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A TAXONOMIC STUDY OF THE GENUS BLENNIUS L.  
OF LEBANON

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#### ABSTRACT

Eight species of the Blenniidae, Blennius sanguinolentus, B. pavo, B. sphinx, B. fluviatilis, B. cristatus, B. inaequalis, B. galerita, and B. trigloides were collected from the coastal waters of Lebanon and described. Original drawings, meristic and proportionality data appear in the descriptions. Blennius palaestinensis W. Steinitz, 1927 is placed in the synonymy of B. sanguinolentus Pallas, 1811. B. inaequalis Linnaeus, 1758, is described for the first time from the eastern Mediterranean. The distribution of Mediterranean blenniids is reviewed. Notes on habits are included.

## ACKNOWLEDGEMENTS

I wish to express my deepest appreciation to Dr. Robert E. Lewis, my advisor during the course of this study, and Dr. Carl J. George of the American University of Beirut, for their invaluable assistance, encouragement and guidance. I also wish to thank Messrs. Charles and Richard Bridgwood, and many others who helped me collect the material.

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## INTRODUCTION

The eastern Mediterranean basin includes the Aegean sea and extends from the east coasts of Sicily and Tunisia to the coasts of Lebanon and Syria.

Our present knowledge of the taxonomy of the blenniid fishes of the eastern Mediterranean, especially the south-eastern part of this region, comes primarily from the work of H. Steinitz (1949a, 1949b, and 1950). Other works include those of Carus (1887/93), Ninni (1923), and Tortonese (1948) on the northern parts of the region, and those of Erazi (1941, 1942), Kosswig (1942), Aksiray (1954) and Slastenenko (1955-56) on the coasts of Turkey, Sea of Marmara, Bosphorus, and the Black Sea.

The purposes of the present work are to provide basic information on the blenniid fishes of the Lebanese coast, and to bridge the gap in the study of the blennies of the eastern Mediterranean, since Lebanon is situated between the better known areas of Turkey and Palestine.

Information about each of the eight species is developed in the following order:

- a) Synonymy
- b) Diagnosis
- c) Description
- d) Color
- e) Distribution
- f) Discussion
- g) Tables (meristic and proportionality data)

The accompanying drawings are all original and, except for B. fluviatilis and B. trigloides, have been made from fresh material.

#### MATERIALS AND METHODS

With the exception of two specimens of B. sanguinolentus taken at a depth of 18-20 meters, all of the blennies in the AUB collection were captured in tide-pools and rocky ledges in shallow waters (0.5-2.0 meters) along the coast, in rivers, and river mouths. Rotenone poisoning was by far the most extensively employed method of collecting. The fresh specimens were immediately placed in 10% formalin in sea-water. Borax was frequently used as a buffer. In the laboratory, specimens were either transferred to 8-10% buffered solution of formalin and tap-water, or were thoroughly washed and placed in 70% ethyl alcohol.

Measurements were made with a pair of dividers and estimated to the nearest tenth millimeter on a measuring board graduated in millimeters. Although the smallest structures were measured under a dissecting microscope, an error of  $\pm 0.2\text{mm}$ . may be assumed when referring to the tables.

In all but a few instances, H. Steinitz's (1949a) method of measurement was followed. This was done not because his method is the best, since its arbitrary nature is a serious limit to its broader application, but because the detailed data presented by Steinitz were the only ones from a locality close to Lebanon and hence were useful as a reference for comparison.

Briefly, the technique is as follows:

a) Standard length: from the median anterior tip of the upper lip to a point on the midlateral posterior margin of the ultimate vertebra as determined under the dissecting microscope with transmitted light.

b) Length of head: the projection, on the axial plane, of the line joining the same anterior point as in the standard length with the most posterior membranous margin of the operculum.

c) Diameter of eye: the horizontal at the soft, membranous orbital border.

d) Interorbital space: the narrowest, usually just anterior to or between the bases of the supraorbital tentacles.

e) Body height: the vertical from the ventral abdominal margin to the base of the dorsal fin, just behind the root of the pectoral fin.

f) Length of pectoral fins: from the middle of the line connecting the ends of the arc-shaped base of these fins to the tip of the longest ray.

g) Length of ventral fins: medially from the point of emergence of these fins from the body surface to the tip of the longest ray.

## SYSTEMATICS

### Blennius Linnaeus

Blennius Linnaeus, 1758. Syst. Nat., ed. X, p. 256 (type

Blennius ocellaris L.)

Salarias Forskal, 1777, Descr. Anim., p. 22 (Blennius galerita L.)

Ichthyocoris Bonaparte, 1840. "Fauna Ital.," III, Pesc., I, part 1, fasc. XXVIII, Type Blennius varus. Risso.

Adonis Gronow, 1854. Cat. Fish., Ed. Gray, p. 93, (Adonis pavonimus Gronow = Blennius ocellaris L.)

Liophrys Gill, 1896, Amer. Nat., XXX, p. 498, Type Blennius pholis Linne.

Diagnosis. Body elongate, low, compressed posteriorly, scaleless, covered with thick layer of mucus\*; each jaw with a single series of fine, fixed, closely set, long and slightly recurved teeth, a strong curved tooth generally present behind the series in both jaws or in the lower.

General Description. Supraorbital tentacles usually well developed, simple filamentous, dichotomously branched or palmate; anterior nostrils usually with simple filamentous or palmately fringed tentacle; interorbital space and nape of neck naked, with a solid fleshy crest (B. pavo, and B. fluviatilis), or with a series of filaments (B. galerita, and B. cristatus); gill-

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\* Blennius = etymologically derived from Greek "vlenna" (mucus)

opening wide; branchiostegal rays six. Lateral line seldom distinct throughout its length, generally originating dorso-laterally to posterior opercular margin, extending caudally well above the midline to just anterior to anus where it descends and continues midlaterally. Dorsal fin single, occupying most of the dorsal side of the trunk, with at most a distinct notch between the spinous and soft portion, the ultimate ray of the latter sometimes united by a membrane with the caudal fin. Anal fin usually longer than soft portion of dorsal fin, often (mature males) with anterior one or two elements modified into fleshy excrescences. Ventral fins jugular, filiform, usually composed of three rays or one spine and two rays. Pectoral fins with 12-14 (rarely 15) rays, the longest of which often extends beyond the anus. Pyloric caeca and swim-bladder absent. Small fish (aver. size 50-70mm.), primarily carnivorous, feeding on small crustaceans and other animals of minute size.

Supplementary Notes. The colors are extremely variable, differences existing among members of the same species. In general, however, close observation reveals a more or less consistent pigmentational pattern throughout the genus. The pattern is characterized by 5-8 broad transverse bands, darker than the ground color and often with white or light blue margins. In specimens over 50mm. in total length these transverse bands bifurcate at approximately the height of the midlateral line or continue beyond it, the portions below the midline being out of phase with the portions above it.

Certain of the species show a secondary sexual dimorphism expressed in the form of a prominent fleshy crest on the head (male B. pavo and B. fluviatilis), exceedingly long supraorbital tentacles (male B. sphinx and B. inaequalis), modified anterior elements of the anal fin (males of most species), and strikingly bright coloration, especially during breeding seasons (males in some species and females in others).

Although the typical habitat of the species of this genus is the supralittoral zone, at least one species, B. ocellaris, is commonly found on deep rocky bottoms; B. pavo has often been observed in brackish waters, while B. fluviatilis frequents all three environments, namely, sea, brackish, and fresh-water rivers and lakes.

In addition to their ability to change their color in accordance with the particular environment they happen to inhabit, the small size of these fishes makes them difficult to see. Like most of the strictly littoral benthic fishes, the small blennies depend strongly on concealment for their survival. Ony stone, crevice, empty mollusk shell or sea weed may be used as a shelter. When not hidden, they spend their time crawling on the bottom of the tide-pool or over rocks, using their pectoral and ventral fins for support and anchorage. Occasionally, they may be observed swimming but soon drop to the bottom.

The thick layer of mucus surrounding the bodies of the blennies enables these animals to tolerate a wide range of salinity. (Bertin and Arambourg, 1958)

Distribution. The genus Blennius is the only representative of the family Blenniidae in the Mediterranean Sea, the genera Cristiceps (Clinus) Risso, 1826, and Tripterygion Risso, 1826, having been placed in a separate family, the Clinidae. Of the 18 species so far identified in the Mediterranean, nine, or perhaps ten, also occur in the eastern Atlantic region, eight in the Bosphorus and the Sea of Marmara, and seven have been reported from the Black Sea. On the basis of available data the distribution of these 18 species is summarized in Table 1.

B. knipovitschi and B. ponticus are either endemic Black Sea species (Steinitz, 1950) or immigrants into the Black Sea from the Mediterranean where they do not exist at present (Slastenenko, 1939).

B. canevae, B. dalmatinus, and B. zvonimiri are apparently very restricted in their distribution. Their range includes, according to Steinitz (1950), "...islands and west coast of Italy; Adria; eastern islands and coast (?)." Ben Tuvia (1953) includes B. zvonimiri and B. canevae in his "Mediterranean Fishes of Israel" and Svetovidov (1958) in his "Blenniid Fishes of the Black Sea."

B. basiliscus has so far been reported only from Algiers (Dieuzeide et al. 1955), Turkey (Aksiray, 1954), and Palestine (Bodenheimer, 1935; Steinitz, 1950). The data from the first two localities are not sufficient to justify an inference as to its frequency of occurrence. In Palestine, on the other hand, it has been found only once (one specimen), while its

TABLE 1: GEOGRAPHIC DISTRIBUTION OF 18 SPECIES OF THE GENUS BLENNIUS L.

|                                      | WESTERN MEDITERRANEAN<br>& ADRIATIC SEA |        |         | EASTERN MEDITERRANEAN |         |        |                        |           |
|--------------------------------------|---|--------|---------|-----------------------|---------|--------|------------------------|-----------|
|                                      | EAST<br>ATLANTIC                        | EUROPE | ALGIERS | PALESTINE             | LEBANON | TURKEY | BOSPHORUS<br>& MARMARA | BLACK SEA |
| 1. <i>B. galerita</i> L.             | +                                       | ±      | +       | +                     | ±       | +      | +(Bosph only)          | +         |
| 2. <i>B. cristatus</i> L.            | +                                       | ±      | +       | +                     | +       | +      |                        |           |
| 3. <i>B. rouxi</i> Cocco.*           |   | ±      |         |                       |         |        |                        |           |
| 4. <i>B. pavo</i> Risso.             | +                                       | +      | +       | +                     | +       | +      | +                      | +         |
| 5. <i>B. fluviatilis</i> Asso.       | +                                       | +      |         |                       | ±       | +      |                        |           |
| 6. <i>B. inaequalis</i> L.           | ?                                       | ±      | +       |                       | +       |        |                        |           |
| 7. <i>B. sanguinolentus</i> Pallas.  | +                                       | +      | +       | +                     | +       | +      | +                      | +         |
| 8. <i>B. gattorugine</i> Brunn.      | +                                       | +      | +       | +                     |         | +      | +                      |           |
| 9. <i>B. tentacularis</i> Brunn.**   |   | +      | +       |                       |         | +      | +                      | +         |
| 10. <i>B. ocellaris</i> L.           | +                                       | +      | +       | +                     |         |        | +                      | +         |
| 11. <i>B. sphinx</i> Cuv. & Val.     |   | +      | +       | +                     | +       |        | +                      | +         |
| 12. <i>B. pholis</i> L.              | +                                       | ±      |         |                       |         | +      | +                      |           |
| 13. <i>B. triploides</i> Cuv. & Val. | ±                                       | +      | +       | +                     | ±       | +      | +                      | +         |
| 14. <i>B. erythrocephalus</i> Risso  |   | +      |         |                       |         |        |                        |           |
| 15. <i>B. basiliscus</i> Cuv. & Val. |   |        | +       | ±                     |         | +      |                        |           |
| 16. <i>B. caneuae</i> Vincig.        |   | +      |         | +                     |         |        |                        | ?         |
| 17. <i>B. dalmatinus</i> Stdchn.     |   | +      |         |                       |         |        |                        |           |
| 18. <i>B. zvonimiri</i> Kol.         |   | +      |         | +                     |         |        |                        | ?         |
| 19. <i>B. knipovitschi</i> Stasten.  |   |        |         |                       |         |        |                        | (+)       |
| 20. <i>B. ponticus</i> Stasten.      |   |        |         |                       |         |        |                        | (+)       |

\* *B. rouxi* has been reported from the Suez Canal (Gravel, 1936)

\*\* *B. tentacularis* occurs in the Aegean Sea

+ = present  
± = rare  
? = uncertain  
(+) = endemic

TABLE 1: GEOGRAPHIC DISTRIBUTION OF 18 SPECIES OF THE GENUS BLENNIUS L.

|                                      | WESTERN MEDITERRANEAN<br>& ADRIATIC SEA |        |         | EASTERN MEDITERRANEAN |         |        |                        |           |
|--------------------------------------|---|--------|---------|-----------------------|---------|--------|------------------------|-----------|
|                                      | EAST<br>ATLANTIC                        | EUROPE | ALGIERS | PALESTINE             | LEBANON | TURKEY | BOSPHORUS<br>& MARMARA | BLACK SEA |
| 1. <i>B. galerita</i> L.             | +                                       | ±      | +       | +                     | ±       | +      | +(Bosph only)          | +         |
| 2. <i>B. cristatus</i> L.            | +                                       | ±      | +       | +                     | +       | +      |                        |           |
| 3. <i>B. rouxi</i> Cocco*            |   | ±      |         |                       |         |        |                        |           |
| 4. <i>B. pavo</i> Risso.             | +                                       | +      | +       | +                     | +       | +      | +                      | +         |
| 5. <i>B. fluviatilis</i> Asso.       | +                                       | +      |         |                       | ±       | +      |                        |           |
| 6. <i>B. inaequalis</i> L.           | ?                                       | ±      | +       |                       | +       |        |                        |           |
| 7. <i>B. sanguinolentus</i> Pallas.  | +                                       | +      | +       | +                     | +       | +      | +                      | +         |
| 8. <i>B. pectorugine</i> Brunn.      | +                                       | +      | +       | +                     |         | +      | +                      |           |
| 9. <i>B. tentacularis</i> Brunn.**   |   | +      | +       |                       |         | +      | +                      | +         |
| 10. <i>B. ocellaris</i> L.           | +                                       | +      | +       | +                     |         |        | +                      | +         |
| 11. <i>B. sphinx</i> Cuv. & Val.     |   | +      | +       | +                     | +       |        | +                      | +         |
| 12. <i>B. pholis</i> L.              | +                                       | ±      |         |                       |         | +      | +                      |           |
| 13. <i>B. triploides</i> Cuv. & Val. | ±                                       | +      | +       | +                     | ±       | +      | +                      | +         |
| 14. <i>B. erythrocephalus</i> Risso  |   | +      |         |                       |         |        |                        |           |
| 15. <i>B. basiliscus</i> Cuv. & Val. |   |        | +       | ±                     |         | +      |                        |           |
| 16. <i>B. canevae</i> Vincig.        |   | +      |         | +                     |         |        |                        | ?         |
| 17. <i>B. dalmatinus</i> Stdchn.     |   | +      |         |                       |         |        |                        |           |
| 18. <i>B. zvonimiri</i> Kol.         |   | +      |         | +                     |         |        |                        | ?         |
| 19. <i>B. knipovitschi</i> Slasten.  |   |        |         |                       |         |        |                        | (+)       |
| 20. <i>B. ponticus</i> Slasten.      |   |        |         |                       |         |        |                        | (+)       |

\* *B. rouxi* has been reported from the Suez Canal (Gravel, 1936)  
 \*\* *B. tentacularis* occurs in the Aegean Sea

+ = present  
 ± = rare  
 ? = uncertain  
 (+) = endemic

presence is not mentioned in the Atlantic, west-European Mediterranean coasts, the Bosphorus, the Sea of Marmara, or the Black Sea. It is assumed that this species is rare (Bougis, 1959).

