

# LITTORAL FISHES OF THE AZORES: AN ANNOTATED CHECKLIST OF FISHES OBSERVED DURING THE "EXPEDITION AZORES 1989".

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## ARQUIPÉLAGO



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An annotated list of 63 species of fishes belonging to 33 families found in the Azores during the "Expedition Azores 1989" is presented. Two species new to the Azores are cited: *Kyphosus incisor* and *Pomatoschistus pictus*.

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Neste artigo apresentamos uma lista de 63 espécies, pertencentes a 33 famílias, e que foram observadas durante os trabalhos da Expedição Açores 1989. Duas das espécies são pela primeira vez referidas para os Açores: *Kyphosus incisor* e *Pomatoschistus pictus*.

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## INTRODUCTION

Previous lists of fishes from the Azores are old (HILGENDORF 1888; COLLETT 1897; REGAN 1903; COLLINS 1954), or in reports of limited circulation (ANON 1972; SALDANHA 1979). Recent publications are either restricted to habitats (e.g. intertidal pools: ARRUDA 1979, 1980 or shallow sandy beaches: NASH & al. 1992) or to one family (e.g. ALMEIDA & HARMELIN-VIVIEN 1983). In contrast the biology and fisheries of some species have been studied in detail (see MARTINS 1990).

The Azores and surrounding Atlantic waters have recently been included in the FISHES OF NORTH-ATLANTIC AND THE MEDITERRANEAN (WHITEHEAD & al. 1984/86). This reference will hereafter be referred to as FNAM. However, the publication is misleading as several, even some very common species, are not given as being present in the Azores.

The present paper gives an account of the fishes reported in the littoral of the Azores during

the "Expedition Azores 1989" and gives the most complete recent list for littoral species. The expedition took place over the months of June and July on the islands of Pico and Faial. Details about the expedition can be found in MARTINS & al. (1992). During the Expedition special attention was paid to selected families of benthic fish because of the interests of the authors and the lack of reliable information concerning these families in the Azores; i.e. Blenniidae, Gobiidae, Tripterygiidae and Gobiesocidae. The distribution and abundance of the 14 most common fish species of the rocky littoral zone at Monte da Guia, Faial, is given by PATZNER & SANTOS (in press).

## METHODS

Fish were observed at a variety of locations around the islands of Faial and Pico (Fig. 1). In an effort to standardise the data the following information and abbreviations are given for each species within the list:

