A REVISION OF THE EASTERN-ATLANTIC *TRIPTERYGIIDAE* (PISCES, BLENNIOIDEI) AND NOTES ON SOME WESTAFRICAN BLENNIOID FISH

by

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SUMMARY.– Tripterygiid fish from Senegal, the Canary Islands, Madeira, and the French Atlantic coast are compared with specimens of *Tripterygion xanthosoma* Zander & Heymer, 1970. All specimens are found to belong to the same species. The correct name for this species is *T. delaisi* Cadenat & Blache 1970. *T. xanthosoma* Zander & Heymer 1970 and *T. atlanticus* Wheeler & Dunne 1975 are synonyms. A list is given of the nominal species of the genus *Tripterygion* and their current identification. Only three species are now recognized in the genus.

The reproductive behaviour of *Lipophrys velifer* confirms that the species is closely related to the mediterranean "canevac-group". The occurence of *Lipophrys trigloides* at Senegal extends the range of the species 2000 km southwards. The occurence of *Blennius normani* at Senegal extends the range of the species 1200 km northwards. *B. normani* and *B. ocellaris* may interbreed in the area of Senegambia. *Hypleurochilus langi*, whose original description in 1923 was based on a single specimen is redescribed. The specific status of *Malacoctenus africanus* is confirmed. The species, inadequately described in 1950 and known from only two specimens, is redescribed.

RESUME.– Des poissons Tripterygiidae provenant des côtes du Sénégal, des îles Canaries, de Madère et de la côte Atlantique française sont comparés aux spécimens de *Tripterygion xanthosoma* Zander et Heymer, 1970. Tous ces exemplaires appartiennent à la même espèce dont le nom correct est *T. delaisi* Cadenat et Blache, 1970. *T. xanthosoma* Zander et Heymer, 1970 et *T. atlanticus* Wheeler et Dunne, 1975 sont synonymes. Une liste des espèces nominales de *Tripterygion* est donnée avec leur identification actuelle. Seules trois espèces sont maintenant reconnues valables.

Le comportement de *Lipophrys velifer* lors de la reproduction confirme que cette espèce est très proche du "groupe *canevae*" méditerranéen. La découverte de *Lipophrys trigloides* au Sénégal étend son aire de distribution 2000 km vers le sud et celle de *Blennius normani* 1200 km vers le nord. *B. normani* et *B. ocellaris* peuvent être interféconds au large de la Sénégambie. *Hypleurochilus langi*, dont la description originale en 1923 était basée sur un seul individu, est redécrite. Le statut spécifique de *Malacoctenus africanus* est confirmé. L'espèce, insuffisamment décrite en 1950 et connue seulement à partir de deux individus est redécrite.

INTRODUCTION

Six million years ago, the Mediterranean sea was dry (Hsü *et al.* 1973, Hsü 1974). Therefore, all species inhabiting the Mediterranean sea today have either

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entered it through the Strait of Gibraltar (and more recently the Suez Canal), or invaded it from freshwater, or evolved within it from such immigrants. As Ekman (1935, 1967) has shown, the majority of the immigrants came from the westafrican area. The key to the understanding of the evolution of the mediterranean fauna lies in a better understanding of the eastern-Atlantic fauna.

Zander and Heymer (1970, 1976) have revised the mediterranean Tripterygiidae. They recognize three species in the Mediterranean sea : *Tripterygion tripteronotus* (Risso, 1810), *T. xanthosoma* Zander and Heymer 1970, and *T. melanurus* Guichenot 1850. Two tripterygiid species have been described from the eastern Atlantic, *Tripterygion delaisi* Cadenat and Blache 1970 from Senegal and *T. atlanticus* Wheeler and Dunne 1975 from the English Channel and northern France. However, Zander and Heymer (1970) have pointed out that the description of *T. delaisi* given by Cadenat and Blache (1970) does not agree with the type material deposited at the Museum d'Histoire Naturelle at Paris. Wirtz (1976, 1978) suggested that *T. atlanticus* and *T. xanthosoma* might be the same species. Almeida and Gomes (1977) suggested that *T. delaisi* and *T. xanthosoma* might be the same species. Clearly, a comparison of a series of eastern-Atlantic specimens from Senegal to the English Channel and specimens from the Mediterranean Sea was necessary to clarify the status of the eastern-Atlantic Tripterygiidae.

The blenniid fish of Westafrica have been dealt with by Fowler (1963), Poll (1959), Bauchot (1966), Blache *et al.* (1970), and Penrith and Penrith (1972). This paper contains some supplementary information on the morphology, ecology, behaviour, and systematic position of four benniids and one clinid from Westafrica.

MATERIAL AND METHODS

Observations on ecology and behaviour were made while skin-diving at the Ile de Gorée, Senegal (14°38' northern latitude), the Canary Islands, and the French Atlantic coast. Specimens were caught with a handnet, using the anaesthetic quanaldine.

Additional specimens were studied at the fish collection of the Institut Fondamental d'Afrique Noire (IFAN) and were borrowed from other museums. The morphological descriptions are based on specimens deposited at

BMNH	British Museum of Natural History, London
IFAN	Fish collection of the IFAN at Gorée, Senegal
MMF	Museu Municipal Funchal, Madeira
MNHN	Museum National d'Histoire Naturelle, Paris
PW	Private collection of P. Wirtz
USNM	United States National Museum, Washington
UZMK	Universitetets Zoologiske Museum, Copenhagen
ZMH	Zoologisches Museum Hamburg, W-Germany
ZSM	Zoologische Sammlung des Bayerischen Staates, München, W-Germany

Family TRIPTERYGIIDAE

Tripterygion delaisi Cadenat & Blache 1970

Synonyms : *T. xanthosoma* Zander & Heymer 1970, *T. atlanticus* Wheeler & Dunne 1975.