The position of B. rouxi and B. erythrocephalus is not clear (Rey, 1960). Gruvel (1936) reported B. rouxi from the Suez Canal.

The presence of B. inaequalis in the eastern Atlantic is questionable. In the western Mediterranean this species is considered to be rare. From the eastern Mediterranean B. inaequalis is described for the first time in this work.

B. sphinx, although abundant throughout the Mediterranean, does not occur in the Atlantic.

The systematic position of B. cristatus (B. crinitus) is not clearly defined, hence no definite conclusions regarding its distribution can be drawn.

B. pholis is the only boreal species of the genus present in the Mediterranean but its occurrence here is very rare.

Finally, B. sanguinolentus, B. pavo, B. trigloides, B. galerita, B. gattorugine, and B. ocellaris are the species with the widest distribution. Of these six species, the last two have not yet been found in the coastal waters of Lebanon. However, based on distributional data available, there is no reason to account for the absence of these two species in this area.

Key to the eight species of the  
genus Blennius included  
in the present work

1. Head without filamentous or solid fleshy crest.....2  
Head with filamentous or solid fleshy crest.....5

2. Notch between spinous and soft portion of dorsal fin absent,  
spines and rays subequal, the latter continuous through a  
membrane with the caudal fin; supraorbital tentacles pal-  
mate from base. (pl. I)

Blennius sanguinolentus

Notch between spinous and soft portion of dorsal fin present,  
spines and rays not subequal; supraorbital tentacles not  
palmate from base.....3

3. Supraorbital tentacles absent; distance from posterior border  
of orbit to base of first dorsal spine shorter than that  
from posterior border of orbit to tip of snout; spines and  
rays of dorsal fin subequal; pectoral fins large, almost  
as long as head. (pl. VIII)

Blennius trigloides

Supraorbital tentacles present.....4

4. Spinous portion of dorsal fin higher than soft portion in  
specimens over 60.0mm. total body length; supraorbital  
tentacles simple filamentous and long, 1.0-1.2 times in  
eye diameter; a vertically elongated brown-red spot edged

with light-blue behind the eye. (pl. III)

Blennius sphinx

Spinous portion of dorsal fin distinctly lower than soft portion; supraorbital tentacles branched and longer than half the eye diameter; upper anterior profile of head with flapped pores. (pl. VI)

Blennius inaequalis

5. Head and nape of neck with filamentous crest.....6  
Head and nape of neck with solid fleshy crest.....7
6. A single flat, transversely set, distally fringed tentacle arises middorsally from posterior part of interorbital space and followed by a longitudinal series of simple filaments; lateral ends of upper lip extend into fleshy flaps lighter in color than background color of cheeks. (pl. VII)

Blennius galerita

A single flat, transversely set, etc., tentacle absent; nape of neck with a longitudinal series of filaments arising from low fleshy crest. (pl. V)

Blennius cristatus

7. Head of males with a solid fleshy crest; a darkbrown band runs obliquely from dorsal margin of head, through the eye, to anterior portion of upper lip; a round, dark-brown spot edged with light-blue present behind and equal in size to the eye. (pl. II; pl. IX, fig. 1)

Blennius pavo

Round, dark-brown spot behind the eye absent. (pl. IV)

Blennius fluviatilis

All the material studied belongs to the collection of the American University of Beirut Museum of Natural History (AUBMNH)

Blennius sanguinolentus Pallas, 1811

(pl. I; pl. X, fig. 1)

Blennius sanguinolentus Pallas, 1811. Zoogr. rossoasiat., Vol. III, p. 168-171.

Blennius pholis Risso, 1826. Eur. Merid., Vol. III, p. 232; Guichen. Explor. Alger. Poiss., p. 70.

Blennius sanguinolentus Pallas, Rathke, 1837. Mem. sav. etr. Ac. Sc. St Petersburg., Vol. III, p. 34.

Blennius palmicornis Cuv. & Val., 1839. Hist. Nat. Poiss. Vol. XI, p. 214, pl. 320; Jenyns, Zool. Beagle, Fishes, p. 83; Lowe, Proc. zool. 1839 p. 83 et 1843 p. 86 and Trans. zool. Soc. Vol. III, p. 9.

Blennius parvicornis Cuv. & Val., 1839. Hist. Nat. Poiss. Vol. XI, p. 257.

Blennius palaestinensis Steinitz, 1927. Beitrage zur Kenntnis der Kusten-fauna Palastinas, Erster Teil, p. 347.

Diagnosis. Supraorbital tentacles palmate from base; margin of dorsal fin straight, spines and rays subequal, the latter continuous through a membrane with the caudal fin.

Description. Head slightly longer than high, 5-5.3 times in total body length; anterior profile convex with upper jaw protruding; eyes round, their diameter contained 2.5-3 times in length of head in specimens 40-45mm. total body length, and 5 times in length of head in specimens over 50mm. total length; mouth with a single series of closely set teeth, 36-38 in the upper and 32-35 in the lower jaw; two curved teeth present one on each side behind the series of teeth in the lower jaw, rarely one or two feeble ones present in upper jaw; pharyngeal teeth sharp and well developed; interorbital space convex and shorter than diameter of eye; nape of neck naked.

Abdomen usually distended to various degrees, hence maximum body height variable ranging from 4.3 to 5.2 times in total body length; dorsal fin arising slightly anterior to the vertical from the posterior preopercular margin, not notched or otherwise marked between spinous and soft portion, continuous through a membrane with the caudal fin; anal fin with anterior two elements modified (mature males) into rounded fleshy structures (pl. X, fig. 1); ventral fins with three rays, the inner inconspicuous, the middle one the longest; pectoral fins of simple rays the longest hardly reaching the anus.

D. XII - 19 to 22; A. I or II - 20 to 22

P. 13; V. 2 - 3

Color. Colors vary considerably according to environment, age, and season; ground color ranges from light olive green-gray in animals from junctions of sand and rock, to dark gray-brown in those from rocks with rich algal growth; several brown streaks

radiating in pairs from the orbit, the front pair extending down over and beyond the upper lip, the next running over and posterior to the angle of the mouth; body with six or seven rather ill-defined light to dark-brown bands running obliquely in a posterodorsal direction; shortly after the midlateral line the bands breaking into irregular pattern of rounded spots their density diminishing and their color lightening ventrally; ventral abdominal area light-colored and devoid of any pattern; a row of dark-brown to black dashes alternating with silver ones present slightly below and parallel to the midlateral line; pectoral and caudal fins with two to three arc-shaped transverse bright orange bands; posterior extremity of dorsal fin with irregularly distributed orange-red spots fading quickly and disappearing completely shortly after death; a dark spot usually present between the first and second dorsal spine; margin of anal fin white, submarginally black fading into light gray proximally; ventral fins pink fading to yellowish gray in preserved material.

Distribution. B. sanguinolentus is apparently distributed throughout the Mediterranean Sea. It is definitely present on the northern and southern coasts of the western Mediterranean (Lozano Rey, 1960; Dieuzeide et al., 1955), as well as on the northern (Aegean Sea), north-eastern (Turkey) and southern (Egypt) regions of the eastern basin of this Sea (Carus, 1887-93; Aksiray, 1954; Tillier, 1902). It abounds along the Palestinian

coast and seems to be about to colonize the Suez Canal (Steinitz, 1949b).

The Sea of Marmara, the Bosphorus, and the Black Sea are all known to be inhabited by this species, its presence in this area having been reported as far northeast as the Sea of Azov (Kosswig, 1942).

B. sanguinolentus is found along the north-eastern Atlantic coasts of Europe the river Loire being the northernmost limit of its distribution. Southward, the limits, although not clearly defined, include the Sea of Madeira, the Canary Islands, the Islands of Cape Verde, and a large part of the tropical west-African coast. It is apparently rare in the English Channel.

Discussion. This and the following species, B. pavo, are commonest along the shallow littoral zone of Lebanon, abounding in tide-pools throughout the year. The largest blennies in the collection belong to this species. Due to their relatively large size these fishes can easily be observed in their natural environment. By using their pectoral and ventral fins they stand on top of barely submerged rocks and, if undisturbed, may remain in that position for a long time. When they swim they do so with remarkable agility. It is not uncommon to see these blennies creeping out of a tide-pool, across a narrow rocky barrier into another tide-pool in search of food. They are capable, as is the case with most of the members of this genus, of rapidly changing their color in response to environmental color changes.

Blennius sanguinolentus Pallas.

TABLE 2; Measurements & Counts on Lebanese specimens

| Meas. in mm.    | 1             | 2      | 3      | 4      | 5      | 6 <sup>1</sup> | 7      | 8      | 9      | 10     | 11     | 12     | 13     |
|-----------------|---------------|--------|--------|--------|--------|----------------|--------|--------|--------|--------|--------|--------|--------|
| Total length    | 137.0         | 127.0  | 124.0  | 115.0  | 111.0  | 89.0           | 75.0   | 64.0   | 54.0   | 48.0   | 39.5   | 32.0   | 26.3   |
| Stand. length   | 112.0         | 106.0  | 105.5  | 97.0   | 94.0   | 75.0           | 63.0   | 53.0   | 44.5   | 39.0   | 33.0   | 26.0   | 21.5   |
| Head length     | 27.2          | 24.6   | 24.2   | 22.3   | 21.5   | 17.6           | 14.9   | 12.6   | 10.8   | 9.5    | 8.6    | 7.0    | 5.0    |
| Body depth      | 32.0          | 27.0   | 26.0   | 25.0   | 23.0   | 29.5           | 15.5   | 13.5   | 11.5   | 10.0   | 7.7    | 6.0    | 4.8    |
| Eye diameter    | 5.5           | 5.0    | 5.5    | 5.0    | 5.0    | 4.0            | 3.5    | 3.5    | 3.4    | 3.0    | 2.7    | 2.4    | 2.0    |
| Interorb. space | 4.5           | 4.0    | 4.0    | 4.0    | 3.0    | 2.7            | 2.3    | 2.4    | 1.6    | 1.8    | 1.6    | 1.5    | 1.6    |
| Pector. fin (L) | 27.0          | 25.0   | 23.0   | 22.0   | 20.5   | 16.0           | 13.0   | 12.0   | 10.0   | 9.5    | 7.5    | 6.7    | 5.4    |
| Ventral fin (L) | 21.0          | 19.5   | 17.0   | 17.5   | 16.0   | 9.0            | 11.0   | 10.5   | 9.4    | 8.5    | 6.7    | 5.3    | 4.6    |
| Dorsal fin      | XII-20        | XII-20 | XII-21 | XII-20 | XII-21 | XII-19         | XII-21 | XII-21 | XII-21 | XII-21 | XII-21 | XII-21 | XII-21 |
| Anal "          | I-20          | II-20  | I-21   | I-20   | II-21  | II-20          | II-21  | II-21  | II-21  | I-21   | II-21  | II-21  | II-21  |
| Caudal "        | 13            | 13     | 13     | 13     | 13     | 13             | 13     | 13     | 13     | 13     | 13     | 13     | 13     |
| Pectoral "      | R.13,<br>L.14 | 13     | 13     | 12     | 13     | R.13,<br>L.11  | 13     | 13     | 13     | 13     | 13     | 13     | 13     |
| Ventral "       | 3             | 3      | 2      | 3      | 3      | ?              | 2      | 3      | 3      | 3      | 3      | 3      | 3      |

<sup>1</sup> Pectoral, caudal and ventral rays deformed

Blennius sanguinolentus Pallas

TABLE 3; Measurements & Counts on Palestinian specimens

|                 | (a)    | (b)    | (c)    | (d)    |
|-----------------|--------|--------|--------|--------|
| Total length    | 175.0  | 149.0  | 105.0  | 92.5   |
| Stand. length   | 153.0  | 126.5  | 91.0   | 80.0   |
| Head length     | 28.0   | 31.5   | 21.5   | 19.5   |
| Body depth      | 31.0   | 30.0   | 21.0   | 19.5   |
| Eye diameter    | 6.0    | 6.5    | 5.0    | 4.5    |
| Interorb.space  | 5.0    | 4.0    | 3.0    | 2.5    |
| Pectoral fin(L) | 31.0   | 29.0   | 20.5   | 19.0   |
| Ventral fin(L)  | 25.0   | 23.0   | 16.5   | 16.5   |
| Dorsal fin      | XII-21 | XII-21 | XII-21 | XII-21 |
| Anal "          | I-21   | I-21   | II-21  | II-20  |
| Caudal "        | —      | —      | —      | —      |
| Pectoral "      | 13     | 13     | 13     | 13     |
| Ventral "       | 3      | 3      | 3      | 3      |

(From Steinitz, 1949b, p. 182)

Blennius sanguinolentus Pallas

TABLE 4; Comparison of Ratios and Counts

| Ratios                   | LEBANESE SPECIMENS | PALESTINIAN SPECIMENS |
|--------------------------|--------------------|-----------------------|
| Total length/depth       | 4.3-5.5            | 4.7-5.6               |
| Total length/head(L)     | 4.6-5.3            | 4.7-6.2               |
| Stand. length/depth      | 3.5-4.4            | 4.2-4.9               |
| Stand. length/head(L)    | 3.8-4.4            | 4.0-5.5               |
| Head/eye diameter        | 2.5-4.9            | 4.3-4.8               |
| Eye/interorbital space   | 1.2-1.7            | 1.2-1.8               |
| Total length/ventrals(L) | 5.7-6.9            | 5.6-7.0               |
| Head/pectoral(L)         | 0.9-1.1            | 0.9-1.1               |
| Head/ventral(L)          | 1.1-1.4            | 1.1-1.4               |
| <hr/>                    |                    |                       |
| Counts                   |                    |                       |
| Dorsal fin               | XII-20to22         | XII-20to22            |
| Anal "                   | I-II/20-22         | I-II/20-21            |
| Pectoral "               | 12-13              | 13-14                 |
| Ventral "                | 3                  | 3                     |

These fishes feed primarily on small crustaceans. In spite of the fact that they have often been described as exclusively carnivorous, the length of their alimentary canal, as compared to that of a typically carnivorous fish of the same size, i.e. a goby, suggests herbivorous tendencies. Further study is necessary before a definite statement concerning the feeding habits of these fishes can be given.

Material studied. AUBMNH P-453(46), P-454(15), P-455(54), P-456(120).

Blennius pavo Risso, 1810

(pl. II; pl. IX, fig. 1, pl. X, fig. 4 )

Blennius pavo Risso, 1810. Ich. de Nice, p. 138 et Hist. Nat. Poiss., 1926, p. 232.

Blennius lepidus Pallas, 1811. Zoogr. rosso-asiat., Vol. III, p. 171.

Blennius graphicus Risso, 1826. Hist. Nat. Eur. Merid., p. 234, fig. 41.

Blennius lepidus Pallas. Rathke, 1837. Mem. Sav. etr. Ac. Sc. St Petersburg, Vol. III, p. 34.

