

First record of *Pachycara thermophilum* (Pisces, Zoarcidae) from Ashadze Hydrothermal Vent Field (Mid-Atlantic Ridge, 13°N)

M. Biscoito¹, P. Briand², A. J. Almeida³

Introduction

The genus *Pachycara* is represented in the Atlantic Ocean by eight species (Anderson and Fedorov, 2004; Biscoito and Almeida, 2004; Anderson and Mincarone, 2006), two of which are restricted to deep-sea hydrothermal vents on the Mid-Atlantic Ridge: *P. thermophilum* Geistdoerfer, 1994, from Broken Spur (29°10'N, 43°10.3'W, 3020 m), TAG (26°08'N, 44°49' W, 3600 m), Snake Pit (23°22'N, 44°57'W, 3480 m) and Logatchev (14°45'N, 44°58.7'W, 3000 m), and *P. saldanhai* Biscoito & Almeida, 2004, from Rainbow (36°13.1'N, 33°54.35'W, 2300 m) (Biscoito *et al.*, 2002; Biscoito and Almeida, 2004).

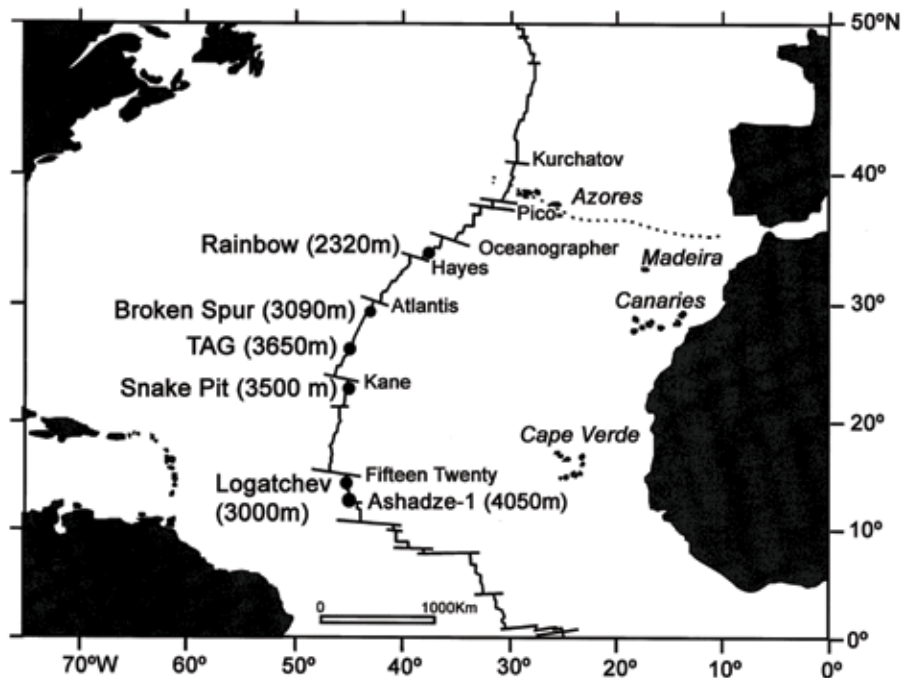
In 2007 the French-Russian Serpentine cruise took place at the northern Mid-Atlantic Ridge (NMAR) on board the French R/V *Pourquoi Pas?* (Fouquet *et al.*, 2008). The objective was to determine the geological, geochemical, biological and microbiological variability of hydrothermal systems at two recently

discovered sites, Ashadze and Krasnov, that were not yet studied and sampled with submersibles. Additional sampling was also planned on the Logatchev hydrothermal field.

Ashadze-1 hydrothermal vent field (12°58'N, 44°51'W, 4080m, southernmost confirmed active vent on the NMAR; Fig. 1), is the deepest known black smoker field, located on serpentinized peridotites (mantle rock altered by sea water). After its discovery in 2003 (Beltenev *et al.*, 2003), Ashadze-1 was revisited in 2005 (Beltenev *et al.*, 2005), but no remarks on the fish fauna were made.

In the course of the Serpentine cruise three new specimens of *P. thermophilum* were collected, two at Logatchev and one at Ashadze hydrothermal vent field, the latter being the southernmost and deepest record of this species. The confirmation of the specimens' identities and their counts and measurements are reported herein.

Figure 1: Hydrothermal vent fields on NMAR where *Pachycara* spp. occur.



¹Museu Municipal do Funchal (História Natural)/Estação de Biologia Marinha do Funchal - IMAR - Cais do Carvão, 9000-107 Funchal, Portugal, E-mail: manuel.biscoito@cm-funchal.pt; ²IFREMER, Centre de Brest, BP 70, 29280 Plouzané, France; ³Universidade de Lisboa, Faculdade de Ciências, DBA, Centro de Oceanografia, Laboratório Marítimo da Guia, Av. Nossa Senhora do Cabo, 939, 2750-374 Cascais, Portugal

Materials and methods

All specimens were collected with the suction sampler of the Remotely Operated Vehicle (ROV) *Victor 6000* during three dives, one (312-03) at Ashadze-1 and two (315-06 and 316-07) at Logatchev.

Measurements were taken on ethanol preserved specimens to the nearest 0.5 mm. Definition of characters and measurements follow those of Anderson (1982, 1994). Vertebrae and fin ray counts were made from x-rays.

Abbreviations used: HL, head length; SL, standard length; IFREMER, Institut Français de Recherche pour l'Exploitation de la Mer; MMF, Museu Municipal do Funchal (História Natural); MNHN, Museum national d'Histoire naturelle.

The specimens will be deposited in the collections of the MNHN and MMF.



