2	19074.8 ± 13.4	19316.8 ± 10.7	19305.7 ± 12.9	12398.9 ± 25.9	13252.4 ± 23.9	10666.3 ± 35.2
control 1 G.domestica	13980.3 ± 17.9 t= 36.9	13433.5 ± 15.5	13143.7 ± 18.2	6642.73 ± 13.3 t= 23.0	7071.13 ± 15.6 t= 11.2	6399.53 ± 14.9 t= 12.3	12763.9 ± 22.3	9994.4 ± 14.9	11869.2 ± 21.9
control 2 C.livia	11121.2 ± 18.9	9710.5 ± 16.4	11147.3 ± 13.9	16155.4 ± 11.3 t= 21.0	16357.2 ± 9.2 t= 11.1	16376.1 ± 7.7 t= 15.7	13039.1 ± 12.3	12699.0 ± 11.7	12940.0 ± 5.6

* Significant difference between parameter in migratory birds at zero day of arrival and two weeks after capture, using F-test, $P < 0.05$.

. significant difference (t-test) between parameter of migratory species and the corresponding non migratory species, $P < 0.05$.

± S.E.

Table (16-B) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) total protein of F.atra and nonmigratory birds during recovery.

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	14539.0 ± 27.3	14175.0 ± 15.2	13388.8 ± 29.1	19699.8 ± 11.7	24694.2 ± 23.2	22885.3 ± 27.9	15290.6 ± 19.9	20249.5 ± 23.2	17609.3 ± 13.9
control 1 G.domestica	13980.3 ± 17.9	13433.5 ± 15.5	13143.7 ± 18.2	6642.73 ± 13.3 t= 9.18	7071.13 ± 15.6 t= 9.8	6399.53 ± 14.9 t= 15.7	12763.9 ± 22.3	9994.4 ± 14.9	11869.2 ± 21.9
control 2 C.livia	11121.2 ± 18.9	9710.5 ± 16.4 t= 5.8	11147.3 ± 13.9	16155.4 ± 11.3 t= 9.05	16357.2 ± 9.2 t=10.23	16376.1 ± 7.7 t= 15.9	13039.1 ± 12.3 t= 13.7	12699.0 ± 11.7 t= 16.8	12940.0 ± 5.6 t=11.64

* Significant difference between parameter in migratory birds at zero day of arrival and two weeks after capture, using F-test, $P < 0.05$.

. Significant difference (t - test) between parameter of migratory species and the corresponding non migratory species., $P < 0.05$.

±S.E.

Table (16-C) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) total protein of S.turtur and non migratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
S.turtur	4997.7 ± 9.9	6173.9 ± 11.3	6309.1 ± 7.9	7528.16 ± 8.9	6434.0 ± 12.5	6177.33 ± 17.3	16673.4 ± 10.3	11924.0 ± 13.9	17161.9 ± 11.9
control 1 G.domestica	13980.3 ± 17.9 t= 37.7	13433.5 ± 15.5 t= 5.86	13143.7 ± 18.2 t= 15.7	6642.73 ± 13.3	7071.13 ± 15.6	6399.53 ± 14.9	12763.9 ± 22.3	9994.4 ± 14.9	11869.2 ± 21.9
control 2 C.livia	11121.2 ± 18.9 t= 5.3	9710.5 ± 16.4 t= 20.2	11147.3 ± 13.9 t= 8.8	16155.4 ± 11.3 t=16.79	16357.2 ± 9.2 t=6.96	16376.1 ± 7.7 t=36.7	13039.1 ± 12.3 t= 13.1	12699.0 ± 11.7	12940.0 . 5.6 t=14.90

* Significant difference between parameter in migratory birds at zero day of arrival and two weeks after capture, using F-test, $P < 0.05$.

. Significant difference (t - test) between parameter of migratory species and the corresponding non migratory species., $P < 0.05$.

± S.E.

& B).

On the other hand, in the deep pectoral muscle, the total protein content in the nonmigratory C.livia was always significantly lower than the values in the migratory species F.atra and S.turtur. tables 16 B & C .

(11B) *B* - lipoprotein : -

(i) Serum : -

The circulating *B* - lipoprotein was significantly decreased in both C.coturnix and S.turtur from the day of arrival and throughout the weeks of recovery, being 809.8 mg and 479.0 mg and decreased to 243.7 mg and 197.5 mg respectively,(tables 17 A & C). On the other hand, the *B* - lipoprotein level was significantly increased from 455.05 mg at zero day of capture to 736.7 mg after the 2nd week of recovery in F.atra (table 17 B).

Generally, as shown in tables 17 A, B & C it is clear that, the levels of *B* - lipoprotein in the three migratory species were significantly lower than those in the non flying, non migratory G.domestica and C.livia.

(ii) Pectoral muscle : -

Statistical analysis revealed a nonsignificant difference in the *B* - lipoprotein content of the superficial muscles of both C.coturnix and S.turtur, from landing to the 2nd week of recovery (tables 17 A & C).

Table (17-A) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) β - lipoprotein of C.coturnix and nonmigratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
C.coturnix	809.8 ± 3.2	824.9 ± 4.1	243.7 * ± 1.4 F= 69.7	1662.5 ± 6.3	1828.55 ± 5.9	1471.65 ± 9.1	595.1 * ± 7.3 F=104.3	2092.5 ± 10.3	1871.5 ± 5.9
control 1 G.domestica	7760.2 ± 13.3 t= 9.7	8150.0 ± 10.5 t= 11.9	7957.0 ± 7.9 t= 15.9	3026.51 ± 11.1 t= 12.5	3131.65 ± 7.9 t= 5.96	3621.1 ± 4.4 t= 9.16	7076.05 ± 9.9 t= 9.6	6016.01 ± 8.4 t= 7.3	6097.03 ± 6.7 t= 15.3
control 2 C.livia	2533.2 ± 9.1 t= 14.9	2314.15 ± 7.7 t= 17.2	2367.0 ± 8.3 t= 19.1	3924.05 ± 5.9 t= 9.9	4328.15 ± 9.4 t= 14.9	3875.5 ± 11.1 t= 12.8	1776.31 ± 7.2 t= 9.7	1600.70 ± 5.9 t= 8.8	1999.71 ± 4.4

* Significant difference (F - test) between data of migratory species throughout the duration of the experiment., $P < 0.05$.

. Significant difference (t - test) between parameter of migratory species and the corresponding non migratory species., $P < 0.05$.

± S.E.

Table (17-B) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) β - lipoprotein of F.atra and nonmigratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	455.05 ± 7.2	397.31 ± 3.9	* 736.7 ± 8.1 F= 13.3	* 979.95 ± 4.3 F= 39.5	1453.15 ± 10.1	1449.5 ± 8.9	* 999.45 ± 3.3 F= 15.9	1148.65 ± 7.9	1432.25 ± 11.2
control 1 G.domestica	. 7760.2 ± 13.3 t= 9.6	. 8150.0 ± 10.5 t= 23.2	. 7957.0 ± 7.9 t= 22.6	. 3026.51 ± 11.1 t=14.35	. 3131.65 ± 7.9 t= 9.24	. 3621.1 ± 4.4 t= 10.8	. 7076.05 ± 9.9 t= 15.7	. 6016.01 ± 8.4 t= 12.4	. 6097.03 ± 6.7 t= 22.9
control 2 C.livia	. 2533.2 ± 9.1 t= 8.49	. 2314.15 ± 7.7 t= 9.9	. 2367.0 ± 8.3 t= 18.2	. 3924.05 ± 5.9 t= 9.9	. 4328.15 ± 9.4 t= 10.3	. 3875.5 ± 11.1 t= 14.3	. 1776.31 ± 7.2 t= 9.4	. 1600.70 ± 5.9 t= 17.3	. 1999.71 ± 4.4 t= 14.3

* Significant difference (F - test) between data of migratory species throughout the duration of the experiment. , $P < 0.05$.

. Significant difference (t - test) between parameter of migratory species and the corresponding non migratory species.,$P < 0.05$.

± S.E.