Material :

29 ♂♂, 6♀♀	Ile de Gorée, Senegal, Febr. 1977 ; ZMH 5960
2 ♂♂	Punta de Tene, Tenerife, 19/2/1975 ; ZMH 5961
2 ♂♂	Teresitas, Tenerife, 20/2/1975 ; ZMH unregistered
6 ♂♂, 2♀♀	Tenerife ; BMNH unregistered
1 ♂	Pontinha, Madeira, 30/3/1959 ; MMF 15598a
2♀♀	Pontinha, Madeira, 31/5/1959 ; MMF 15808-9
2 juv.	Le Croisic near Nantes, autumn 1976 ; leg GRUET
2 ♂♂, 1 ♀	Roscoff, 19/3/1974 ; BMNH 1974-3-19 : 12-14 (paratypes of *T. atlanticus)*
1 ♂	Roscoff, 10/9/1975 ; BMNH 1975-9-10 : 14
2 ♂♂, 2♀♀	Roscoff, 26/4/1977 ; ZMH 5962
5 ♂♂, 1 ♀	Banyuls-sur-Mer, July 1969 ; ZMH 4238 - 4240 (holo-and paratypes of *T. xanthosoma)*
41 ♂♂, 5 ♀♀	Banyuls-sur-Mer, July 1969 ; ZMH unregistered
3 specimens	Ile de Gorée, Senegal, 21/9/1950 ; MNHN 63-210, 63-211, 61-970 (holotype and paratypes of *T. delaisi)*

For comparative purpose this material is split into four groups : 1) Senegal, 2) Atlantic Islands, 3) French Atlantic coast, 4) Mediterranean sea. The specimens of *T. tripteronotus* (Risso, 1810) mentioned in the text are those described by Zander and Heymer (1970).

Morphology

Figure 1 shows the mean value ($\bar{x}$), standard deviation (s), and range of the vertical fin ray counts (D-2, D-3,A), of the longitudinal scale count (L1), and of the

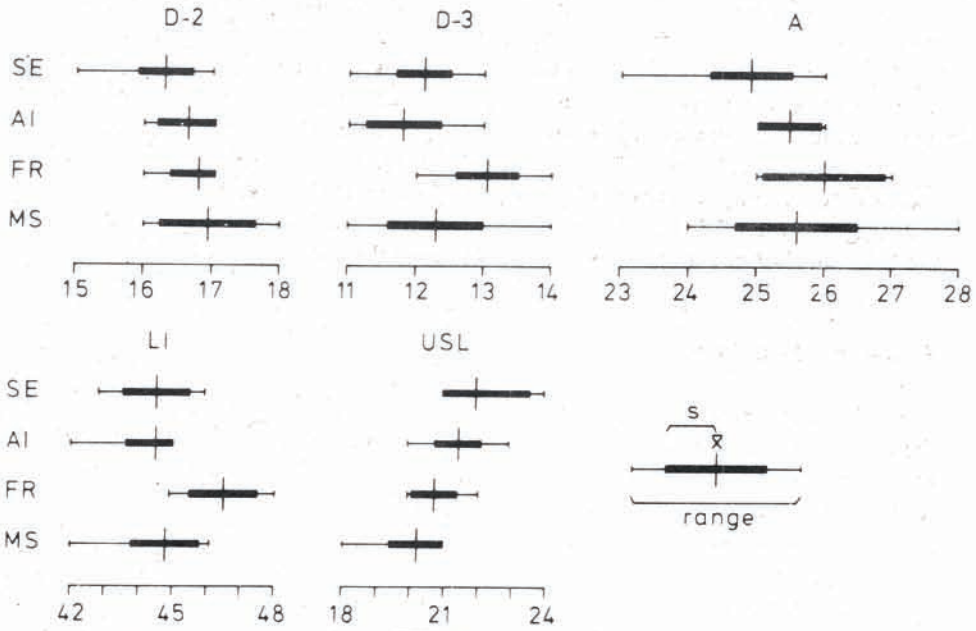

fig. 1.– *Tripterygion delaisi* : Mean value ($\bar{x}$), standard deviation (s), and range of fin ray counts (second and third dorsal fin, anal fin), of the longitudinal scale count (L1) and of the scale count for the upper section of the lateral line (USL). SE : Senegal, AI : Atlantic Islands, FR : French atlantic coast, MS : Mediterranean Sea.

scale count for the upper section of the lateral line (USL). In the Atlantic, the number of fin rays of the second dorsal fin and of the anal fin increases from south to north. Such a correlation of vertical fin ray count and distance from the equator is frequently found in fish (Barlow, 1961). The fin ray counts for the third dorsal fin and the longitudinal scale count do not conform to this pattern. The scale count for the upper section of the lateral line decreases from north to south.

Maximum size recorded is 89 mm total length for a male from Roscoff. The largest specimen known from the Mediterranean sea is only 78 mm long (Rovinj). Possibly, the lower mean annual temperature at northern latitudes delays sexual maturation and increases the period of fast growth. At the French mediterranean coast, the males are sexually mature after one year of life (Wirtz, 1978) ; no comparative observations are available for north-eastern Atlantic populations.

The cephalic pores of the lateral line system vary as shown in figure 2. According to Wheeler and Dunne (1975), one of the features distinguishing *T. atlanticus* from *T. xanthosoma* is an uninterrupted preopercular series of cephalic pores. All the Atlantic material has an uninterrupted series of cephalic pores. A critical revision of mediterranean specimens showed that nearly all of these, too, have an uninterrupted series ; only a few animals have the interrupted series shown by Zander and Heymer (1970, fig. 2).

