

FISHES FROM THE LUCKY STRIKE AND MENEZ GWEN HYDROTHERMAL VENT SITES (MID-ATLANTIC RIDGE)

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With 1 table

ABSTRACT. The fish fauna from the Lucky Strike hydrothermal vent site (Mid-Atlantic Ridge, 37° 18' N) was first observed during the exploratory dives of the DSRV ALVIN in 1993. In 1994 more observations were carried out by the authors and other members of the DIVA 2 scientific party, during 26 dives with the French submersible NAUTILE. A new site, named Menez Gwen, some 60 Km north of Lucky Strike was then explored for the first time and the ichthyofauna recorded.

A total of 20 species were recorded, not only inside the active vent fields, but also on their periphery. The species' identification was based mainly on video records, colour slides and direct observations from the submersibles. Specimens of *Etmopterus princeps*, *Hydrolagus pallidus*, *Ilyophis blachei*, *Simenchelys parasitica*, *Synaphobranchus kaupi*, *Gaidropsarus* n. sp., *Epigonus telescopus*, *Cataetys laticeps* and *Trachyscorpia cristulata echinata* were collected either with a hand net operated with the submersibles' articulated arms, or in baited fish traps. One of these, *Gaidropsarus* n. sp., turned out to be a new species to science and is being described elsewhere. Of the 20 identified species, 7 are new to the Mid-Atlantic Ridge, off the Azores. However, some of these records must be considered as provisional as identifications were not based on collected specimens.

The observed fish fauna from Lucky Strike and Menez Gwen have bathyal characteristics and no endemic fish species were recorded from these hydrothermal vent sites. Knowledge of the fish fauna of the Mid-Atlantic Ridge in general or associated with hydrothermalism is still very poor. More data on the different sites concerning not only the ichthyofauna, but also the environmental parameters linked with venting are necessary to understand the distribution of its associated fauna. Depth, fluid toxicity, vent age, and larval dispersal are probably important factors linking with the presence of an endemic fauna.

RESUMO. A fauna ictiológica do campo hidrotermal Lucky Strike (Crista médio-Atlântica, 37° 18' N) foi observada pela primeira vez em 1983, durante mergulhos exploratórios realizados a bordo do DSRV ALVIN. Em 1994 foram efectuadas mais

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observações, pelos autores e por outros membros da missão científica DIVA 2, durante 26 mergulhos com o submersível Francês NAUTILE. Um novo sítio activo, baptizado de Menez Gwen, então descoberto a cerca de 60 Km a Norte do Lucky Strike, foi também explorado e a ictiofauna registada.

Um total de 20 espécies de peixes, ocorrendo não só no interior dos sítios activos, mas também na sua periferia, foi registado. A identificação das espécies baseou-se principalmente na análise dos registos vídeo, diapositivos e observações directas a partir do interior do submersível. Espécimes de *Etmopterus princeps*, *Hydrologus pallidus*, *Ilyophis blachei*, *Simenchelys parasitica*, *Synaphobranchus kaupi*, *Gaidropsarus* n. sp., *Epigonus telescopus*, *Cataetx laticeps* e *Trachyscorpia cristulata echinata* foram colhidos com recurso a um enxalavar operado pelo braço articulado do submersível ou a covos iscados. Um dos exemplares colhidos revelou tratar-se de uma nova espécie do género *Gaidropsarus*, que está a ser descrita noutra trabalho. Das 20 espécies identificadas, 7 são novas para a Crista médio-Atlântica, ao largo dos Açores. Contudo, alguns destes registos devem ser considerados provisórios, uma vez que as respectivas identificações não se basearam em exemplares colhidos.

A fauna ictiológica observada no Lucky Strike e no Menez Gwen possui características batiais e não foi observado nenhum endemismo. O conhecimento da ictiofauna da Crista médio-Atlântica, em geral e da associada ao hidrotermalismo profundo, em particular, é ainda escasso. Para melhor compreender a fauna associada a este fenómeno, são necessários ainda mais dados, não só faunísticos, mas também ambientais. Profundidade, toxicidade dos fluidos, idade das fontes hidrotermais e dispersão larvar, constituem seguramente importantes factores ligados à presença ou ausência de uma fauna endémica.

INTRODUCTION

The fish fauna from the Lucky Strike hydrothermal vent site (Mid-Atlantic Ridge, 37° 17' N) was observed for the first time during the exploratory dives of the DSRV ALVIN in 1993 when 2 specimens were collected.