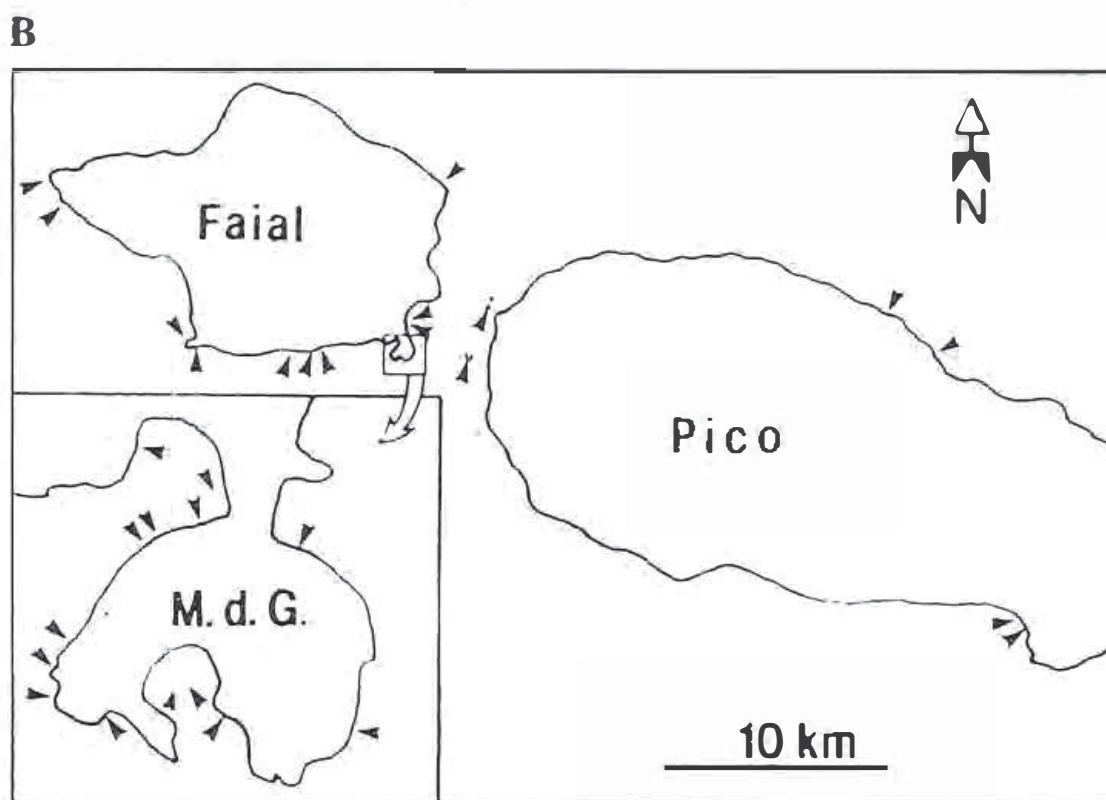
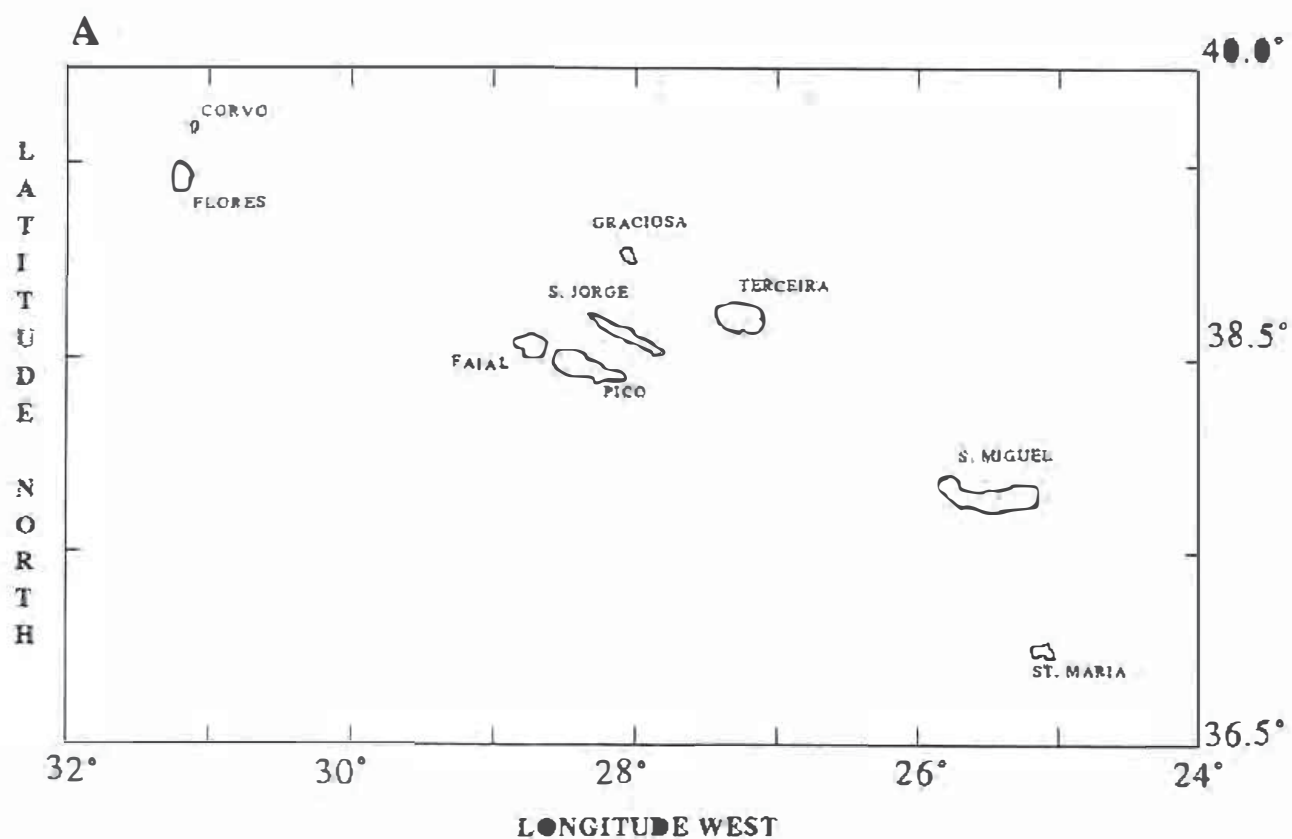


Fig. 1 - The Azores (A) and main locations on the Islands of Faial and Pico where observations were made - M.d.G.: Monte da Guia - (B).