Table (17-C) Changes in the level of serum (mg/100 ml) and pectoral muscle (mg/100 g) β - lipoprotein of S.turtur and nonmigratory birds during recovery.

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
S.turtur	479.0 ± 2.3	397.6 ± 2.5	197.5 ± 1.3 * F= 37.3	3666.25 ± 7.7	2747.51 ± 6.7	2671.25 ± 9.1	392.3 ± 2.2 * F=196.9	1029.35 ± 5.3	936.7 ± 7.2
control 1 G.domestica	7760.2 ± 13.3 t= 9.7	8150.0 ± 10.5 t= 23.8	7957.0 ± 7.9 t= 18.9	3026.51 ± 11.1	3131.65 ± 7.9 t= 15.4	3621.1 ± 4.4 t= 9.1	7076.05 ± 9.9 t= 34.9	6016.01 ± 8.4 t= 10.7	6097.03 ± 6.7 t= 17.6
control 2 C.livia	2533.2 ± 9.1 t= 23.7	2314.15 ± 7.7 t= 27.0	2367.0 ± 8.3 t= 37.0	3924.05 ± 5.9	4328.15 ± 9.4 t= 23.3	3875.5 ± 11.1 t= 25.2	1776.31 ± 7.2 t= 21.3	1600.70 ± 5.9 t= 19.2	1999.71 ± 4.4 t= 11.9

* Significant difference (F - test) between data of migratory species throughout the duration of the experiment., $P < 0.05$.

. Significant difference (t - test) between parameter of migratory species and the corresponding non migratory species., $P < 0.05$.

± S.E.

On the other hand, F.atra showed a significant elevation in its *B* - lipoprotein concentration, starting from the first day of arrival to the 1 st week of recovery (979.95 mg increased to 1453.15 mg) (table 17 B).

C.coturnix, F.atar and S.turtur, recorded a lowering in their *B* - lipoprotein content in the deep pectoral muscle after the first day of arrival (being 595.1 mg, 999.45 mg and 392.3 mg increasing to 2092.5 mg, 1148.15 mg and 1029.35 mg after the 1st week of recovery (tables 17 A, B & C).

The superficial and deep pectoral muscles *B* - lipoprotein in the three migratory species showed significant decrease in *B* - lipoprotein content than in the non flying and nonmigrating G.domestica and C.livia (tables 17 A, B & C).

(C) BODY COMPOSITION RATIO:

(1C) Water content : -

(i) Superficial pectoral muscle : -

The significant variation in the water content of the superficial pectoral muscle revealed that the water percentage decreased gradually at the end of the 2 nd week of recovery in both F.atra and S.turtur,(being 43.997 % and 42.732 % at the first day of landing, and decreased to 37.117 % and 35.999 % after two weeks of capture, respectively).On the other hand, in C.coturnix, the water percentage increased towards the 2nd week after recovery (being 41.098 % in O - day of capture, and was elevated to 45.366 % in the 2 nd week after recovery) (table 18).

(ii) Deep pectoral muscle : -

Table (18) The percentage of water content in the superficial and deep pectoral muscle of migratory species just after landing and two weeks after recovery.

Duration	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
		RECOVERY			RECOVERY	
Species	O - DAY day of capture	1st week	2nd week	O - DAY day of capture	1st week	2nd week
C.coturnix	41.098 ± 0.09	40.361 ± 0.42	45.366 ± 1.22 * F= 15.2	46.366 ± 1.01 * F= 12.3	33.966 ± 0.91	39.806 ± 0.99
F.atra	43.997 ± 0.51	42.979 ± 0.19	37.117 ± 0.09 * F= 13.3	48.979 ± 0.04	48.527 ± 0.16	47.798 ± 0.61
S.turtur	42.732 ± 0.72	45.327 ± 0.41	35.999 ± 1.0 * F= 11.7	49.375 ± 0.91	47.352 ± 0.4	46.191 ± 0.09

* Significant difference ,P<0.05.

The deep pectoral muscle water content in the three migratory species,(C.coturnix, F.atra and S.turtur) decreased from 46.366 %, 48.979 % and 49.375 % at the first day of arrival to 39.806 %, 47.798 % and 46.191 % at the 2nd week after recovery

(2C) Lean - dry weight : -

(i) Superficial pectoral muscle : -

As shown in table (19), the lean - dry weight of the superficial muscle during the first day of capture was noted to be higher than after two weeks of recovery in C.coturnix and S.turtur species (49.001 g, 45.003 g at zero day and 23.3019 g and 12.27 g after the recovery period, respectively). On the other hand, F.atra, showed a nonsignificant variation throughout the experiment.

(ii) Deep pectoral muscle : -

A nonsignificant variation in the lean-dry weight was recorded in the deep pectoral muscle of both F.atra and S.turtur during the time of the experiment. On the other hand, the highest values of the lean-dry weight was recorded in C.coturnix, just after arrival (44.703 g) and the lowest after the 1st week of capture (25.261 g). (table 19).

(D) ENZYMES : -

(1D) Glucose - 6 - phosphate dehydrogenase : -

Table (19) Lean - dry weight (g / 100 g tissue) of the three migratory species (C.coturnix, F.atra, S.turtur), just after landing and two weeks after recovery (mean ± S.E.)

Duration	PECTORAL MUSCLE					
	SUPERFICIAL.P			DEEP.P		
Species	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	49.001 ± 0.09 **	13.260 ± 0.3 *	23.301 ± 0.1	44.703 ± 0.04 *	25.261 ± 0.09	28.681 ± 0.9
F.atra	46.001 ± 0.7	42.792 ± 0.1	48.163 ± 0.09	39.132 ± 0.07	43.527 ± 0.4	38.46 ± 0.07
S.turtur	45.003 ± 0.1	43.021 ± 0.2	12.27 ± 0.04 **	42.831 ± 0.9	40.711 ± 0.3	38.91 ± 0.3

* Significant difference · , $P<0.05$ ·

* * Highly significant difference · , $P<0.01$ ·

(i) Serum : -

The estimated G6P - DH in C.coturnix, F.atra and S.turtur were 997.37 mu, 365.62 mu and 690.37 mu respectively on the day of arrival. After the 2 nd week of recovery, the G6P-D4 activity increased to 1243.52 mu, 11392.11 mu and 12092.37 mu respectively in the three migratory species (tables 20 A, B & C).

The levels of G6P - DH in the migratory species were significantly higher than that in G.domestica. On the other hand, there was no significant difference in the enzyme activity between the migratory species and C.livia during the recovery period, (tables 20 A, B & C), except on the day of capture.

(ii) Pectoral muscle : -

The statistical analysis revealed that, there was a significant decrease in G6P - DH activity in both superficial and deep pectoral muscles on the day of arrival compared with their levels throughout the recovery period; being 90.31 mu, 90.72 mu and 75.09 mu in the superficial muscle and 66.73 mu, 60.93 mu and 30.93 mu in the deep pectoral muscles, and increased to 280.79 mu, 250.33 mu and 280.91 mu in the superficial muscles and to 340.49 mu, 337.91 mu and 155.93 mu in the deep pectoral muscles of C.coturnix, F.atra and S.turtur respectively.

In the three migratory species, the enzyme activity was significantly higher than in the non flying G.domestica in the superficial pectoral muscle through the duration of the experiment. Contrary, the enzyme activity in C.livia superficial pectoral muscle was significantly higher than its level in the three migratory species throughout the experiment.

Table (20-A) Changes in the activity of serum (mu/ml) and pectoral muscle (mu/g) glucose - 6 - phosphate dehydrogenas of C. coturinx and nonmigratory species during recovery .

