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ASSESSMENT OF BODY CONDITION IN TEAL AND SHOVELER DUCKS STAGING AT MANZALA LAKE

(With 7 Tables and 4 Figures)

By

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تقدير الحالة الجسمية لبط الشرشير والكيش المهاجر أثناء توقفهم ببحيرة المنزلة

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في دراسة لتقدير التركيب الجسمي لبط الشرشير والكيش المهاجر لبحيرة المنزلة، تم فحص عدد ٢٤ بطة شرشير(٩ ذكور و١٥ إناث) وعدد ١٨ بطة كيش(٩ذكور و٩انـاث) وتقدير نسب الدهون والبروتين وارتباطها بوزن الجسم٠ زاد متوسط وزن ذكور الشرشير عن الإناث(٢٧٦ ±٤٧ جم مستوى معنوية اقل من ٠٥ و ٠%) وزاد متوسط وزن ذكور الكيش عن الإناث(٥٠٤± ٤٠ جم مستوى معنوية اقل من ٠٥و٠%).كذلك ارتفعت نسبة البروتين في إناث الشرشير عنها في الذكور (٦٧و٦٥± ٢٤و٣% مستوى معنوية اقل من ٠٥و٠%) ولم يكن هناك اختلاف معنوي في نفس المكون لطيور الكيش وبشكل عام كانت نسب البروتين في الطيور بنوعيها أعلى من نسب الدهون(معنوية اقل من ٠٥و%) ،كما ظهر ارتباط خطي موجب بين وزن الجسم في البط بنوعيه ونسب الدهون(ر=٨٥ و٠ في الشرشير، ر=٦٧ و٠ في الكيش) بينما ظهر ارتباط عكسي بين وزن الجسم ونسب الدهون (ر= -٨٥و٠ في الشرشير، ر= -٧١و٠ في الكيش) كماظهر ارتباط خطى موجب بين وزن الجسم والقلب(ر=٨١و٠ في الشرشير، ٢٣و٠ في الكيش) وبين وزن الجسم والكبد في كلا النوعين(ر=٦٧و٠ في الشرشير، ر=٩٣و٠ في الكيش)٠

SUMMARY

This study was carried out to assess body condition of Teal, *Anas crecca* and Shoveler, *Anas clypeata* staging at Manzala Lake. A total of 24 Teals (9 males, 15 females) and 18 Shoveler (9 males and 9 females) were live captured over 2 months period in 1999 to be tested for body mass, fat and protein reserves. Males of teal species had on

average higher body mass (276± 47 gm, $p<0.05$) than females (235.4±27.79gm). Males of Shoveler species had on average higher body mass (504.3± 40.04 gm, $p<0.05$) than females (437.67±43.97gm). In terms of nutrient reserves, females of Teal species had on average higher protein percentage (65.67± 3.24, $p<0.05$) than males (60.34+7.2gm), while there was no difference between both sexes of Shoveler in protein content. In general, average protein content was higher than fat content in both species ($p<0.05$). In both species, there was a positive correlation between body mass and fat content ($r=0.85$ in Teal, and $r=0.67$ in Shoveler) however, a negative correlation between body mass and protein content was recorded ($r=-0.85$ in Teal, $r=-0.71$ in Shoveler). The correlation between heart mass and body mass was($r=0.81$ in Teal, and $r=0.23$ in Shoveler) and between liver mass and body mass was ($r=0.67$ in Teal, $r=0.93$ in Shoveler).

Key words: *Body condition, teal and shoveler ducks, Manzala lake.*

INTRODUCTION

Waterfowl use several types of natural and man-made wetlands for feeding, breeding and staging. The artificial wetlands, which substitute for the lost or damaged natural wetlands include sewage ponds (Swanson 1977), stock ponds (Lokemoen 1973), dug ponds (Evrard 1975), gravel pits (Street, 1982), and flood or storm water control impoundments (Adams et al., 1985). Although little knowledge of different aspects of the productivity of man-made ponds for waterfowl is known, many authors suggested that the use of these ponds by waterfowl was correlated with food availability and feeding behavior and the importance of invertebrates for satisfying the protein requirements of ducks for growth, breeding, and molting has been realized for some time (Sudgen 1973, Swanson and Meyer 1973).