Blennius pavo Risso. Cuv. & Val., 1841. Hist. Nat. Poiss., Vol. XI, p. 238.

Blennius pavo Risso. Guenther, 1861. Cat. fish. Vol. III, pp. 221 and 261.

Blennius lepidus Pallas. Kessler, 1865. Naturaliste, Moscow, Nr. 24, p. 437 et Trav. exp. Aralo-Caspique, 1877, Vol. IV, p. 226.

Blennius pavo Risso. Slastenenko, 1934. St zool. di Napoli, 14. p. 98 et Ann. S. Univ. de Jassy, 1939, Vol. XXV, p. 142.

Diagnosis. A dark-brown spot edged with light-blue present just behind and equal in size to the eye; head with fleshy crest, particularly prominent in male individuals; a brown oblique band present from dorsal margin of head, through the eye, to anterior portion of upper lip.

Description. Head 4.8-5.3 times in total body length; anterior profile convex in female, abruptly descending in male specimens; upper lip overhanging lower; upper jaw with larger number of teeth than lower, the numbers increasing with age (Table 5); two curved teeth present in each jaw, those in the lower much stronger than those in the upper; eye round and 4.5-5 times in the length of head; supraorbital tentacles small,  $1/3-2/5$  of the eye diameter, filamentous in young, usually fringed in older specimens; anterior nostrils surrounded by small fleshy tubercles extending dorsally into short filamentous tentacles; interorbital space and nape of neck with fleshy crest, especially prominent in mature male individuals (pl. IX, fig. 1).

Body generally very compressed, its height being approximately  $1/5$  of total body length; dorsal fin arises in the vertical between the bases of the pectoral and ventral fins, not notched between the spinous and soft portion, the latter

being continuous with the caudal fin; anterior two elements of anal fin modified, in mature male individuals, into copiously folded fleshy structures (pl. X, fig. 4); ventral fins with three rays, the middle one the longest; pectoral fins with 14 simple rays the longest extending to the anus.

D. XII - 21 to 23; A. I or II - 23 to 24

P. 14; V. 3

Color. Colors range from yellow-greenish with light-brown bands to olive green-gray with dark-brown bands, depending on light intensity and background shades; a single broad brown band edged with light-blue extending obliquely from the dorsal margin of the crest (head in females) down through the eye to the upper lip; ventral side of head with three brown angular bands, their apices pointing caudally; sides of head with light-blue reticulum extending down to the ventral margin of the operculum; light-blue dots irregularly distributed over the sides of the head and body, becoming denser toward the posterior portion of the trunk; body with 7-8 bifid, transverse bands; the limbs of each band joining those of the adjacent bands at the height of the midlateral line; color of bands fading below the mid-line leaving the ventral part of the body light yellow-gray and devoid of any pattern; dorsal fin greenish-gray with oblique rows of brown spots; often a dark spot present between the first and second dorsal spine; anal fin with white margin, submarginally dark-brown fading proximally; a light-

blue dot present at the base of each ray of this fin; base of pectoral fin with a dark-brown vertical streak; caudal and ventral fins greenish-gray.

Distribution. B. pavo is best known and studied in the Mediterranean Sea where it is abundant, especially along the eastern coasts. It has been reported from the Bosphorus, the Black Sea, and the north-eastern Atlantic coasts of Europe. In 1901 Tillier reported that B. pavo had penetrated the Suez Canal as far as the lake Timsah. In 1936 Gruvel confirmed Tillier's findings and in 1937 this fish was reported to have reached the southern end of the Canal (Gruvel, 1936; Gruvel, 1937, from Steinitz, 1950).

Discussion. As previously mentioned, this species is very common throughout the year along the rocky coasts of Lebanon. In addition to its bright, contrasting colors, B. pavo shows a remarkable secondary sexual dimorphism which finds its most spectacular expression in the often enormous fleshy crown of the male. The same structure is very low or completely missing in female individuals. Members of this species are capable of tolerating a wide range of salinity and temperature, and may be kept alive for a long time in indoor sea-water aquaria. When chased or during the night they are found lying flat on their sides under rocks on the bottom of tide-pools, their highly compressed bodies fitting into hardly noticeable clearances.

It seems pertinent at this point to mention that in the past, several workers have observed a similarity in many

TABLE 5; Measurements & Counts on Lebanese specimens\*

| Meas. in mm.      | 1      | 2      | 3      | 4      | 5      | 6      | 7               | 8      | 9      | 10     | 11     | 12     | 13     |
|-------------------|--------|--------|--------|--------|--------|--------|-----------------|--------|--------|--------|--------|--------|--------|
| Total length      | 97.0   | 91.0   | 82.0   | 79.5   | 70.5   | 69.0   | 65.5            | 59.0   | 55.0   | 53.5   | 47.0   | 41.0   | 37.0   |
| Standard length   | 84.0   | 76.0   | 69.0   | 66.0   | 60.5   | 60.0   | 56.5            | 50.0   | 47.0   | 45.5   | 40.5   | 34.7   | 31.0   |
| Body height       | 19.0   | 18.0   | 16.0   | 15.0   | 13.5   | 13.2   | 13.0            | 11.0   | 10.0   | 9.5    | 9.0    | 7.3    | 6.3    |
| Head length       | 20.0   | 17.0   | 16.0   | 15.5   | 14.0   | 13.8   | 12.3            | 11.6   | 10.5   | 10.3   | 9.8    | 8.0    | 7.0    |
| Eye diameter      | 4.0    | 3.7    | 3.7    | 3.8    | 3.2    | 2.9    | 3.0             | 2.5    | 2.5    | 2.5    | 2.4    | 2.3    | 2.0    |
| Interorb. space   | 2.5    | 3.0    | 2.4    | 3.0    | 2.0    | 2.0    | 2.0             | 2.0    | 1.8    | 1.6    | 1.6    | 1.3    | 1.2    |
| Length of Caudal  | 13.0   | 15.0   | 13.0   | 13.5   | 10.0   | 9.0    | 9.0             | 9.0    | 8.0    | 8.0    | 6.5    | 6.3    | 6.0    |
| Length of Pector. | 16.5   | 16.0   | 13.5   | 13.0   | 11.0   | 11.0   | 7.0 11.5<br>R L | 9.5    | 9.0    | 9.0    | 8.3    | 7.5    | 7.0    |
| Length of Ventr.  | 8.5    | 10.0   | 7.0    | 9.0    | 7.0    | 8.0    | 7.3             | 6.5    | 6.2    | 6.2    | 5.6    | 5.0    | 5.0    |
| Teeth-upper jaw   | 26     | 28     | 27     | 28     | 24     | 24     | 21              | 23     | 21     | 20     | 21     | 19     | 20     |
| Teeth-lower jaw   | 20     | 21     | 21     | 21     | 17     | 18     | 17              | 18     | 17     | 16     | 17     | 16     | 17     |
| Dorsal fin        | XII-23 | XII-22 | XII-22 | XII-21 | XII-21 | XII-23 | XII-23          | XII-21 | XII-22 | XII-22 | XII-23 | XII-21 | XII-22 |
| Anal "            | II-23  | I-23   | I-23   | I-23   | I-24   | 26     | I-26            | I-23   | I-24   | I-23   | I-23   | I-25   | I-24   |
| Pectoral "        | 14     | 14     | 14     | 14     | 14     | 14     | 11 14<br>R L    | 14     | 14     | 14     | 14     | 14     | 14     |
| Ventral "         | 3      | 3      | 3      | 3      | 3      | 3      | 3               | 3      | 3      | 3      | 3      | 3      | 3      |
| Caudal "          | 2,13,3 | 2,13,2 | 2,13,2 | 2,12,2 | 2,13,2 | 3,12,2 | 2,13,3          | 2,13,2 | 3,11,3 | 3,13,3 | 2,13,2 | 2,13,2 | 2,13,2 |

\* Only female specimens

TABLE 6; Measurements &amp; Counts on Palestinian specimens

| Meas. in mm.       | 1      | 2      | 3     | 4      |
|--------------------|--------|--------|-------|--------|
| Total length       | 84.0   | 80.5   | 73.0  | 60.0   |
| Standard length    | 70.0   | 68.0   | 62.0  | 50.0   |
| Body height        | 16.5   | 15.0   | 12.0  | 10.0   |
| Head length        | 16.5   | 15.0   | 14.0  | 12.0   |
| Eye diameter       | 3.5    | 3.5    | —     | 3.0    |
| Interorbital space | 3.0    | —      | —     | —      |
| Length of Caudal   | 14.0   | 12.5   | 11.0  | 10.5   |
| " " Pectoral       | 15.0   | 13.0   | —     | 12.5   |
| " " Ventral        | 9.5    | 10.0   | —     | 9.5    |
| Teeth-upper jaw    | 25     | 26     | 23    | 22     |
| " -lower jaw       | 19     | 20     | —     | 16     |
| Dorsal fin         | XII-22 | XII-22 | —     | XII-22 |
| Anal fin           | II-23  | II-23  | II-23 | 25     |
| Pectoral fin       | 14     | 14     | —     | 14     |
| Ventral fin        | I-2or3 | I-2or3 | —     | I-2or3 |

(From Steinitz 1950, p. 60)

TABLE 7; Comparison of Ratios &amp; Counts

| Ratios                | Lebanese sp. | Palestinian sp. |
|-----------------------|--------------|-----------------|
| Total length/height   | 5.0 - 5.8    | 5.1 - 6.1       |
| Total length/head(L)  | 4.8 - 5.3    | 5.0 - 5.4       |
| Head/eye              | 3.3 - 5.0    | 4.0 - 4.7       |
| Eye/interorb.space    | 1.2 - 1.7    | 1.2             |
| Total length/Caudal   | 6.0 - 7.5    | 6.0 - 6.6       |
| Total length/Pectoral | 5.2 - 6.4    | 4.8 - 6.2       |
| Total Length/Ventral  | 7.5 - 11.7   | 6.3 - 8.8       |
| <hr/>                 |              |                 |
| Dorsal fin            | XII-21to23   | XIorXII-22to24  |
| Anal fin              | I-II-23-24   | II-23-24        |
| Pectoral fin          | 14           | 14              |
| Ventral fin           | 3            | I-2or3          |

As shown above, a high variability exists in the length of the ventral, pectoral, and caudal fins. In general, it can be said that these fins are proportionately longer in young than in old individuals. This variability in length, primarily in the case of the ventral fins was observed in all species examined. One reason for this phenomenon may be the fact that these animals strongly depend on these fins for anchorage on rocky substrates against the action of waves which is particularly intense on the shallow rocky coasts.

characters between B. pavo and B. fluviatilis. Recently, emphasis has been placed on the importance of a detailed study of the anatomy of B. pavo in connection with Roule's statement that "..... it was this species which, invading the rivers everywhere along the coast of the Mediterranean Sea, has undergone certain structural changes and is today represented in the fresh water as B. vulgaris (= B. fluviatilis)."  
(Roule, 1934; from Steinitz, 1950).

Material studied: AUBMNH P-467(109), P-468(14), P-469(13).

Blennius sphinx Cuv. & Val., 1839.

(pl. III; pl. X, fig. 10)

Blennius sphinx Cuv. & Val, 1839. Hist. Nat. Poiss., Vol. X,  
p. 236.

Diagnosis. Supraorbital tentacles long, 1.2-1.0 times in eye diameter, filamentous, rarely fringed at the tip; spinous portion of dorsal fin higher than soft portion in specimens over 60mm. total body length; a brown-red, white-edged spot present behind the eye.

Description. Head longer than high, 4.1-5.0 times in total body length, with anterior profile subvertical; eye round, 3.6-5.0 times in head length; interorbital space concave and narrow, 1.5-2.2 times in eye diameter; mouth with fine, closely set teeth, 39-42 in the upper and 34-36 in the lower jaw, sometimes with clusters of teeth growing above the serial ones in the upper jaw; two large curved teeth present in each jaw,

those of the lower strongest; anterior nostril surrounded by a short fleshy tubercle the caudal border of which extends to form a large tentacle; the latter may be simple filamentous, palmately fringed or composed of two wing-shaped appendages arising from a common stalk each with 5-6 finger-like structures of unequal length (pl. X, fig. 10); branchiostegal region often distended; dorsal side of head and nape of neck with numerous pores.

Body fusiform, its height contained 5.3-6-3 times in total body length; dorsal fin arises in the vertical slightly behind the posterior preopercular margin, deeply notched between the spinous and soft portion, the 12th spine very short and not extending to the margin of the fin membrane; last dorsal ray connected through a membrane with the caudal peduncle; first and second rays of anal fin conspicuously shorter than following rays; caudal fin large, and rounded; pectoral fins with 14 rays the longest often extending beyond the anus to the first ray of the anal fin; ventral fins with one feeble spine medially and two rays.

D. XII or XIII - 15 to 17; A. 18-20

P. 14; B. 1-2

Color. Ground color brownish dorsally, yellowish laterally and ventrally; in addition to the vertically elongated brown-red, white-edged spot behind the eye, several light-blue dots and streaks present on the sides of the head; two to three pairs of oblique brown bands present on the yellow ventral side of

the head, the members of each pair converging caudally; those of the anterior and middle pair meeting each other midventrally; body with six transverse brown bands edged with white or light-blue; each band consisting of two indented parallel stripes tapering ventrally; the first, second, fourth and fifth bands converging toward the more or less vertical third one, a half band present beginning slightly above the mid-lateral line between the first and second band; the bands extend dorsally over almost 1/3 of the length of the dorsal spines and rays; dorsal fin with brown spots arranged in oblique rows; high spinous portion of large individuals (over 60mm.) with pinkish-red, wavy, longitudinal bands distally; first and second elements of the anal fin entirely dark-brown, rest of the fin white-margined; caudal fin also with white margin and two or three transverse brown bands; pectoral fins with 3-4 irregular transverse brownish bands; ventral fins pink, fading to yellowish in preserved material.

Distribution. Although B. sphinx seems to be widely distributed in the western Mediterranean, its presence has not been reported beyond Gibraltar, this area apparently constituting the westernmost limit of its distribution. Until 1941 there existed no records concerning the distribution of this species in the eastern Mediterranean, inspite of the fact that it had been reported from the Black Sea. Since then it has officially been recorded from Turkey (1941) and Palestine (1945). The first Lebanese specimens of B. sphinx were caught and identified in 1959.

To summarize, B. sphinx is probably endemic in the Mediterranean Sea with a secondary area of distribution in the Black Sea (Steinitz, 1949a).

Discussion. The members of this species are small fishes seldom attaining a length of more than 75-80mm. Their small size makes it difficult to observe them in their natural environment. Being rather common on our coasts, these fishes may be found during certain periods of the year (large numbers of young, 15-20mm., have been observed during the month of July) in shallow tide-pools in direct, continuous communication with the open sea. Unlike B. pavo, B. sphinx is sensitive to temperature and salinity fluctuations.

Based on a comparison of Palestinian specimens and descriptions of specimens from western Mediterranean coasts, Steinitz (1949a) discusses certain differences and "peculiarities" which may be of interest in the light of data obtained from Lebanese specimens. The main differences emphasized by this author are in connection with, a) the dentition, b) the "peculiar nasal tentacle", and c) the form of the dorsal fin.