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	* 997.37 ± 7.3 F= 15.3	1300.38 ± 9.2	1243.52 ± 5.3	* 90.31 ± 2.1 F= 27.3	280.32 ± 1.3	280.79 ± 1.2	* 66.73 ± 2.1 F= 16.9	333.92 ± 0.9	340.49 ± 2.1
control 1 G.domestica	. 2.25 ± 0.04 t= 79.4	. 4.29 ± 0.03 t= 44.1	. 3.59 ± 0.09 t= 51.3	. 10.94 ± 0.1 t= 39.2	. 11.94 ± 0.3 t= 72.3	. 9.78 ± 0.7 t= 15.9	. 240.94 ± 3.2 t= 22.3	. 230.91 ± 2.3 t= 15.3	. 230.99 ± 2.1 t= 17.9
control 2 C.livia	. 1125.92 ± 5.5 t= 11.3	1220.71 ± 3.9	1103.92 ± 5.3	. 440.91 ± 3.4 t= 16.3	. 399.42 ± 2.1 t= 12.3	. 431.21 ± 2.3 t= 14.3	. 233.91 ± 2.1 t= 26.3	. 230.09 ± 1.7 t= 13.9	. 220.95 ± 1.1 t= 17.2

* Significant difference (F - test) between levels in migratory species during the duration of the experiment., $P<0.05$.

. Significant difference (t - test) between levels in migratory and nonmigratory species. $P<0.05$

± S.E.

Table (20-B) Changes in the activity of serum (mu/ml) and pectoral muscle (mu/g) glucose - 6 - phosphate dehydrogenas of F.atra and nonmigratory species during recovery .

Duration / Species	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
	O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY		O-DAY day of capture	RECOVERY	
		1 st week	2 nd week		1 st week	2 nd week		1 st week	2 nd week
F.atra	* 365.62 ± 5.2 F= 11.3	1099.93 ± 7.2	11392.1 ± 7.3	* 90.72 ± 1.1 F= 12.1	260.91 ± 2.1	250.33 ± 0.9	* 60.93 ± 2.3 F= 10.9	330.92 ± 2.1	337.91 ± 0.7
control 1 G.domestica	. 2.25 ± 0.04 t= 49.3	. 4.29 ± 0.03 t= 35.2	. 3.59 ± 0.09 t= 37.9	. 10.94 ± 0.1 t= 25.9	. 11.94 ± 0.3 t= 27.9	. 9.78 ± 0.7 t= 20.3	. 240.94 ± 3.2 t= 17.9	. 230.91 ± 2.3 t= 12.3	. 230.99 ± 2.1 t= 9.9
control 2 C.livia	. 1125.92 ± 5.5 t= 29.2	1220.71 ± 3.9	1103.92 ± 5.3	. 440.91 ± 3.4 t= 11.9	. 399.42 ± 2.1 t= 12.3	. 431.21 ± 2.3 t= 9.7	. 233.91 ± 2.1 t= 25.3	. 230.09 ± 1.7 t= 16.7	. 220.95 ± 1.1 t= 13.7

* Significant difference (F - test) between levels in migratory species during the duration of the experiment. , $P<0.05$.

. Significant difference (t - test) between levels in migratory and nonmigratory species. , $P<0.05$.

• ± S.E.

Table (20-C) Changes in the activity of serum (mu/ml) and pectoral muscle (mu/g) glucose - 6 - phosphate dehydrognas of S.turtur and nonmigratory species during recovery .

	SERUM			PECTORAL MUSCLE					
				SUPERFICIAL.P			DEEP.P		
Duration / Species	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O-DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
S.turtur	* 690.37 ± 7.3 F= 13.9	1293.39 ± 3.1	12092.4 ± 5.3	* 75.09 ± 1.3 F= 14.3	260.63 ± 1.9	280.91 ± 0.7	* 30.93 ± 0.9 F= 9.9	130.93 ± 0.7	155.93 ± 1.0
control 1 G.domestica	. 2.25 ± 0.04 t= 51.3	. 4.29 ± 0.03 t= 39.2	. 3.59 ± 0.09 t= 41.3	. 10.94 ± 0.1 t= 40.3	. 11.94 ± 0.3 t= 32.7	. 9.78 ± 0.7 t= 27.2	. 240.94 ± 3.2 t= 37.5	. 230.91 ± 2.3 t= 13.7	. 230.99 ± 2.1 t= 16.7
control 2 C.livia	. 1125.92 ± 5.5 t= 9.9	1220.71 ± 3.9	1103.92 ± 5.3	. 440.91 ± 3.4 t= 11.3	. 399.42 ± 2.1 t= 14.2	. 431.21 ± 2.3 t= 17.9	. 233.91 ± 2.1 t= 19.9	. 230.09 ± 1.7 t= 11.3	. 220.95 ± 1.1 t= 15.1

* Significant difference (F - test) between levels in migratory species during the the duration of the experiment. , P<0.05.

. Significant difference (t - test) between levels in migratory and nonmigratory species. , P<0.05.

± S.E.

On the other hand, the deep pectoral muscle of C.coturnix and F.atra indicated a high enzyme activity throughout the two weeks of capture compared with the two nonmigratory species. Yet, in S.turtur the estimated enzyme activity in the deep pectoral muscles was significantly lower than in the two nonmigratory species throughout the experiment. (table 20 C).

(E) HORMONES : -

(1E) Insulin : -

(i) Serum : -

The circulating insulin level in C.coturnix, F.atra and S.turtur was 24.326 UIu, 13.131 UIu and 23.939 UIu on the day of arrival respectively and was significantly increase to 42.02 UIu, 18.533 UIu and 40.129 UIu after two weeks of recovery respectively, as shown in tables 21 A, B & C .

It was clear from tables 21 A, B & C that, the insulin levels in migratory species were significantly higher than those of the nonmigratory G.domestica and C.livia.

(ii) Pancreas : -

The pancreatic tissue concentration of insulin was, 340.321 UIu, 300.31 UIu, and 340.071 UIu just after landing, and was significantly increased to 670.34 UIu, 430.03 UIu and 640.379 UIu after the second week of recovery in C.coturnix, F.atra and S.turtur respectively. (tables 21 A, B & C).

Table (21-A) Changes in the level of Serum (UIU/ml) and pancreas (UIU/g) insulin of C.coturnix and nonmigratory species during recovery .

Duration / Species	SERUM			PANCREAS		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	24.326 ± 0.91	24.731 ± 1.2	42.02 * ± 1.4 F= 13.9	340.321 ± 1.5	339.391 ± 0.9	670.34 * ± 1.9 F= 27.9
control 1 G.domestica	5.832 . ± 0.04 t= 19.9	7.312 . ± 0.03 t= 17.4	5.470 . ± 0.1 t= 23.9	660.091 . ± 2.3 t= 12.1	590.781 . ± 1.6 t= 11.9	650.731 ± 2.1
control 2 C.livia	8.661 . ± 0.91 t= 18.4	9.233 . ± 0.09 t= 15.7	8.319 . ± 0.5 t= 19.2	240.091 . ± 2.1 t= 10.3	250.944 . ± 1.7 t= 14.2	221.939 . ± 2.2 t= 23.2

* Significant difference (F - test) between levels in migratory species during the duration of the experiment. , $P<0.05$.

. Significant difference (t - test) between levels in migratory and nonmigratory species. , $P<0.05$.

± S.E.

Table (21-B) Changes in the level of serum (UIU/ml) and pancreas (UIU/g) insulin of F.atra and nonmigratory species during recovery .

Duration / Species	SERUM			PANCREAS		
		RECOVERY			RECOVERY	
	O - DAY day of capture	1 st week	2 nd week	O - DAY day of capture	1 st week	2 nd week
F.atra	13.131 ± 0.7	11.959 ± 0.9	18.533 * ± 1.4 F= 19.3	300.31 ± 1.9	360.90 ± 1.3	430.03 * ± 2.1 F= 13.7
control 1 g.domestica	5.832 . ± 0.04 t= 11.7	7.312 . ± 0.03 t= 13.4	5.470 . ± 0.1 t= 14.9	660.091 . ± 2.3 t= 23.9	590.781 . ± 1.6 t= 20.7	650.731 . ± 2.1 t= 15.7
control 2 C.livia	8.661 . ± 0.91 t= 17.2	9.233 . ± 0.09 t= 14.9	8.319 . ± 0.5 t= 12.9	240.091 ± 2.1	250.944 . ± 1.7 t= 16.9	221.939 . ± 2.2 t= 26.7

* Significant difference (F - test) between levels in migratory species during the duration of the experiment. , $P<0.05$.