A number of studies suggested that growth and body composition of waterfowl occur in response to nutrient availability (Sedinger and Flint, 199; Ankney, 1996 and Reed and Plante, 1997). However, significant changes in the species composition and proportion of the species constituting the nutrients consumed by birds vary in response to changes in food availability (Dirschl, 1969). Significant annual differences in body mass and size of fledging barnacle goslings (*Branta leucopsis*) recorded at a breeding site in Baltic sea were

explained by variations in the protein content of food eaten during growth (Larsson and Forslund, 1991).

Manzala Lake is rich in organic matter due to the passage of sewage water into the lake from different inlets. Thousands of migratory ducks use the lake as a feeding stop over site before proceeding further to the wintering grounds. The ability of the species to store the necessary food reserves quantitavely and qualitatively determines their survival success (Davidson and Evans, 1986).

The objective of this study was to test whether there was a difference in body composition between two duck species staging at Manzala Lake and between their sexes.

MATERIALS and METHODS

1- SPECIMEN COLLECTION:

Twenty four Teal ducks (9 males, 15 females) and eighteen Shoveler ducks (9 males, 9 females) were live captured at lake Manzala from October to December 1999. Identification of sex for each species was carried out by plumage color separation according to Bellrose (1980).

2-BODY MASS, BODY COMPONENTS AND MORPHOLOGICAL ANALYSIS:

The ducks were weighed intact (complete, non eviscerated) to the nearest gram by an electronic balance to determine body mass.

Total body length, wing length and leg length were measured to the nearest 0.1cm according to Hohman and Taylor (1986) for morphological analysis. The ducks were scarified and the heart and liver were removed and weighed to the nearest 0.1 gm.

The carcasses of scarified birds, separated by species and sex, were placed in polyethylene bags and frozen at - 20° C until further analysis.

3- ESTIMATION OF TOTAL BODY FAT, PROTEIN AND ASH CONTENTS:

Body samples were freeze-dried and ground into a homogenous mixture. Estimation of fat content was carried out by ether extraction of dried, homogenized carcasses according to Williams (1984). Fat content of the body has been expressed as a percentage (grams fat/grams dry body weight x100).

Estimation of protein content was carried out by Kjeldahl analysis on the fat free residue (Ankney and MacInnes 1978) and then ash was calculated.

The chemical analysis was carried out in the laboratory of biochemistry, Animal and poultry department, Desert Research Center, Mataria.

4- STATISTICAL ANALYSIS:

Test of significance using two-tailed t test was used to compare average means of body mass, fat and protein contents within and between samples at ($P< 0.05$). Regression of analysis was used to correlate body mass with liver mass, heart mass, fat and protein contents for each species.

RESULTS

1-BODY MASS, BODY COMPONENTS AND MORPHOLOGICAL ANALYSIS

Body masses of the 24 Teals ranged from 208 to 335 gm. Males had higher average body mass (276± 47 gm) compared with the average body mass of females (235.40±27.7gm), (t= -1.74, P<0.05, Fig 1). Body, wing, and leg lengths in males averaged 37.5±1.30, 28±1.73 and 12.67±0.5cm, respectively. In females body, wing and leg lengths averaged 34.5± 1.09, 26.4± 1.8 and 12.6± 0.5 cm, respectively (Table 1). Liver mass ranged from 3.0 to 9.0 gm with an average of 4.6± 1.68 gm in females and 6.67± 1.8 gm in males. Heart mass ranged from 2.0 to 4.0 gm with an average of 2.60± 0.51gm in females and 3.33± 0.5 gm in males.

Table 1: Mean body mass, and body, wing and leg lengths of Teal species.

Species	N	Ave.body Mass(gm)	Aver.body Length(cm)	Aver.wing Length(cm)	Aver.leg Length(cm)
Adult male	9	276±47	37.5±1.30	28.0± 1.73	12.67± 0.5
Adult female	15	235.4 ±22.7	34.5± 1.09	26.4±1.8	12.6± 0.5

Body masses of the 18 Shovelers were ranged from 378 to 553 gm. Males had on average higher body mass (504.33±40.04gm) than that of females (434.67±43.97gm), (t= -1.76, df=4, P< 0.05, Table2). Body, wing and leg lengths in males averaged 49.17± 6.25, 33.67± 2 and 16.5 cm, respectively. In females body, wing and leg lengths averaged 45.5,

30± 9.45 and 15.67± 0.5 cm, respectively (Table 2). Liver mass ranged from 7.0 to 10 gm. with an average of 8.33± 1.53 gm. in females and 7.67± 0.58 gm. in males. Heart mass ranged from 3.0 to 5.0 gm. with an average of 4.33± 1.15 in females and 5.33± 0.58 gm. in males.