In 1994 more observations were carried out by the authors and other members of the DIVA 2 scientific team during 26 dives with the French submersible NAUTILE (DESBRUYÈRES *et al.*, 1994). A new site, named Menez Gwen, some 60 Km north of Lucky Strike (MAR, 37° 50' N) was then explored for the first time and the ichthyofauna recorded.

During both the 1993 and 1994 cruises other material was also collected (SALDANHA, 1995; SALDANHA *et al.*, 1996). These results are here presented.

MATERIAL AND METHODS

Study areas

Lucky Strike is the largest hydrothermal vent field currently known along the

Mid-Atlantic Ridge. It is located in a depression formed by the lower slopes of three extinct volcanoes surrounding a lava lake at ca. 1,700 m depth. These volcanoes are the summit of the Lucky Strike Seamount (37° 17'.5 N) emerging from the Mid-Atlantic Ridge rift valley. The vent field extends over approximately one kilometre along the sea floor with a width of ca. 700 m. It shows numerous individual sites, displaying a variety of hydrothermal activity, ranging from black smokers to flanges and diffuse venting. Chimneys located at the top of the mounds can attain a total height of up to 20 m. Fluid temperatures ranged from 198°C to 333°C. Vent morphology and geology as well as fluid composition and the presence of shell chaff suggest long-lived hydrothermalism and indicate that the vent field has been reactivated (LANGMUIR *et al.*, 1993; COLODNER *et al.*, 1993; HUMPHRIS *et al.*, 1993).

The fluid composition studied by COLODNER *et al.* (1993) showed, for many elements such as silica, the same ranges as for other submarine hydrothermal vents, but for other elements, there were specific distinguishing chemical characteristics compared to other Atlantic vent sites.

The ambient bottom water (bathyal) temperature was around 5°C.

The Lucky Strike vent field physiography is dominated by a very rich population of a yellowish Mytilid mussel (COMTET *et al.*, 1996) and thick, fibrous, whitish bacterial mats that occasionally cover large areas of the mussel beds. Bresiliid shrimps are also abundant as well as the Bythograeid crab *Segonzacia mesatlantica*. Thousands of mussels cover large areas of mound surfaces and chimneys, penetrating also into cracks. They are in the close vicinity of fluid emanations, in water temperatures generally ranging from 5°C to 18°C and probably tolerate brief temperature increases to as high as 30°C (*cf.* VAN DOVER, unpublished).

Menez Gwen hydrothermal vent field is situated some 60 Km north of Lucky Strike, along the Mid-Atlantic Ridge, between 37° 50'.45 N and 37° 50'.56 N, at depths between 840 and 870 m. Its size is very modest when compared with Lucky Strike and extends over an area of nearly 200 m². Mounds and chimneys are of small size and the maximum recorded temperature was 281°C, although diffuse venting was observed throughout the area reaching 25°C.

At Menez Gwen, Mytilid beds are also present, but they do not attain the dimensions found at Lucky Strike, being reduced to small patches (DESBRUYÈRES *et al.*, 1994).

Study and collecting techniques

Visual observations on the ichthyofauna were carried out from the submersibles ALVIN and NAUTILE, video-recorded and photographed. The videos and stills obtained were examined for fish identification.

Material was collected with the help of the submersible arms using hand nets.

Fish traps were also laid down on the hydrothermal field. Small-sized traps, like those used by artisanal Portuguese fishermen, were set close to the vents by the NAUTILE during the DIVA 2 cruise for periods of 24 hours on average.

During the DIVA 2 cruise a big pyramidal metallic trap (IFREMER model) equipped with an acoustic release and floating devices, was also deployed in the vicinity of vents, for periods of ranging from 24 to 48 hours. To this trap, hanging ca. 1 metre above the sea floor, were attached 2 other smaller traps (MMF model, described in BISCOITO (1993)) which were laid on the sea-bed.

All traps were baited with black scabbard fish (*Aphanopus carbo*) entrails and squid.

The morphological, anatomical and stomach content study of the collected specimens followed the techniques currently used, including dissections and X-ray examination.

The listing of the species follow the taxonomic criteria used in WHITEHEAD *et al.* (1984).

Abbreviations. IFREMER: Institut Français de Recherche pour l'Exploitation de la Mer; MB: Museu Bocage, University of Lisbon; MMF: Museu Municipal do Funchal (Natural History); SL: Standard length; TL: Total length.

Results

Ord. Carcharhiniiformes, Fam. Scyliorhinidae

Apristurus maderensis CADENAT & MAUL, 1966 - Madeira catshark.

Lucky Strike, DIVA 2, Nautile dives no. 6 and 8 (8 and 10 June 1994), ca. 1,700 m depth (video record only).