Animals were observed and collected during the reproductive season at Ile de Gorée, Tenerife, Roscoff, and the coasts of the Mediterranean sea (cf. Zander and Heymer, 1970 ; Wirtz, 1978). At all these locations, the body of males occupying a territory was coloured brightly yellow, their head was black. Zander and Heymer (1976, fig. 1) give a drawing showing the extent of the black colour. Some specimens from Senegal and from the Atlantic islands show a pattern similar to the one of *T. tripteronotus* : the ventral fins including their tips and the body area between the short arms of the ventral fins are black. Other specimens from the same locations and the specimens from the other locations show the pattern typical for "*T. xanthosoma*". The colour pattern of females and of non-territorial males is identical to the one described by Zander & Heymer (1970, fig. 7) and by Wirtz (1976, plate 1c , 1978, fig. 2) : they are greybrown with five broad dark bands on the body, the last of which forms an extension onto the caudal peduncle.

Ecology and Behaviour

At all locations studied, the fish inhabited the rocky sublittoral. In contrast to the mediterranean population, animals from the Atlantic were not restricted to the zone receiving 1-10 % of the incoming light ("Reflexlicht zone", Riedl, 1966). Atlantic *Tripterygion* were frequently found in the zone receiving 10-100 % of the incoming light ("Oberlichtzone", Riedl, 1966) ; males established territories in open sunlight and as high up as the low water spring tide level.

A detailed description of the behaviour of the mediterranean *Tripterygion* is given by Wirtz (1978). This paper also contains some remarks on the behaviour of the *Tripterygion* at Gorée. In contrast to the mediterranean population ("*T. xan-*

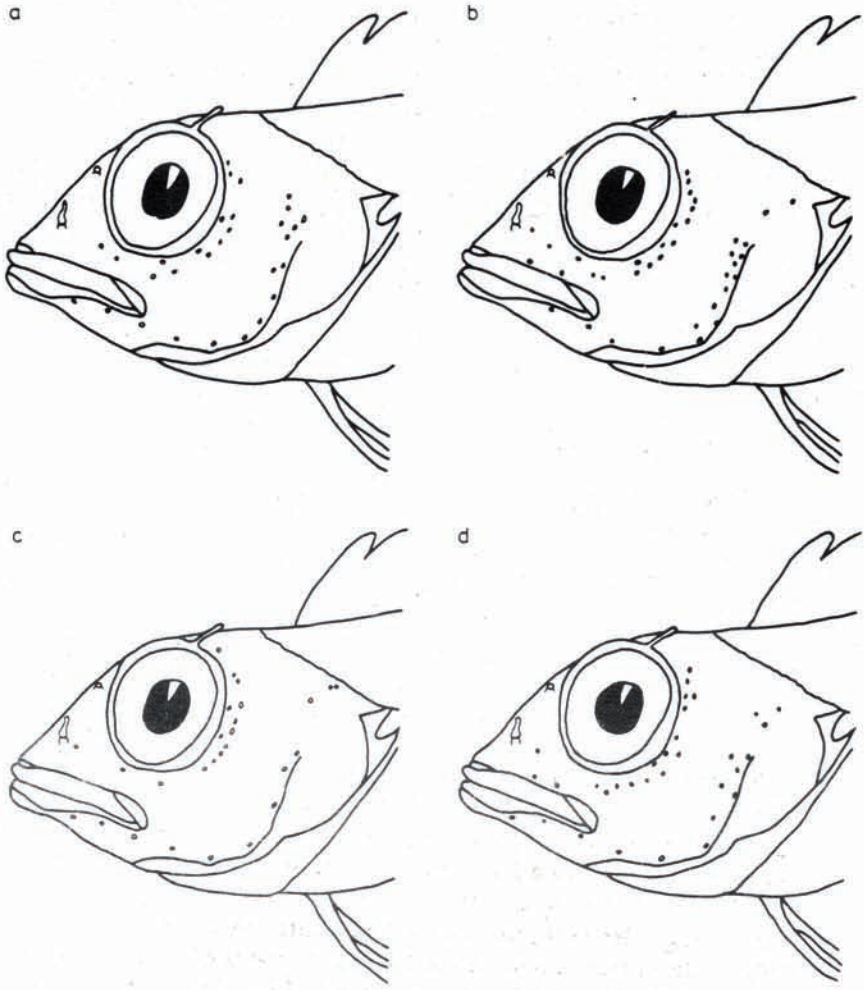

Fig. 2.– Variation in the cephalic pore system of *T. delaisi*. a : Gorée, b : Teneriffa, c : Nantes, d . Roscoff.

thosoma" in Wirtz, 1978), the courtship behaviour of the males at Gorée is not rigidly ritualized to "figure-8-swimming" along the substrate ; males at Gorée courting passing females swim loops of variable shape along the substrate and up into the watercolumn (Wirtz, 1978 fig. 11 b & e).

Discussion

There is no single trait by which it would be possible to tell apart specimens collected at any two of the locations studied. The differences between specimens

from different locations are marginal and are only apparent in a statistical comparison of larger samples. All specimens therefore belong to the same species.

The variation in the fin ray numbers in the second dorsal fin and in the scale count of the lateral line could indicate that the mediterranean population is the endpoint of a cline starting at the Westafrican coast.

The Westafrican population seems to be less specialized than the mediterranean one in three aspects. The extent of the black colour on the head of territorial males is more variable, the courtship behaviour is more variable and a wider range of habitats is occupied. All three apparent restrictions of the species' variability in the mediterranean sea could be due to the presence of closely related species, i.e. they could represent a case of character displacement. The specialization in reproductive colour and courtship behaviour may serve sexual isolation against *T. tripteronotus* and *T. melanurus*. The wide range of habitats of the Atlantic population, which tolerates nearly all light regimes, could be restricted in the mediterranean sea by the competition of *T. tripteronotus* in the zone receiving more than 10 % of the incoming light and *T. melanurus* in the zone receiving less than 1 % of the incoming light. Possibly, the realized niche has by now become the fundamental, genetically fixed niche of the mediterranean population (Zander and Heymer, 1977).

