Italian Journal of Zoology
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t741771159

Marine fish biodiversity in the Oligocene of Froidefontaine (Belfort Territory, France)

Andre Pharisat [a]
[a] Géosciences, Université de Franche-Comté, Montbéliard, France

To cite this Article Pharisat, Andre(1998) 'Marine fish biodiversity in the Oligocene of Froidefontaine (Belfort Territory, France)', Italian Journal of Zoology, 65: 1, 189 — 191
To link to this Article: DOI: 10.1080/11250009809386811
URL: http://dx.doi.org/10.1080/11250009809386811

Ital. J. Zool., *65. Suppl.*: 189-191 (1998)

Marine fish biodiversity in the Oligocene of Froidefontaine (Belfort Territory, France)

ANDRE PHARISAT

Géosciences, Université de Franche-Comté,
25030 Besançon & Muséum G. Cuvier, F-25200 Montbéliard (France)

ABSTRACT

The study of new, very rich and stratigraphically well defined materials from the Oligocene fish deposits of Froidefontaine (Belfort Territory, France) clearly demonstrates a highly diversified ichthyofauna. For example, the diversification within the Gasterosteiformes, is almost the same as that described from contemporary localities of the Russian Paleogene. The faunal composition indicates a stenohaline, littoral and subtropical palaeoenvironment. It is also characterized by its clear palaeobiogeographical biopolarity: on one hand, there are typical elements of the colder seas (e.g. *Cetorhinus parvus*) that entered the Upper Rhine-Valley Rift System from the North; on the other hand, there also are species (e.g., *Aeoliscus heinrichi* and *Aulostomus medius*) that clearly represent warmer seas of the SE - Paratethys.

KEY WORDS: Marine fishfauna - Rupelian age - Froidefontaine - Upper Rhine Valley Rift System - France.

(Received 28 August 1997 - Accepted 22 January 1998)

The fishbearing Oligocene deposits of Froidefontaine in the Belfort Territory of France (Fig. 1) have been known for more than a century. Several species were already described in elder literature (Sauvage, 1870; Théobald, 1934; Faivre, 1969). More recent investigations clearly pointed out a further diversity and modernity of this ichthyofauna (Pharisat, 1977 unpublished Dipl. thesis, 1991, 1992, 1993). New and stratigraphically well-defined materials have been studied for the present work in the G. Cuvier Museum, Château des Ducs de Wurtemberg (Montbéliard, France). This very rich collection comprises a total of more than 11000 well-preserved specimens. As a result – in addition to the seven selachian species already known from the literature – 27 teleostean fish species can be demonstrated. Thus, a total of 34 fish species that are new recorded from this locality. A synopsis of the fishfauna follows (+ means new record):

Elasmobranchs – *Synodontaspis acutissima* (Agassiz, 1844), *Synodontaspis cuspidata* (Agassiz, 1844), *Cetorhinus parvus* Leriche, 1908 (Fig. 2), *Carcharocles angustidens* Agassiz, 1843, *Isurus desori* (Agassiz, 1844), *Physogaleus latus* (Storms, 1894) (Fig. 3), *Myliobatis oligocaena* (Leriche, 1910).

Teleosts – *Clupea sardinites* (Heckel, 1850), + *Neohalecopsis* Weiler, 1928 sp., + *Eophycis froidefontainensis* Pharisat, 1991, *Palaeogadus arambourgi* (Théobald, 1934), + *Hemiramphus georgii* Jerzmanska, 1968, + *Capros radobojanus* (Kramberger, 1882), + *Aulostomus medius* Weiler, 1920, *Aeoliscus heinrichi* (Heckel, 1850), + *Doryrhamphus fredericae* (Pharisat, 1991), + *Nepigastrosyngnathus micheli* Pharisat, 1993, + *Properca sabbai* Pauca, 1929, *Serranus budensis* (Heckel, 1856), *Pristigenys spinosus* (Blainville, 1818), + *Caranx glarisianus* (Agassiz, 1844), + *Leiognathus altapinnus* (Weil-

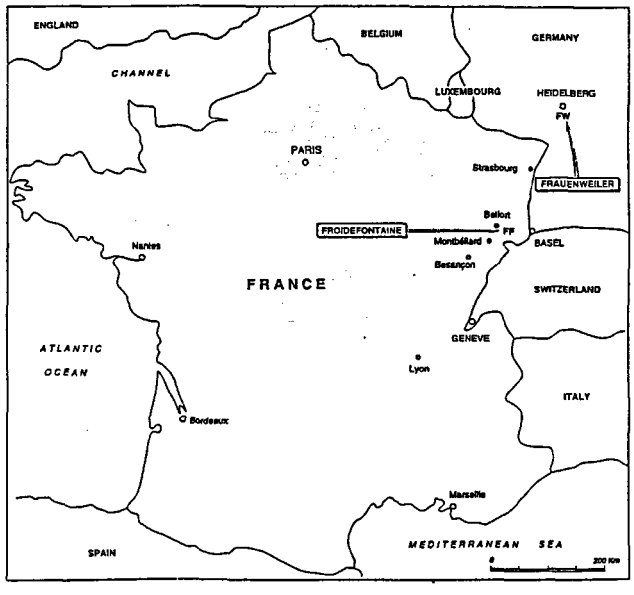

Fig. 1 - Map of location of the fish deposit of Froidefontaine (France).