Apristurus can be visually identified by the conspicuous interbranchial septa with a median projecting lobe. The observed fish showed this peculiarity together with a long head, the first dorsal fin behind mid-point of body and only a little smaller than the second dorsal fin, the origin of the first dorsal fin slightly in advance of the posterior end of the pelvic fin base and the inter-dorsal fin space very small. The colour was blackish brown. All these characteristics fit in the description of *A. maderensis*, a species attaining at least 680 mm total length. However there are at least 25 described species of this little known genus (COMPAGNO, 1984b) and a precise identification is only possible with a captured specimen. Consequently, this first record of *A. maderensis* from the Mid-Atlantic Ridge off the Azores must be considered as provisional.

This fish was observed twice, swimming not far from the bottom on the lava lake that is surrounded by the individual vent sites of Lucky Strike.

A. maderensis is believed to be a benthopelagic fish living on continental slopes (700-1,700 m) and was recorded from the NE Atlantic, off Madeira and possibly also off Ireland and off the northern limit of the Bay of Biscay (CADENAT & BLACHE, 1981;

COMPAGNO, 1984b; QUÉRO, 1984; QUÉRO *et al.*, 1993).

Ord. Squaliformes, Fam. Squalidae

Centroscymnus coelolepis BOCAGE & CAPELLO, 1864 - Portuguese dogfish

Lucky Strike, DIVA 2, Nautilé dives no.3, 8 and 19 (5, 10 and 25 June 1994), ca. 1,700 m depth (video records and photograph).

This species was recognisable by its stocky body, not strongly tapering back from pectoral region, the short snout, the dorsal fins about equal in size and height, the pelvic fins insertion in advance of the second dorsal origin with free rear tips extending beyond second dorsal insertion. In general, specimens of this species are dark brown, but some individuals exhibited a lighter brown colour. They can attain 1,140 mm TL. It is a benthopelagic species found along the continental slope and seamounts, recorded between 270 m and 3,675 m (COMPAGNO, 1984a).

At Lucky Strike it was observed swimming not far from the bottom and away from the hydrothermal vent field. It has a wide geographic distribution in the Atlantic, ranging from Grand Banks to Delaware Bay and from Iceland to Sierra Leone, including the Azores, Madeira and adjacent seamounts. It was also recorded from Namibia and the western Cape coast (COMPAGNO, 1984a).

Etmopterus princeps COLLETT, 1904 - Great lanternshark

Lucky Strike, DIVA 2, 1 female, MMF 26873, 648 mm TL, collected in fish trap model MMF, 8 June 1996, 1,730 m depth.

This lanternshark has a stout body with a thick snout and a short tail. The origin of the first dorsal fin is well behind the free rear tips of the pectoral fins, the second dorsal fin is much larger than the first and the pelvic fins are well in advance to the second dorsal fin. It presents a general blackish brown colour and attains a maximum length of 750 mm.

The stomach contents examination showed the remains of a fish which could not be identified as it had been partially digested.

It is a benthopelagic fish living on the continental slopes of both sides of the North Atlantic (COMPAGNO, 1984a). To our knowledge, this is the first time *E. princeps* has been recorded from the Mid-Atlantic Ridge off the Azores.

Etmopterus pusillus (LOWE, 1839) - Smooth lanternshark

Menez Gwen, DIVA 2, Nautilé dive no. 11 (13 June 1994), ca. 900 m.

The smooth lanternshark may be distinguished from *E. princeps* by its fairly slender body together with a moderately short tail. The dorsal fins are small and low, the second being larger than the first, both anteriorly presenting a strong curved spine. The tip of the pectoral fins are slightly in advance of the first dorsal fin origin. The pelvic fins are well in advance of the second dorsal fin origin. The colour is blackish above. It attains 470 mm TL.

The specimen was observed swimming near the bottom well away from the vent field, and agreed with the description of *E. pusillus*, a species already recorded from the area (COMPAGNO, 1984a). However a definite identification will only be obtained with a captured specimen.

E. pusillus is considered a benthic species, ranging from depths of 300 m to 1,000 m or more, along continental slopes. It has been recorded in the Atlantic from Portugal to South Africa, including Madeira, Azores and Canary Islands; Gulf of Mexico, southern Brazil and Argentina and the central South Atlantic. Western Pacific, from Japan and western Indian Ocean, from South Africa (COMPAGNO, 1984a).

Ord. Chimaeriformes, Fam. Chimaeridae

Hydrolagus pallidus HARDY & STEHMANN, 1990 - Ghost shark

Lucky Strike, Alvin dive no. 2605 (31 May 1993), 1620 m. One specimen collected with hand net, (MB 3500, +810 mm TL (the tip of the tail shows a mutilation)).