Three different names have in the past been proposed for specimens from different locations : *T. atlanticus* Wheeler and Dunne 1975 (north-eastern Atlantic), *T. delaisi* Cadenat and Blache 1970 (Senegal), and *T. xanthosoma* Zander and Heymer 1971 (Mediterranean sea). Of these names, *T. delaisi* has priority. The issue of *Bull. Mus. natn. Hist. nat. (Paris)* containing the description of *T. delaisi* appeared in June 1970, whereas the issue of *Vie et Milieu* containing the description of *T. xanthosoma* did not appear until July 1971.

In addition to the locations already mentioned, *T. delaisi* has also been found along the coasts of Portugal (Almeida and Gomes, 1978) and in the Gulf of Gascogne, France (Loir 1978, Quéro *et al.*, 1979). *T. tripteronotus*, however, cannot be confirmed from any location outside the Mediterranean Sea and Black Sea. All records of *"T. tripteronotus"* from Atlantic localities (Lowe 1837, Alaejos 1923, Buen 1932, Fowler 1936, Noronha and Sarmento 1948, Maul 1949, Albuquerque 1954) are dated from a time before the specific status of *T. delaisi* was recognized and do in fact give meristic data typical for *T. delaisi*. In the Atlantic, the range of *T. delaisi*, therefore, extends from Senegal to the English Channel. No other species of the family Tripterygiidae has so far been found in the eastern Atlantic.

Zander and Heymer (1971, 1976) and Wirtz (1978) have speculated on the evolution of the eastern Atlantic and mediterranean Tripterygiidae. Taking into account the present findings, it seems most likely that a primary westafrican *Tripterygion* invaded the Mediterranean sea several times. Fluctuations in the sea level (Hsü *et al.* 1973, Hsü 1974) closed the mediterranean population from genetic inflow for variable times and probably even separated the mediterranean population into an eastern and western half - thereby making possible a genetic divergence of the mediterranean stock from the westafrican one and subspecification of the first group of invaders within the Mediterranean sea. The first group of invaders accordingly evolved to *T. melanurus* (with the subspecies *melanurus* in the eastern and the

subspecies *minor* in the western half of the Mediterranean sea), the second one to *T. tripteronotus*, and the third one (possibly still entering from the eastern Atlantic) to the mediterranean population of *T. delaisi*.

Arambourg (1927) described a fossil species, *Tripterygion pronasus* from the Miocene of Oran. Counts by Zander and Heymer (pers. com.) of the type, which is deposited at the Museum National d'Histoire Naturelle Paris, are III-XVI-13 for the dorsal fins and II-24 for the anal fin (III-XVI-11 and I-21 according to Arambourg 1927). If my hypotheses concerning the evolution of the genus *Tripterygion* are correct, *T. pronasus* would be the primary westafrican *Tripterygion* postulated in the preceding paragraph. At the time *T. pronasus* was fossilized, the other species of the genus *Tripterygion* would not yet have existed.

Together with two earlier publications (Zander and Heymer 1970, 1976), this paper forms a revision of the genus *Tripterygion*. In his revision of the family Tripterygiidae, Rosenblatt (1959) listed six nominal species in the genus *Tripterygion*. Four of these have since been shown to be synonyms, three more have been described, but only one of the additional names is still valid. Table I gives a list of the nominal species of the genus *Tripterygion* and their current identification. Only three species are now recognized in the genus : *Tripterygion tripteronotus* (Risso, 1810), *T. melanurus* Guichenot, 1850 (with the subspecies *melanurus* Guichenot, 1850 and *minor* Kolombatović 1892), and *T. delaisi* Cadenat & Blache 1970.

Tabl. I List of nominal species of the genus *Tripterygion* (not including numerous names wrongly assigned to this genus).

SPECIES	PRESENT INDENTIFICATION
Blennius tripteronotus Risso, 1810	*T. tripteronotus* (Risso, 1810)
Tripterygion atlanticus Wheeler & Dunne, 1975	*T. delaisi* Cadenat & Blache 1970
Tripterygion delaisi Cadenat & Blache 1970	*T. delaisi* Cadenat & Blache 1970
Tripterygion melaenocephalum Cocco, 1829	*T. tripteronotus* (Risso, 1810)
Tripterygion melanurum Carus, 1893	*T. melanurus* Guichenot, 1850
Tripterygion melanurus Guichenot, 1850	*T. melanurus* Guichenot, 1850
Tripterygion minor Kolombatovic, 1904	*T. melanurus* Guichenot, 1850
Tripterygion nasus Risso, 1826	*T. tripteronotus* (Risso, 1810)
Tripterygion tripteronotus (Risso, 1810)	*T. tripteronotus* (Risso, 1810)
Tripterygion xanthosoma Zander & Heymer, 1970	*T. delaisi* Cadenat & Blache, 1970
Tripterygium nikolskii Maksimov, 1909	*T. tripteronotus* (Risso, 1810)

Family BLENNIIDAE

Lipophrys velifer (Norman, 1935) : fig. 6
Synonyms : *Blennius velifer* Norman, 1935 ; *Blennius elongatus* Cadenat, 1950.

Material :
approximately 200 specimens from Senegal and 100 specimens from the Cape Verde Islands ; IFAN (coll. et det. J. Cadenat).10 specimens, Ile de Gorée, 2/77 ; ZMH 5963, 4 specimens, Ile de Gorée, 2/77 ; ZSM 25370.

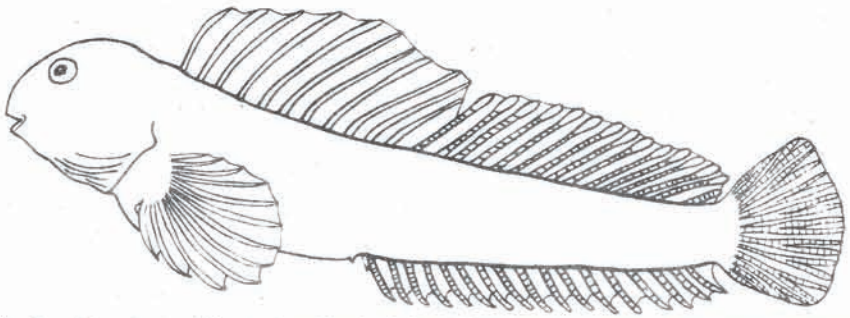

Fig. 3.– *Lipophrys velifer*, male with glandular thickening of the tips of the second dorsal fin (drawn after a photograph).