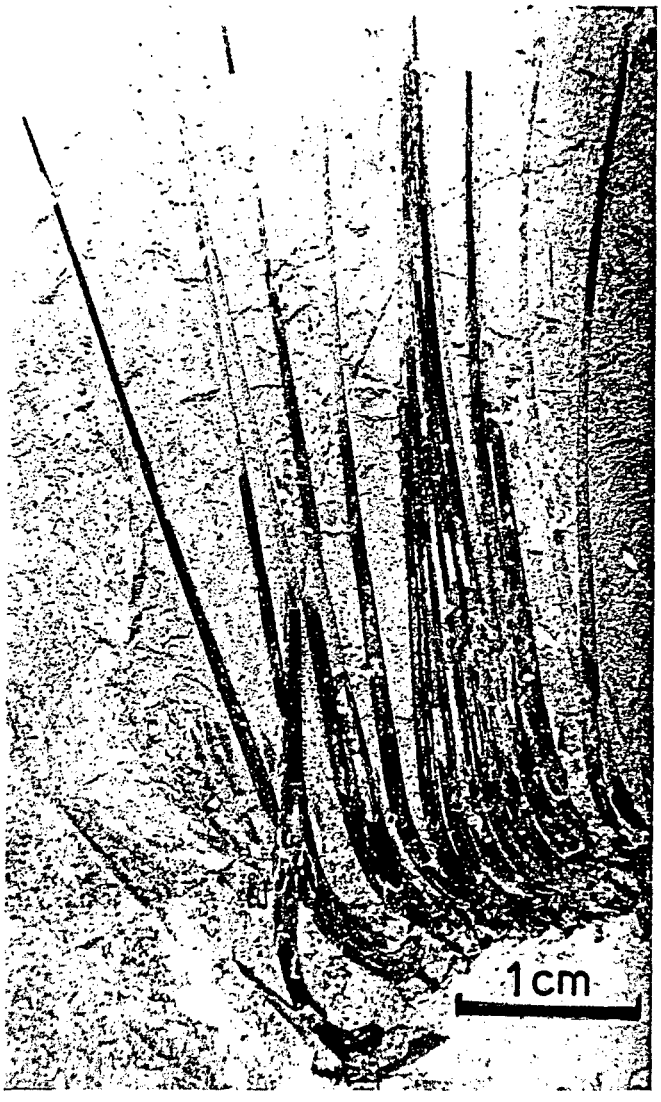

Fig. 2 - *Cetorhinus parvus* Leriche, 1908, bundle of barbels (16) from the filter apparatus. Froidefontaine, Nr. CET.FR.AP.2.

Fig. 3 - *Physogaleus latus* (Storms, 1894), part of jaws with files of teeth. Froidefontaine, Nr. GL.FR.AP.1.

er, 1955), + *Sparus schopii* (Wittich, 1900), + Sparidae ind., + *Trachinus minutus* (Jonet, 1958), + *Palimphyes elongatus* (Blainville, 1818), *Lepidopus glarisianus* (Blainville, 1818), *Palaeorhynchus glarisianus* Blainville, 1818, *Sarda brachycephala* (Leriche, 1908), + *Scomberomorus* (*Cybium*) Lacépède, 1801 sp., + *S.* (*Cybium*) *lingulatus* (H. v. Meyer, 1846), + *Scomberomorus* (*Cybium*) *dumonti* (Van Beneden, 1871), + Scombroidei indet., + *Sphyraenodus* Agassiz, 1844 sp., *Glyptorhynchus* Leriche, 1908 sp.

Based on the above, a great degree of diversification can be documented for the Froidefontaine fossil site, which is almost the same as that described from contemporary localities in the Carpathians (Jonet, 1958; Jerzmanska, 1968; Ciobanu, 1977), the Russian Paleogene (Rodzhdestvensky, 1950; Daniltshenko, 1960; Parin, 1992a, b; Bannikov & Parin, 1997), or Germany (Mayence basin, the Frauenweiler locality, respectively: Weiler, 1928, 1966; Micklich & Parin, 1996). This high diversity may be best demonstrated by the Gasterosteiformes (Syngnathoidei).