Lucky Strike, DIVA 2, Nautilé, 9 dives (June, 1994) ca. 1700 m (video records and photographs).

According to HARDY & STEHMANN (1990) this large Chimaerid species is closely related to *Hydrolagus affinis* (CAPELLO, 1867), a dark purplish brown ghost shark. *H. pallidus* differs from *H. affinis* mainly by its creamy - grey colour and in having the pre-pelvic tenacula of adult males straight or only slightly irregular along the distal edge, in contrast with a broad, deep indentation, in *H. affinis*.

In a previous paper, one of us (SALDANHA, 1995) identified this collected specimen of ghost shark as *H. mirabilis* (COLLETT, 1904). This was based on the body proportions and the assumption that the long tail filament was lacking (mutilated). However, the observation of live material during the DIVA 2 dives, the re-examination of the collected specimen (MB 3500), the conclusions of HARDY & STEHMANN (1990) and a comparison with other species of *Hydrolagus*, lead us to consider that the specimen collected in the Alvin dive and the ones observed at Lucky Strike during DIVA 2 are all *H. pallidus*. Actually all the individuals observed from the submersible and recorded on video were very light coloured with an overall creamy - whitish tone and were lacking the long caudal filament.

H. pallidus was one of the species more frequently observed, always swimming at some distance from the bottom in the vicinity of the vent fields. Stomach content analysis of the collected specimen revealed a diet of decapod crustaceans, amphipods and a cirriped. Due to the advanced digested condition of the material, no evidence that those animals belonged to the hydrothermal vent community could be established (SALDANHA, 1995).

The collected specimen was lacking an eye (left side) and the same observation was made by HARDY and STEHMANN (1990) for one of their specimens of *H. affinis*.

H. pallidus attains 910 mm TL and has been recorded from the southern Bay of

Biscay to off western Scotland on Rosemary Bank, from depths between 1,200 m and 2,075 m. Also from the eastern slope of the northern Mid-Atlantic Ridge (ca. 47° 50'N, 27° 09'W, 1900 m) (HARDY *and* STEHMANN, 1990). This is the first record of this species from the Mid-Atlantic Ridge, off the Azores.

Ord. Anguilliformes, Fam. Synphobranchidae

Ilyophis blachei SALDANHA & MERRETT, 1982

Lucky Strike, DIVA 2, 1 specimen, MMF 26867, 785 mm TL, collected in fish trap model MMF, 10 June 1994, 1,720 m depth. Nautilic dives nos. 8, 9 and 18 (10, 11 and 24 June 1994) (video records).

This Synphobranchid is light coloured when observed from the submersible. The collection of a specimen allowed confirmation of the identification of observed and video recorded material (cf. SALDANHA & MERRETT, 1982; BISCOITO & SALDANHA, unpublished).

This benthopelagic fish was observed several times swimming close to the bottom and in the vicinity of the vents.

It has been recorded on the lower continental slope of the eastern Atlantic, from the Porcupine Seabight to the north of the Bay of Biscay (SALDANHA & BAUCHOT, 1986). This is the first record of this species from the Mid-Atlantic Ridge off the Azores.

Simenchelys parasitica (GILL ms) GOODE & BEAN, 1879

Lucky Strike, DIVA 2, two specimens, MMF 26865, 333 mm TL, 7 June 1994, 1,740 m depth, and MMF 26866, 333 mm TL, 8 June 1994, 1730 m depth, both caught in a fish trap, model MMF.

This Anguilliform fish is unmistakable, based on its blunt head and uniform dark brown coloration. It attains 610 mm TL.

Both specimens were collected on the edge of the hydrothermal vent field. Although it was not observed from the submersible, it is a fairly common species, having been observed during the dives of the bathyscaphe ARCHIMEDE in 1969 off the Azores, swimming near the bottom (SALDANHA, 1977). It was also collected again on the slope of the Hirondelle Basin, off the Azores, during the cruise ESCAPE, 1995 (MARQUES & COLAÇO, unpublished).

It is a benthopelagic fish living on continental slopes and upper abyssal depths, from 1,000 to 3,000 m. Geographically it is a cosmopolitan species from cold deep waters, not recorded from the Mediterranean (SALDANHA & BAUCHOT, 1986).

Synphobranchus kaupi JOHNSON, 1862 - Cut-throat eel

Lucky Strike, DIVA 2, 1 specimen, MMF 26868, 607 mm TL, 10 June 1994, caught in a fish trap model MMF, 1,720 m; 1 specimen, MMF 26870, 635 mm TL, 26 June 1994,

caught in a small fish trap, set down at smoker "Isabel", 1,685 m. Nautilé, 7 dives (video records).