. Significant difference (t - test) between levels in migratory and nonmigratory species. , $P<0.05$.

± S.E.

Table (21-C) Changes in the level of Serum (UIU/ml) and Pancreatic (UIU/g) insulin of S.turtur and nonmigratory species during recovery .

Duration / Species	SERUM			PANCREAS		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECPVERY 1 st week	RECPVERY 2 nd week
S.turtur	23.939 ± 0.19	25.033 ± 1.2	40.129 * ± 1.4 F= 19.7	340.071 * ± 1.9 F= 17.9	660.323 ± 1.5	640.379 ± 2.2
control 1 g.domestica	5.832 . ± 0.04 t= 18.9	7.312 . ± 0.03 t= 19.3	5.470 . ± 0.1 t= 22.7	660.091 . ± 2.3 t= 11.1	590.781 ± 1.6	650.731 ± 2.1
control 2 C.livia	8.661 . ± 0.91 t= 15.9	9.233 . ± 0.09 t= 15.2	8.319 . ± 0.5 t= 16.6	240.091 . ± 2.1 t= 11.3	250.944 . ± 1.7 t= 8.9	221.939 . ± 2.2 t= 19.9

* Significant difference (F - test) between levels in migratory species during the duration of the experiment. , P<0.05.

. Significant difference (t - test) between levels in migoratory and nonmigratory species,,P< 0.05.± S.E.

In G.domestica, the concentration of insulin was significantly higher than that in the three migratory species on the day of capture and one week post arrival. At the end of the recovery period, these differences dropped, except for F.atra, which was still significantly lower concentration than the G.domestica.

(2E) Glucagon : -

(i) Serum : -

A highly significant circulating level of glucagon was recognized in C.coturnix, F.atra and S.turtur (66.639 pg, 15.266 pg and 44.391 pg respectively) just after arrival, and was then significantly decreased after the 2 nd week of recovery (10.892 pg, 8.323 pg and 17.376 pg respectively).

The serum glucagon concentration in G.domestica and C.livia was significantly higher than the levels in the migratory species (table 22 A, B & C).

(ii) Pancreas : -

The pancreatic tissue levels of glucagon were 1188.012 pg, 1720.55 pg and 1969.72 pg in C.coturnix, F.atra and S.turtur on the day of landing, respectively. The level of glucagon significantly decreased to 273.912 pg, 329.371 pg and 173.034 pg respectively after the two weeks of recovery (tables 22 A, B & C).

The pancreatic glucagon level in the G.domestica and C.livia was significantly lower than that in the migratory birds on the day of capture. After two weeks of recovery, this picture was

Table (22-A) changes in the level of serum (Pg/ml) and pancreas (Pg/g) glucagon of C.coturnix and nonmigratory species during recovery.

Duration / Species	SERUM			PANCREAS		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
C.coturnix	* 66.639 ± 0.03 F= 19.7	15.531 ± 0.91	10.892 ± 0.49	* 1188.012 ± 3.99 F= 65.3	209.733 ± 2.63	273.912 ± 4.31
control 1 G.domestica	. 198.031 ± 2.21 t= 15.2	. 201.302 ± 1.9 t= 17.1	. 159.399 ± 1.7 t= 12.9	1393.021 ± 4.41	. 1322.13 ± 5.31 t= 25.9	. 1197.277 ± 4.91 t= 19.9
control 2 C.livia	. 120.321 ± 1.37 t= 13.7	* . 99.732 ± 0.99 t= 11.3 F= 8.70	. 109.173 ± 1.11 t= 19.9	* 1096.341 ± 2.21 F= 37.5	502.933 ± 3.71	. 703.27 ± 5.17 t= 11.9

* Significant difference (F - test) between levels in migratory species during the duration of the experiment., $P<0.05$.

. Significant variation (t - test) between data in migratory and nonmigratory species. , $P<0.05$.

± S.E.

Table (22-B) Changes in the level of serum (Pg/ml) and pancreas (Pg/g) glucagon of F.atra and nonmigratory species during recovery.

Duration / Species	SERUM			PANCREAS		
	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	0 - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
F.atra	* 15.266 ± 0.77 F= 13.9	5.733 ± 1.1	8.323 ± 0.09	* 1720.55 ± 4.21 F= 39.3	350.031 ± 3.91	329.371 ± 4.41
control 1 G.domestica	. 198.031 ± 2.21 t= 16.9	. 201.302 ± 1.9 t= 16.3	. 159.399 ± 1.7 t= 35.4	. 1393.021 ± 4.41 t= 19.3	. 1322.13 ± 5.31 t= 26.2	. 1197.277 ± 4.91 t= 19.4
control 2 C.livia	. 120.321 ± 1.37 t= 11.3	* . 99.732 ± 0.99 t= 110.7 F= 8.7	. 109.173 ± 1.11 t= 30.5	* . 1096.341 ± 2.21 F= 37.5 t= 11.2	. 502.933 ± 3.71 t= 12.7	. 703.27 ± 5.17 t= 13.9

* Significant difference (F - test) between levels in migratory species during the duration of the experiment. , $P<0.05$.

. Significant difference (t - test) between data in migratory and nonmigratory species. , $P<0.05$.

± S.E.

Table (22-C) Changes in the level of serum (Pg/ml) and pancreas (Pg/g) glucagon of S.turtur and nonmigratory species during recovery .

Duration / Species	SERUM			PANCREAS		
	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week	O - DAY day of capture	RECOVERY 1 st week	RECOVERY 2 nd week
S.turtur	* 44.391 ± 3.1 F= 17.9	10.039 ± 0.19	17.376 ± 2.11	* 1969.72 ± 7.91 F= 25.7	160.341 ± 3.91	173.034 ± 1.39
control 1 G.domestica	. 198.031 ± 2.21 t= 10.7	. 201.302 ± 1.9 t= 17.3	. 159.399 ± 1.7 t= 19.7	. 1393.021 ± 4.41 t= 12.7	. 1322.13 ± 5.31 t= 71.2	. 1197.277 ± 4.91 t= 38.3
control 2 C.livia	. 120.321 ± 1.37 t= 9.9	* . 99.732 ± 0.99 t= 10.3 F= 8.7	. 109.173 ± 1.11 t= 19.3	* . 1096.341 ± 2.21 F= 37.5 t= 21.3	. 502.933 ± 3.71 t= 16.6	. 703.27 ± 5.17 t= 23.3

* Significant difference (F - test) between levels in migratory species during the duration of the experiment. , $P<0.05$.

. Significant difference (t - test) between data in migratory and nonmigratory species. , $P<0.05$.

± S.E.

reversed; the glucagon content in C.coturnix, F.atra and S.turtur, 273.912 pg, 329.371 pg and 173.034 pg respectively was significantly decreased in comparison to 1197.277 pg in G.domestica and 703.27 pg in C.livia). (tables 22 A, B & C).

(G) HISTOCHEMISTERY : -

(1G) Fat : -

As shown in table (23) and, plates (1-2-3) the perctoral muscles showed an increase in intracellular lipid content in C.coturnix, F.atra and S.turtur during the recovery period, compared to that detected in the day of arrival.

The distribution of lipid in the superficial pectoral muscles was more obvious than that in the deep pectoral.

The muscle fibres of C.coturnix, particularly the red ones, accumulate more lipid, in comparison to F.atra and S.turtur which was noticeably faint. In all species, the differentiation between the intermediate and the white fibers was more or less distinct (plate 1-2-3).