Table 2: Body mass, and body, wing and leg lengths of Shoveler species.

Species	N	Ave.body Mass(gm)	Aver.body Length(cm)	Aver.wing Length(cm)	Aver.leg Length(cm)
Adult male	9	*504.3±40.04	*49.17±6.25	33.67±2.0	16.5±0.00
Adult female	9	434.67±43.97	45.5±0.00	30.0±9.45	15.67±0.5

2- PROTEIN, FAT AND ASH CONTENTS:

Among Teal individuals, females had higher body protein reserves than males (t= 1.85, P<0.05). Males, on the other hand, had higher fat reserves than females (t= -1.45, P< 0.05, Fig 2).

Within Shoveler individuals there was no difference between males and females in terms of protein and fat reserves. However, comparison between protein and fat reserves in all individuals indicated a difference in favor of protein reserve (t= 2.26, df=10, P< 0.05).

There was no difference in ash contents among and within species and between sexes (Table 3).

Table 3: Percentages of protein, fat and ash in both Teal and Shoveler species.

Species	Sex	%protein	%fat	%ash
Teal	Male	60.34± 7.2	27.57± 9.4	13.05± 1.36
	Female	*65.67± 3.24	18.04± 8.8	16.36 ±2.6
Shoveler	Male	50.01± 12.01	38.28± 13.97	12.15± 3.3
	Female	51.71± 4.25	36.93± 4.77	12.20± 1.41
	All	*50.86± 46	37.61± 9.37	

4- CORRELATION OF BODY MASS WITH HEART AND LIVER MASS.

In Teal, there was a high positive correlation between body mass and heart mass. The liver mass was only moderately correlated with body mass (Table 4).

Table 4: Correlation of body mass with heart and liver masses in Teal species.

Dependent	Independent	Intercept	Slope	r
Body mass (gm)	Liver mass (gm)	85.37	27.95	0.67
	Heart mass (gm)	107	52.56	0.81

In shoveler, heart mass had a weak correlation with body mass whilst liver mass was highly correlated with body mass (Table 5).

Table 5: correlation of body mass with heart and liver masses in Shoveler species.

Dependent Variable	Independent	Intercept	Slope	r
Body mass (gm)	Heart mass	369.5	12.5	0.23
	Liver mass	203	55.1	0.93

5 -CORRELATION OF BODY MASS WITH FAT AND PROTEIN RESERVES.

In Teal, there was a high positive correlation between body mass and fat percentage while the correlation between body mass and protein percentage was highly negative (Table 6, Fig 3).

Table 6: Correlation of body mass with protein and fat reserves in Teal species.

Independent Variable	Dependent	Intercept	Slope	r
Body mass (gm)	% Protein	93.29	-0.10	-0.85
	% fat	-29.56	0.19	0.84

In Shoveler, body fat was positively correlated with body mass whilst protein reserve was negatively correlated with body mass (Table 7, Fig 4).

Table 7: Correlation of body mass with body protein and fat in Shoveler species.

Independent Variable	Dependent Variable	Intercept	Slope	r
Body mass (gm)	Fat%	-13.51	0.10	0.67
	Protein%	97.95	-0.10	-0.71

DISCUSSION

Body weight in bird species is commonly related to some internal and external factors, such as fat deposit (Johnson et al. 1985), protein reserve (Davidson 1984), food availability (Davidson and Evans 1986), age and breeding conditions (Thomas 1986). The high average body mass observed in males of both duck species is probably related to the high-energy requirements needed for migration (Blem 1976). Aggressive individuals, which need to monopolize resources in critical habitats, are favored by big body size (Drickamer and Vessey 1986) in order to defend their territories. Body fat reserve is one of the crucial factors responsible for body weight increase (Johnson et al.1985) The positive correlation observed in the relationship between body mass and fat reserve in the ducks indicates the role of fat in supporting the body weight. Wood (1982) mentioned that many migrants accumulate considerable amount of fat prior to their trans-Sahara flights to support their body mass. The livers of the birds play a crucial role in the fattening process and that was evidenced by a presence of positive correlation between liver mass and body mass in all individuals involved in the study. Filippo et al. (1988) indicated that hyperlipogensis in birds during the pre-migratory phase is enhanced by an increased rate of hepatic synthesis of fatty acids.