Menez Gwen, DIVA 2, 1 specimen, MMF 26871, 532 mm TL, 21 June 1994, caught in a fish trap model MMF, 850 m depth; 1 specimen, MMF 26872, 585 TL, 14 June 1994, caught in a fish trap model IFREMER, 870 m depth.

The elongate head, the insertion of the dorsal fin well behind the origin of the anal fin and the dark brown colour allowed identification of specimens. They were all swimming near the bottom around the vent fields and sometimes over the sulphide deposits. One specimen was observed trying to enter a baited fish trap deployed near an active chimney.

It is a benthopelagic species from the continental slopes at depths between 400 m and 2,650 m and attains 640 mm TL. It has a world-wide distribution, but is absent from the Mediterranean and probably the Gulf of Mexico (SALDANHA & BAUCHOT, 1986).

Ord. Notacanthiformes, Fam. Notacanthidae

Polyacanthonotus cf. rissoanus (FILIPPI & VÉRANY, 1859)

Lucky Strike, DIVA 2, Nautilé, 4 dives, ca. 1,700 m (video records only).

Many of the specimens observed and recorded during the Nautilé dives and assigned to *P. cf. rissoanus*, showed the typical head profile of this species, as well as body morphology. *P. rissoanus* has been previously recorded from the Azores (SULAK, 1986). However, *P. challengerii* (VAILLANT, 1888), a very similar species, can also occur in the area, therefore a definite identification can only be obtained with the a captured specimen.

P. cf. rissoanus was fairly common, often observed from the submersible. The whitish colour and the undulating movements used for locomotion by the posterior part of the tail, were characteristic. Several specimens were observed swimming either close to the bottom or in mid-water, sometimes in a vertical position, near the edge of the hydrothermal vent fields.

This benthopelagic species attains ca. 360 mm TL and is distributed on continental slopes and upper abyssal depths from 500 m to 2,800 m. In the eastern Atlantic it has been recorded off Ireland, the Azores and off South Africa. Found also in the Mediterranean. In the western Atlantic, from Davis Strait to Cape Hatteras and in the Pacific Ocean, off Australia (SULAK, 1986).

Ord. Gadiformes, Fam. Macrouridae

Several specimens of this family have been observed during the Nautilé dives, either at Lucky Strike or Menez Gwen. In general they were found very near the active vent fields and sometimes over them. Although good video records and some slides were obtained, reasonable identification of the specimens seen was only possible for the following single species.

Coelorhynchus cf. labiatus (KOEHLER, 1896) - Spear-snouted grenadier
Lucky Strike, DIVA 2, Nautilé dive no. 9, 11 June 1994, ca. 1,700 m depth (video record only).

This Macrourid fish shows a long sharply pointed snout. The shape of the dorsal fin, the position of the pelvic fins relative to the pectoral fin and the height of the anal fin, and the size of the eye in relation to head length, separate this species from those of the genus *Trachyrhynchus*. It attains more than 500 mm TL.

Only *C. labiatus* has been recorded from the area, and consequently we are inclined to assign the observed specimen to this species. However, definite identification can only be obtained with a collected specimen.

It was observed swimming close to the bottom in the inner periphery of the vent field. It is a bathypelagic fish from the continental slope and it is distributed in the eastern North Atlantic from Scotland to Cape Verde and the Azores (COHEN *et al.*, 1990).

Fam. Gadidae

Gaidropsarus n. sp.

Lucky Strike, DIVA 2, 1 specimen, MMF 26884, 320 mm SL, 10 June 1994, Nautilé dive No. 8, 1,685 m depth. Caught with a hand net using the articulated arm of the submersible. Lucky Strike, DIVA 2, Nautilé 5 dives (video records).

The body proportions, number of vertebrae and meristic characters of the collected specimen indicate that it belongs to a different species from those of the genus *Gaidropsarus* previously described (cf. SVETOVIDOV, 1986). Another specimen of this reddish *Gaidropsarus* fish has also been recorded from the northern part of the Bay of Biscay (Blackmud Canyon), caught between 850-900 m. Consequently the species cannot be considered as an endemic of the Lucky Strike hydrothermal vent system. This new species is currently being described by the authors (SALDANHA & BISCOITO, in press).

This fish was fairly abundant in several places and was found inside crevices of the mussel beds, well inside the active hydrothermal vent. Stomach content analysis showed a diet of hydrothermal vent Bresiliid shrimps (*Chorocaris fortunata* MARTIN & CHRISTIANSEN, 1995).

