

**COMPARISON OF MERISTIC AND MORPHOMETRIC
CHARACTERS OF SOLEA AEGYPTIACA IN MEDITERRANEAN
SEA AND LAKE QARUN, EGYPT.**

BY

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ABSTRACT

A comparison study of morphometric and meristic characters of Solea aegyptiaca collected from Mediterranean Sea and Lake Qarun during the period of 1993-1994, revealed significant differences in six meristic counts and in all the twenty morphometric measurements, this high degree of different biometric measurements indicates that the transplanted sole fish in Lake Qarun has become a distinct population.

INTRODUCTION

The sole, *Solea vulgaris* was first introduced into Lake Qarun in 1938 and transplanting was continued in 1943, 1945 and 1948. The transplanted young sole fish (7-10 cm) were collected from the Egyptian Mediterranean Sea near Abu-Kir Bay off Maadia which is situated at about 32 Kilometers from Alexandria at the East. The successful acclimatization of sole fish was established in Lake Qarun, since it has become a major part of the lake fishery (El-Zarka, 1963). Lake Qarun occupies the lowest part of Faiyoum depression which lies about 90 Kilometers to the south west of Cairo. It is a closed basin with no apparent outlets having an area of 20235 hectares. The temperature and the salinity range from 10.0 to 33.3 C and from 18.0‰ to 36.0‰ respectively in Lake Qarun (Soliman, 1989). On the other hand, the temperature and salinity in the Egyptian Mediterranean waters range from 17.0 to 28.0 C (Kamel, 1993)

and from 27.0‰ to 39.0‰ (Beltagy *et al.*, 1985). The first work on population identity of transplanted sole as *Solea vulgaris* in Lake Qarun has been done by Ezzat *et al.* (1979) but this study was carried out before sole fish has been differentiated into two species *Solea vulgaris* and *Solea aegyptiaca* (Quignard *et al.*, 1984). The aim of the present study is to compare the biometric characters of the only identified *Solea aegyptiaca* in Lake Qarun with those of Mediterranean to know if transplanted sole in Lake Qarun has become a distinct population.

MATERIALS AND METHODS

For the biometric study of Soles in Mediterranean Sea and Lake Qarun, random samples 416 fish of different lengths (140-290 mm) obtained from the commercial catch of Abu-Kir Bay and Lake Qarun in the period from 1993 to 1994. Twenty morphometric measurements and seven meristic counts were carried out in the laboratory on fresh material. All the measurements were taken to the nearest mm. The morphometric measurements related to total length included the following: standard length, head length, body girth, dorsal fin base length and anal fin base length. While head depth, body depth, caudal peduncle depth, eye diameter, interorbital width, snout length, postorbital length, upper jaw length, lower jaw length, caudal fin length, pectoral fin length, ventral fin length, pre-anal length, pre-dorsal length and pre-ventral length were related to head length. The following meristic counts were also done on vertebrae number, scales number on the lateral line, number of caudal fin rays, pectoral fin rays, ventral fin rays, dorsal fin rays and anal fin rays.

Meristic and morphometric characters were analyzed separately using variance and covariance methods as suggested by Ihssen *et al.* (1981). The significant difference of each morphometric and meristic characters was considered at 5% and 1% levels.

RESULTS

The statistical comparison of morphometric characters indicated that all the five characters were tested on total length and fifteen characters on head length showed highly significant differences at 1% level between Mediterranean Sea and Lake Qarun fish (Table 1). Analysis of the data also showed that the

Mediterranean Sea fish had a higher mean values than Lake Qarun fish in all examined morphometric characters (Fig. 1).

A comparison study of meristic characters for Mediterranean Sea and Lake Qarun fish showed that highly significant differences ($P < 0.01$) existed in vertebrae number, number of caudal fin rays, pectoral fin rays, ventral fin rays, dorsal fin rays and anal fin rays show significant difference at 5% level but only scale numbers on lateral line show no significant difference (Table2). All meristic counts which showed highly significant differences had higher mean values in Mediterranean Sea soles than those in Lake Qarun (Fig. 2).