Identification of the fishes follows FNAM (WHITEHEAD & al. 1984/86) and the Clotnam (Check List of North-Atlantic and Mediterranean: HUREAU & MONOD 1979) number is indicated. In general, individuals were collected (see below) and identified in the laboratory. However, some species, especially for the purposes of determining abundance were identified in the field. This was only done when there was no doubt as to the species identification. Reference is made to whether the species in question is recorded for the Azores in FNAM.

The following categories are used in the results to qualify the observations:

1. Coll.: Collected and preserved fish. Collection during the expedition was done by (a) hand nets, (b) hand nets plus the anaesthetic Quinaldine (GIBSON, 1967), (c) seine netting (NASH & al. 1992), (d) traps baited with sardines and/or squid, (e) rod and line and (f) spear fishing. All specimens collected have been deposited in the collection of the "Departamento de Oceanografia e Pescas" (DOP) (University of the Azores at Horta, Faial). A few species were donated to The Natural History Museum, London, and to the "Naturhistorisches Museum" at Vienna, Austria.

2. Phot.: Photographed fish. Several fishes were photographed in the field by one of us (RAP). Additional photographs were taken of captured fish in an aquarium. Copies of all photographs were deposited at the DOP. Second copies of R.A. Patzner's photographs were deposited at the Zoological Institute of the University of Salzburg, Austria.

3. Abundance: The relative abundance of fishes observed was evaluated in the field using the methods of HARMELIN-VIVIEN & HARMELIN (1975). This category is also restricted to the observations made during the Expedition.

The following arbitrary groupings were used:

- I- only one specimen found during the Expedition
- II- rare, single specimens
- III- not common
- IV- common
- V- very common

4. Occurrence: Information on the habitat type is provided along with notes on the observed

depth range of the fish species. In general, most observations were made between 0 and 20 m therefore there is the possibility of a greater depth for some species.

## RESULTS: LIST OF FISHES

The following species of fish were collected (Coll.), photographed (Phot.) or could be visually identified in the field:

### SELACHII (CHONDRICTHYES)

#### PLEUROTREMATA

##### NOTIDANOIDEI

##### Fam. Triakidae

1. *Galeorhinus galeus* (L., 1758) (Clotnam 13.3.1; not listed for the Azores in FNAM). Phot. Abundance: I. Occurrence: Only one specimen, caught with a spear gun. Swimming in midwater at a depth of approximately 5 m, near Capelinhos, Faial.

#### HYPOTREMATA

##### MYLIOBATOIDEI

##### Fam. Dasyatidae

2. *Dasyatis pastinaca* (L., 1758) (Clotnam 22.1.1). Coll. Phot. Abundance: III. Occurrence: Lives on sandy bottoms; depth range 0.5 to 20 m.

##### Fam. Myliobatidae

3. *Myliobatis aquila* (L., 1758) (Clotnam 23.1.1). Phot. Abundance: I. Occurrence: Seen only once, swimming in midwater between the surface and a depth of 5 m, near Castelo Branco, Faial.

### OSTEICTHYES

#### ISOSPONDYLI (CLUPEIFORMES)

##### Fam. Clupeidae



4. *Sardina pilchardus* (Walbaum, 1972) (Clofnam 33.3.1: not listed for the Azores in FNAM). Coll. Abundance: II. Occurrence: Midwater species found in Horta harbour and Porto Pim bay, Faial; depth range 0.5 to 2 m.

#### INIOMI (SCOPELIFORMES)

##### MYCTOPHOIDEI

##### Fam. Synodontidae

5. *Synodus saurus* (L., 1758) (Clofnam 51.1.2). Phot. Abundance: IV. Occurrence: Demersal on sandy and muddy bottoms from 2 to 20 m depth. The body is partly buried in the substratum.

#### APODES (ANGUILLIFORMES)

##### Fam. Muraenidae

6. *Enchelycore anatina* (Lowe, 1841) (Clofnam 73.2.1). Abundance II. Occurrence: Between rocks and in caves; depth range 10 to 20 m.