Although the difference was small, the number of teeth in the upper jaw of the Lebanese material tends to be consistently larger than the number of teeth in the lower jaw. This small difference does not seem to be inconsistent with Steinitz's statement that "the upper and the lower jaws bear a nearly equal number of teeth." Similarly, "the well developed and differentiated nasal tentacle" is apparently not "highly specific" for Palestinian specimens since Lebanese specimens exhibit the

same characteristic differentiation of this structure. In only a few of the specimens examined does the form of the nasal tentacle fit Steinitz's description of the same appendage in the Palestinian material. In most instances this structure appears to be even more complicated (see description and fig. 10, pl. X).

Concerning the spines of the dorsal fin, Steinitz (1949a) points out that "the dorsal fin deviates from the earlier descriptions, its variable height being mostly lower than the body." This statement applies to all but the largest (over 60mm. total body length) individuals of our collections which exhibit a highly developed spinous portion (Table 8). Our data indicate that the ratio of the length of the longest dorsal spine to the length of the longest dorsal ray increases with the size of the animal. Finally, in none of the specimens studied was the length of the supraorbital tentacle found to be less than half the diameter of the eye, as is the case with most of the Palestinian specimens.

Our data do not support Steinitz's suggestion that "the dentition, the peculiar nasal tentacle and the form of the dorsal fin are perhaps a first indication of systematic separation provided that the earlier descriptions (Moreau, 1881; Carus, 1887/93) are sufficiently reliable for the species in the western Mediterranean".

Material studied: AUBMNH P-470(21), P-471(4), P-472(10), P-473(4).

TABLE 8; Measurements &amp; Counts on Lebanese specimens.

| Meas. in mm.            | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     |
|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total length            | 76.0   | 65.5   | 53.7   | 51.5   | 49.0   | 45.0   | 43.5   | 41.0   | 38.0   | 36.5   | 36.0   | 33.0   | 32.0   |
| Standard length         | 64.0   | 56.0   | 45.3   | 43.0   | 41.0   | 38.0   | 36.0   | 34.0   | 31.5   | 30.0   | 29.3   | 27.0   | 26.7   |
| Body height             | 12.0   | 10.6   | 9.2    | 8.8    | 8.3    | 8.0    | 7.8    | 7.2    | 7.0    | 6.9    | 6.4    | 6.0    | 6.0    |
| Head length             | 15.3   | 13.2   | 11.1   | 10.9   | 10.0   | 9.4    | 9.2    | 9.0    | 8.4    | 8.3    | 8.1    | 7.5    | 7.8    |
| Eye diameter            | 3.1    | 3.1    | 3.0    | 2.8    | 2.7    | 2.6    | 2.4    | 2.3    | 2.0    | 2.2    | 2.2    | 2.1    | 2.1    |
| Interorb. space         | 1.8    | 1.7    | 1.7    | 1.7    | 1.3    | 1.2    | 1.3    | 1.2    | 1.3    | 1.3    | 1.1    | 1.0    | 1.0    |
| Tentacle length         | 2.5    | 2.1    | 1.8    | 2.0    | 2.0    | 2.2    | 2.1    | 2.3    | 1.5    | 2.0    | 1.7    | 1.7    | 2.0    |
| Length of P             | 19.0   | 15.8   | 13.4   | 13.2   | 12.5   | 11.3   | 10.8   | 11.2   | 10.5   | 9.7    | 9.6    | 8.8    | 7.7    |
| Length of V             | 12.2   | 10.4   | 8.6    | 8.6    | 8.1    | 7.9    | 7.5    | 7.8    | 6.5    | 6.1    | 6.0    | 5.9    | 5.6    |
| Length of C             | 12.0   | 9.5    | 8.4    | 8.5    | 8.0    | 7.0    | 7.5    | 7.0    | 6.5    | 6.5    | 6.7    | 6.0    | 5.3    |
| Teeth; upper jaw        | 40     | 42     | 39     | 41     | 38     | —      | —      | —      | —      | —      | —      | —      | —      |
| Teeth; lower jaw        | 35     | 36     | 34     | 37     | 31(?)  | —      | —      | —      | —      | —      | —      | —      | —      |
| Max. length of D-spines | 16.0   | 13.0   | 7.0    | 7.2    | 6.9    | 5.1    | 4.3    | 4.0    | 3.8    | 3.7    | 3.3    | 3.0    | 2.8    |
| Max. length of D-rays   | 9.5    | 8.0    | 6.2    | 6.4    | 6.3    | 5.0    | 4.9    | 4.8    | 4.3    | 4.1    | 3.8    | 3.6    | 3.6    |
| Dorsal fin              | XII-16 | XII-16 | XII-16 | XII-16 | XII-16 | XII-16 | XII-17 | XII-16 | XII-15 | XII-15 | XII-15 | XII-16 | XII-16 |
| Anal fin                | 19     | 19     | 20     | 19     | 19     | 20     | 19     | 19     | 18     | 18     | 18     | 19     | 19     |
| Pectoral fin            | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     |
| Ventral fin             | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    | 1-2    |
| Caudal fin              | 3,12,3 | 2,12,2 | 2,13,3 | 3,12,3 | 2,12,2 | 2,12,2 | 2,12,2 | 2,12,2 | 3,12,2 | 2,12,2 | 2,12,2 | 2,12,2 | 2,12,2 |

TABLE 9; Measurements &amp; Counts on Palestinian specimens.

| Meas. in mm.           | (a)    | (b)    | (c)    | (d)  | (e)    | (f)  | (g)        | (h)    | (i)    | (j)    |
|------------------------|--------|--------|--------|------|--------|------|------------|--------|--------|--------|
| Total length           | 51.5   | 50.0   | 49.5   | 43.5 | 34.0   | 34.0 | 32.5       | 26.5   | 22.5   | 18.5   |
| Standard length        | 43.5   | 42.0   | 42.5   | —    | 29.5   | —    | —          | 22.5   | —      | —      |
| Body height            | 8.5    | 8.5    | 8.0    | —    | 5.5    | —    | —          | —      | —      | —      |
| Head length            | 9.0    | 8.5    | 9.0    | —    | 6.5    | —    | —          | 5.5    | —      | —      |
| Eye diameter           | 2.5    | 2.5    | 2.5    | —    | 2.5    | —    | —          | 2.0    | —      | —      |
| Interorb.space         | 1.0    | 1.0    | 1.0    | —    | 1.0    | —    | —          | <1.0   | —      | —      |
| Tentacle length        | 1.0    | 1.0    | 3.0    | —    | 1.0    | —    | —          | >1.0   | —      | —      |
| Length of P            | 12.0   | 12.0   | 11.0   | —    | 8.5    | —    | —          | 6.5    | —      | —      |
| Length of V            | 7.5    | 8.0    | 7.5    | —    | 6.0    | —    | —          | 5.5    | —      | —      |
| Length of C            | 8.0    | 8.0    | 7.0    | —    | 4.5    | —    | —          | 4.0    | —      | —      |
| Teeth;upper jaw        | 39     | 36     | 35     | 37   | —      | 34   | 34or<br>35 | —      | —      | —      |
| Teeth;lower jaw        | 33     | 34     | 36     | 34   | —      | 30   | 29         | —      | —      | —      |
| Max.length of D-spines | 5.5    | 5.5    | 8.5    | —    | 3.5    | —    | —          | —      | —      | —      |
| Max.length of D-rays   | 6.0    | 6.0    | 5.5    | —    | 4.0    | —    | —          | —      | —      | —      |
| Dorsal fin             | XII-15 | XII-16 | XII-16 | —    | XII-16 | —    | —          | XII-16 | XII-16 | XII-16 |
| Anal fin               | I-17   | I-18   | II-18  | —    | I-18   | —    | —          | II-18  | II-18  | II-17  |
| Pectoral fin           | 14     | 14-15* | 13-15* | —    | 14     | —    | —          | 14     | 14     | 14     |
| Ventral fin            | I-3    | I-3    | I-3    | —    | I-3    | —    | —          | I-3    | —      | —      |

\* In these specimens differences have been revealed between left and right pectoral fins.

(From Steinitz 1949a, p. 147)

TABLE 10; Comparison of ratios & counts

| Ratios                    | Lebanese sp.        | Palestinian sp. |
|---------------------------|---------------------|-----------------|
| Total length/height       | 5.3-6.3             | 5.9-6.2         |
| Total length/head(L)      | 4.1-5.0             | 4.8-5.9         |
| Head(L)/eye diameter      | 3.6-5.0             | 2.6-3.6         |
| Eye/interorbital space    | 1.5-2.2             | 2.0-2.8         |
| Total length/caudal       | 5.4-6.8             | 6.3-7.6         |
| Total length/pectoral     | 3.6-4.2             | 4.0-4.5         |
| Total length/ventral      | 5.3-6.3             | 5.0-6.9         |
| Total length/eye diameter | 15.2-24.5           | 13.3-19.8       |
| <hr/>                     |                     |                 |
| Counts                    |                     |                 |
| Teeth; upper jaw          | 38-42 <sup>1</sup>  | 34-39           |
| Teeth; lower jaw          | 31-37 <sup>2</sup>  | 29-36           |
| Fins ; Dorsal             | XII or XII-15 to 17 | XII-15 to 16    |
| Anal                      | 18-20               | 1-2/17-18       |
| Pectoral                  | 14                  | 13-15           |
| Ventral                   | I-2                 | I-3             |

1 & 2 Specimens 1, 2, 3, 4, and 5. (see Table 8)

Blennius fluviatilis Asso, 1801

(pl. IV; pl. X, fig. 2)

Blennius fluviatilis Asso, 1801. Introduccion a la ictiologia oriental de Espana, Ann Cienc Nat. Vol. 4, No. 10 p. 31.

Blennius frater Bloch, 1801. Systema Ichthyologiae inconibus ex illustratum. p. 171.

Blennius vulgaris Pollini, 1816. Viaggio al Lago di Garda, Verona. Vol. VIII p. 20, fig. 1.

Blennius sugefianus Risso, 1819, p. 131

Salarias (Blennius) varus Risso, 1826. Hist. Nat. Eur. Merid., Vol. III, p. 237.

Blennius cagnota Cuv. & Val., 1828. Hist. Nat. Poiss. Vol. XI, p. 249.

Blennius anticulus Bonaparte, 1840. Faun. Ital. Pesci.

Blennius lupulus Bonaparte, 1840. op. cit.

Blennius alpestris Blanchard, 1866. p. 261.

Diagnosis. Males with fleshy crest on head; no round spot behind the eye (see B. pavo)

Description. Head 3.9-4.7 times in total body length; snout elongated with upper profile convex; interorbital space and nape of neck with fleshy crest in mature male specimens; eye round and small, 4.6-6.7 times in length of head; supraorbital tentacle simple filamentous or with 3-4 finger-like structures; anterior nostril surrounded by short fleshy tubercle, its dorsal border extending into a short flap; upper jaw with 16-23 teeth,

lower with 14-17; canines present in both jaws, sometimes one or two additional ones present usually in lower jaw.

Body height 5.1-6.2 times in total body length; dorsal fin arising in the vertical slightly anterior to the posterior extremity of the operculum, slightly notched between spinous and soft portion, with the spines shorter than the rays; last ray continuous by a membrane with the caudal peduncle close to the origin of the caudal fin; mature male specimens with first and second anterior elements of anal fin modified into fleshy lobes (pl. X, fig. 2); caudal fin rounded and rather large, 5-5 1/3 times in total body length, with yellowish, sheath-like structures of questionable function at the base of each ray; pectoral fins with 13-14 rays, the longest extending slightly beyond the anus; ventral fins with three rays, the middle the longest, the outer the shortest.

D. XIII to XIV-15 to 16; A. II-18 to 19

P. 13-14; V. 3

Color. Ground color varying from olive green-gray to brownish (yellowish-brown in preserved specimens); anterodorsal part of head brown, the color extending in the form of a band over the anterior border of the crest; another oblique brown band extending from the posterior part of the crest, through the eye, over the mouth to the anterior tip of the lower lip; a third, broader band behind the former extending from the space between the posterior extremity of the crest (posterior

occipital border in females) and the base of the first dorsal spine to the middle of the cheek behind the eye; lower half of preoperculum with a distinct brown streak directed posteroventrally from the ventral border of the orbit to the angle of the mouth; ventral side of head yellowish (preserved specimens); body with 5-6 broad, brown, transverse bands, each composed of several parallel "zig-zag" streaks fading away just below the midlateral line; dorsal fin brownish-gray, with irregular oblique rows of brown spots; often, especially in young specimens, a dark spot present between the first and second or between the second and third dorsal spines; caudal fin with a distinct brown, transverse band proximally and several irregular ones over the rest of the fin; anal fin dark-gray with white margin; base of pectoral fins with a brown, vertically elongated spot, upper rays yellow-gray, lower brownish; ventral fins yellowish-brown.

Discussion. B. fluviatilis is the only species of this genus so far found in both marine and fresh-water habitats. Our collection includes specimens caught in tide-pools along the coast of Beirut, in brackish waters in the mouth of Nahr Ed-Damour, as well as in the Nahr Ibrahim, about one kilometer from the sea. It is apparently commonest in fresh waters and has been reported from many rivers and fresh-water lakes in the circum-Mediterranean region.

The fact that the same species from different localities has been described by different or even the same author under

different names is not surprizing. A comparison of the Lebanese material with that from the western (Lozano y Ray, 1960), north-eastern (Erazi, 1941, from Steinitz, 1950), and south-eastern Mediterranean regions reveals a considerable degree of variation. Even among the individuals of our own collection there exist unusual differences in meristic characters (Tables 11 and 13). Among these differences are the number of dorsal spines and the number of pectoral rays. Another unstable character is dentition. Although the number of teeth is more or less constant for the various size-groups, the teeth themselves are losely set and unequally developed. The canines of the lower jaw are not as a rule stronger than those of the upper one. The oposite is often the case. In some instances these teeth were found to be very poorly developed, sometimes one or two missing altogether. On the other hand, in two or three specimens an additional canine was noted growing anterior to the "normal" one.

Our present knowledge on this particular group of fishes cannot fully account for the high degree of variation within the species. However, the different ecological conditions existing in the large variety of habitats B. fluviatilis has been invading are probably responsible for this variation. Regarding Roule's hypothesis which states that B. fluviatilis is "nothing else than a modified B. pavo," (Roule, 1935, from Steinitz, 1950), certainly more than simple, external morphological data are necessary before it can be decided.

Material studied: AUBMNH: P-5(5), P-461(5), P-462(10).