Within the Centriscidae, *Aeoliscus heinrichi* (Fig. 4) generally is the most common species (Rozhdestvensky, 1950; Daniltshenko, 1960; Blot, 1980; Parin, 1992b; Micklich & Parin, 1996). Another rare species, *Aeoliscus distinctus,* was recently described from the Frauenweiler fossil site (Micklich & Parin, 1996). It probably is also present in the French deposits: some of the Froidefontaine specimens have a short moveable tip of the first anterior dorsal spine, as described for *A. distinctus* and as also present in the in the Recent *A. punctulatus* (Bianconi, 1854). *A. heinrichi* and *A. distinctus* are closely related to one another and *A. distinctus* appears as an intermediate species between the first metioned species and *A. apscheronicus* (Lednev, 1914). The latter species is typical for the Upper Maikop deposits (Zuramarkent Horizon) of the Caucasus, which are stratigraphically defined as Lower Miocene by Rozhdestvensky (1950) and Daniltshenko (1960). In the family Syngnathidae, two new species have been recorded from Froidefontaine: *Doryrhamphus fredericae* and *Nepigastrosyngnathus micheli* (Pharisat, 1991, 1992, 1993). *D. fredericae* is a very small species, which is closely related to *A. squalidus* Daniltshenko, 1960, a Caucasian species from the lower part of the *Planorbella* bed of the Khadum Horizon of Daghestan (Daniltshenko, 1960), as well as to the Recent Indo-Pacific species *D. dactyliophorus* (Bleeker, 1853). *Nepigastrosyngnathus micheli* is a highly problematic species, based on a

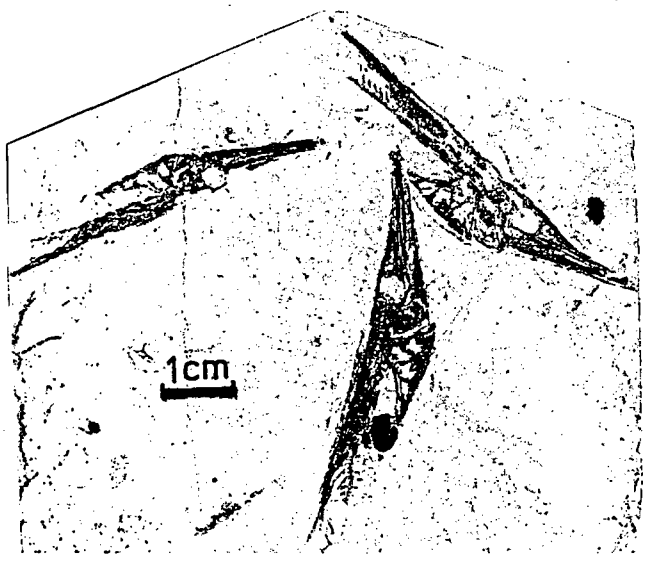

Fig. 4 - *Aeoliscus heinrichi* (Heckel, 1850), three specimens with scales of *Clupea sardinites* (Heckel, 1850). Froidefontaine, Nr. A.FR.AP.877-879.

unique specimen: according to Blot (1980, personal discussion) this specimen is a "very small syngnathid (*Syngnathus* ?) with eggs". According to the Upper Rhine Valley Rift System, the richness of Gasterosteiformes in the Froidefontaine as well as in the Frauenweiler fossil sites most likely is due to the same influence of warmer seas from the South or South-East.

As a further coincidence, Percoidei as well as Scombroidei also are relative abundant in both localities: there are at least seven percoid species in Froidefontaine and more than 11 in Frauenweiler (Micklich, 1996). As a peculiarity, allometric growth could be demonstrated for *Pristigenys spinosus*. Concerning the Scombroidei, more than 10 species are recorded from Froidefontaine, whilst there are at least 13 in the Frauenweiler fossil site. In Froidefontaine, *Palaeorhynchus glarisianus* is the most common scombroid species, where more than 300 specimens have been found to date. Interestingly, small-sized juvenile specimens of the typical trichiurid *Lepidopus glarisianus* are predominant.

Within the Scombridae, *Sarda brachycephala* from Froidefontaine is very close to the specimens described from Entlebuch by Fröhlicher & Weiler (1952). As in the Trichiuridae, most of the Scombridae are represented by very small-sized specimens, a feature, that is also shared by the majority of specimens of the other teleostean families in the Froidefontaine locality. Therefore, it may be concluded, that during the Oligocene, the gulf of Montbeliard was some kind of spawning zone, with, however offshore connections. As already indicated above, the Oligocene fishfauna of Froidefontaine has many species in common with the contemporary deposits of the Polish and Rumanian Carpathians (Jerzmanska, 1968; Ciobanu, 1977) and with those of the Caucasus (Rozhdestvensky, 1950; Daniltshenko, 1960; Bannikov & Parin, 1997).