7. *Muraena augusti* KAUP, 1856 (Clofnam 73.1.-: species not considered in FNAM). According to G. E. Maul (Museu Municipal do Funchal, Madeira: pers. comm.) it is not a subspecies of *M. helena* but a valid species. Phot. Abundance: III. Occurrence: Benthic in crevices and between boulders, from 5 to 20 m.

8. *Muraena helena* L., 1758 (Clofnam 73.1.1). Coll. Phot. Abundance: III. Occurrence: Observed as benthic in small caves in rocks and between boulders, from 5 to 20 m. One juvenile (TL = 36 cm) was found in a tidepool.

9. *Gymnothorax unicolor* (Delaroche, 1809) (Clofnam 73.2.2). Coll. Phot. Abundance: III. Occurrence: As *M. helena*, in one case both species were observed together in one crevice.

##### Fam. Congridae

10. *Conger conger* (L., 1758) (Clofnam 82.1.1: not listed for the Azores in FNAM). Abundance: II.

Occurrence: In crevices and between boulders; depth range 10 to 20 m.

##### Fam. Ophichthidae

11. *Apterichthys caecus* (L., 1758) (Clofnam 86.2.1). Coll. Abundance: III. Occurrence: Active during the night on sandy bottoms; depth range 2 to 6 m (Seen, collected and photographed by Peter Wirtz, University of Freiburg, Germany, September 1989 at Porto Pim Bay, deposited at DOP/UA).

#### SOLENICHTHYES (SYNGNATHIFORMES)

##### SYNGNATNOIDEI

##### Fam. Syngnathidae

12. *Hippocampus ramulosus* Leach, 1814 (Clofnam 97.4.2). Coll. Phot. Abundance: I. Occurrence: Demersal species found amongst brown algae *Dictyota* sp. in Porto Pim bay, Faial, at 3 m depth.

#### ANACANTHINI (GADIFORMES)

##### Fam. Gadidae

13. *Gaidropsarus guttatus* (Collet, 1890) (Clofnam 101.20.3). Coll. Phot. Abundance: II. Occurrence: In crevices and freeswimming between boulders, also found in tide pools; depth range 0.2 to 10 m.

14. *Phycis phycis* (L., 1766) (Clofnam 101.15.1: not listed for the Azores in FNAM). Phot. Abundance: II-III. Occurrence: Found in rock crevices and between boulders; depth range 7 to 20 m.

#### PERCOMORPHI (PERCIFORMES)

##### PERCOIDEI

##### Fam. Serranidae

15. *Anthias anthias* (L., 1758) (Clofnam 124.2.1). Phot. Abundance: II. Occurrence: Two groups

were observed at Monte da Guia, Faial, in front of caves at 25 and 30 m depth, respectively.

16. *Epinephelus marginatus* (Lowe, 1834) (Clofnam 124.5: species not considered in F NAM). Abundance of adults: II. Occurrence: Usually hiding in caves between large boulders, from 10 to 20 m depth. An abundance of IV was only observed for juveniles in the lagoon of Lajes (Pico). Occurrence: Associated with boulders; depth range 0.5 to 1 m. Postmetamorphic juveniles occur in intertidal rocky shore pools in September. They only stay for a few days (SANTOS 1992). This species has been traditionally classified as "*Epinephelus guaza*", and as so listed for the Azores in F NAM. We followed the recent revision of the Serranidae made by HEEMSTRA (1991).

17. *Mycteroperca fusca* (Lowe, 1836) (Clofnam 124.6.: species not considered in F NAM). Abundance: II. Occurrence: Rocky bottoms and around large boulders; depth range 10 to 20 m. This species has been traditionally classified for the Macaronesian archipelagos either as "*Epinephelus alexandrinus*" = *Epinephelus costae* (Steindachner, 1878), or as *Mycteroperca rubra* (Bloch, 1793). We followed the recent revision of HEEMSTRA (1991).

18. *Serranus atricauda* Günther, 1874 (Clofnam 124.1.2). Phot. Abundance: IV. Occurrence: Areas with bedrock and boulders; depth range 5 to 20 m.

#### Fam. Apogonidae

19. *Apogon (Apogon) imberbis* (L., 1758) (Clofnam 127.1.1). Coll. Abundance: III. Occurrence: During daytime they hide in crevices of different sizes, during the night they are found outside the crevices; depth range 5 to 20 m.