Morphology

The largest individual encountered was a male of 5.7 cm total length. The description given by Penrith and Penrith (1972) for animals from Angola fits the specimens from Senegal except in one point. The lips are not "thick" (Penrith and Penrith 1972, p. 75) ; they are, on the contrary, thin and the fold of the upper lip is much reduced. In males caught in February/March the tips of the soft dorsal rays are thickened with glandular tissue (cf. fig. 3). In adult males, the spinous dorsal fin is twice as high as the soft dorsal fin ; in females and juveniles they are of the same height.

Live colouration of males observed at Gorée is olive green with small redbrown and yellow spots and stripes. There are many small red spots on the head. The large eyespot behind the eye is dark green with a light blue margin. The membrane of the first dorsal fin is light green with small redbrown stripes and a brilliant white margin. Females differ from males in having a much darker body and transparent membranes of both dorsal fins.

Ecology and Behaviour

The species inhabits the rocky intertidal zone of sheltered and exposed shores (cf. fig. 4). Males occupy tightly fitting bore holes in the rocks, which they enter headfirst or tailfirst. Females were never seen in such holes except when spawning.

The population at Gorée was spawning during all the observation period. Upon entering the hole or when courting a female outside the hole, the male changes its colour : the head turns black excepting four conspicuous brightly yellow stripes (fig. 5) and the speckled green of the body turns into a drab uniform brown. If a female approaches a male occupying a hole, the male comes out, swims towards the female, and performes "Circle Jump", i.e. it rapidly swims a full circle around the female at a distance of about one body length, the whole circle taking less than a second. The male may repeat the circle jump several times or may swim back to its hole, enter it, and perform "Nodding", i.e. repeatedly raise and lower the head. One nodding bout consists of three to four nods and lasts for three to four seconds. The

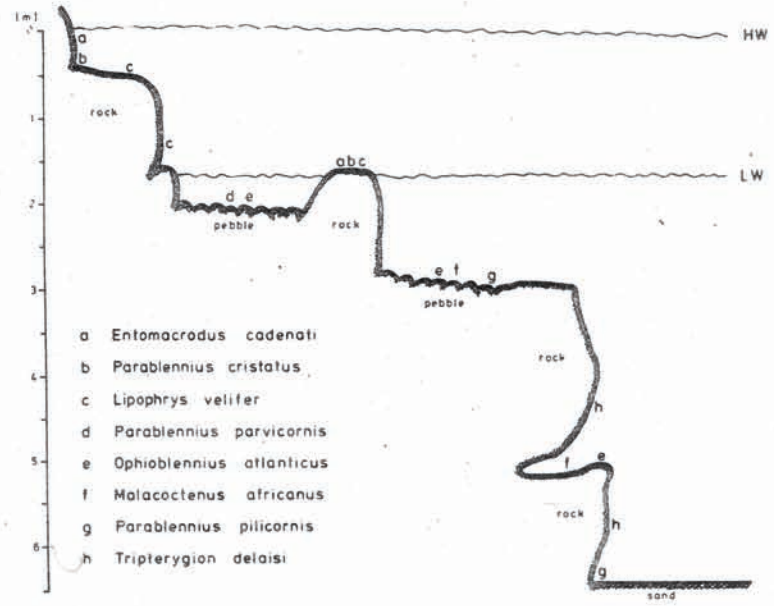

Fig. 4.– Vertical distribution of some blennioid fish along a transect at the Ile de Gorée. HW : high water level, LW : low water level.

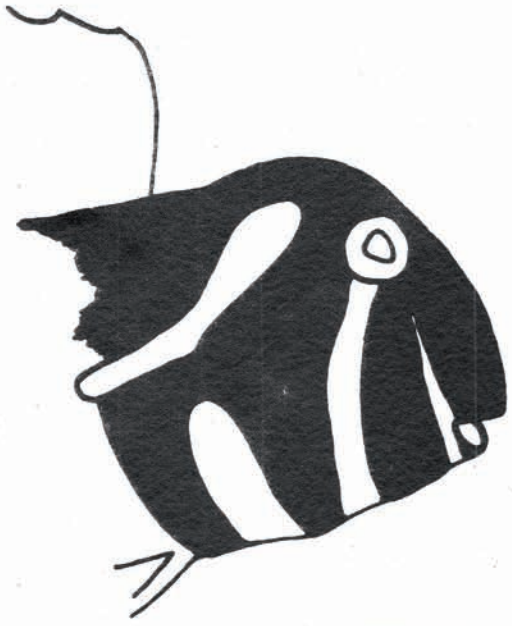

Fig. 5.– Head of a courting *Lipophrys velifer* male.

female either ignores the male or enters the hole and presumably spawns there. The male sometimes performs circle jump around a hole containing a female. After the female leaves, the male continues to court and to attract passing females. It is not known whether females can spawn repeatedly during the reproductive season, as is the case in many, if not all, Blenniidae (Wirtz 1977, in prep.). If another male approaches a male occupying a hole, the resident performs nodding, but never circle jump.

Outside the holes, males and females peacefully nibble at the substrate as close together as one body length. Only rarely two males threaten each other with dorsal fins fully spread and the head raised, sometimes performing slow tailbeats.

Discussion

Sexual dimorphism in colour, glandular thickening of fin tips, and even in the height of the dorsal fin may be restricted to the spawning season (cf. Heymer and Zander, 1976 ; Zander, 1975). Some of the differences between males and females described could therefore be absent outside the spawning season.