Fam. Moridae

Lepidion schmidti SVETOVIDOV, 1936

Lucky Strike, DIVA 2, Nautilé, 5 dives, June 1994, ca. 1,700 m depth. (Video records and colour slides).

Menez Gwen, DIVA 2 Nautilé, 3 dives, June 1994, ca. 900 m depth. (Video records only).

The long dorsal ray, the length of the chin barbel, the eye diameter, the relative

position of the pectoral and pelvic fins and the shape of the lateral line lead us to assign the observed specimens to *Lepidion schmidti*. Although the available videos and colour slides leave little doubt, a definite identification can only be obtained from captured specimens.

Specimens observed were lying on the bottom, among rocks or in crevices in the inner periphery of the active vents, over brown sulphide deposits.

L. schmidti is considered a rare species, and most of the specimens have been taken ca. 2,000 m depth. It was first described from Sagami Bay (Japan) and other specimens tentatively identified as this species have been caught west of the Bay of Biscay and Ireland (COHEN, 1986). If our identification is correct, this is the first record of this species from the Mid-Atlantic Ridge, off the Azores.

***Laemonema latifrons* HOLT & BYRNE, 1908 ?**

Lucky Strike, Alvin dive No. 2606 (video record only). DIVA 2, Nautilé dive No. 8, 10 June 1994, ca. 1,700 m depth (video record only).

The general shape of the body, especially the short chin barbel, the small first dorsal fin and the very small gap between the two dorsals, suggest these specimens are *L. latifrons*. The main visible difference on the video is the dimension and shape of the caudal fin. The drawing presented by HOLT & BYRNE (1908) shows a relatively elongate and short caudal fin. Our video recordings show a rounded caudal fin.

Both our recordings show the fish inside a crevice in the mussel beds, in heated water (5°C - 30°C), the same conditions sometimes noted for *Gaidropsarus* n.sp. and for *Cataetx laticeps*.

L. latifrons is a benthopelagic species known from a few localities, from the slope of the sub-arctic and temperate northeastern Atlantic. It attains 150 mm SL (COHEN, 1986). In the present case, the specimens were small (ca. 200 mm TL).

***Mora moro* (RISSO, 1810) - Common mora**

Menez Gwen, DIVA 2, Nautilé dive No. 14, 20 June 1994, ca. 900 m (video record only).

This identification was possible due to the general morphology of the recorded fish; body and head shape, the two dorsal fin lobes and the two anal fin lobes.

At Menez Gwen, the specimen was observed and recorded swimming within some 5 m of the bottom, over pillow lava, well away from the hydrothermal vent site. During observations from the bathyscaphe ARCHIMÈDE in the Azores in 1969 (SALDANHA, 1977) the same species was seen, also close to the bottom.

M. moro attains 600 mm SL and is a benthopelagic species on continental slopes. It has a wide geographical distribution on the northeastern Atlantic, from Iceland, Faroes to Cape Bojador, Madeira, Azores and Canary Islands, western Mediterranean and Pacific Ocean, off Chile, southern Australia and New Zealand, Indian Ocean, South of Madagascar (COHEN *et al.*, 1990).

Ord. Beryciformes, Fam. Berycidae

Beryx splendens LOWE, 1834 - Alfonsino

Menez Gwen, Diva 2, Nautilé dive no. 11, 13 June 1994, ca. 900 m.

This species can be easily identified due to its general morphology and bright red colour. One specimen was observed over pillow lavas, well away from the active sites. It attains 400 mm SL and is a benthopelagic species living on the upper slope (200-850 m). It has a worldwide geographical distribution, recorded from a number of areas in the Atlantic and Pacific Oceans (MAUL, 1986).

Ord. Zeiformes, Fam. Oreosomatidae

Neocyttus helgae (HOLT & BYRNE, 1908) - False boarfish

Lucky Strike, DIVA 2, Nautilé dives Nos. 2 and 10, 4 and 12 June 1994, ca. 1,700 m depth (video records only).

Menez Gwen, DIVA 2, Nautilé dives Nos. 11 and 15, 13 and 21 June 1994, ca. 900 m depth (video records only).

This rare fish can be easily identified due to its peculiar shape. The body is almost rhomboid, the pre-dorsal profile distinctly concave, the eye large, the mouth small, and the dorsal and anal fins opposite with prominent and very strong spines. The colour of the observed specimens was greyish to light violet.

They were observed swimming gently close to the bottom, over pillow lavas away from active vent fields.