#### Fam. Pomatomidae

20. *Pomatomus saltator* (L., 1766) (Clofnam 129.1.1). Coll. Abundance: II. Occurrence: Caught by seine netting at approximately 1 m depth over sand in Porto Pim bay, Faial.

#### Fam. Carangidae

21. *Pseudocaranx dentex* (Bloch & Schneider, 1801) (Clofnam 131.1.2). Phot. Abundance: II-III. Occurrence: Juveniles are pelagic very often associated with boulders, adults generally less orientated to topographical features, occasionally in big schools; depth range 5 to 20 m.

22. *Seriola dumerili* (Risso, 1810) (Clofnam 131.9.1: not listed for the Azores in F NAM). Phot. Abundance: III. Occurrence: Pelagic in schools; depth range 5 to 20 m. Juveniles of around 20 cm length are sometimes associated with schools of *Balistes carolinensis*.

23. *Trachinotus ovatus* (L., 1758) (Clofnam 131.11.1). Coll. Phot. Abundance: IV. Occurrence: Pelagic; depth range 1 to 10 m.

#### Fam. Mullidae

24. *Mullus surmuletus* L., 1758 (Clofnam 138.1.2: not listed for the Azores in F NAM). Coll. Phot. Abundance: IV. Occurrence: Benthic on sandy and muddy bottom, sometimes also found on rocky ground; depth range 1 to 20 m.

#### Fam. Sparidae

25. *Boops boops* (L., 1758) (Clofnam 139.2.1). Coll. Phot. Abundance: III-IV. Occurrence: Pelagic in schools; depth range 1 to 15 m.

26. *Diplodus sargus* (L., 1758) (Clofnam 139.4.3: not listed for the Azores in F NAM). Coll. Phot. Abundance: IV. Occurrence: Commonly found over soft and hard bottoms; depth range: tide-pools, only juveniles to 20 m.

27. *Pagellus acarne* (Risso, 1826) (Clofnam 139.7.2: not listed for the Azores in F NAM). Coll. Phot. Abundance: III. Occurrence: Juveniles are pelagic; depth range 0.5 to 10 m. On one occasion some adults were observed in 30 m depth close to bedrocks.

28. *Pagellus hogaravea* (Brünnich, 1768). Coll. Phot. (Clofnam 139.7.3; not listed for the Azores in FNAME). Abundance: IV. Occurrence: Juveniles are pelagic; depth range 0.5 to 10 m.

29. *Pagrus pagrus* (L., 1758) (Clofnam 139.1.4; not listed for the Azores in FNAME). Coll. Abundance: II. Occurrence: Juveniles live in sheltered bays at lower depths, the adults are demersal.

30. *Sarpa salpa* (L., 1758) (Clofnam 139.9.1; not listed for the Azores in FNAME). Coll. Phot. Abundance: IV. Occurrence: Pelagic schooling species; depth range 1 to 15 m.

#### Fam. Kyphosidae

Two species of *Kyphosus* occur in the Azores. It is impossible to differentiate them in the wild, since they can be distinguished only by the number of gill rakers on the lower branch of the first arch. This was done and both species were confirmed to occur in this area, sharing the same habitat.

31. *Kyphosus incisor* (Cuvier, 1831) (Clofnam 142.1.2; genus not listed for the Azores in FNAME). Abundance II. Occurrence: Often in small groups, pelagic but feeding close to the bottom, or under floating material; depth range 5 to 10 m. Individuals may be observed together with *Sarpa salpa*, or *Balistes carolinensis*.

32. *Kyphosus sectator* (L., 1766) (Clofnam 142.1.1; genus not listed for the Azores in FNAME). Abundance: III. Occurrence: Often in small groups, pelagic but feeding close to the bottom, or under floating material; depth range 5 to 10 m. Individuals may be observed together with *Sarpa salpa*, or *Balistes carolinensis*.

#### Fam. Pomacentridae

33. *Abudefduf luridus* (Cuvier, 1830) (Clofnam 144.2.1). Coll. Phot. Abundance: IV. Occurrence: Remain close to rocks and large boulders; depth range 2 to 20 m. Males defend their nests of

demersal eggs. Spawning was frequently observed during the Expedition. EDWARDS (1986) states that a new genus will be described. Spawning occurred during the time of the Expedition.