TABLE 11; Measurements &amp; Counts on Lebanese specimens.

| Meas. in mm.     | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total length     | 102.0  | 93.0   | 86.5   | 81.0   | 77.0   | 74.5   | 70.0   | 65.0   | 63.0   | 61.0   | 51.0   | 45.0   | 31.0   |
| Standard length  | 84.0   | 77.0   | 70.5   | 65.3   | 62.8   | 60.5   | 57.5   | 54.3   | 52.5   | 51.5   | 42.7   | 37.5   | 26.0   |
| Body height      | 18.8   | 17.0   | 15.6   | 14.5   | 14.2   | 13.0   | 11.8   | 12.0   | 12.0   | 12.0   | 10.0   | 8.0    | 5.0    |
| Head length      | 24.3   | 21.4   | 19.0   | 17.0   | 17.7   | 16.2   | 15.5   | 15.6   | 15.3   | 15.0   | 12.6   | 11.0   | 7.8    |
| Eye diameter     | 3.8    | 3.2    | 3.4    | 3.1    | 3.0    | 3.1    | 3.0    | 2.7    | 2.7    | 2.5    | 2.3    | 2.1    | 1.7    |
| Interorb. space  | 3.2    | 2.8    | 2.5    | 2.3    | 2.0    | 2.0    | 2.0    | 1.7    | 2.0    | 1.7    | 1.5    | 1.2    | 1.0    |
| Tentacle length  | 2.2    | 1.7    | 1.7    | 1.6    | 1.5    | 1.5    | 1.3    | >1.0   | 1.0    | 1.5    | >1.0   | >1.0   | >1.0   |
| Length of C      | 18.0   | 16.0   | 16.0   | 15.7   | 14.2   | 14.0   | 12.5   | 10.7   | 10.5   | 9.5    | 8.3    | 7.5    | 5.0    |
| Length of P      | 19.0   | 19.0   | 18.0   | 18.2   | 17.2   | 17.5   | 15.0   | 13.0   | 13.0   | 12.5   | 11.0   | 10.0   | 7.0    |
| Length of V      | 13.0   | 13.0   | 11.2   | 12.0   | 11.0   | 11.0   | 9.5    | 9.0    | 8.5    | 8.4    | 7.0    | 6.0    | 4.5    |
| Teeth; upper jaw | 23     | 22     | 20     | 20     | 21     | 21     | 21     | 15(?)  | 20     | 19     | 19     | 18     | 16     |
| Teeth; lower jaw | 16     | 14     | 16     | 16     | 16     | 17     | 16     | 15     | 15     | 16     | 15     | 14     | 15     |
| Fin formula: D   | XII-16 | XIV-15 | XIV-16 | XII-16 | XII-15 | XIV-16 | XIV-16 | XIV-16 | XIV-16 | XIV-16 | XIV-16 | XIV-16 | XII-16 |
| A                | II-18  | II-18  | II-19  | 20     | II-18  | 18     | 20     | II-19  | II-19  | II-19  | II-19  | 21     | II-19  |
| P                | 14     | 13814  | 13814  | 14     | 13     | 13     | 14813  | 14815  | 14     | 14     | 14     | 14     | 14     |
| V                | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      |
| C                | 2,13,2 | 2,13,2 | 2,13,2 | 2,12,2 | 1,13,1 | 2,13,2 | 2,13,2 | 2,13,3 | 2,13,2 | 3,13,3 | 3,13,3 | 2,13,3 | 2,13,3 |

TABLE 12; Measurements &amp; Counts on Palestinian Specimens

| Meas. in mm.      | (a)   | (b)    | (c)    | (d)    |
|-------------------|-------|--------|--------|--------|
| Total length      | 65.5  | 63.0   | 51.5   | 41.0   |
| Standard length   | 55.0  | 53.5   | 43.5   | 35.0   |
| Body height       | 10.5  | 10.5   | 10.5   | 7.5    |
| Head length       | 17.0  | 15.5   | 12.5   | 9.5    |
| Eye diameter      | 3.5   | 3.0    | 2.5    | 2.5    |
| Interorb.space    | 2.0   | 2.0    | 2.0    | 1.0    |
| Tentacle length   | 1.0   | —      | <1.0   | —      |
| Length of C       | 10.5  | 9.5    | 8.0    | 6.0    |
| Length of P       | 13.5  | 13.5   | 10.5   | 7.5    |
| Length of V       | 8.5   | —      | 7.5    | —      |
| Teeth ; upper jaw | 19    | 20     | 16     | 15     |
| Teeth ; lower jaw | 16    | 16     | 14     | 15     |
| Fin formula : D   | ? -15 | XIV-16 | XIV-15 | XIV-16 |
| A                 | II-17 | II-19  | II-19  | II-18  |
| P                 | 14    | 14     | 14     | 14     |
| V                 | I-3   | I-3    | I-3    | I-3    |

(From Steinitz, 1950, p. 65)

TABLE 13; Comparison of ratios &amp; counts

| Ratios                   | Lebanese sp.     | Palestinian sp. |
|--------------------------|------------------|-----------------|
| Total length/height      | 5.1-6.2          | 4.9-6.2         |
| Total length/head(L)     | 3.9-4.7          | 3.7-4.3         |
| Standard length/height   | 4.3-5.2          | 4.1-5.2         |
| Standard length/head(L)  | 3.3-3.8          | 3.2-3.7         |
| Head length/eye diameter | 4.6-6.7          | 3.8-5.2         |
| Eye/interorb. space      | 1.2-1.8          | 1.3-2.5         |
| Eye/tentacle length      | 1.7-2.7          | >2.5-3.5        |
| Total length/P(L)        | 4.3-5.4          | 4.7-5.5         |
| Total length/V(L)        | 6.8-7.9          | 6.9-7.7         |
| <hr/>                    |                  |                 |
| Counts                   |                  |                 |
| Teeth ; upper jaw        | 16-23            | 15-20           |
| Teeth ; lower jaw        | 14-17            | 14-16           |
| Dorsal fin               | XIIItoXIV-15to16 | XIV-15to16      |
| Anal fin                 | II-18to19        | II-17to19       |
| Pectoral fin             | 13-14            | 14              |
| Ventral fin              | 3                | I-3             |

Blennius cristatus Linnaeus, 1758

(pl. V; pl. X, fig. 3, 8,&9,)

Blennius cristatus Linnaeus, 1758. Syst. Nat. p. 256.

Blennius crinitus Cuv. & Val., 1836. Hist. Nat. Poiss.,  
Vol. II, p. 237.

Blennius nuchifilis Cuv. & Val., 1836. op.cit. Vol. II, P. 253.

Blennius asterias Good & Bean, 1882. Proc. U.S. Nat. Mus.,  
Vol. 5, p. 416.

Diagnosis. Head with longitudinal series of filaments mid-dorsally.

Description. Head slightly longer than high and 4.0-4.5 times in total body length; anterior profile straight and abruptly descending; a series of fine filaments growing on a low, fleshy crest, the latter beginning between the eyes and extending to the base of the first dorsal spine; eyes protruding dorsally, their diameter contained 3.0-3.5 times in the length of head in individuals below 40.0mm, total length and 4.0-4.7 times in the length of head in individuals over 40.0mm; interorbital space in front of crest narrow and concave; supraorbital tentacles palmately fringed (pl. X, fig. 8), often equal to or slightly longer than half the eye diameter; anterior nostril surrounded by short fleshy tube expanding dorsally into a palmately fringed appendage (pl. X, fig. 9); upper and lower jaws with 20-26 closely set teeth; two small conines present, one on each side of the lower jaw only (sometimes one or both missing).

Body rounded anteriorly, compressed posteriorly, its height varying from 4.7 to 5.2 times in total body length; dorsal fin arising in the vertical slightly anterior to the posterior margin of the preoperculum, distinctly notched between the spinous and soft portion, the former generally lower than the latter; last dorsal ray not continuous with the caudal fin; eleventh or twelfth dorsal spine usually very small; anterior two elements of anal fin expanded distally (males) into darkly pigmented, fleshy excrescences (according to Lozano y Rey a sign of sexual maturity, pl. X, fig. 3); caudal fin contained about 6 times in the total length; pectoral fins with 14 rays, the longest extending slightly beyond the anus; ventral fins with 3 rays, the inner closely bound to the middle one.

D. XI to XII-14 to 15; A. 1 to II-15 to 17 (♂) and 17-18(♀)

P. 14; V. 3.

Color. Ground color varying from brownish-gray to pale olive green; head and anterior part of body darker than rest of the trunk; sometimes a brown, light-blue margined spot present behind the eye; body with six broad, brown transverse bands each composed of two streaks bifurcating above the midlateral line, the secondary streaks running parallel and in a "zig-zag" fashion, eventually fusing again and fading away leaving the ventral side of the body yellowish-gray; all but the sixth band (the latter situated on the caudal peduncle) extending

dorsally over the base of the dorsal fin; ventral half of the posterior part of the body with several light-blue, round spots; dorsal fin with oblique rows of brown spots and usually, but not always, with a dark spot between the first and second spine; caudal fin with three arc-shaped, brown bands across its rays; anal fin usually dark-brown or gray; dorsal, anal, and caudal fins white-margined; pectoral fins with 2-3 brown cross bands, particularly distinct on the lower half of the fins; ventral fins light or dark brown, depending on the general body shade.

Distribution. Lack of investigation rather than actual occurrence may be the main reason for the scarcity of data concerning the distribution of B. cristatus. From the available records it appears that this species is relatively commoner in the western than the eastern Mediterranean. It has been reported from Algiers (Dieuzeide et al., 1955), Palma de Mallorca, and the coasts of Italy (Carus, 1887/93). On the other hand, Palestine and Turkey were, until now, the only eastern Mediterranean localities known to be inhabited by this fish.

In the Atlantic B. cristatus is thought to be very rare (Moreau, 1881). It has been reported from La Rochelle on the Atlantic coast of France, from the coasts of the Spanish Sahara (Lazano y Rey, 1960), and the tropical Atlantic (Jordan et al., 1955)

Discussion. Prior to discussion, an attempt should be made to clarify the taxonomic position of this species. Several authors, among whom are Gunther (1861) and Steinitz (1949b, 1950), appear to accept two "species", namely, B. cristatus L. and B. crinitus Cuv. & Val.. The descriptions of these two "species" by the former author are very similar, if not identical. Steinitz (1949b) gives a detailed description of B. crinitus while limiting his discussion on B. cristatus to some very interesting points concerning its geographic distribution. On the other hand, Dieuzeide et al. (1955) and Lozano y Rey (1960) recognize only the species B. cristatus placing B. crinitus as a synonym of the former. Briefly stated, some of the reasons supporting Dieuzeide's and Lozano y Rey's approach, which is followed also in the present work, are:

- a) the similarity of Gunther's descriptions of the two "species",
- b) the lack of a detailed description of B. cristatus in Steinitz's work and this author's repeated emphasis on the fact that all descriptions of B. crinitus which he had been able to consult were based on an insufficient number of specimens,
- c) the fact that the specimens in our collection examined in the course of this study all fit very well into the descriptions of both, the authors who describe B. crinitus and those who describe B. cristatus.

A careful comparative study of specimens supposedly belonging to the two different species is essential for the final solution of this problem.

B. cristatus is fairly common along the Lebanese coasts. It seldom attains a size larger than 80mm., the average total body length ranging between 40-50mm. The members of this species seem to be capable of adapting themselves to several different environments, for example, richly vegetated limestone tide-pools, sandy stretches almost devoid of vegetation, and poorly vegetated submerged sand-stone formations. The differences in the various environments are primarily reflected in the shade of the pigmentational pattern. Pale green with poorly defined transverse bands is found in animals from sandy habitats, and brownish-gray with dark-brown, sharply delineated bands in animals from rocky tide-pools.

Of the external morphological characters the filamentous crest of the head is of particular interest, not only because of its diagnostic value but also because of its variability in terms of the number, pattern of growth, and distribution of the filaments. In specimens of 30-35mm. total length 9-12 filaments occur in single file, their length increasing caudally. With increase in size of the fish the number of filaments increases from 12-18 in specimens of 45-50mm., up to 21-37 and 45 in specimens of 60-65mm. and 80mm., respectively. As the number of filaments increases

TABLE 14; Measurements & Counts on Lebanese specimens

| Meas. in mm.     | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total length     | 83.5   | 68.0   | 66.0   | 63.0   | 59.0   | 54.0   | 50.0   | 47.5   | 47.0   | 40.5   | 37.0   | 31.0   | 22.0   |
| Standard length  | 69.5   | 56.0   | 56.0   | 52.5   | 49.5   | 45.0   | 42.0   | 40.5   | 40.0   | 33.8   | 31.0   | 25.5   | 18.0   |
| Body height      | 16.0   | 14.0   | 14.0   | 13.5   | 12.0   | 11.5   | 10.7   | 9.3    | 9.2    | 8.0    | 7.5    | 6.0    | 4.2    |
| Head length      | 18.2   | 15.8   | 16.5   | 14.5   | 13.7   | 13.0   | 11.5   | 11.0   | 11.0   | 9.5    | 8.5    | 7.5    | 5.5    |
| Eye diameter     | 4.2    | 3.6    | 3.5    | 3.3    | 3.3    | 3.1    | 2.8    | 3.0    | 3.0.   | 2.5    | 2.5    | 2.1    | 1.8    |
| Interorb.space   | 2.0    | 1.8    | 1.6    | 1.5    | 1.3    | 1.2    | 1.3    | 1.1    | 1.0    | 1.0    | 1.0    | 1.0    | >1.0   |
| Orbital tentacle | 2.0    | 1.7    | 1.5    | 1.5    | 1.0    | 1.7    | 1.6    | 1.0    | 1.2    | 1.0    | 1.0    | 1.0    | >1.0   |
| Length of C      | 14.0   | 12.0   | 10.0   | 10.5   | 9.5    | 9.0    | 8.0    | 7.0    | 7.0    | 6.7    | 6.0    | 5.5    | 4.0    |
| " P              | 18.0   | 14.0   | 15.0   | 15.0   | 13.0   | 12.0   | 11.5   | 11.0   | 11.0   | 9.7    | 9.0    | 7.8    | 5.0    |
| " V              | 11.4   | 10.0   | 9.5    | 9.0    | 9.0    | 8.0    | 7.5    | 7.0    | 7.0    | 6.2    | 5.7    | 5.0    | 3.5    |
| Teeth;upper jaw  | 25     | 25     | 24     | 24     | 24     | 25     | 24     | 26     | 26     | 23     | 23     | 22     | 20     |
| " ;lower jaw     | 26     | 24     | 24     | 24     | 24     | 22     | 23     | 23     | 24     | 22     | 23     | 20     | 20     |
| Fins : D         | XII-14 | XII-14 | XII-15 | XII-14 | XI-15  | XII-14 | XII-14 | XII-14 | XII-14 | XII-14 | XII-14 | XII-14 | XII-14 |
| A                | II-15  | II-16  | 17     | II-16  | II-17  | II-16  | 17     | I-17   | 17     | I-17   | 17     | 17     | 18     |
| P                | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     |
| V                | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      | 3      |
| C                | 2,13,1 | 2,14,1 | 2,14,1 | 2,13,2 | 2,13,1 | 2,13,2 | 2,13,3 | 3,13,2 | 2,13,2 | 2,13,3 | 2,13,3 | 2,13,2 | 3,13,2 |

Blennius cristatus Linnaeus

TABLE 15; Measurements & Counts on Palestinian specimens

| Meas. in mm.      | (a)    | (b)    | (c)    | (d)    | (e)    |
|-------------------|--------|--------|--------|--------|--------|
| Total length      | 102.5  | 84.0   | 65.5   | 65.0   | 34.5   |
| Standard length   | 85.5   | 68.0   | 55.0   | 54.5   | —      |
| Body height       | 23.0   | 19.0   | 13.5   | 13.5   | —      |
| Head length       | 21.0   | 17.0   | 14.0   | 15.0   | 7.5    |
| Eye diameter      | 4.0    | 4.0    | 3.5    | 3.5    | 2.5    |
| Interorb. space   | 2.5    | 2.0    | 1.5    | 1.5    | 1.0    |
| Orbital tentacle  | 2.0    | 1.5    | 1.5    | 1.5    | 1.0    |
| Length of C       | 17.0   | 15.0   | 10.0   | 10.5   | —      |
| " " P             | 21.0   | 18.5   | 16.0   | 16.0   | —      |
| " " V             | 13.5   | 12.0   | 10.0   | 10.0   | —      |
| Teeth ; upper jaw | 24-25  | 25     | —      | 26     | —      |
| " ; lower jaw     | 27     | 24     | —      | 25     | —      |
| Fins ; D          | XII-14 | XII-14 | XII-14 | XII-15 | XII-14 |
| " ; A             | II-16  | II-16  | II-15  | I-16   | II-16  |
| " ; P             | 14     | 14     | 14     | 14     | 14     |
| " ; V             | I-3    | I-3    | I-3    | I-3    | I-3    |

(From Steinitz 1940b, p. 190)  
data on B. crinitus

Blennius cristatus Linnaeus

TABLE 16; Comparison of ratios & Counts.

| Ratios                   | Lebanese sp.   | Palestinian sp. |
|--------------------------|----------------|-----------------|
| Total length/Body height | 4.7-5.2        | 4.4.-4.9        |
| Total length/head(L)     | 4.0-4.6        | 4.3-4.9         |
| Head(L)/eye diameter     | 3.1-4.7        | 3.0-5.3         |
| <u>Counts</u>            |                |                 |
| Teeth in upper jaw       | 20-26          | 22-29           |
| " " lower jaw            | 20-26          | 22-30           |
| Fins : D                 | XItoXII-14to15 | XItoXII-13to16  |
| A                        | ItoII-15to17♂  | ItoII-15-16     |
| P                        | 17-18 ♀        | 14              |
| V                        | 3              | I-3             |

\* (From Steinitz 1949b, p. 191 on B. crinitus)

their pattern of growth changes from single file to an irregular distribution all over the surface of the fleshy crest. The length of the filaments is also irregular in large specimens, very short ones being dispersed among the long ones which often grow to a length of 1.5mm.