1

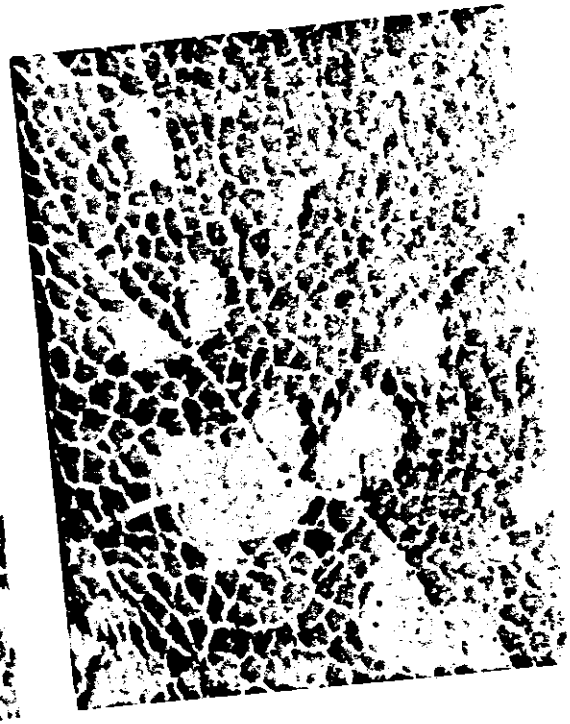

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PLATE (1)

PLATE (1)

Material (superficial and deep pectoral muscles of C.coturnix) stained by Oil red O method according to Lillie and Ashburn (1943) for the demonstration of fat content.

(I) Superficial pectoral muscle : -

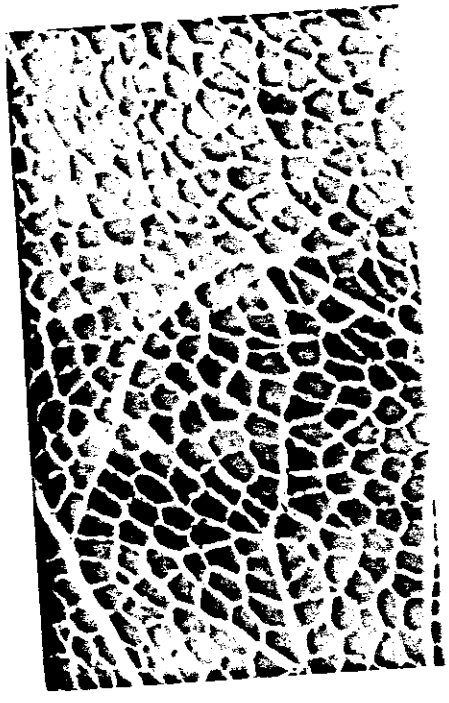
Fig.(1) The musc. fibres at 0 - day of recovery, showing weak reaction (+) of Oil Red 0 x 100.

Fig.(2) The musc. fibres after two weeks of recovery, showing a strong reaction (+ + +) of Oil Red 0 x 100.

(II) Deep pectoral muscle : -

Fig.(3) The musc. fibres at 0 - day of recovery, showing weak (+) reaction of Oil Red 0 x 100.

Fig.(4) The musc. fibres after two weeks of recovery, showing a moderate reaction (+ +) of Oil Red 0 x 100.



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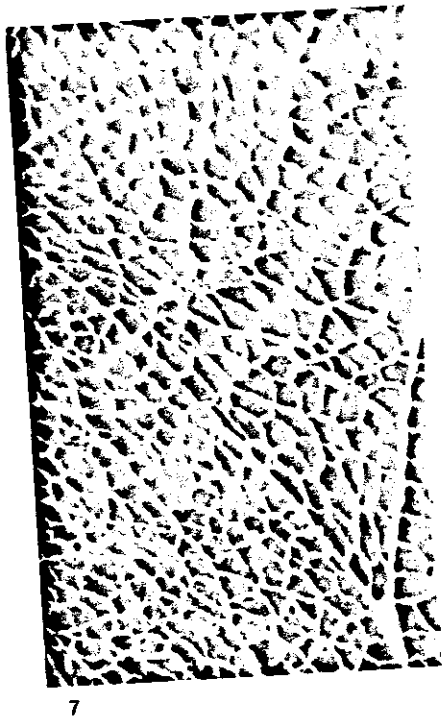

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8

PLATE (2)

Material (superficial and deep pectoral muscle of F.atra) stained by Oil Red 0 method according to Lillie and Ashburn (1943) for the demonstration of fat content.

(I) Superficial pectoral muscle : -

Fig.(5) The musc. fibres at 0 - day of recovery, showing negtive reaction (-) of Oil Red 0 x 100.

Fig.(6) The musc. fibres after two weeks of recovery, showing a week reaction (+) of Oil Red 0 x 100.

(II) Deep pectoral muscle : -

Fig.(7) The musc. fibres at 0 - day of recovery, showing negtive reaction (-) of Oil Red 0 x 100.

Fig.(8) The musc. fibres after two weeks of recovery, showing a weak reaction (+) of Oil Red 0 x 100.

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12

PLATE (3)

PLATE (3)

Material (superficial and deep pectoral muscle of*S.turtur*) stained by Oil Red 0 method according to Lillie and Ashburn (1943) for the demonstration of fat content.

(I) Superficial pectoral muscle : -

Fig.(9) The musc. fibres at 0 - day of recovery, showing weak reaction (+) of Oil Red 0 x 100.

Fig.(10) The musc. fibres after two weeks of recovery, showing a moderate reaction (+ +) of oil red 0 x 100.

(II) Deep pectoral muscle : -

Fig.(11) The musc. fibres at 0 - day of recovery, showing negative reaction (-) of Oil Red 0 x 100.

Fig.(12) The musc. fibres after two weeks of recovery, showing a weak reaction (+) of Oil Red 0 x 100.

(2G) Succinic dehydrogenase : -

As shown in table (23) and plates (4-5-6) a low SDH activity was observed in the muscles on the day of arrival in the three migratory species. The reaction for the enzyme was markedly increased after recovery.

In C.coturnix as shown in fig.(13), the SDH activity recorded a moderate reaction (++) just after migration. The white fibers (W) (10%) showed a very weak reaction. Intermediate (I) type (5%) fibres exhibited a weak reaction, while the red fibres (R) (85%) showed a strong reaction. (tables 25 & 26).

A very strong SDH activity (+ + + +) was recorded in the superficial pectoral muscle at the end of the 2 nd week (Fig 14) The SDH activity in all fibre types was increased.

Figure (15) showed a very strong reaction (+ + + +) SDH activity at 0 - day of arrival in the deep pectoral muscle. The numerous white fibres (50%) exhibited a week reaction. There was a few intermediate fibres (10%) with moderate reaction. Red fibres (40%) recorded strong reaction (tables 25 & 26).

At the end of the 2nd week of recovery, the SDH activity increased in the deep pectoral muscle (+ + +). SDH activity increased in all fibre types. The intermediate fibres were difficult to be seen.

Generally in C.coturnix, the superficial and deep pectoral muscles could be histochemically classified to three fibre types (white, intermediate and red) (table 25)

In F.atra as shown in fig (17), the SDH activity recorded a moderate reaction (+ +) just after migration. The white fibre (W) (12%) had a very weak reaction. The intermediate (I) fibres represented 6% and showed a moderate reaction, while the red fibres (R) (82%) had a strong reaction.(tables 25 & 26).

A strong SDH activity (+ + +) was recorded in the superficial pectoral muscle at the end of the 2nd week. (fig.18)

Figure (19) showed a moderate reaction (+ +) of SDH activity at 0 - day of arrival. (table 23)

At the end of the 2nd week of recovery, the SDH activity increased in the deep pectoral muscle showing a strong reaction (+ + +) table (23).

The red fibres represented 51% and showed a strong reaction. The intermediate fibres (49%) showed moderate reaction. There was no white fibres. (tables 25 & 26).

In S.turtur as shown in fig (21), the SDH activity recorded a weak reaction (+) just after landing. The three fibre types could be differentiated, the white fibres (45%) with very pale reaction, intermediate fibres (20%) exhibited a moderate reaction and red fibres (35%) with strong reaction.(tables 25 & 26).

A strong of reaction SDH activity (+ + +) was recorded in the superficial pectoral muscle at the end of the 2nd week (Fig.22).

Figure (23) showed a moderate reaction (+ +) of SDH activity at 0 - day of arrival in the deep pectoral muscle. There were only two fibre types. The red fibres (90%) with strong reaction and white fibres (10%) exhibited weak reaction. At the end of the 2nd week of recovery, the SDH activity increased in the deep pectoral muscle (+ + +) table (23).