34. *Chromis limbata* (Valenciennes, 1833) (Clofnam 144.1.1; in FNAME as *C. chromis*). Coll. Phot. Abundance: V. Occurrence: Females are pelagic in schools usually over rocks and boulders, the males take care of the nests containing demersal eggs. EDWARDS (1986) considered *C. limbata* as a distinct species and not as a subspecies of *C. chromis*. Spawning was frequently observed during the Expedition (July and beginning of August).

#### Fam. Labridae

35. *Centrolabrus trutta* (Lowe, 1833) (Clofnam 145.3.2). Coll. Phot. Abundance: III. Occurrence: Associated with boulders from 2 to 15 m depth. Juveniles also occur in tidepools and associated with drifting algae in shallow water over sand.

36. *Coris julis* (L., 1758) (Clofnam 145.4.1). Coll. Phot. Abundance: V. Occurrence: Close to bedrock and boulders, usually in small groups. The secondary males are always solitary; depth range 2 to 20 m. There is a notable difference in coloration, especially in secondary males, compared to the Mediterranean *C. julis*.

37. *Labrus bergyllia* Ascanius, 1767 (Clofnam 145.1.2). Coll. Abundance: II. Occurrence: Between rocks and boulders from 10 to 20 m depth.

38. *Pseudolepidaplois scrofa* (Valenciennes, 1839) (Clofnam 145.8.1; not listed for the Azores in FNAME). Phot. Abundance: II. Occurrence: adults are pelagic or hide in large caves and under big boulders; depth range 15 to 20 m.

39. *Symphodus* (*Crenilabrus*) *mediterraneus* (L., 1758) (Clofnam 145.9.6; not listed for the Azores in FNAME). Coll. Phot. Abundance: III. Occurrence: Found near rocks and boulders from 5 to 20 m depth. Some nesting males were observed at 18 m



depth. Nest building by males was observed in July.

40. *Thalassoma pavo* (L., 1758) (Clofnam 145.10.1). Coll. Phot. Abundance: V. Occurrence: Juveniles swim in small groups, the adults were found singularly on rocky substrata from tidepools to 20 m depth. This was the most common fish in all areas observed, except on the two transects on the north coast of Pico close to São Roque.

#### Fam. Scaridae

41. *Sparisoma (Euscarus) cretense* (L., 1758) (Clofnam 146.1.1). Phot. Abundance: III. Occurrence: Adults found near rocks and boulders; depth range 5 to 20 m. Juveniles were only seen in the lagoon of Lajes, Pico; depth range 0.5 to 1 m. A heterochronous species which does not undergo sexual reversal, according to GONZALES PEREZ (1989) as in most species within this family. Adult females are brightly coloured, males more or less grey.

#### Fam. Trachinidae

42. *Echiichthys vipera* (Cuvier, 1829) (Clofnam 148.2.1 = 148.1.4; not listed for the Azores in FNAME). Abundance III-IV. Occurrence: One specimen was caught with a beach seine in Porto Pim bay in less than 3 m depth during the Expedition. However, numerous individuals were caught during autumn, winter and spring (NASH & al. in press).

#### SCOMBROIDEI

##### Fam. Scombridae

43. *Sarda sarda* (Bloch, 1793) (Clofnam 158.4.1). Abundance: I. Occurrence: One record of an individual obtained with a spear gun; pelagic near the surface.

#### GOBIOIDEI

##### Fam. Gobiidae

MILLER (1984) gave a detailed description of the gobies of the Macaronesian Islands. He only lists one species of this family (*Gobius paganellus*) for the Azores.

44. *Gobius paganellus* L., 1758 (Clofnam 162.1.9). Coll. Phot. Abundance: III-IV. Occurrence: Demersal in tidepools, on rocky substrata and on soft bottoms close to rocks; depth range 0.2 to 15 m.

45. *Pomatoschistus pictus* (Malm, 1865) (Clofnam 162.21.7; not listed for the Azores in FNAME). Coll. Phot. Abundance: III-IV. Occurrence: On sandy and muddy substrata near rocks; depth range 1 to 20 m. This species constitutes a new record for the Azores. The spawning season was completed by July. Breeding males occur singly in cavities under hard objects, females are benthic in schools, and juveniles are pelagic in large schools, 5 to 100 cm above the bottom (PATZNER & SANTOS 1990).