In his synopsis of the genera of the family Blenniidae, Norman (1943) united the following species in the subgenus *Lipophrys* : *adriaticus* Steindachner, 1883, *canevae* Vinciguerra, 1880, *dalmatinus* Steindachner, 1883, *nigriceps* Vinciguerra, 1883, *pholis* Linnaeus, 1758, *trigloides* Cuvier & Valenciennes 1836, and *velifer* Norman 1935 (the three other names he included have since been shown to be synonyms . cf. Bath, 1977). Revising the tribe *Blennini,* Bath (1977) raised *Lipophrys* to generic level, but split off *trigloides* into a separate genus *Paralipophrys.* Zander (1978) has argued that the criteria used by Bath (1977) to separate these two genera are not useful on a generic level. He therefore included *trigloides* again into the genus *Lipophrys.*

Both Bath (1977) and Zander (1978) used morphological and anatomical criteria. The observations described above give two specialized ethological criteria in addition, namely Circle Jump and the yellow colouring of the cheeks of courting males. Wirtz (1978 and unpublished) has observed the courtship behaviour of 9 mediterranean blenniids (*adriaticus*, *canevae*, *dalmatinus*, *nigriceps*, *rouxi*, *sanguinolentus*, *sphynx*, *tentacularis*, *zvonimiri*). Of these, only *adriaticus*, *canevae* and *dalmatinus* perform Circle Jump. Of all eastern Atlantic and mediterranean blenniids, apparently only the males of *adriaticus*, *canevae*, *dalmatinus*, *nigriceps*, and *velifer* show yellow cheeks when courting. This indicates that these species are more closely related to each other than to any other atlanto-mediterranean blenniid. *Lipophrys velifer* is more specialized than the other four species in at least two characters, the elongation of the lower canines (cf. Penrith and Penrith, 1972) and the increase of the height of the dorsal fin.

Lipophrys trigloides (Val., 1836)

Synonyms : *Blennius trigloides* Val., 1836 ; *Paralipophrys trigloides* (Val., 1836)

Material :
1 specimen from Mauretania ; IFAN 53.1938
6 specimens, Ile de Gorée . IFAN 62.173
1 specimen, Ile de Gorée, 2/77 ; PW 305

Lipophrys trigloides inhabits the Mediterranean sea and the Marmara Sea ; in the eastern Atlantic, it is reported northwards to the mouth of the river Gironde (Bath, 1973), southwards to Madeira and the Canary Islands (Fowler, 1936). The occurence of *Lipophrys trigloides* at the Ile de Gorée extends the range of the species 2000 km southwards.

Lipophrys trigloides is not mentioned in the key to the westafrican marine fish by Blache *et al.* (1970). Having no supraorbital tentacles, it would key out as *Lipophrys velifer (Blennius velifer)*, from which it is. however, easily distinguished by having a groove between the eyes (whereas *L. velifer* has a crest), 13 pectoral rays (12 in *L. velifer*). and the first dorsal fin lower than the second one (at least as high as the second one in *L. velifer*). For a photograph of *L. trigloides* see Wirtz (1976, plate 2a).

Blennius normani Poll 1949

Material :
1 ♀ , Senegal ; IFAN 53.1051
1 ♂ , Ivory coast ; IFAN 63.6
1 ♀ , Ivory coast ; IFAN 58.390
1 ♂ , Gambia, IFAN 55.1583

Poll (1949) described *Blennius normani* on the basis of three specimens caught south of the mouth of the river Congo. He differentiated the species from the very similar *Blennius ocellaris* Linnaeus, 1758 by the shape of the supra-orbital tentacles (simple, long round filaments in *Blennius normani*, broad and bearing lap-like fringes at the rear in *B. ocellaris)* and the absence of small skin flaps at the height of the eye below the first spine of the dorsal fin (present in *B. ocellaris)*. Roux (1957) described one additional specimen from Pointe Noire (Congo), Bauchot (1966) three additional specimens from Nigeria. Cadenat (1960) mentions finding *B. normani* along Ghana and Sierra Leone coasts. The specimens at the collection of the IFAN extend the range of the species 1200 km northwards.

Some of the IFAN specimens seem to have an intermediate expression of the characters used to distinguish *B. ocellaris* and *B. normani.* The supraorbital tentacles of the female from the Ivory Coast do not have a round cross-section, but a distinctly ellipsoid one : if the rear edge of the tentacle was corrugated, it would closely resemble an *"ocellaris"* tentacle. The male from the Ivory Coast does have a skin flap below the dorsal fin on the left side, but not on the right one. The male from Gambia has a skin flap below the dorsal fin on both sides.

B. ocellaris is known from the north-eastern Atlantic (cf. Wheeler 1969) and the Mediterranean sea (cf. Zander, 1972). The collection of the IFAN contains a typical *ocellaris* specimen from Casablanca, Morocco, (Cat. no. 52.35), which

apparently is the southernmost record of the species. This specimen was bought at the fish market, but it seems unlikely that it was brought there all the way from the Mediterranean sea.

The three intermediate specimens could indicate that *B. normani* and *B. ocellaris* interbreed in the area of Senegambia and the Ivory Coast. In this case, *B. normani* should be considered a subspecies of *B. ocellaris*. A larger series of specimens from the suggested area of interbreeding would be necessary to clarify the status of *B. normani*.

Concerning *B. ocellaris* and *B. normani*, Wirtz (1976), Bath (1977), and Zander (1978) give the same incorrect information. It is true that the branchiostegal membrane may form a small fold across the isthmus, but it is connected to the isthmus, i.e. not free of the isthmus as in species of, for instance, *Lipophrys* and *Parablennius*. *Blennius ocellaris* and *B. normani* key to *Hypleurochilus* in the keys given by Wirtz (1976) and Bath (1977).

The four IFAN specimens of *B. normani* were dredged from a depth of 30 to 100 m, i.e. at the same depth at which *B. ocellaris* is found.