The filamentous structures of the supraorbital and nasal tentacles also increase in number with increase in size of the animal. In no case were there found to be more than 10-11 in the former or more than six in the latter. Apparently these numbers, once attained, remain fairly constant.

Material studied. AUBMNH; P-269(2), P-474(27), P-475(8), P-476(1), P-478(1).

Blennius inaequalis Linnaeus, 1758

(pl. VI; pl. IX, fig. 2; pl. X, fig. 5 & 6)

Blennius inaequalis Linnaeus, 1758. Syst. Nat. p. 230.

Diagnosis. Two to three flapped pores present dorsal to each posterior nostril; at least one more such pore occurs above and posterior to each eye; supraorbital tentacles longer than half the eye diameter; nasal tentacles longer than interorbital space and usually bifid.

Description. Head 4.0-4.5 times in total body length, with anterior profile subvertical; eyes 3.2-4.2 times in length of head, round, and protruding anterodorsally; iris with alternating pinkish-red and black radiating streaks; supra-

orbital tentacles simple, distally tapering filaments, frequently with 3-4 smaller branches, or flattened structures palmately divided into 4-5 filaments, the outermost always the longest and often equal to or slightly longer than the eye diameter (pl. X, fig. 6); interorbital space concave and narrow, 2.0-3.0 times in the diameter of the eye; anterior nostril surrounded by a fleshy tube extending dorsally into a long, usually bifid, rarely trifid, filament (pl. X, fig. 5); posterior nostrils large, either high-ridged or, more commonly, with a fleshy flap; mouth with fine, closely set teeth, 24-35 in the upper and 22-30 in the lower jaw, the numbers apparently increasing with age; both jaws with well developed canines, those of the lower jaw larger; numerous, characteristically distributed pores present in the cephalic region (pl. IX, fig. 2); those dorsad of the posterior nostril either high-ridged (young specimens) or with fleshy flaps arising from the anterior border of the aperture and extending posteriorly (mature individuals).

Body rounded anteriorly, compressed posteriorly, its maximum height contained 4.8-5.6 times in total body length; dorsal fin arising in the vertical from or slightly behind the posterior preopercular margin, rather sharply notched between spinous and soft portion, the former conspicuously shorter than the latter; last dorsal ray connected with the caudal peduncle by a membrane sometimes extending over the base of the caudal fin; anterior two elements of anal fin markedly

shorter than the following rays and, in individuals over 60mm. total length, with small fleshy excrescences at their tips; pectoral fins with 14 rays, the longest extending to the anus; ventral fins with three rays, the innermost very thin and closely attached to the middle one.

D. XII-17 to 18; A. I to II-18 to 19

P. 14; V. 3

Color. Ground color varying from cinnamon brown in animals from vegetated limestone tide-pools and rocky ledges to pale yellowish-gray in inhabitants of sandy environments; bands, streaks, and dots in the first case dark-brown, pinkish-red in the second case; dorsal half of operculum and preoperculum with numerous dark-brown, round dots; preopercular surface often with brownish reticulum on lighter background; cheek with a dark-brown, angular streak extending from the posterior border of the orbit to the angle of the mouth; several vertical, brownish, parallel streaks present on the snout; supraorbital tentacles brownish-gray, nasal tentacles yellowish; body with 6-7 brown, transverse bands each composed of two pairs of parallel streaks not clearly delineated in the anterior three bands; base of anal fin with a series of ten to eleven, orderly spaced, almost parallelogram shaped, brown spots; a large dark spot present on each side of the caudal peduncle; flanks with a series of 5-6 spots, greenish phosphorescent

in light-colored animals, golden in dark-colored ones; anal fin brown distally, lighter proximally; caudal, pectoral and ventral fins brownish and devoid of any pattern, with numerous bright-red spots and streaks in animals caught during June and July.

Distribution. B. inaequalis is rather rare in the Mediterranean. It has been reported from the Mediterranean coasts of France and Spain, and the coasts of Algiers. Apparently, except for the present work, there exists no other record from the eastern Mediterranean, probably due to insufficient investigation in this area.

In the eastern Atlantic, San Sebastian on the northern coast of Spain is the only locality mentioned in the available literature (Lozano y Rey, 1960)

A systematic investigation is necessary if a more complete picture of the distribution of this species is to be obtained.

Discussion. B. inaequalis is not uncommon along the Lebanese coasts, especially during the summer months. It is a small fish, averaging 40-45mm. in size.

Very few records exist concerning this species. In the available descriptions there are a few points worth discussing. Both, Dieuzeide (1955) and Lozano y Rey (1960) report the number of teeth in each jaw to be 12-14. In the



Blennius inaequalis Linnaeus

TABLE 18; Ratios & Counts.

| Ratios                    |              |
|---------------------------|--------------|
| Total length/height       | 4.8-5.6      |
| Total length/head(L)      | 4.0-4.5      |
| Standard length/height    | 4.1-4.8      |
| Standard length/head(L)   | 3.4-3.8      |
| Head length/eye diameter  | 3.2-4.2      |
| Eye diam./interorb.space  | 1.9-3.0      |
| Eye diam./tentacle length | 0.9-2.1      |
| Total length/P(L)         | 4.4-5.0      |
| Total length/W(L)         | 6.1-7.7      |
| Counts                    |              |
| Teeth ; upper jaw         | 24-32        |
| " ; lower jaw             | 22-28        |
| Dorsal fin                | XII-17to18*  |
| Anal fin                  | ItoII-18to19 |
| Pectoral fin              | 14           |
| Ventral fin               | 3            |

\* Very rarely XIII or XI

specimens of the AUB collection this number was never found to be less than 22 (Table 17), even in the youngest (26-28mm. total length) individuals examined. The supraorbital tentacle, though highly variable in form, is always remarkably long and not at all "small" as described by Dieuzeide (1955). Differences in coloration are, of course, justifiable in view of the variability of this character. None of the authors mention the presence of either the dark spot on the sides of the caudal peduncle or the series of dark spots at the base of the anal fin, yet these two pigmentational characters appear to be constant and persist even after long preservation in either alcohol or formalin. Finally, only Lozano y Rey (1960) describes the peculiar flapped pores of the dorsal cephalic region which, as is also his opinion, appear to constitute the most important diagnostic character of the species.

Material studied. AUBMNH; P-463(12), P-464(7), P-465(65), P-466(1), P-477(4).

Blennius galerita Linnaeus, 1758

(pl. VII)

Blennius galerita Linnaeus, 1758. Syst. Nat. Vol. X, p. 256.

Blennius montagui Fleming, 1828. Brit. Anim., p. 128.

Blennius artedi Cuv. & Val., 1836. Hist. Nat. Poiss. Vol. XI, p. 171, pl. 322.

Blennius inaequalis Lowe, 1841. Trans. zool. Soc. London,  
Vol. III, p. 185.

Diagnosis. Posterior part of interorbital space with a flat, transversely set tentacle followed by a series of filaments; lateral margins of upper lip flattened; supraorbital tentacles absent.

Description. Head longer than high, 4.8-4.9 times in total body length, anterior profile oblique; eyes 4.0-4.4 times in length of head, protruding anterodorsally; interorbital space 1.4-1.7 times in eye diameter, flat or slightly concave; mouth with numerous very fine teeth, 46-59 in the upper and 30-39 in the lower jaw; two moderate-sized canines present in lower jaw only; additional fine teeth occasionally present above serial ones in upper jaw; posterior half of interorbital space with a single, fleshy, transversely set tentacle followed by a series of simple filaments; anterior nostril with a complex tentacle arising from a short, fleshy tube surrounding the nostril composed of one (in rare cases two separate) palmately fringed structure, dorsally (caudal<sup>d</sup>) and usually a simple filament, ventrally (cephalad).

Body rounded anteriorly, compressed posteriorly, its height contained 5.4-6.0 times in the total body length; dorsal fin arising somewhat anterior to posterior opercular margin, sharply notched between spinous and soft portion, the latter continuous by a membrane with the caudal peduncle;

thirteenth dorsal spine very short,  $1/5-1/4$  the length of the first dorsal ray; first two elements (spines according to Steinitz, 1949b) of anal fin less than half the length of the following rays; caudal fin rounded and large, 5.6-6.3 times in total body length; longest rays of pectoral fins extending to or slightly beyond the anus; ventral fins with three rays, the middle the longest, the inner the thinnest.

D. XIII-16 to 17; A. I to II-18 to 19

P. 12; V. 3

Color. Dark-brown, dense reticulum over the whole upper half of body; seven, black, transverse bands distinct below a row of silver dots running above and parallel to the mid-lateral line; ventral half of flanks with a series of bright-silver rhomboidal spots mingling with the silver color of the ventral side of the body; head with two brown streaks, the most anterior one extending from the anteroventral border of the orbit to and including the upper lip; the second streak running posterior to the former and bifurcating just above the upper lip, one limb passing in front of, the other behind the fleshy flap of the lip; throat with one or two brown, angular bands, with apices lying mid-ventrally and directed caudally; dorsal fin brownish-gray with 3-4 oblique rows of brown spots; caudal fin yellowish-gray with 3-4 brown, transverse bands; anal fin white-margined, dark-brown submarginally; pectoral fins with 5-6 arcshaped, transverse

brown bands; ventral fins yellowish-brown.

Distribution. Reports from the equatorial islands of Sao Tome and Annobon (eastern part of the Gulf of Guinea), and the coasts of Senegal and the islands of Azores, Canary, and Madeira on the one hand, and from the Portuguese and the Atlantic coasts of Spain and France, up to the south coast of England and the English Channel, on the other, indicate that B. galerita is distributed over a large area of the eastern and north-eastern Atlantic Ocean.

In the western Mediterranean this species has been found in several localities along the Spanish coasts, from Gibraltar to Barcelona. The Adriatic Sea is also known to be inhabited by this fish. The presence of B. galerita in the eastern Mediterranean and its neighboring Seas has so far been reported from Palestine, the Bosphorus, and the Black Sea.

Discussion. Our collections indicate that B. galerita is not very common along the Lebanese coast. Its small size and dark brown color make it difficult to observe in its natural habitat of tide-pool bottoms and vegetated rocky shelves.

For the sake of comparison additional structural details are included. The dorsally ridged, distally fringed, caudally directed interorbital (nuchal) tentacle in the Lebanese

TABLE 19; Measurements &amp; Counts on Lebanese specimens

| Meas. in mm.       | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Total length       | 63.0    | 59.0    | 53.0    | 52.5    | 50.5    | 48.5    | 48.0    | 48.0    | 41.0    |
| Standard length    | 53.0    | 49.0    | 44.0    | 43.5    | 42.0    | 40.0    | 39.8    | 39.5    | 34.0    |
| Body height        | 11.2    | 10.0    | 9.0     | 9.0     | 8.7     | 9.0     | 8.0     | 8.0     | 7.0     |
| Head length        | 13.0    | 12.0    | 10.7    | 11.0    | 10.6    | 10.0    | 10.0    | 9.8     | 8.5     |
| Eye diameter       | 3.0     | 2.8     | 2.7     | 2.5     | 2.5     | 2.3     | 2.5     | 2.3     | 2.0     |
| Interorb. space    | 2.0     | 2.0     | 1.6     | 1.7     | 1.6     | 1.5     | 1.6     | 1.4     | 1.2     |
| Nuchal tentacle    | 1.3     | 1.7     | 1.5     | 1.2     | 1.4     | 1.0     | 1.4     | 1.5     | 1.0     |
| Length of Pectoral | 14.5    | 14.3    | 12.0    | 12.5    | 11.5    | 11.0    | 11.0    | 11.5    | 9.5     |
| " " Ventral        | 7.5     | 7.3     | 6.2     | 6.4     | 6.3     | 6.0     | 5.7     | 6.5     | 4.8     |
| " " Caudal         | 10.0    | 10.0    | 9.0     | 9.0     | 8.5     | 8.5     | 8.2     | 8.5     | 7.0     |
| Teeth ; upper jaw  | 58      | 59      | 55      | 55      | 54      | 46      | 53      | 46      | 46      |
| " ; lower jaw      | 39      | 37      | 34      | 38      | 34      | 30      | 34      | 32      | 32      |
| Fins : D           | XIII-16 | XIII-16 | XIII-17 | XIII-16 | XIII-17 | XIII-17 | XIII-17 | XIII-17 | XIII-17 |
| A                  | II-18   | I-18    | II-19   | II-18   | II-18   | II-18   | II-18   | II-18   | II-18   |
| P                  | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      | 12      |
| V                  | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       | 3       |
| C                  | 3,13,2  | 2,13,2  | 2,13,2  | 2,13,3  | 2,13,2  | 3,13,3  | 2,13,2  | 3,13,2  | 2,13,3  |

TABLE 20; Measurements &amp; Counts on Palestinian specimens.

| Meas. in mm.       | (a)    | (b)     | (c)     | (d)     | (e)    | (f)     |
|--------------------|--------|---------|---------|---------|--------|---------|
| Total length       | 74.0   | 73.0    | 71.0    | 48.0    | 44.5   | 41.5    |
| Standard length    | 62.0   | 61.0    | 59.5    | 37.0    | 36.0   | 33.5    |
| Body height        | 13.0   | 13.0    | 12.5    | 7.5     | 6.5    | —       |
| Head length        | 14.5   | 14.5    | 14.0    | 9.5     | 9.0    | —       |
| Eye diameter       | 3.0    | 3.0     | 3.0     | 2.5     | 2.5    | —       |
| Interorb. space    | 2.0    | 2.0     | 2.0     | 1.0     | 1.0    | —       |
| Nuchal tentacle    | 3.0    | 3.0     | 2.5     | 1.5     | 1.0    | —       |
| Length of Pectoral | 15.5   | 17.0    | 17.5    | 10.5    | 10.5   | —       |
| " " Ventral        | 8.0    | 10.0    | 9.5     | 6.5     | 5.5    | —       |
| " " Caudal         | 12.5   | 13.0    | 12.0    | 9.0     | 8.0    | 7.5     |
| Teeth; upper jaw   | 76     | 59      | 62      | —       | —      | —       |
| " ; lower jaw      | 47     | 41      | 40      | —       | —      | —       |
| Fins ; D           | XII-17 | XIII-16 | XIII-17 | XIII-17 | XIV-16 | XIII-16 |
| A                  | II-18  | II-17   | II-18   | II-17   | II-18  | II-17   |
| P                  | 12     | 12      | 12      | 12      | 12     | 12      |
| V                  | I-2(3) | I-2(3)  | I-2(3)  | I-2(3)  | I-2(3) | —       |