DISCUSSION

The present study showed that the Mediterranean Sea and Lake Qarun soles (*Solea aegyptiaca*) were significantly different for 20 morphometric characters and 6 out of 7 meristic characters. These biometric traits had lower values in Lake Qarun sole than those found in the Mediterranean Sea. The reduction of meristic counts and the decrease of morphometric measurements of Lake Qarun sole appear to be related to the increase of temperature and due to the differences in the other environmental conditions. Various authors have noticed that the topography and physicochemistry of habitat in addition to the climatic conditions affect the biometric variation of fish population (Clark, 1973, cited from Henault and Fortin, 1989; Taylor and Mc Phail, 1985; Rosenau and Mc Phail, 1987; Swain and Holtby, 1989). The influence of the higher temperature on the decrease of number of dorsal and anal fin rays has been reported by Taning (1952) in Salmon *Salmon trutta* and Henault & Fortin (1989) in Cisco *Caregonus artedii*. A similar decrease in vertebral count and dorsal fin number related to the increase of temperature for *Solea vulgaris* in Lake Qarun was noticed by Ezzat *et al.* (1979).

In the present study, the environmental variation between Mediterranean Sea and Lake Qarun exhibit contrasting selection pressure on body forms. These variations are inherited and seem to reflect adaptation to local conditions. However, this high degree of biometric differences between Mediterranean Sea and Lake Qarun soles indicated that the solea population in Lake Qarun

Table (1): Comparative relationship of the regression coefficient morphometric measurements for *Solea aegyptiaca* in Mediterranean Sea and Lake Qarun.

Morphometric character	Mediterranean Sea			Lake Qarun			FB	FM
	a	b	r	a	b	r		
In total length								
Standard length	-0.1803	0.8671	0.9997	-0.1835	0.8758	0.9997	15.66 ^{***}	679.24 ^{***}
Head length	0.3104	0.1476	0.9962	0.5724	0.1313	0.9793	63.06 ^{***}	132.16 ^{***}
Body girth	-1.3347	0.6769	0.9933	1.1424	0.5679	0.9833	143.93 ^{***}	35.65 ^{***}
Dorsal base length	-0.1174	0.8455	0.9997	-0.3647	0.8654	0.9995	887.32 ^{***}	416.74 ^{***}
Anal base length	-0.1324	0.7002	0.9986	-0.6761	0.7263	0.9983	43.71 ^{***}	0.03
In head length								
Head depth	-0.3939	1.4091	0.9977	0.2684	1.2780	0.9818	56.24 ^{***}	743.08 ^{***}
Body depth	-1.1245	1.9770	0.9940	-0.3901	1.8215	0.9854	35.10 ^{***}	321.68 ^{***}
Caudal peduncle depth	-0.1785	0.5223	0.9863	0.0357	0.4509	0.9653	47.93 ^{***}	23.47 ^{***}
Eye diameter	0.0415	0.1286	0.9531	-0.1070	0.1724	0.9634	99.27 ^{***}	1.75
Interorbital width	0.0324	0.1581	0.9336	-0.0964	0.1866	0.9271	17.96 ^{***}	125.25 ^{***}
Snout length	0.0150	0.2362	0.9849	0.1761	0.1613	0.9623	300.46 ^{***}	1223.31 ^{***}
Post-orbital	-0.2053	0.6140	0.9956	-0.2257	0.6530	0.9813	17.36 ^{***}	667.15 ^{***}
Upper jaw length	-0.0745	0.3458	0.9923	0.0083	0.2988	0.9865	105.25 ^{***}	1049.11 ^{***}
Lower jaw length	-0.0764	0.2969	0.9906	-0.0361	0.2596	0.9908	92.20 ^{***}	1934.28 ^{***}
Caudal fin length	-0.0094	0.8675	0.9879	-0.2900	0.9201	0.9724	8.89 ^{***}	178.91 ^{***}
Pectoral fin length	-0.0828	0.4520	0.9753	-0.1629	0.4523	0.9689	0.0004	275.41 ^{***}
Ventral fin length	-0.2600	0.3731	0.9704	-0.1261	0.3248	0.9291	19.52 ^{***}	29.49 ^{***}
Pre-anal length	-0.8106	1.5207	0.9912	-0.4605	1.4816	0.9828	2.72	434.97 ^{***}
Pre-dorsal length	-0.3262	0.2991	0.9678	-0.1837	0.2451	0.9538	48.65 ^{***}	105.48 ^{***}
Pre-ventral length	-0.2934	1.0682	0.9922	0.0051	0.9660	0.9888	53.69 ^{***}	39.78 ^{***}

a = intercept, b = slope, r = correlation coefficient.
 FB = test of slope, FM = test of adjusted means.
^{***} Significant at 1% level.

Figure (1): Comparative mean values of morphometric measurements of the Mediterranean and Qarun Soles.