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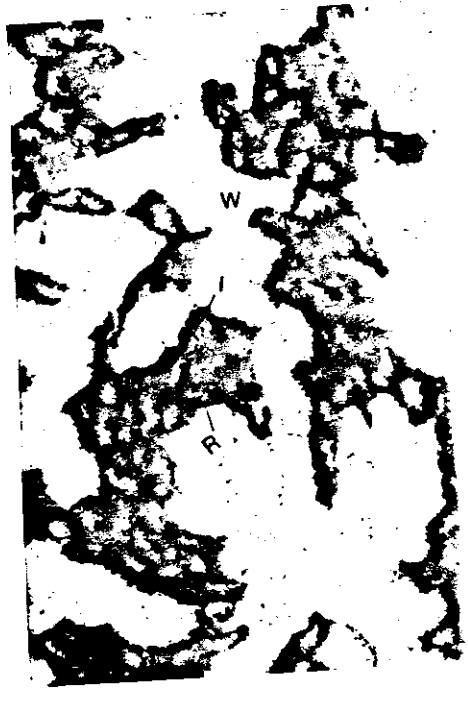

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PLATE (4)

PLATE (4)

Material (superficial and deep pectoral muscle of C.coturnix) stained according to Pears (1972) for the demonstration of SDH activity.

(I) Superficial pectoral muscle : -

Fig.(13) The musc. fibres at 0 - day of recovery, showing moderate reaction (+ +), SDH activity x 100.

NB : White fibres (w) with very weak reaction, red fibres (R) with strong reaction and intermediate fibres (I) with moderate reaction.

Fig.(14) The musc. fibres after two weeks of recovery, showing very strong reaction (+ + + +), SDH activity. x 100.

NB : The reaction increased in all the three fibre types.

(II) Deep pectoral muscle : -

Fig.(15) The musc. fibres at 0 - day of recovery, showing strong reaction (+ + +), SDH activity. x 100.

NB : * Numerous white fibres with very weak reaction, in which the formazan deposits were scattered within the fibres (w).

* Very few intermediate fibres with moderate reaction in which the formazan granules are scattered within the fibres (I).

* Red fibres lesser than the white fibres and with strong reaction. The formazan granules are accumulated centrally and subsarcolemmally. (R).

Fig.(16) The musc. fibres after two weeks of recovery, showing strong reaction (+ + +),SDH activity. x 100.

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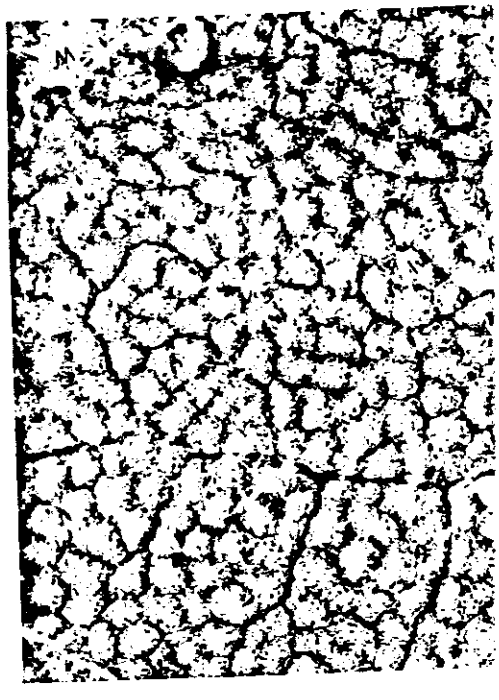

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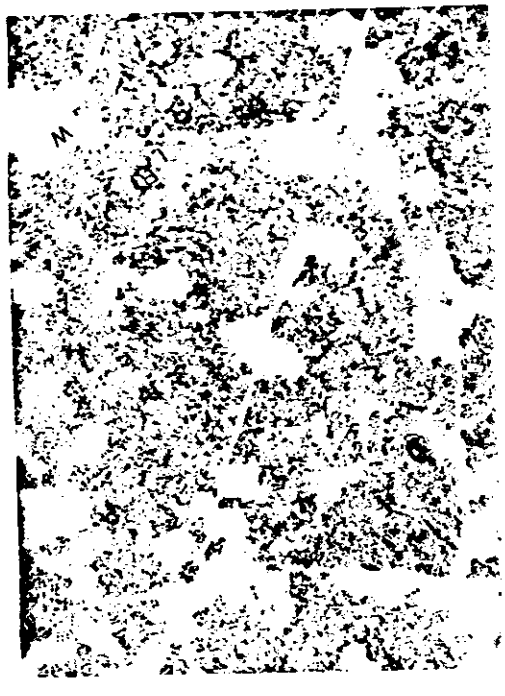

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PLAT E (5)

PLATE (5)

Material (superficial and deep pectoral muscle of F.atra) stained according to Pears (1972) for the demonstration of SDH activity.

(I) Superficial pectoral muscle : -

Fig.(17) The musc. fibres at 0 - day of recovery, showing moderate reaction (+ +), SDH activity x 100.

NB : * Very weak reaction in white fibres (w).

* Moderate reaction in intermediate fibres (I).

* Strong reaction in red fibres (R).

* The distribution of formazan deposit within the fibres was scattered as fine needle shaped granules.

Fig.(18) The musc. fibres after two weeks of recovery, showing strong reaction (+ + +), SDH activity. x 100.

NB : The reaction became strong and homogeneously distributed in all fibre types.

(II) Deep pectoral muscle : -

Fig.(19) The musc. fibres at 0 - day of recovery, showing moderate reaction (+ +), SDH activity. x 100.

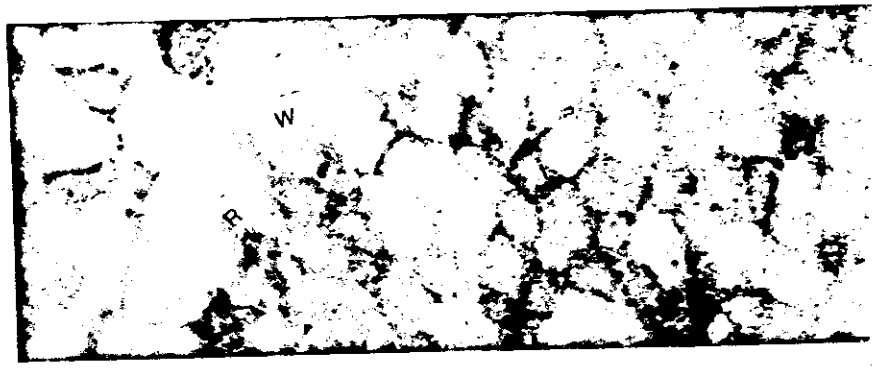
NB : * There was no white fibres.

* Few red fibres with strong reaction (R).

* Numerous intermediate fibres with moderate reaction (I).

* The distribution of formazan deposit was scattered within the fibres.

Fig.(20) The musc. fibres after two weeks of recovery, showing strong reaction (+ + +), SDH activity. x 100.



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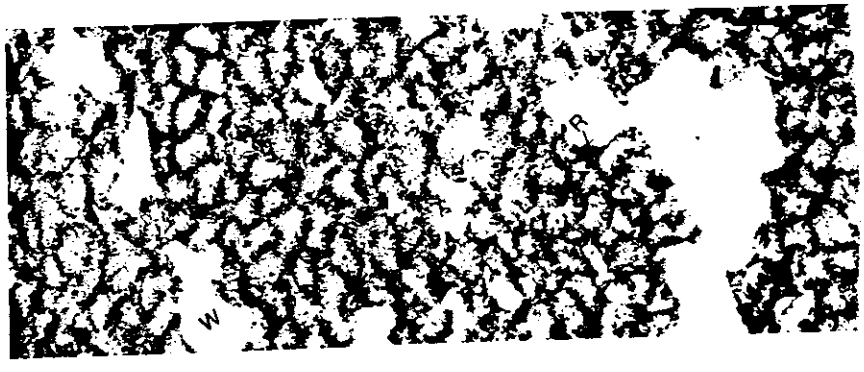

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PLATE(6)

PLATE (6)

Material (superficial and deep pectoral muscle of*S.turtur*) stained according to Pears (1972) for the demonstration of SDH activity.