In conclusions, three general trends should be stressed:

1) - The ichthyofauna of Froidefontaine is in many ways very similar to that of Frauenweiler. 2) - The ichthyofauna of Froidefontaine is less influenced by the colder seas coming from North Atlantic via the northern section of the Rhine Valley Rift system than by the warmer seas from the South-South-East from the SE - Paratethys. 3) - There probably was a littoral subtropical spawning zone (gulf of Montbeliard) with offshore connections.

REFERENCES

Bannikov A. F., Parin N. N., 1997 - The list of marine fishes from Cenozoïc (Upper Paleocene-Middle Miocene) localities in southern European Russia and adjacent countries. J. Ichthyol., *37*: 133-146.

Blot J., 1980 - La faune ichthyologique des gisements du Monte Bolca (Province de Vérone, Italie). Catalogue systématique présentant l'état actuel des recherches concernant cette faune. Bull. Mus. nat. Hist. nat. Paris, 4, C, *2*: 339-396.

Ciobanu M., 1977 - La faune fossile de l'Oligocène de Piatra Neamt. Academiei Republici Socialiste Romania, Bucuresti, 159 pp.

Daniltshenko P. G., 1960 - Kostistye Ryby Maykopskih otlozenij Kavkaza. USSR Ac. Sci. Moscow, *78*: 1-208.

Faivre F., 1969 - Les Poissons fossiles de Froidefontaine. Bull. Soc. Hist. nat. Pays de Montbéliard, *1966-67*: 74-101.

Fröhlicher H., Weiler W., 1952 - Die Fischfauna der Unterstampischen Molasse des Entlebuchs Kt. Luzern, und ihre paläogeograpische Bedeutung. Ecl. geol. Helv. Basel, *49*: 135-140.

Jerzmanska A., 1968 - Ichthyofaune des couches à Ménilites. Acta Palaeontol. Pol., Warszawa, *13*: 379-488.

Jonet S., 1958 - Contribution à l'étude des schistes disodyliques oligocènes de Roumanie. Lisboa, 112 pp.

Micklich N., Parin N. N., 1996 - The fishfauna of Fraunenweiler (Middle Oligocene, Rupelian, Germany): First results of a review. Publ. espec. Inst. Esp. Oceanogr., *21*: 129-148.

Parin N. N., 1992a - A new genus and species of pipefish (Syngnathidae) from the Oligocene of the North Caucasus. Paleontol. J., *2*: 132.

Parin N. N., 1992b - A new species of shrimpfish (Centriscidae, Syngnathiformes) from the Upper Eocene of the North Caucasus. J. Ichthyol., *32*: 164-166.

Pharisat A., 1991 - La paléoichthyofaune du Rupélien marin de Froidefontaine (Territoire de Belfort). Ann. Sci. Univ. Franche-Comté Besançon, Géol., *4*: 13-98.

Pharisat A., 1992 - Nouvelles données sur l'ichthyofaune du Rupélien marin de Froidefontaine (Territoire de Belfort). C. R. Acad. Sci., Paris 2, *315*: 387-392.

Pharisat A., 1993 - Un curieux spécimen de Syngnathidae du Rupélien marin de Froidefontaine (Territoire de Belfort, France). Bull. trim. Soc. Géol. Normandie et Amis du Muséum du Havre, *80*: 67-68.

Rozhdestvensky A., 1950 - Rod *Centriscus* is Maïkopskich otlozenij Kavkaza. Akad. Nauk SSSR. Trudy Pal. Inst. Moscow, Leningrad, *25*: 26-55.

Sauvage H. E., 1870 - Poissons de Froidefontaine. Bull. Soc. geol. France, Paris, 2, *27*: 397-410.

Théobald N., 1934 - Contribution à la paléontologie du Bassin oligocène du Haut-Rhin et du Territoire de Belfort. Les Poissons oligocènes. Bull. Serv. Carte géol. Als.-Lor., Strasbourg, *2*: 117-162.

Weiler W., 1928 - Beiträge zur Kenntnis der Fische des Mainzer Beckens II. Abh. Hess. Geol. Land. Darmstadt, *8*, 63 pp.

Weiler W., 1966 - Die Bedeutung der Fischfunde im Rupelton des Tongrube Frauenweiler bei Wiesloch südlich Heidelberg. Z. Rh. nat. Ges. Mainz, *4*: 17-26.