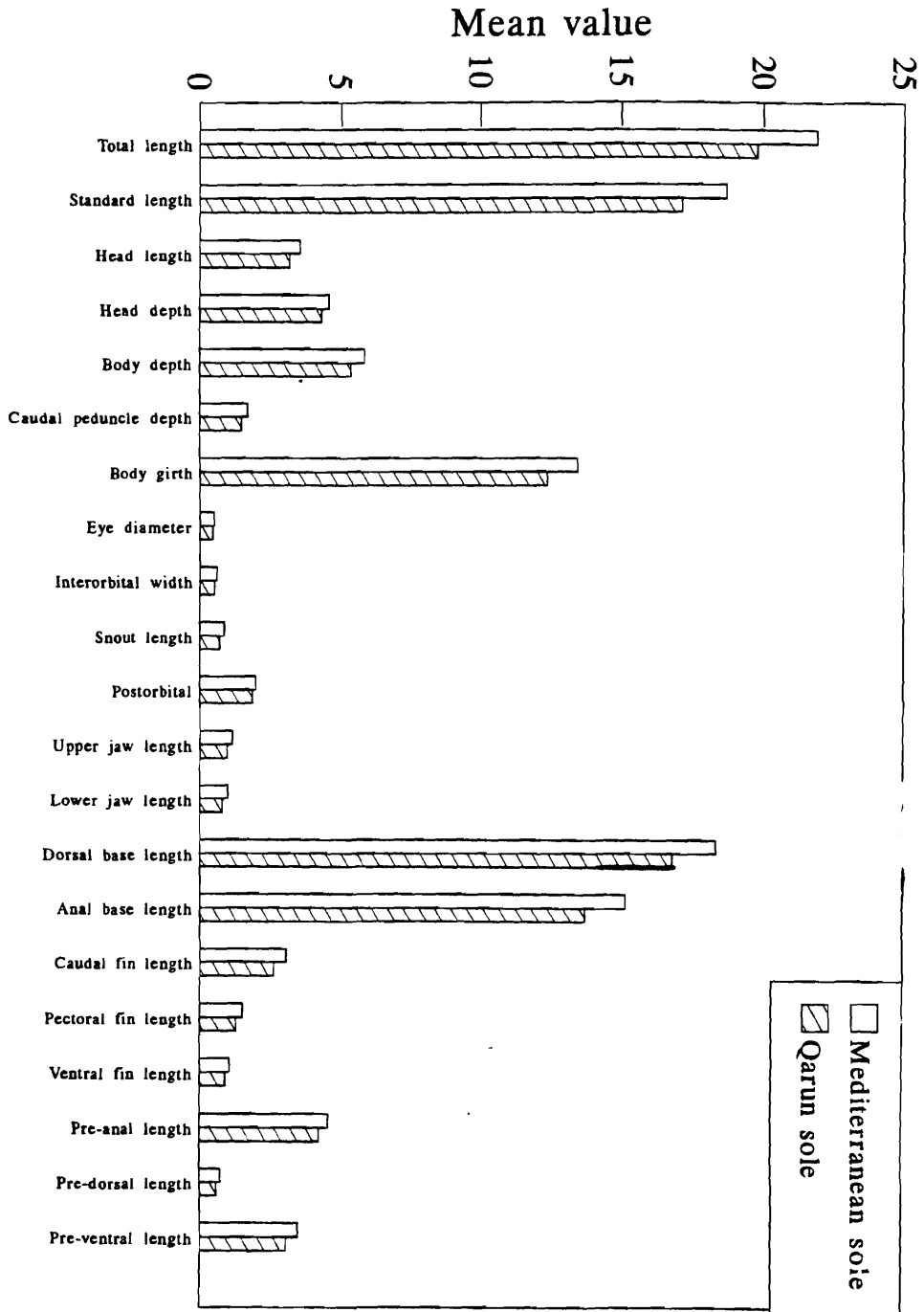


Table 2. Comparison of meristic characters for *Solea aegyptiaca* in Mediterranean Sea and Lake Qarnun.