(I) Superficial pectoral muscle : -

Fig.(21) The musc. fibres at 0 - day of recovery, showing a weak reaction (+), SDH activity x 100.

NB : * White fibres with very weak reaction. (w).

* Few red fibres with strong reaction (R).

* Numerous intermediate fibres with moderate reaction (I).

* The formazan granules were centrally and subsarcolemmally distributed in the red fibres.

Fig.(22) The musc. fibres after two weeks of recovery, showing strong reaction (+ + +), SDH activity. x 100.

(II) Deep pectoral muscle : -

Fig.(23) The musc. fibres at 0 - day of recovery, showing moderate reaction (+ +), SDH activity. x 100.

NB : * There was no intermediate fibres.

* Numerous red fibres with strong reaction (R)

* Few white fibres with weak reaction (w)

* The formazan granules were centrally and subsarcolemmally distributed in the red fibres.

Fig.(24) The musc. fibres after two weeks of recovery, showing strong reaction (+ + +), SDH activity. x 100.

NB : * The formazan granules were subsarcolemmally distributed.

(3G) Glycogen : -

As shown in table (23) and plates (7-8-9), in all the migratory species the white fibres were stained intensely with Best's carmine. The stain was not almost uniformly distributed within the whole contours of the fibres.

In general, the deposition of glycogen during recovery had no harmony in its distribution according to the different types of fibres.

The glycogen contents in the deep pectoral muscles were lower than in the superficial muscles (especially in C.coturnix) on the day of arrival. After two weeks of capture the glycogen content in the deep pectoral muscle became higher than that in the superficial.

There was an increase in glycogen content in both the superficial and deep pectoral muscle after the two weeks of recovery in the three migratory species (table 23).

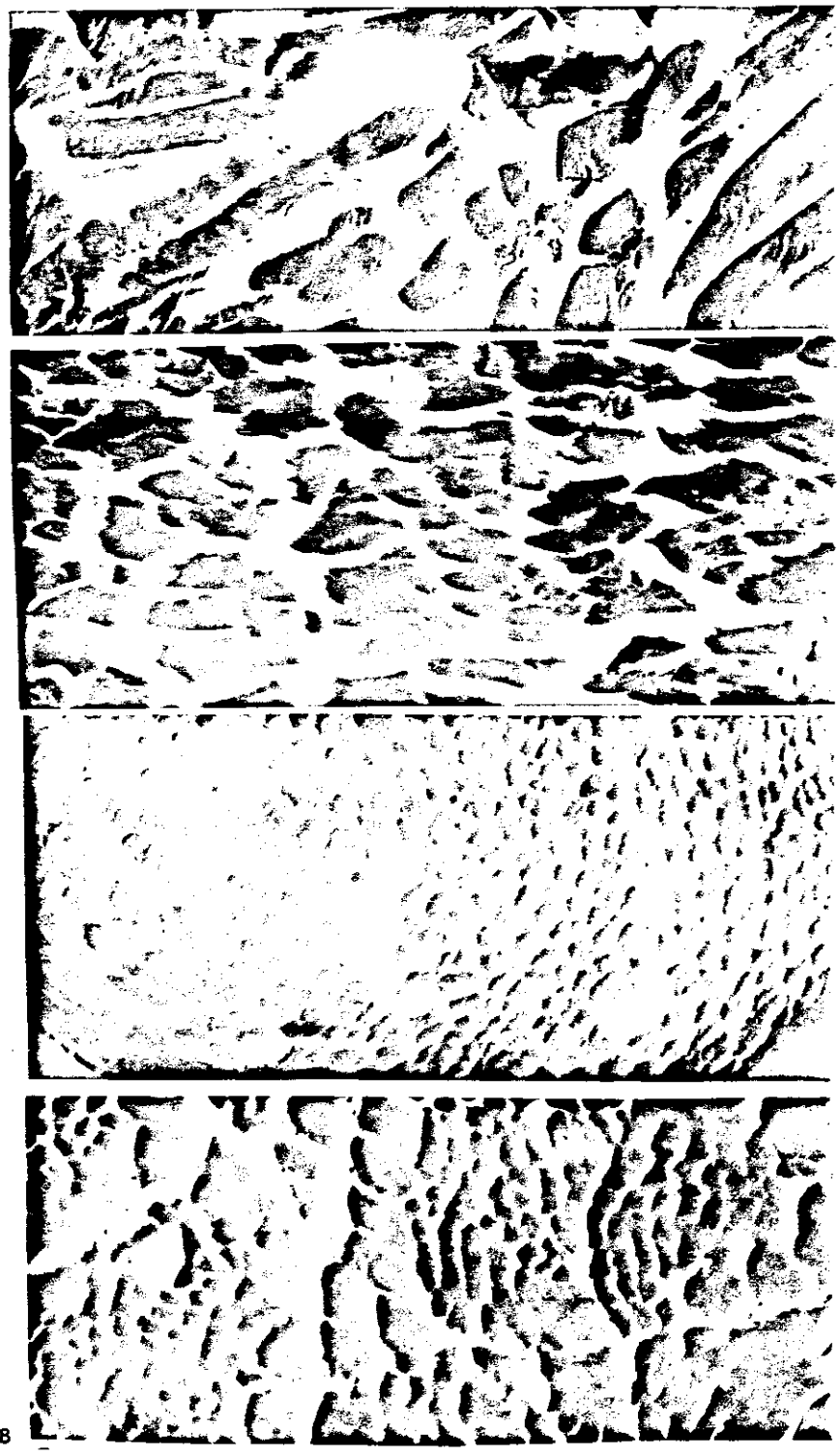

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PLATE (7)

PLATE (7)

Material (superficial and deep pectoral muscle of C.coturnix) stained by Best's carmine method according to Best (1906) for the demonstration of glycogen..

(I) Superficial pectoral muscle : -

Fig.(25) The musc. fibres at 0 - day of recovery, showed moderate reaction (+ +) of Best carmine x 100.

Fig.(26) The musc. fibres after two weeks of recovery, showed strong reaction (+ + +) of Best carmine x 100.

(II) Deep pectoral muscle : -

Fig.(27) The musc. fibres at 0 - day of recovery, showed weak reaction (+) of Best carmine x 100.

Fig.(28) The musc. fibres after two weeks of recovery, showed very strong reaction (+ + + +) of Best carmine x 100.