(From Steinitz, 1949b, p. 171)

TABLE 21; Comparison of Ratios &amp; Counts

| Ratios                  | Lebanese sp. | Palestinian sp.  |
|-------------------------|--------------|------------------|
| Total length/height     | 5.4-6.0      | 5.6-6.9          |
| Total length/head(L)    | 4.8-4.9      | 4.7-5.1          |
| Standard length/height  | 4.4-4.9      | 4.3-5.5          |
| Standard length/head(L) | 4.0-4.1      | 3.9-4.3          |
| Head/eye diameter       | 4.0-4.4      | 3.6-4.8          |
| Eye/interorb.space      | 1.4-1.7      | 1.6-2.3          |
| Head/nuchal tentacle    | 6.5-10.0     | 4.8-8.8          |
| Total length/caudal     | 5.6-6.3      | 5.3-5.9          |
| Total length/pectoral   | 4.1-4.4      | 4.1-4.8          |
| Total length/ventral    | 7.4-8.5      | 7.3-9.3          |
| <hr/>                   |              |                  |
| Counts                  |              |                  |
| Teeth;upper jaw         | 46-59        | 59-76            |
| " ;lower jaw            | 30-39        | 40-47            |
| Fins ;Dorsal            | XII-16to17   | XIIItoXIV-16to17 |
| Anal                    | ItoII-18to19 | II-17-18         |
| Pectoral                | 12           | 12               |
| Ventral                 | 3            | I-2(3)           |

specimens perfectly fits Steinitz's description of the same structure in Palestinian specimens. The number of simple, occasionally bifid, filaments behind the tentacle varies from four to seven. The number of the small appendages which arise from the palmate dorsal (caudal) structure of the complex nasal tentacle is also variable. The portion of this tentacle which arises from the ventral (rostral) border of the nasal tubercle usually consists of either one or two separate, rarely one bifid, delicate filaments.

Contrary to Steinitz's report (Steinitz, 1949b) on the anatomy of the ventral fins, a spine was not found in the Lebanese specimens examined. This fin consists of a very thin inner ray connected by a narrow membrane throughout its length with the middle ray which is the longest. The third, outer, ray is shorter and thicker than the middle one from which the former is separate except proximally.

Material studied. AUBMNH; P-459(6), P-460(3)

Blennius trigloides Cuv. & Val., 1836

(pl. VIII; pl. X, fig. 7)

Blennius trigloides Cuv. & Val., 1836. Hist. Nat. Poiss. Vol. XI, p. 168 (228).

Pholis laevis Lowe, 1839. Proc. zool. Soc. London. p. 83.

Blennius trigloides Cuv. & Val., Bonaparte, 1841. Faun. Ital. Pesci., fasc. 18, fig. 6.

Blennius trigloides Cuv. & Val., Guichenot, 1850. Explor.

Alger. Poiss., Vol. III, p. 71.

Blennius pholis Steindachner, 1868. pl. 1, fig. 2 (no description).

Blennius trigloides Cuv. & Val., Vinciguerra, 1880. Ann. Mus.

Civico Genova, Vol. XV, p. 443.

Diagnosis. Supraorbital tentacles absent; interorbital space and nape of neck naked; anterior nostrils with two palmately fringed tentacles each; pectoral fins large, almost as long as head.

Description. Head large, 3.6-4.1 times in total body length, with anterior profile straight and obliquely descending; snout pointed, especially in juvenile specimens; eyes round, large, 3.3-4.5 times in length of head, and protruding anterodorsally; interorbital space concave, 1.7-1.9 times in the eye diameter; no interorbital and/or nuchal appendages of any sort; anterior nostril with two palmately fringed tentacles arising from the dorsal (caudal) and ventral (rostral) borders of the nasal tubercle (pl. X, fig. 7); mouth with a series of 17-31 in the upper and 14-25 teeth in the lower jaw, the numbers apparently increasing with age; canines present, one on each side of each jaw, those of the lower conspicuously larger than those of the upper; sometimes an additional, smaller canine present anterior to "normal" ones; branchiostegal area distended, especially in large specimens (above 80mm. total length), giving the impression of a "swollen neck"; body abruptly

compressed behind the head, its height contained 5.2-5.6 times in the total body length; dorsal fin arising in the vertical from the posterior preopercular margin, deeply notched between spinous and soft portion, the twelfth spine very short, 3.5 times in the length of the first ray; soft portion higher than spinous, the former not continuous with the caudal fin; anal fin with one or two often inconspicuous spines followed by 17-18 rays; caudal fin rounded, proportionately larger in young than in mature individuals; pectoral fins remarkably broad and long, 4.2-4.5 times in total body length, the longest ray extending to the second anal ray in mature specimens and to the third or even fourth anal ray in very young ones; ventral fins composed of a very short outer spine and three rays medially.

D. XII-16 to 17; A. I to II-17 to 18

P. 13; V. I-3

Color. Ground color brownish-yellow to olive green-gray (material preserved in alcohol); dorsal and dorsolateral region of head dark-brown, cheeks lighter; a rather sharply delineated round, brown spot present behind the eye; lower half of head with three brown bands parallel to each other directed anteroventrally; most anterior band extending from the anteroventral border of the orbit, over the upper and lower lip, to the anteroventral tip of the lower jaw, joining the corresponding band from the other side of the head; the middle band arising

behind and below the eye, extending over the preoperculum, through the angle of the mouth to the ventral side of the head there forming an angle with the corresponding band from the other side, the apex of the angle directed caudally; the third band shorter than the former two, extending over the lower part of the operculum and the base of the branchiostegals, but not continuing to the ventral side of the head; body with six brown, symmetrically indented, transverse bands; upper portions of second, third and (in specimens over 75-80mm. total length) fourth of these bands out of phase with their lower portions; dorsal fin white-margined; anal fin with a longitudinal series of dark spots submarginally, tips of rays white; pectoral fins with 3-4 ill-defined, transverse, brown bands; ventral fins light-brown; numerous brown dots (not distinct in young specimens) distributed over almost the entire surface of the head and body, particularly dense on the lower preopercular area, the operculum, the anterodorsal region of the trunk, and the base of the pectoral fins.

Distribution. B. trigloides is apparently rare along the Lebanese coast. In addition to Palestine (Steinitz, 1949b) and Lebanon this species has been reported from the Sea of Marmara (Erazi, 1941), the Black Sea (Svetovidov, 1958), and the Mediterranean coasts of Turkey (Aksiray, 1954).

The distribution of B. trigloides in the western Mediterranean is better known. It has been reported from

several localities along the European coasts, the coast of Algiers, and the Adriatic Sea.

In the Atlantic, the Sea of Madeira (Gunther, 1861), the Canary Islands, and the coasts of Senegal (Dieuzeide et al., 1955) are the only locations mentioned in the available literature. According to Lozano y Rey (1960), this species is scarce in the north-eastern Atlantic.

Discussion. The small number of specimens in our collection permits only a tentative consideration of meristic and pigmentation characters of this fish. However, the following structural details may be useful for a further systematic study of the species.

a) As pointed out by Steinitz (1949b), there is a similarity between the nasal tentacle of B. trigloides and that of B. galerita. The main difference in this structure between the two species is that in B. galerita the rostral component of the tentacle consists of one or two simple filaments united at their base (rarely one bifid), whereas in B. trigloides it is a palmate structure bearing 3-9, usually five, delicate filaments. Moreover, in the latter species the caudal component of the tentacle is more profusely fringed (8-12 filaments) than that of B. galerita (6-8 filaments). It should be mentioned here that the single nasal tentacle of B. sphinx is very similar

to the caudal part of the same tentacle in the former two species. The similarity is closest in large specimens of the three species.

b) The number of teeth in the upper jaw has, in all cases, been found to be greater than that of the teeth in the lower jaw, the difference tending to be constant, at least in individuals over 40mm. total length (Table 22).

c) The ventral fins consist of one spine and three rays. The former, contrary to Steinitz's statement (1949b) concerning its length, was found to be very short and closely attached to the base of the outer ray which is united to the middle ray by a relatively wide membrane. The middle ray is the longest and is closely accompanied almost throughout its length by the inner ray which is the thinnest of the three. This fin was found to be proportionately longer in younger individuals than in older ones.

d) As already mentioned, the pectoral fins of B. trigloides are remarkably large. In addition to their length, their base is very broad, 1.4-1.6 times in the body height.

Material studied. AUBMNH; P-457(3), P-458(1), P-57(3), P-16(1).

TABLE 22; Measurements & Counts on Lebanese specimens

| Meas. in mm.           | 1      | 2      | 3      | 4      | 5      |
|------------------------|--------|--------|--------|--------|--------|
| Total length           | 96.0   | 93.5   | ✕      | 64.0   | 31.0   |
| Standard length        | 81.0   | 80.5   | 76.0   | 54.0   | 25.5   |
| Body height            | 17.0   | 17.0   | 16.0   | 11.7   | 6.0    |
| Head length            | 27.0   | 24.5   | 24.8   | 15.5   | 7.6    |
| Eye diameter           | 6.0    | 5.8    | 6.0    | 4.0    | 2.3    |
| Interorb.space         | 3.4    | 3.5    | 3.5    | 2.4    | 1.2    |
| Length of Pectoral fin | 22.5   | 21.0   | 22.5   | 14.5   | 7.3    |
| " " Ventral "          | 12.0   | 13.5   | 15.0   | 9.0    | 5.0    |
| " " Caudal "           | 15.0   | 13.0   | ✕      | 10.0   | 5.5    |
| Teeth ; upper jaw      | 30     | 31     | 29     | 24     | 17     |
| " ; lower jaw          | 24     | 25     | 23     | 18     | 14     |
| Dorsal fin             | XII-16 | XII-16 | XII-17 | XII-16 | XII-16 |
| Anal "                 | II-17  | I-18   | I-18   | II-17  | I-18   |
| Pectoral "             | 13     | 13     | 13     | 13     | 13     |
| Ventral "              | I-3    | I-3    | I-3    | I-3    | I-3    |
| Caudal "               | 3,12,1 | 3,12,2 | ✕      | 3,12,3 | 3,12,3 |

✕ Caudal fin mutilated

TABLE 23; Measurements & Counts on Palestinian specimens

| Meas. in mm.           | (a)    | (b)    |
|------------------------|--------|--------|
| Total length           | 91.5   | 41.5   |
| Standard length        | 77.0   | 35.5   |
| Body height            | 17.5   | 6.5    |
| Head length            | 21.5   | 10.0   |
| Eye diameter           | 5.0    | 2.5    |
| Interorb. space        | 4.0    | 1.5    |
| Length of Pectoral fin | 22.0   | 9.5    |
| " " Ventral "          | 15.0   | 6.5    |
| " " Caudal "           | 14.5   | 6.0    |
| Teeth ; upper jaw      | —      | 20     |
| " ; lower jaw          | —      | 20     |
| Dorsal fin             | XII-17 | XII-17 |
| Anal "                 | I-18   | II-18  |
| Pectoral "             | 13     | 13     |
| Ventral "              | I-2    | or3    |

(From Steinitz (1949b) p.178)

TABLE 24; Comparison of Ratios & Counts.

|                             | Lebanese sp.     | Palestinian sp. |
|-----------------------------|------------------|-----------------|
| Total length/body height    | 5.2-5.6          | 5.2-6.4         |
| Total length/head(L)        | 3.6-4.1          | 4.2-4.3         |
| Standard length/body height | 4.3-4.8          | 4.4-5.5         |
| Standard length/head (L)    | 3.0-3.5          | 3.6             |
| Head (L)/eye diam.          | 3.3-4.5          | 4.0-4.3         |
| Eye/interorb. space         | 1.7-1.9          | 1.3-1.7         |
| Total length/caudal (L)     | 5.6-7.2          | 6.3-6.9         |
| Total length/Pectoral (L)   | 4.2-4.5          | 4.2-4.4         |
| Total length/Ventral (L)    | 6.2-8.0          | 6.1-6.4         |
| Head(L)/Caudal(L)           | 1.4-1.9          | 1.5-1.7         |
| Head(L)/Pectoral(L)         | 1.0-1.2          | 1.0-1.1         |
| Head(L)/Ventral(L)          | 1.5-2.3          | 1.4-1.5         |
| Teeth ; upper jaw           | 17-31            | (20)            |
| " ; lower jaw               | 14-25            | (20)            |
| Dorsal fin                  | XII-16 to 17     | XII-17          |
| Anal "                      | I to II-17 to 18 | I-II-18         |
| Pectoral "                  | 13               | 13              |
| Ventral "                   | I-3              | I-2 or 3        |

Counts

### SUMMARY

The family Blenniidae is represented in the Mediterranean Sea by 18 species of the genus Blennius L. eight of which have been found in Lebanon. In the order treated in this work these species are:

- 1) B. sanguinolentus Pallas, 1811
- 2) B. pavo Risso, 1810
- 3) B. sphinx Cuv. & Val., 1839
- 4) B. fluviatilis Asso, 1801
- 5) B. cristatus Linnaeus, 1758
- 6) B. inaequalis Linnaeus, 1758
- 7) B. galerita Linnaeus, 1758
- 8) B. trigloides Cuv. & Val., 1836

Measurements and counts of the most important characters of each species are presented in tabular form. Ratios and counts on Lebanese specimens are compared with those of Palestinian specimens. Original drawings of a representative of each species and semi-diagrammatic figures of various structures and appendages supplement the description of the Lebanese material.