Meristic character	Mediterranean Sea			Lake Qarnun			F _{cal}
	N	Range	Mean ± S.D.	N	Range	Mean ± S.D.	
Vertebrae number	206	39-44	41.21 ± 0.8571	210	37-43	40.77 ± 0.9409	25.08**
Scales number in lateral line	206	100-150	119.28 ± 9.0960	210	101-155	120.78 ± 10.0900	2.55
Caudal fin rays	206	18-20	19.57 ± 0.8217	210	14-20	18.92 ± 1.4256	32.20**
Pectoral fin rays	206	7-9	8.04 ± 0.6865	210	6-9	7.67 ± 0.7144	30.11**
Ventral fin rays	206	4-6	5.00 ± 0.1976	210	4-5	4.90 ± 0.3007	16.01**
Dorsal fin rays	206	62-85	71.32 ± 3.9920	210	63-78	70.42 ± 2.4933	7.58**
Anal fin rays	206	52-69	58.18 ± 3.1065	210	52-64	57.55 ± 2.4140	5.30*

* Significant at 5% level.

** Significant at 1% level.

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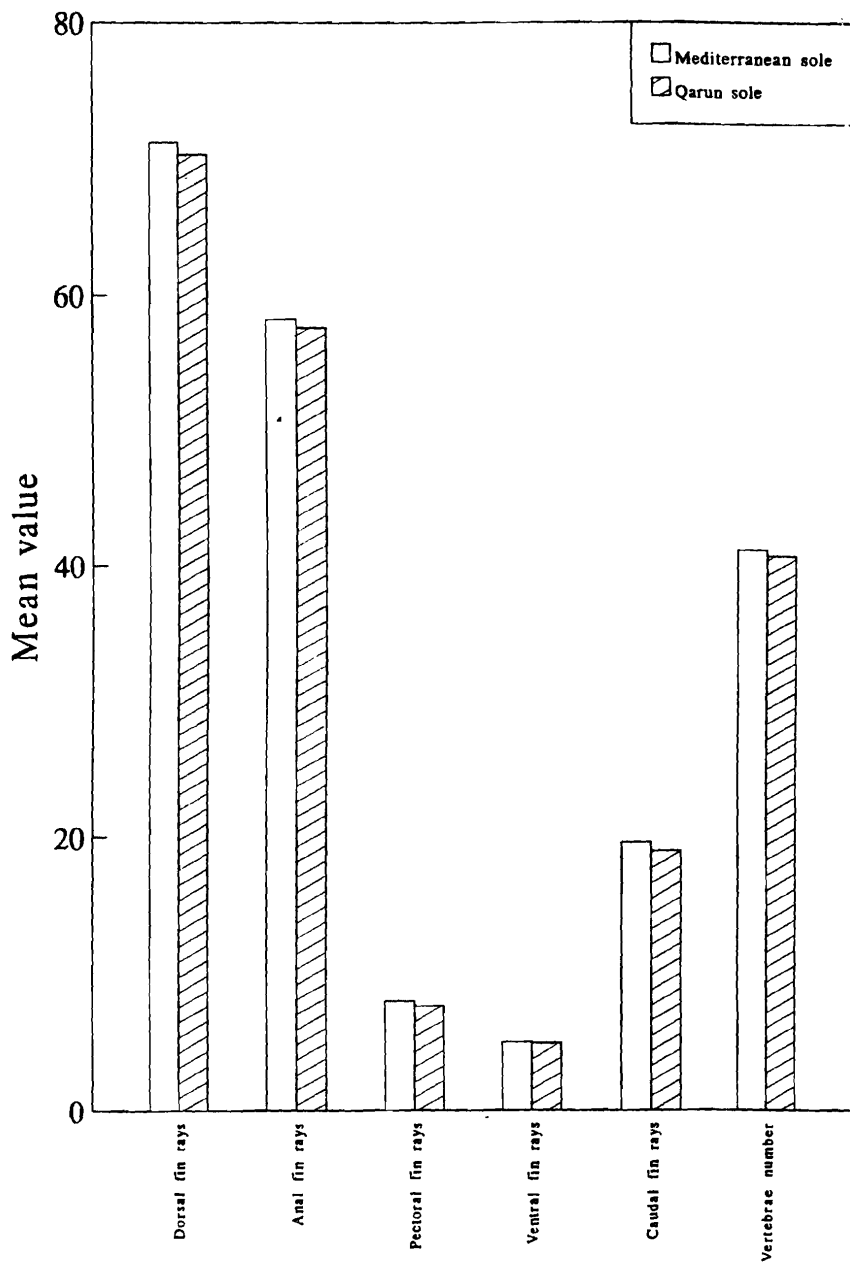


Figure (2): Comparative mean values of meristic counts of the Mediterranean and Qarun soles.

have developed new morphometric and meristic characteristics and becomes a distinct population as compared to that of the Mediterranean Sea.

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