The fact that total body fat in studied birds was lower than protein reserve implies that migratory ducks probably used up most of their fat reserve during flight. The loss of body weight that attributed to fat depletion during migration usually accounts for 30 to 40% (Drickamer and Vessey 1986). Dawson et al. (1983) indicated that oxidation of fat for energy may result in sparing of both glucose and muscle protein and for birds to improve their chances of successful migration they have to rapidly restore
their depleted fat (Moore and Simm 1986).

Meanwhile, protein generally constituted a substantial body reserve in the studied birds with higher values in females of teal species. Nichols and Hines (1987) indicated that increased intake of animal protein was consumed by teals before they arrived on the breeding ground and very early in the season even when the proliferation of reproductive tissues was not apparent. Females of duck species were often noticed feeding proportionally more insects (32%) than males (13%) to be provided with all essential amino acids and calcium required for reproduction (Krapu 1981). In addition, stored protein can be used

(along with fat reserve remaining after migration) to enhance the chances of survival at the migratory destination in the face of unpredictable food availability and weather conditions (Davidson 1984). In spite of the importance of protein as a body reserve its negative correlation with body mass as observed in all studied species probably indicate that the need for protein diminishes in older and fully grown birds with high body mass. Because protein is essential for growth, reproduction and molting (Sudgen 1973, Swanson and Meyer 1973) the need for its accumulation is probably enhanced in low body mass birds.
In conclusion, it is assumed that both duck species were under-nourished in terms of fat reserve and they need to restore their depleted fat before taking off. The ability of rapid body gain depends on food availability in the staging sites, a case that needs to be fully assessed.

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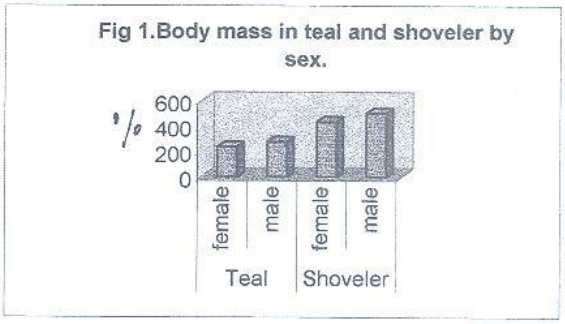
Teal		Shoveler	
female	male	female	male
235	276	434.65	504.3