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PLATE I

PLATE I

B. sanguinolentus Pallas, AUBMNH P-453, adult female 103mm.  
total length; AUB frontage, Lebanon.

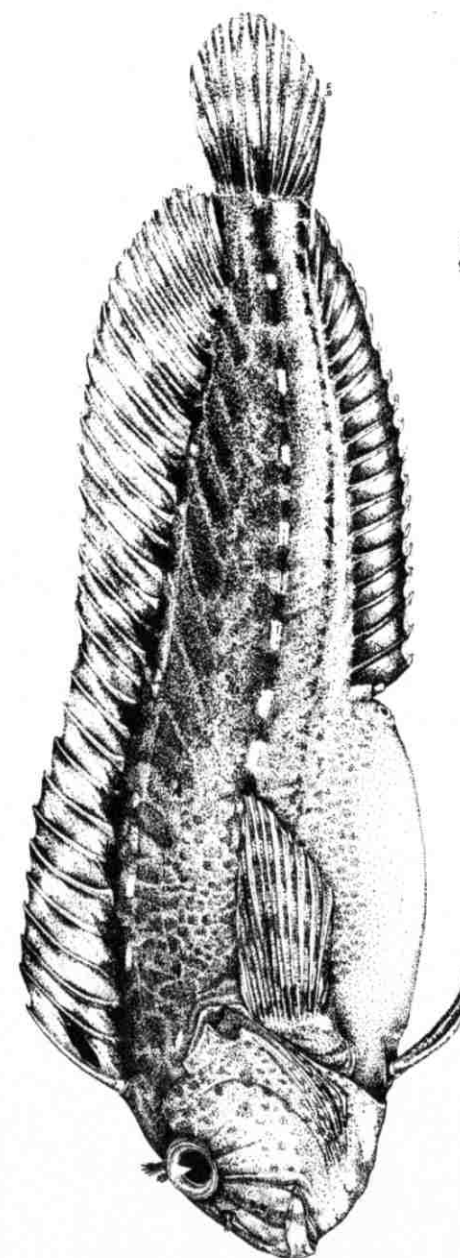


PLATE II

B. pavo Risso, AUBMNH P-468, immature female 47mm. total length; AUB frontage, Lebanon.

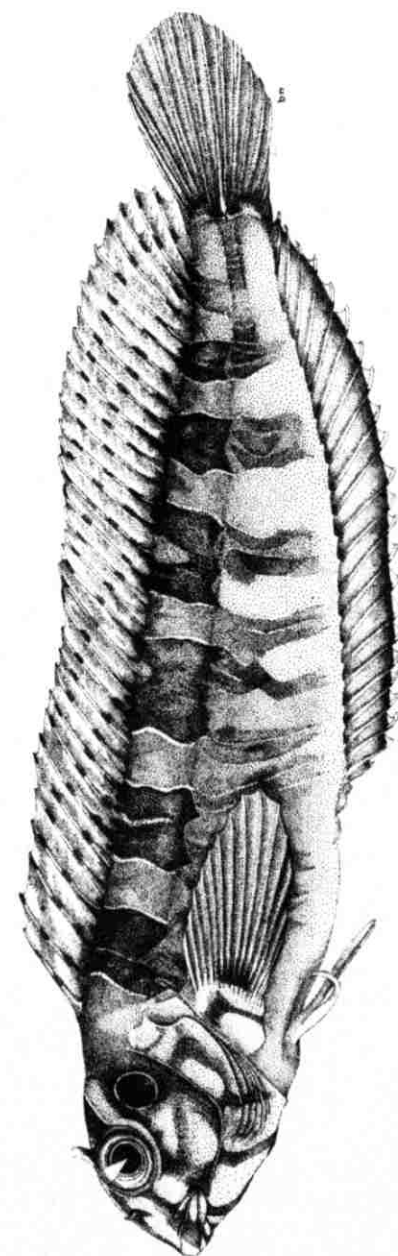


PLATE III

E. sphinx Cuv. & Val, AUBMNH P-471, immature specimen 54mm.  
total length; AUB frontage, Lebanon.



10 mm

PLATE IV

B. fluviatilis Asso, AUBMNH P-5, mature female 75mm. total  
length; Nahr Ibrahim, Lebanon.

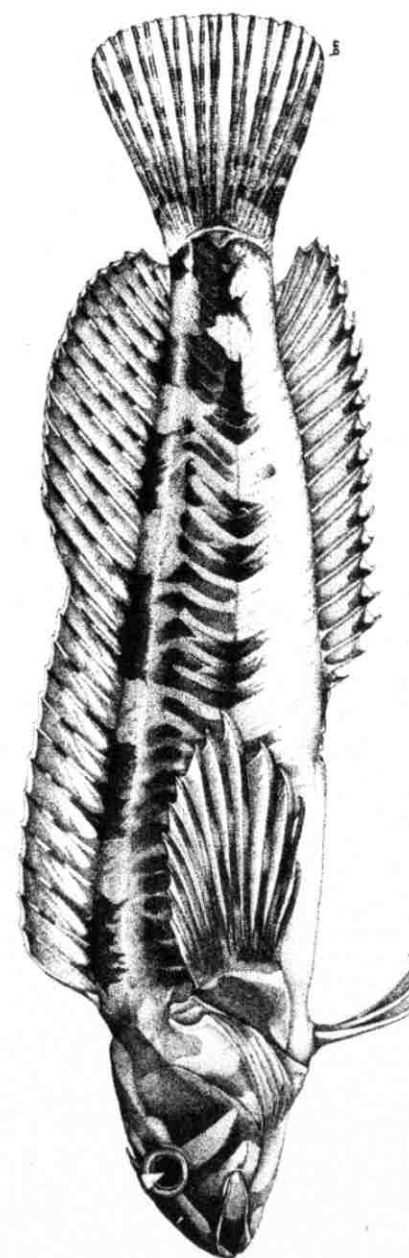


PLATE V

B. cristatus Linnaeus, AUBMNH P-474, immature female 44mm.

total length; AUB frontage, Lebanon.

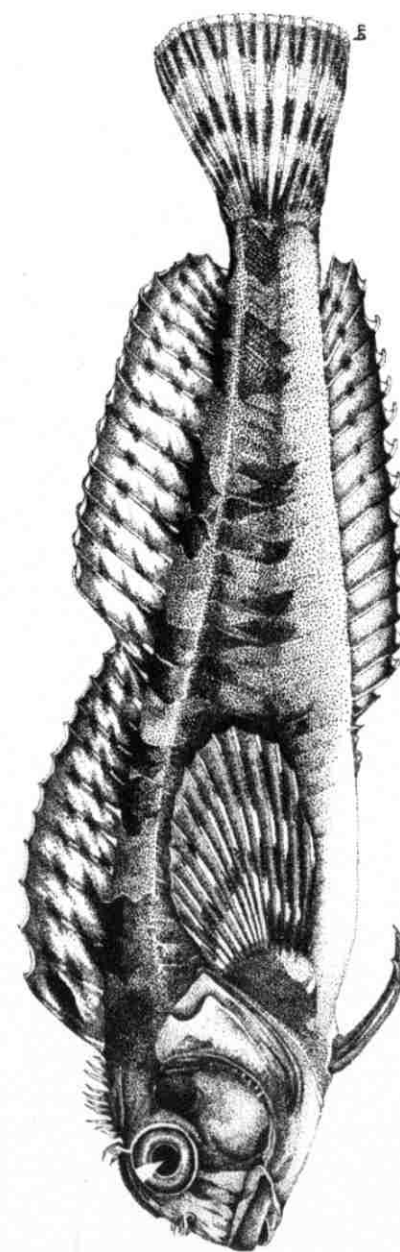


PLATE VI

*B. inaequalis* Linnaeus, AUBMNH P-465, female 54mm. total  
length; AUB frontage, Lebanon.



PLATE VII

B. galerita Linnaeus, AUBMNH P-459, immature specimen 52mm.  
total length; AUB frontage, Lebanon.



10 mm

PLATE VIII

B. trigloides Cuv. & Val, AUBMNH P-457, 96mm. total length;

AUB frontage, Lebanon.

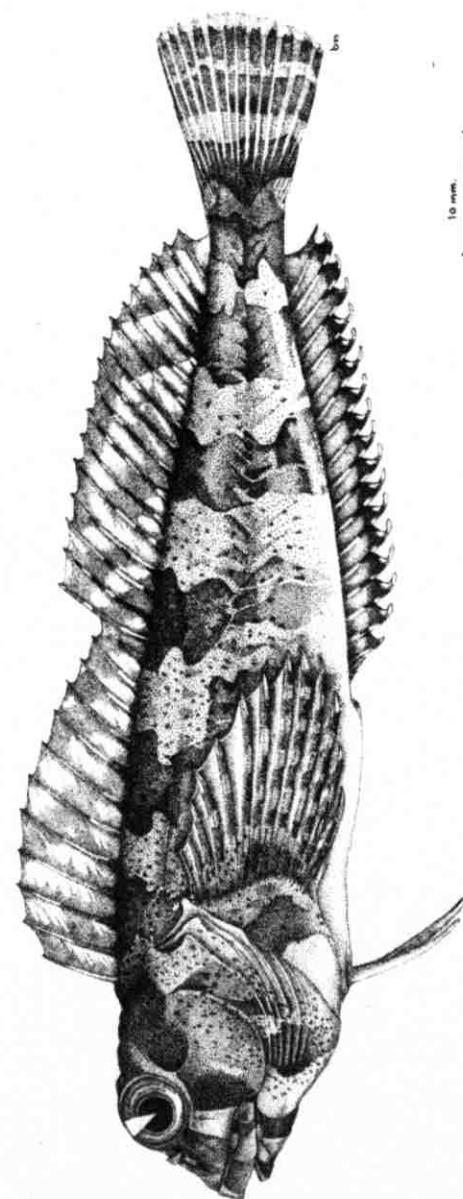


PLATE IX

Fig. 1. *B. pavo*; head of mature male

Fig. 2. *B. inaequalis*; distribution of simple and flapped pores on cephalic region.

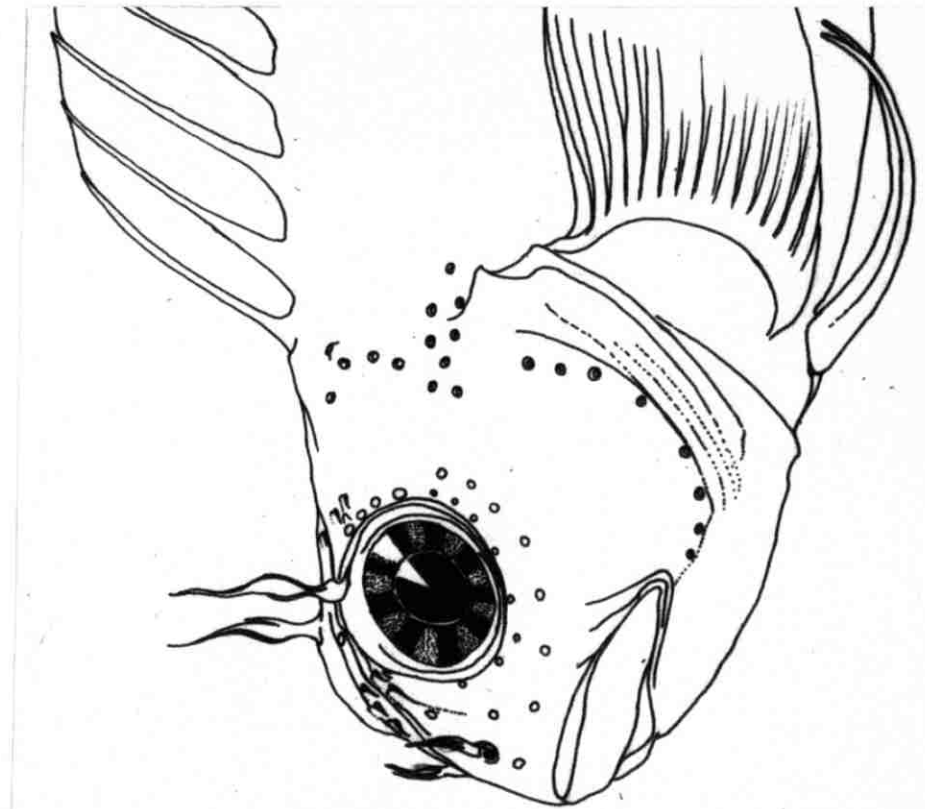
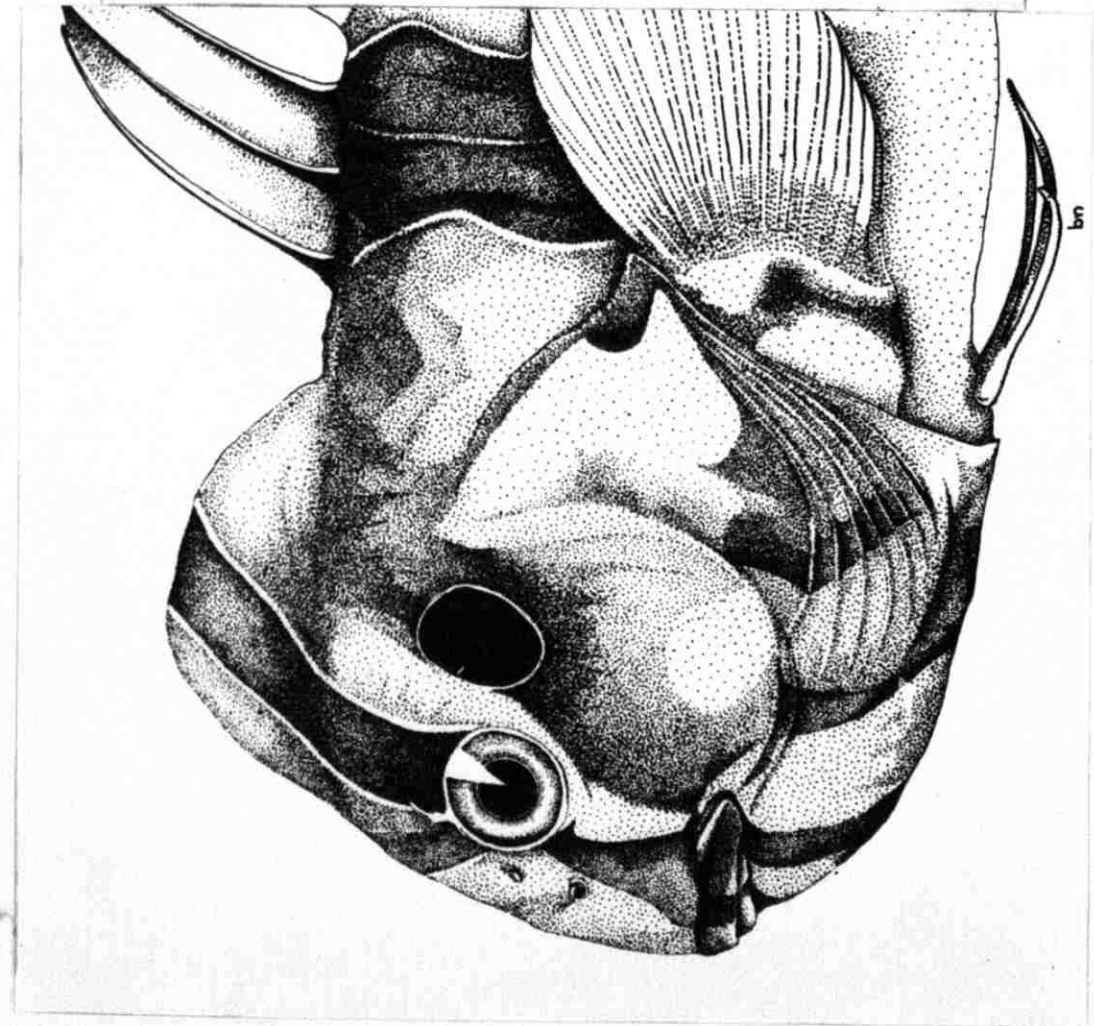


PLATE IX

2



1

PLATE X

Modified first and second anal fin elements in  
mature male specimens (ventral views):

- Fig. 1. B. sanguinolentus  
 2. B. fluviatilis  
 3. B. cristatus  
 4. B. pavo

Supraorbital and nasal tentacles:

5. B. inaequalis; nasal tentacle  
 6. B. inaequalis; supraorbital tentacle  
 7. B. trigloides; nasal tentacle  
 8. B. cristatus; supraorbital tentacle  
 9. B. cristatus; nasal tentacle  
 10. B. sphinx; nasal tentacle.