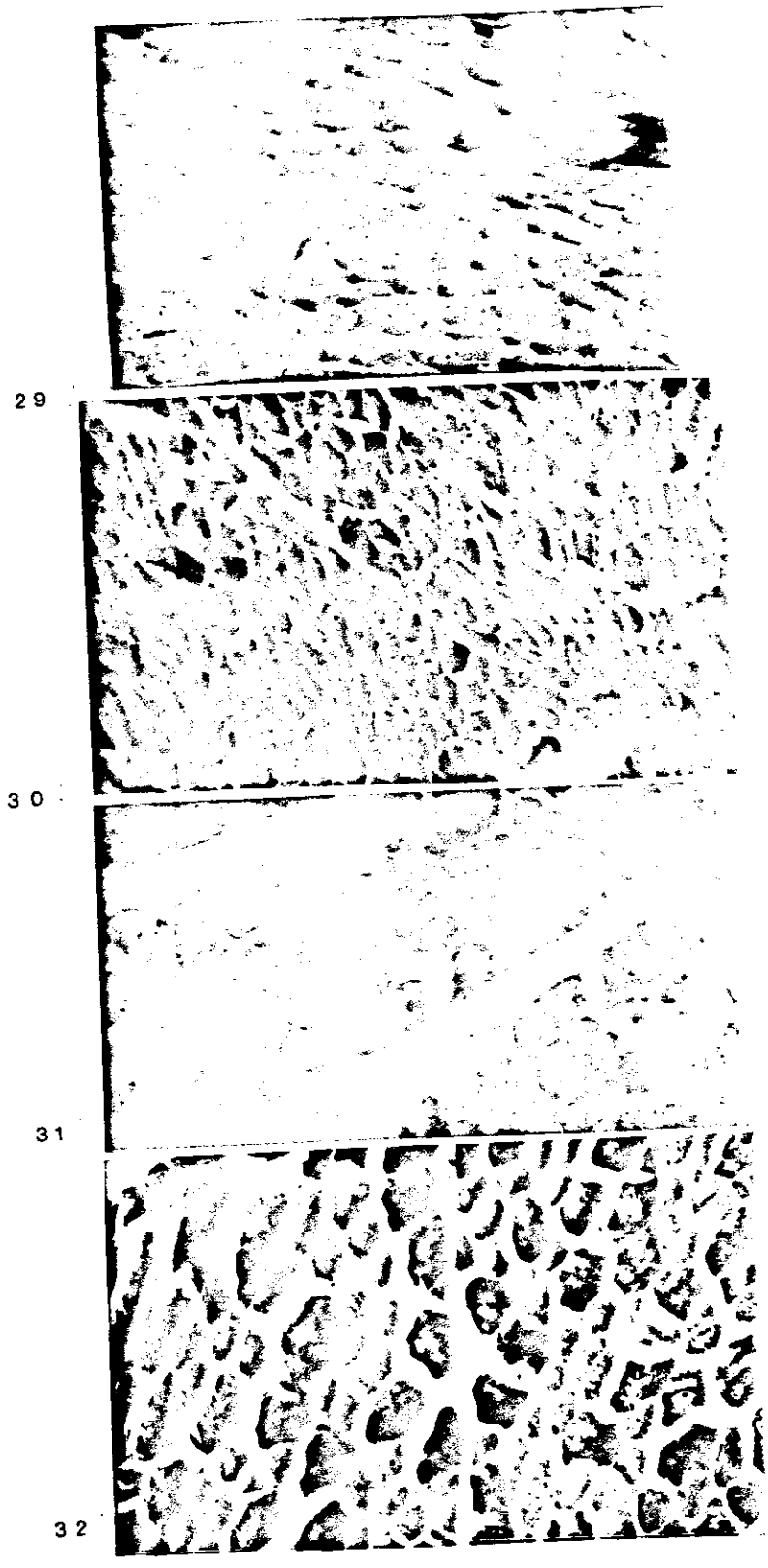


PLATE (8)

PLATE (8)

Material (superficial and deep pectoral muscle of F.atra) stained by Best's carmine method according to Best (1906) for the demonstration of glycogen..

(I) Superficial pectoral muscle : -

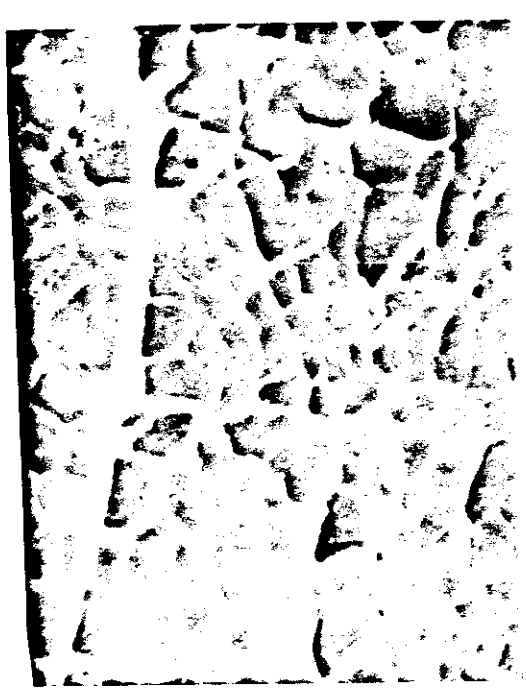
Fig.(29) The musc. fibres at 0 - day of recovery, showed weak reaction (+) of Best carmine x 100.

Fig.(30) The musc. fibres after two weeks of recovery, showed moderate reaction (+ +) of Best carmine x 100.

(II) Deep pectoral muscle : -

Fig.(31) The musc. fibres at 0 - day of recovery, showed weak reaction (+) of Best carmine x 100.

Fig.(32) The musc. fibres after two weeks of recovery, showed strong reaction (+ + +) of Best carmine x 100.



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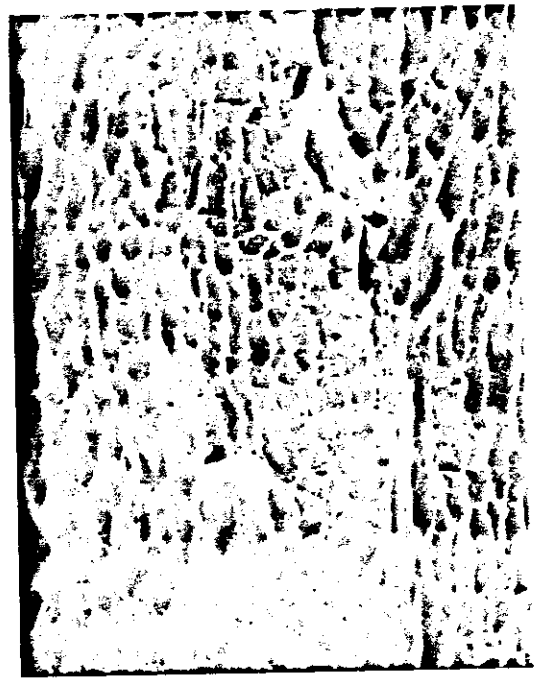

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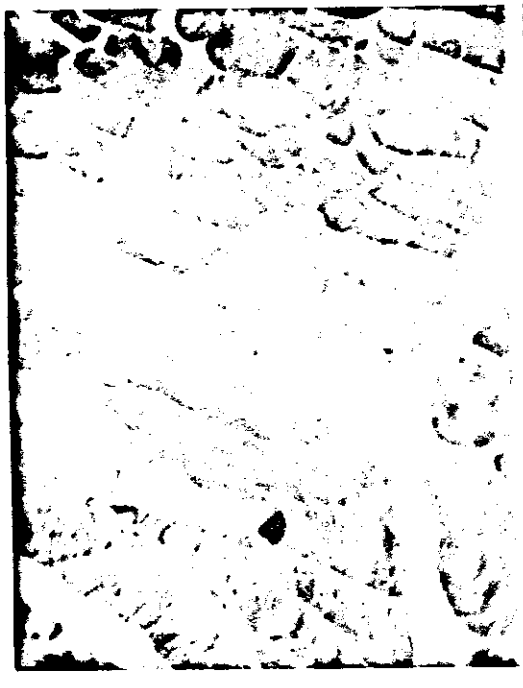

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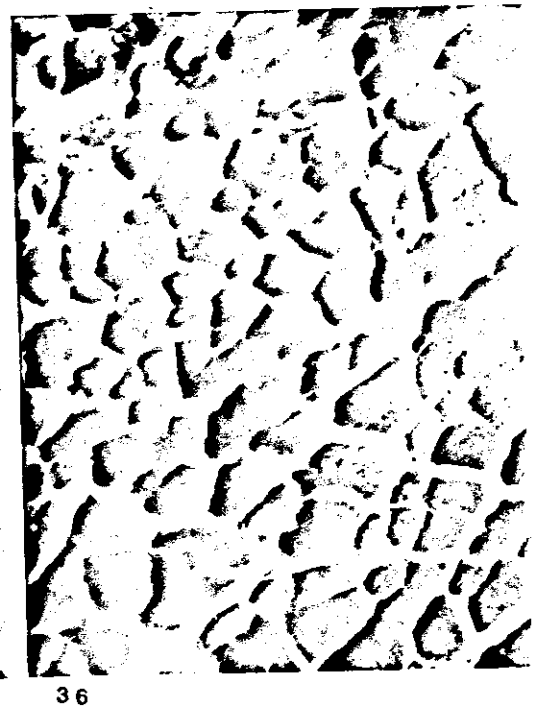

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