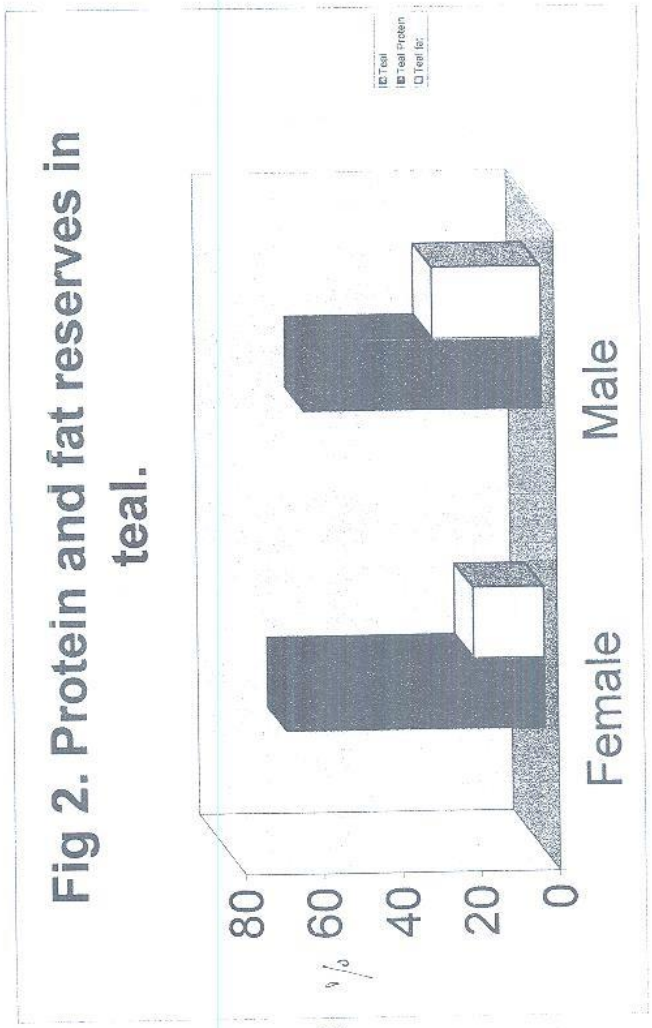
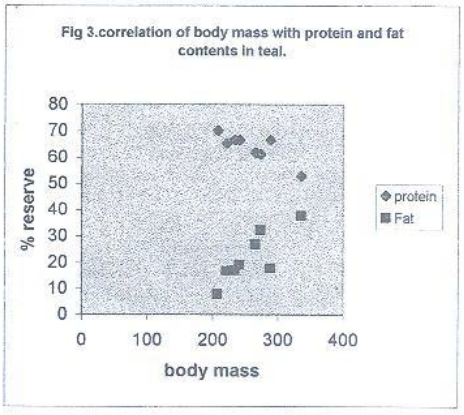


Fig 2. Protein and fat reserves in teal.

Teal			Shoveler		
Body mass	protein	Fat	Body mass	protein	Fat
208	69.89	7.5	476	48.38	41.33
234	66.3	16.73	553	39.45	49.46
221	64.94	16.4	461	63.08	22.62
241	66.3	18.76	499	47.5	42.76
273	60.89	32.04	378	56.5	31.86
288	66.34	17.54	450	50.26	37.6
265	61.51	26.57			
335	52.63	37.38			
	-0.84968	0.841799		-0.71477	0.672076



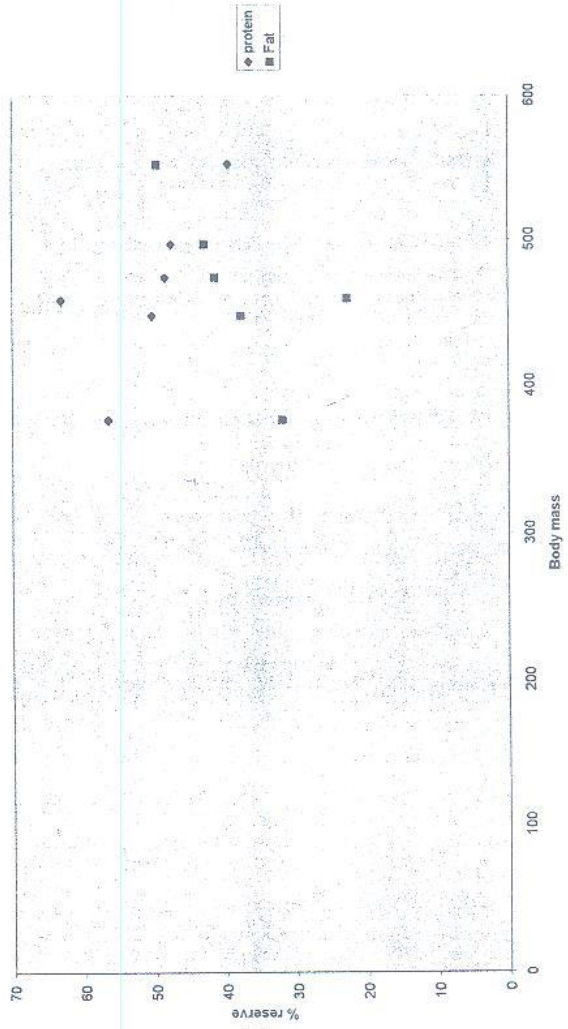


Fig 4.Correlation of body mass with protein and fat contents in shoveler.