Hypleurochilus langi (Fowler, 1923) : fig. 7
Synonym : *Blennius langi* Fowler, 1923

Material :

3 ♂♂	Mouth of the river Casamance (Senegal) ; IFAN 50.112123
2 ♂♂, 1 ♀	Canal de Vridi (Ivory Coast) ; IFAN 63.3-5
1 ♂, 3 ♀♀	Joal (Senegal) ; IFAN uncat.
5 ♂♂, 6 ♀♀	Mouth of the river Niger ; ZMH 4177
1 ♂	No data ; MNHN 84.25
4 ♀♀	Pointe Kounda - littoral nord du Congo, January 1964 ; MNHN 1966.39

Morphology

Fowler's (1923) original description was based on a single specimen. Since then, only two additional specimens have been reported (Poll 1959, Bath 1977). The ten specimens at the collection of the IFAN, the eleven specimens at the Zoological Museum Hamburg, and the five specimens at the Museum d'Histoire Naturelle, Paris, give a broader basis for the description of this species.

The qualitative description given by Fowler (1923) applies to these specimens as well. The length of the supraorbital tentacles varies from approximately two thirds of the eye diameter to two times the eye diameter. The longest tentacles occur in male specimens. The shape of the supraorbital tentacles varies from a single finger-like appendage bearing two to four small filaments at the rear base to four "fingers" of almost equal length. The anterior nostrils form a small tube, which bears up to four cirri on the posterior rim (only one in most cases). There is only one ring of cephalic sensory pores in the infraorbital and the preopercular series. The lateral line does not reach farther than the level of the 8th to 10th spine of the first dorsal fin. Both males and females bear a thin crest on the head, but the crest in females is not as high as in males. The last spine of the first dorsal

fin is shorter than the height of the fin membrane. The size, sex, and finray count of each specimen known is given in table II. Colour in alcohol is a uniform light brown ; some specimens have a dark spot on the membrane between the first and the third dorsal spine. Blache *et al.* (1970, p 359, fig. 917a) give an accurate drawing of this species.

Ecology

The known range of the species is from northern Senegal to the mouth of the Congo. The specimens from Joal have been collected "dans des paquets de palétuviers", i.e. between mangrove roots. Sixteen of the 29 specimens have been collected at the mouth of large rivers, i.e. presumably in hyposaline water. In contrast to this, Blanc *et al.* (1968) found *H. langi* "dans l'eau très salée et très chaude". *H. langi* apparently is a euryhaline species.

Tabl. II : Size, sex, and fin ray counts of the 29 known specimens of *Hypleurochilus langi.*

TOTAL LENGTH mm	SEX	D	A	P	V	Locality	Reference
83	♂	XII:16	II:17	14	3	Congo	Fowler 1923
56	♂	XII:16	II:17	15	I:2	Banana	Poll 1959
?	?	XII:15	II:17	14	I:4	W-Africa	Bath 1977
59	♂	XII:16	II:18	14	1:4	Casamance	
56	♂	XII:16	II:18	14	1:4	"	
51	♂	XII:16	II:17	14	I:4	"	
41	♂	XII:16	II:19	14	I:4	Ivory Coast	
33	♂	XII:15	II:17	14	I:4	"	
29	♀	XII:15	II:17	14	I:4	"	
35	♀	XII:17	II:18	14	I:4	Joal	
29	♂	XII:16	II:17	14	I:4	"	
38	♀	XII:15	II:17	14	I:4	"	
29	♀	XII:16	II:18	14	I:4	"	
65	♂	XII:15	II:17	14	I:4	Niger	
69	♂	XII:15	II:17	14	I:4	"	
72	♂	XII:15	II:18	14	I:4	"	
53	♀	XII:16	II:17	14	I:4	"	
49	♀	XII:15	II:17	14	I:4	"	
58	♂	XII:15	II:17	14	I:4	"	
47	♂	XII:14	II:16	14	I:4	"	
49	♀	XII:15	II:17	14	I:4	"	
48	♀	XII:14	II:17	14	I:4	"	
43	♀	XII:15	II:16	14	I:4	"	
43	♀	XII:15	II:17	14	I:4	"	
58	?	XII:15	II:17	14	I:4	?	
43	?	XII:15	II:16	14	I:4	Congo	
35	?	XII:15	II:17	14	I:4	"	
36	?	XII:16	II:17	14	I:4	"	
36	?	XII:15	II:16	14	I:4	"	

Family CLINIDAE

Malacoctenus africanus Cadenat, 1950, fig. 8

Material :
4♂♂,8♀♀, 1 unsexed, Ile de Gorée and Ile N'Gor, Senegal ; USNM 216971
1 unsexed Ile de Gorée ; PW 314
1 unsexed Dakar ; UZMK P 76992

The species was described by Cadenat (1950) with two sentences. He did not give the number of fin rays or any other quantitative data, but he did give a simple drawing (fig. 211). Since then, only a single specimen has been described. On the basis of 14 specimens the species is redescribed.

Morphology

The size, sex, finray count, number of symphysial pores, and number of tubular lateral line scales of the known specimens are given in table III. There is only a single row of large teeth without small teeth behind them. The length of the shortest ventral ray is more than half the length of the longest ventral ray. Scales present on prepectoral area ; these scales are reduced in size. The preopercular canals do not extend onto the opercle. Free tips of cirri on one orbit 1-6 (4.30 ± 1.02), on one side of nape 5-9 (6.60 ± 1.16), on one anterior nostril 1-3 (1.73 ± 0,52). Total free tips of cirri on one side of the head 8-16 (12.63 ± 1.73). Vertebrae 10 + 26. Maximum length (according to original description) 73.5 mm.

There are six lightbrown to darkbrown bands on the body, which extend onto the dorsal fin. The colour of the interspaces varies to accord with the bottom the fish is resting on ; it changes from redbrown on red algae to light green on green algae and grey on rocks covered with barnacles and calcareous algae.