It attains at least 215 mm SL and is a benthopelagic species from the continental slope, with a recorded depth range of 900-1,680 m. It has been recorded from off Ireland and Madeira (KARRER, 1986). To our knowledge, this is the first record from the Mid-Atlantic Ridge and the first observations of living specimens.

Ord. Perciformes, Fam. Apogonidae

Epigonus telescopus (RISSO, 1810)

Menez Gwen, DIVA 2, Nautilé dive No. 11, 13 June 1994, ca. 900 m depth. 1 Specimen (head only, body eaten by crabs, specimen discarded) caught in fish trap model MMF, 14 June 1994, 850 m depth.

The visual identification of this fish was based on the thickset body, the head rather deep, the blunt snout, the large eye and mouth. The remains of the specimen caught inside the fish trap, provided enough characteristics to identify it.

It was found well away from the active sites, near the bottom, over pillow lavas.

It attains 600 mm SL and is a benthic species from the continental slope, distributed from 75 to 1,200 m. In the Atlantic it ranges from Iceland to the Canaries and Mediterranean. Also from the western coast of South Africa, North America and South Pacific (TORTONESE, 1986).

Fam. Bythitidae

Cataetys laticeps KOEFOED, 1927

Lucky Strike, Alvin dive 2606, 1 June 1993, 1,626 m. depth. One specimen, MB 3501, 673 mm TL, collected with hand net. DIVA 2, Nautilé dive No. 9, 11 June 1994, 1,692 m depth. One specimen, MMF 26861, 610 mm SL, collected with hand net. Nautilé, 13 dives, June 1994 (video records).

Menez Gwen, DIVA2, Nautilé dive No. 12, 14 June 1994 (video record).

This fish can be identified by its massive flattened head, the elongate and thick body and the dorsal and anal fins confluent with the caudal. The collected material enabled the correct identification of the species.

This benthic species attains about 650 mm TL and its bathymetric distribution ranges from 1050 to 2830 m. It was recorded in a few localities in the NE Atlantic and western Mediterranean. Found also in the Azores and along the West African coast to Cape of Good Hope. Possibly in the Gulf of Mexico (NIELSEN, 1986).

At Lucky Strike this species was fairly abundant and often occurred in pairs over sulphide deposits with shell chaff on the inner border of the hydrothermal vent field. It was not possible to verify the sex of these animals occurring in pairs. They showed a very sedentary behaviour and the same specimens were probably often seen at the same place in consecutive dives.

During one of the Alvin dives, a specimen was observed and video recorded well inside the hydrothermal vent field, in a crevice of the mussel bed, near the fluid effluents. The specimen collected during DIVA 2 had 1 Bythograeid crab, *Segonzacia mesatlantica* (WILLIAMS, 1988), and 1 Bresiliid shrimp, *Chorocaris fortunata* MARTIN & CHRISTIANSEN, 1995 in its stomach, which clearly demonstrates that this bathyal species feeds on hydrothermal vent fauna whenever available. This observation seems to be the first on the feeding habits of this species.

Ord. Scorpaeniformes, Fam. Scorpaenidae

Trachyscorpia cristulata echinata (KOEHLER, 1896) - Spiny scorpionfish

Menez Gwen, DIVA 2, Nautilé dive No. 15, 21 June 1994, ca. 900 m depth. One specimen, MMF 26515, 400 mm SL, collected with hand net. Nautilé, 4 dives (video records).

This fish has a very large head and large eye. Its general appearance and red colour allows its specific identification, further confirmed by the collected specimen.

This benthic species attains 500 mm SL and is distributed from 200 m down to more than 2,500 m. Its geographical distribution in the eastern Atlantic ranges from Iceland to Mauritania (HUREAU & LITVINENKO, 1986).

At Menez Gwen it was observed off the active vent areas, on a pillow lava zone and resting over one of them.

Anguilliform fishes and shrimps are part of the species diet as shown by the

stomach contents of one collected specimen and direct observation of *in situ* feeding behaviour.

Ord. Lophiiformes, Fam. Chaunacidae

Chaunax sp.

Menez Gwen, DIVA 2, Nautilite dive no. 12, 14 June 1994, 842 m depth (video record only).

The very large cuboid head, large oblique mouth and overall red colour of the observed and recorded specimen, places it in the genus *Chaunax*.

However, since two similar species, *C. suttkusi* CARUSO, 1989 and *C. pictus* LOWE, 1846, have been recorded from the Azores (CARUSO, 1989; AZEVEDO & HEEMSTRA, 1995) we are not in a position to assign the observed specimen to either of the above.