46. *Thorogobius ephippiatus* (Lowe, 1839) (Clofnam 162.24.1; not listed for the Azores in FNAME). Coll. Phot. Abundance: II. Occurrence: Found in caves with a sandy bottom; depth range 8 to 20 m. The occurrence of this species in the Azores was given preliminary by SALDANHA (1979) but only definitively confirmed by AZEVEDO & al. (1990).

#### BLENNIOIDEI

##### Fam. Blenniidae

Additional information collected during the Expedition on the ecology and reproduction of the blennies of the Azores can be found in PATZNER & SANTOS (in press).

47. *Coryphoblennius galerita* (L., 1758) (Clofnam 164.2.1). Coll. Phot. Abundance: IV. Occurrence: Found in tidepools and on rocky substrata; depth range 0 to 1 m. The males breed in empty barnacle shells. Their spawning season lasts until the end of July.

48. *Lipophrys pholis* (L., 1758) (Clofnam 164.1.13: not listed for the Azores in FNAME). Coll. Phot. Abundance: II. Occurrence: strictly rocky intertidal species in crevices and pools. SANTOS & ALMADA (1988) described a giant race (= *Blenius bufo* Lowe, 1843) that has only been found in Madeira (FOWLER 1936), the Azores and probably the Canaries (DOOLEY & al. 1985).

49. *Lipophrys trigloides* (Valenciennes, 1836) (Clofnam 164.1.19: not listed for the Azores in FNAME). Coll. Abundance: II. Occurrence: Live on rocky substrata; depth range 0 to 1 m.

50. *Ophioblennius atlanticus atlanticus* (Valenciennes, 1836) (Clofnam 164.: genus not listed in FNAME). Coll. Phot. Abundance: IV. Occurrence: Benthic in and near clefts in rocks and between large boulders; depth range 0.5 to 10 m. Spawning took place during the time of the Expedition (end of June, July and beginning of August). Males take care of eggs, which are laid in clefts.

51. *Parablennius incognitus* (Bath, 1968) (Clofnam 164.1.9: not listed for the Azores in FNAME). Coll. Phot. Abundance: III-IV. Occurrence: Benthic on rocky substrata; depth range 0.2 to 11 m. Spawning took place during the time of observations (end of June, July and beginning of August). Deepest observation of a nest with a breeding male was 8.7 m, 50 m distant from the coast line.

52. *Parablennius sanguinolentus* (Pallas 1811) (Clofnam 164.1.15)/ *Parablennius parvicornis* (Valenciennes, 1836) (Clofnam 164.1.11). Coll. Phot. Abundance: IV. Occurrence: they occur exclusively in tide pools. According to ZANDER (1979) the fish of the Atlantic area (including the Azores) belong to the species *P. parvicornis*. ALMEIDA & HARMELIN-VIVIEN (1983), working on material of the Azores, considered *P. parvicornis* as a synonym of *P. sanguinolentus*, as did SANTOS (1989). However, Hans Bath (pers. commn., see also BATH 1990) identified the present species as *P. parvicornis*. SANTOS (1992) reviewed the evidence suggested by the various authors and con-

cluded that they are not sufficient to consider two separate species (see ARRUDA 1979 regarding the assignment to a subspecies). Spawning were observed (June to August).

53. *Parablennius ruber* (Valenciennes, 1836) (Clofnam 164.6.1). Coll. Phot. Abundance: III. Occurrence: Benthic on rocks and around boulders; depth range 0.3 to 10 m.

#### Fam. Tripterygiidae

54. *Tripterygion delaisi* Cadenat & Blache, 1971 (Clofnam 166.1.3: not listed for the Azores in FNAME). Coll. Phot. Abundance: IV. Occurrence: Demersal on rocky substrata; depth range 0.5 to 15 m. ~~This is a new species for the Azores.~~ Spawning was observed during the time of the expedition (end of June, July and beginning of August).

#### MUGILOIDEI

##### Fam. Sphyraenidae

55. *Sphyraena viridensis* (Cuvier, 1829) (Clofnam 180.1.3: not listed for the Azores in FNAME). Abundance: IV. Occurrence: Demersal on rocky substrata; depth range 0.5 to 15 m. Has been reported from Eastern Mediterranean, Cape Verde and Canary Islands. Probably of wider distribution but has been confused with *S. sphyraena* (see FNAME p. 1196). This species is commercially caught in the Azores and has been traditionally identified as *S. sphyraena* (= *S. vulgaris* in DROUET 1861). Identified as *S. viridensis* by Peter Wirtz (University of Freiburg, pers. commn.).