Ecology and Behaviour

Malacoctenus africanus was found on rocky shores sub littorally from low tide level down to at least 5 m below low tide level (cf. fig. 4). At present, the species is only known from the islands Ile de Gorée and Ile N'Gor near Dakar.

Whenever the fish was seen, it was found to rest on the bottom. This is in contrast to the behaviour of *Labrisomus nuchipinnis* (the second clinid in the area), which frequently is seen swimming over the substrate. Whereas the mediterranean clinid *Clinitrachus argentatus* and several species of the genera *Paraclinus* and *Cristiceps* use their ventral fins to "walk" over the substrate (depicted and reviewed by Wirtz and Kacher 1977), *M. africanus* and *L. nuchipinnis* were only seen resting or swimming, never "walking". In February-March the population was not spawning.

Tabl. III : Meristic characters of *Malacoctenus africanus* specimens.

STANDARD LENGTH mm	SEX	D	A	P	V	SYMPHYSIAL PORES	LATERAL LINE SCALES	REFERENCE
?	?	XX:10	-	-	-	-	-	Cadenat 1950 fig. 211
?	?	XIX:11	(21)	13	-	-	-	Blache et al. 1970, fig.915
32,3	♂	XX:10	II:19	14	I:3	2	60	UZMK P76932
60,0	?	XXI:10	II:19	14	I:3	1	-	PW 314
50,0	♂	XX:10	II:19	14	I:3	2	59	USNM 216971
53,4	♀	XX:10	II:19	14	I:3	2	57	"
45,6	♂	XX:10	II:19	14-13	I:3	2	56	"
40,7	♀	XX:10	II:19	14	I:3	2	-	"
54,1	♀	XX:10	II:19	14	I:3	2	59	"
47,4	♂	XX:10	II:19	14	I:3	2	57	"
50,6	♀	XX:11	II:20	14	I:3	1	58	"
44,1	♀	XX:11	II:19	14	I:3	2	58	"
53,6	♀	XX:10	II:19	14	I:3	2	-	"
57,1	♂	XX:10	II:19	14	1:3	2	-	"
44,1	♀	XX:11	II:19	-	I:3	2	56	"
62,2	♀	XX:10	II:19	-	1:3	2	59	"
57,4	?	XX:11	II:20	-	1:3	1	55	"

Discussion

Having only a single specimen of *Malacoctenus africanus*, Springer (1958) indicated that more material could show this species to be conspecific with the western Atlantic *M. versicolor*. The new material described here confirms the specific status of *M. africanus*. It differs from *M. versicolor* in number of dorsal fin rays (XIX-XXI:10-11, usually XX:10 in the former, and XVIII-XIX:11-12, usually XVII.12 in the latter) and in the nature of the preopercular pores (never extending onto the opercle in the former, extending onto the opercle in the latter).

Springer and Gomon (1975) presented a key to the Atlantic *Malacoctenus*. Only one species, *M. africanus* is found in the eastern Atlantic. The new material increases the range of several characters and thus a slight difficulty may be encountered in separating *M. africanus* and *M. triangulatus* in Springer and Gomon's (1975) key. The species can be separated as follows :

A. The dark bands on the body extend well onto the dorsal fin ; no dark blotch on the nape at the origin of the dorsal fin ; segmented dorsal fin ray count usually 10, rarely 11 ; preopercular canals do not extend onto the operculum ; prepectoral area scaled . . . . . *Malacoctenus africanus* Cadenat, 1950

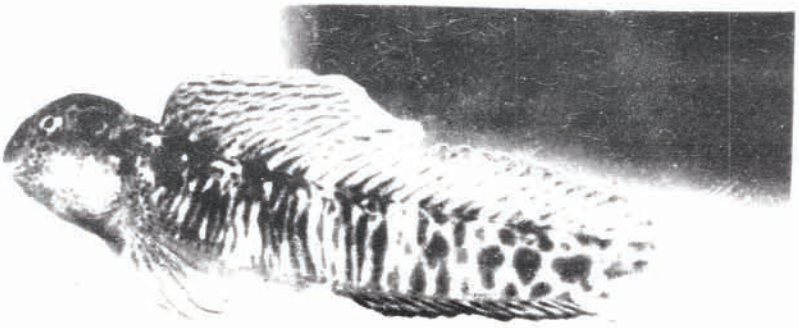

fig. 6.– *Lipophrys velifer*

fig. 7.– *Hypleurochilus langi*

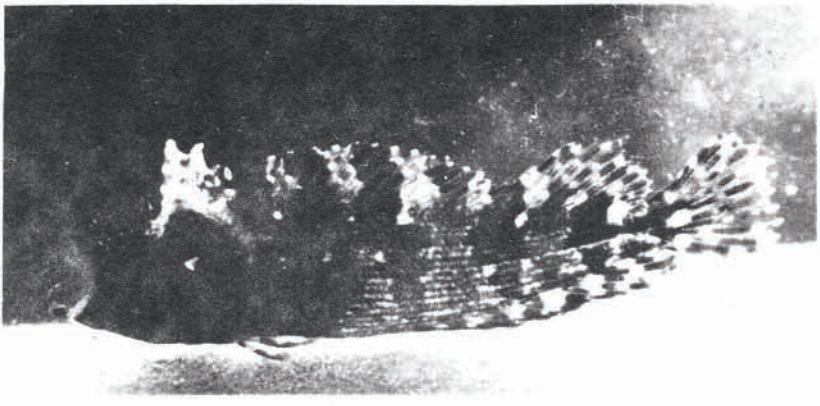

fig. 8.– *Malacoctenus africanus*

AA. The dark bands on the body barely enter (if at all) the dorsal fin ; frequently a dark blotch on the nape at the origin of the dorsal fin ; segmented dorsal fin ray count usually 11 to 13, rarely 10 ; preopercular canals with one or two branches extending onto operculum ; prepectoral area with or without scales . . . . . *Malacoctenus triangulatus* Springer, 1958

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