Both species are benthic on soft and hard substrates. *C. suttkusi* can attain at least 228 mm SL and *C. pictus* 278 mm SL. They have been recorded on either sides of the Atlantic Ocean, from 200 m down to 1,000 m depth.

At Menez Gwen it was lying down on pillow lavas, well away from the active field.

Discussion

GEISTDOERFER (1988) defined for the eastern Pacific ridge three categories of fishes living or being associated with the hydrothermal vent sites or living in their neighbourhood:

i. The endemic species; ii. Those with bathyal or abyssal affinities from the surrounding areas, but penetrating the vent fields; iii. Those living only around the vent areas. These categories are also present in the Atlantic. *Pachycara termophilum*, belonging to the first category, was described by GEISTDOERFER (1995) from Snake Pit hydrothermal vent site (Mid-Atlantic Ridge, 23° 22' N, 3480 m depth). At present this is the only endemic hydrothermal vent fish species recorded from the Atlantic Ocean.

The first observations on the Lucky Strike fish fauna in 1993 (SALDANHA, 1995) as well as those carried out during the DIVA 2 cruise in 1994, did not allow recognition of any endemic species. The new species of *Gaidropsarus* from Lucky Strike has also been recorded from the northern Bay of Biscay (SALDANHA & BISCOITO, in press).

Many of the fishes studied at Lucky Strike were observed well inside the hydrothermal areas, swimming close to the vents or even over them. An unidentified Macrourid was observed over the fluid plume, head upside down, then dropping to the bottom and probably feeding. Other Macrourids, such as *C. labiatus* were observed over the vent field.

Gaidropsarus n. sp., *Lepidion schmidti* and *Cataetys laticeps* were also observed at the edge of the active vents, over the surrounding sulphide deposits with shell chaff.

Water temperature there was near 4.5°C, corresponding to ambient water temperature.

More mobile fishes such as benthopelagic Anguilliforms *Ilyophis blachei* and *Synphobranchus kaupi* were more active over the vent fields in the vicinity of the vent fluids.

Polyacanthonotus cf. *rissoanus* was observed swimming over the vent field or outside it, but always keeping a relative large distance from the bottom and active venting areas.

Finally many other fishes were only observed around the hydrothermal field in ambient temperature water, such as sharks *Apristurus maderensis*, *Centroscymnus coelolepis*, and *Etmopterus pusillus*. *Simenchelys parasitica* is included in this group. *Hydrolagus pallidus* was also observed outside the vent field always swimming at a certain height from the bottom.

At Menez Gwen some of the fishes were observed in the vicinity of the venting field. With the exception of one *C. laticeps*, and two unidentified species (possibly *Beryx* sp. and a Zoarcid) they were all seen in the surrounding bathyal environment.

Stomach content examination of some fishes indicated a diet of hydrothermal organisms, such as the shrimps *Chorocaris fortunata* and crabs *Segonzacia mesatlantica*.

In conclusion, the fish fauna observed at Lucky Strike and Menez Gwen have bathyal characteristics, and this list includes first records from the Mid-Atlantic Ridge off the Azores for several species. No endemic fish fauna were recorded.

Knowledge of the fish fauna of the Mid-Atlantic Ridge in general or associated with hydrothermalism is still very poor. More data on the different sites concerning not only the ichthyofauna, but also the environmental parameters linked with venting are necessary to understand the distribution of its associated fauna. Depth, fluid toxicity, vent age, and larval dispersal are probably important factors linking with the presence of an endemic fauna.

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TABLE 1 - List of species of fish recorded from Lucky Strike and Menez Gwen hydrothermal vent sites.

Species	Lucky Strike	Menez Gwen
<i>Apristurus maderensis</i>	+	
<i>Centroscymnus coelolepis</i>	+	
<i>Etmopterus princeps</i>	+	
<i>Etmopterus pusillus</i>		+
<i>Hydrolagus pallidus</i>	+	
<i>Ilyophis blachei</i>	+	
<i>Simenchelys parasitica</i>	+	
<i>Synaphobranchus kaupi</i>	+	+
<i>Polyacanthonotus</i> cf. <i>rissoanus</i>	+	
<i>Coelorhynchus</i> cf. <i>labiatus</i>	+	
<i>Gaidropsarus</i> n. sp.	+	
<i>Lepidion schmidti</i>	+	+
<i>Laemonema latifrons</i> ?	+	
<i>Mora moro</i>		+
<i>Beryx splendens</i>		+
<i>Neocyttus helgae</i>	+	+
<i>Epigonus telescopus</i>		+
<i>Cataetx laticeps</i>	+	+
<i>Trachyscorpia cristulata echinata</i>		+
<i>Chaunax</i> sp.		+

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