##### Fam. Mugilidae

56. *Chelon labrosus* (Risso, 1826) (Clofnam 181.2.1). Coll. Abundance: IV. Occurrence: Prefer soft bottoms; depth range 0.5 to 2 m. Juveniles are also found in tide pools.

#### SCLEROPAREI (SCORPAENIFORMES)



## SCORPAENOIDEI

### Fam. Scorpaenidae

57. *Scorpaena maderensis* Valenciennes, 1833 (Clofnam 184.1.6). Coll. Phot. Abundance: IV-V. Occurrence: Demersal on rocks, and also in cavities and clefts; depth range 1 to 20 m.

58. *Scorpaena notata* Rafinesque, 1810 (Clofnam 184.1.7). Coll. Phot. Abundance: II. Occurrence: Demersal, often on sandy habitats close to the rocks; depth range 2 to 15 m.

## HETEROSOMATA (PLEURONECTIFORMES)

### PLEURONECTOIDEI

#### Fam. Bothidae

59. *Bothus podas* (Lowe, 1834) (Clofnam 196.1.1: not listed for the Azores in FNAME). Coll. Phot. Abundance: IV-V. Occurrence: Sandy and muddy grounds; depth range 2 to 20 m.

#### Fam. Cynoglossidae

60. *Symphurus nigrescens* Rafinesque, 1810 (Clofnam 199.2.1). Coll. Abundance: II. Occurrence: Found on mud in Horta harbour, Faial, at 10 m depth.

## PLECTOGNATHI (TETRAODONTIFORMES)

### BALISTOIDEI

#### Fam. Balistidae

61. *Balistes carolinensis* Gmelin, 1789 (Clofnam 201.1.2). Phot. Abundance: IV. Occurrence: Pelagic either as single individuals or in schools up to approximately 500 animals; depth range 3 to 20 m.

#### Fam. Tetraodontidae

62. *Sphoeroides spengleri* (Bloch, 1792) (Clofnam 204.3.1). Coll. Phot. Abundance: V. Occur-

rence: Close to the bottom on all types of substrata; depth range 1 to 20 m.

## XENOPTERYGII (GOBIOESOCIFORMES)

### Fam. Gobiesocidae

63. *Diplecogaster bimaculatus pectoralis* Briggs, 1955 (Clofnam 208.2.1.2). Coll. Abundance: III. Occurrence: Only found in association with sea urchins (*Arbacia lixula*, *Paracentrotus lividus* and *Sphaerechinus granularis*) at the upper levels of the subtidal (maximum depth 4 m) (PATZNER & SANTOS <sup>1992</sup> ~~in press~~). What we believe is another Gobiesocidae species, that could not be identified up to now with certainty, was found on solid detritus on a muddy bottom in Horta harbour, Faial, at 13m depth.

## DISCUSSION

The Azores archipelago occupies a very interesting bio-geographical position in the Atlantic since it is relatively isolated from the major continents. Therefore it can be considered as the most oceanic archipelago of the North Atlantic. Seven of the nine islands, and an important group of islets, are located on the Euro-African basin and the two northern islands in the American basin.

There are many problems for colonization of the islands by shallow water benthic organisms. The great distance from continental coasts is certainly the main factor contributing to the low number of shore fishes in the Azores, when compared with the archipelagoes of Madeira (ALBUQUERQUE 1954-56) and Canaries (DOOLEY & al. 1985). Dispersal and survival is particularly difficult for species with benthic eggs and short planktonic stages. Zoogeographic affinities with the Mediterranean have been suggested several times (e.g. BRIGGS 1970, 1974). Endemic marine fishes are almost absent in the Azores. *Scorpaena azorica* (which is only known from the holotype) is the only endemic fish species recorded to date (ESCHMEYER 1969). BRIGGS (1966, 1970) points out that little evolutionary divergence seems to be a common characteristic of the shore fish faunas of the North Atlantic Islands. The list of shallow-

water species given in this paper should be used in conjunction with FNAM (WHITEHEAD & al. 1984/86) for the central islands of the Azores. However, where discrepancies occur between the two publications concerning occurrences this publication should be used. Further to this more general information and references concerning some species can be found in HUREAU & MONOD (1979). A complete list of the fishes of the Azores is included in the "*Livro Vermelho dos Vertebrados de Portugal*", Vol. III (in press).

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