Results:

Pachycara thermophilum Geistdoerfer, 1994

(Figs. 2 - 4 and Tab. 1)

Material examined

Specimen 312-03, 124 mm SL, Ashadze-1 hydrothermal vent field, Mid-Atlantic Ridge, 12°58'N, 44°51'W, 4080 m; R/V *Pourquoi Pas?*, Serpentine cruise, ROV *Victor 6000*, dive 312-03, suction sampler; Specimen 315-06, 312 mm SL, Logatchev hydrothermal vent field, Mid-Atlantic Ridge, site Irina-2, 14°45'N, 44°58'W, 3023 m, R/V *Pourquoi Pas?*, Serpentine cruise, ROV *Victor 6000*, dive 315-06, suction sampler; Specimen 316-07 (specimen damaged), 50 mm HL, Logatchev hydrothermal vent field, Mid-Atlantic Ridge, site Irina-2, 14°45'N, 44°58'W, 3022 m, R/V *Pourquoi Pas?*, Serpentine cruise, ROV *Victor 6000*, dive 316-07, suction sampler.

The specimens observed cover a size range from 124 mm to 312 mm SL, the former (Fig. 2) being the smallest specimen of this species ever measured completely. The specimens are well preserved, with the exception of 316-07, which is broken at mid-body. Counts and measurements of all specimens studied are given in Table 1.

Remarks

Up to the present, *P. thermophilum* seems to be the only zoarcid considered endemic to the hydrothermal vents found in the Mid-Atlantic Ridge vent fields south of Rainbow. At Rainbow, this species is substituted by *P. saldanhai* (Biscoito *et al.*, 2002).

Figure 2: (upper) Detail of *Pachycara thermophilum* from Ashadze-1 vent field.

Figure 3: (lower) Ecological setting of *P. thermophilum* (centre of image) at Ashadze-1 vent field.

The specimens studied agree well with the re-description of *P. thermophilum* by Anderson and Bluhm (1996) with little discrepancies, which will be discussed elsewhere. The specimen from Ashadze is of particular relevance, as it is the smallest and the deepest of this species collected to date, as well as the southernmost record for the species.

Ecological information

The ecological setting of the Ashadze-1 hydrothermal vent site, where the specimen of *P. thermophilum* was collected, will be described in detail elsewhere (Fabri *et al.*, in prep). As in all other vent fields where this species has been observed, the indi-

Table 1: Measurements and counts of the specimens of *P. thermophilum* studied.

	Ashadze-1	Logatchev	Logatchev
Collection No.	312-03	315-06	316-07
Standard length (mm)	124	312	-
Head length (mm)	19,5	56	50
Measurements, in percent SL			
Head length	16,9	17,9	-
Head width	6,5	7,7	-
Head depth	8,1	8,7	-
Pectoral length	9,7	8,7	-
Predorsal length	21,8	23,7	-
Preanal length	39,5	43,9	-
Body height	9,3	13,8	-
Gill slit length	4,4	4,8	-
Caudal fin length	2,8	1,9	-
Measurements, in percent HL			
Head width	38,1	42,9	54,0
Head depth	47,6	48,2	54,0
Upper jaw length	33,3	48,2	46,0
Pectoral length	57,1	48,2	48,0
Snout length	23,8	25,9	30,0
Eye diameter	14,3	10,7	13,0
Gill slit length	26,2	26,8	38,0
Interorbital width	10,3	16,1	16,0
Interpupillary width	33,3	23,2	30,0
Pelvic fin length	11,9	7,1	8,0
Counts			
Vertebrae	29+82	32+80	30+82
Dorsal fin rays	105	106	104
Anal fin rays	86	86	86
Caudal fin rays	-	-	-
Pectoral fin rays	18	-	18
Pelvic fin rays			
Gill-rakers	2+13	2+12	3+13
Pseudobranchs	4	-	5
Vomerine teeth	5	6	5
Palatine teeth	5	7-6	5-4
Teeth rows on dentary	3-4	4	3
Teeth rows on pre-maxillary	2	2	2
Sub-orbital pores	6	6	6
Post-orbital pores	2	2	2
Preoperculomandibular pores	8	8	8
Nasal pores	2	2	2

Figure 4: *P. thermophilum* at Irina-2 site, Logatchev vent field.

viduals are quite inactive, sitting on the bottom over sulphide deposits or over mussel beds not far away from active chimneys. Although not uncommon, they are not as numerous as the Zoarcid *Thermarces cerberus* at the Pacific Ocean vents. At Ashadze-1 the site is dominated by the actinian *Maractis rimicarivora* and the chaetopterid polychaete *Phyllochaetopterus* n. sp. (Fig. 3). A small baited fish trap was used to try to catch these fish, with no results at all, demonstrating that these fish do not seem to be attracted to conventional baits. A similar behaviour was already observed at Rainbow vent field with *P. saldanhai*.

One specimen (315-06) collected at Logatchev was sitting together with another one amongst the mussels, *Bathymodiolus puteoserpentis* (Fig. 4), close to gastropods *Phymorhynchus* sp. and together with numerous ophiuroids and shrimps *Mirocaris fortunata*. Diffuse venting was present, with a maximum temperature of 16.36°C. The other (316-07) was also near another fish of the same species, sitting together over a *B. puteoserpentis* bed, close to small active black smokers on which a dense population of *Rimicaris exoculata* was present. All of the above four specimens showed a languid behaviour when chased by the suction sampler, not giving the impression that they would be fast swimmers, even when disturbed.

Other fish observations at Ashadze revealed only an unidentified macrourid, swimming near dead or less active chimneys. Macrourids occur quite often at those depths and have been regularly seen in the periphery of active vents (Biscoito *et al.*, 2002).

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