JOURNAL OF CRUSTACEAN BIOLOGY, 20(1): 128–131, 2000

OCCURRENCE OF *CHACEON AFFINIS* (DECAPODA: GERYONIDAE) IN THE VICINITY OF A HYDROTHERMAL VENT SITE ON THE MID-ATLANTIC RIDGE

Manuel Biscoito and Luiz Saldanha

(MB) Museu Municipal do Funchal (Natural History), IMAR,
Rua da Mouraria, 31, 9004-546 FUNCHAL, Madeira, Portugal

ABSTRACT

Observations of *Chaceon affinis*, from the French deep submersible *Nautile*, were made at the Menez Gwen hydrothermal vent site (Mid-Atlantic Ridge, 37°50′N) in June 1994. This was the first time that specimens of this species were seen in the inner periphery of an active vent field. Almost all specimens were observed very near mytilid mussel beds, and on one occasion a crab was seen eating the remains of one of these vent mussels. In addition, baited fish traps were deployed in the close vicinity of the active vent field for periods of 24 h. The yield of these catches was much higher than the one obtained at a similar depth in a place without any influence of an active vent field. It is suggested that the population of *C. affinis* living in the vicinity of this vent field can profit from the amount of biomass available inside it.

Menez Gwen hydrothermal vent field, situated on the Mid-Atlantic Ridge, between 37°50.45′N and 37°50.56′N, at depths between 840 and 870 m was discovered in 1994, during the research cruise DIVA 1 with the French deep research submersible *Nautile*. The size of this site is very modest when compared with the nearest known hydrothermal vent site, Lucky Strike (37°18′N), and extends over an area of nearly 200 m^2. 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 (Fouquet *et al.*, 1994).

Inside the active field, small patches of mytilid mussels were found as well as bresiliid shrimps (*Chorocaris chacei* (Williams and Rona)). Abundant bathyal faunas were observed in the periphery of the site (Desbruyères *et al.*, 1994).

Chaceon affinis (A. Milne Edwards and Bouvier, 1894) has been recorded from Iceland to the Cape Verde Islands, including the Azores, Madeira, and the Canary Islands, from depths between 130 and 2,047 m (Manning and Holthuis, 1981, 1989; González *et al.*, 1996). This species, which can locally be very abundant, is a typical continental slope species, inhabiting a variety of bottom substrates, from mud to rock (Manning and Holthuis, 1981; Biscoito, unpublished). This crab is mainly caught in baited traps and has not yet been subject to intense commercial exploitation, as is the case of other Atlantic species of the genus along the west African coast, and in the northwestern Atlantic and the Gulf of Mexico (Hastie, 1995).

Very few direct observations of *Chaceon* in its habitat have been carried out. To our knowledge, only *C. fenneri* (Manning and Holthuis, 1984) and *C. quinquedens* (Smith, 1879) were video-recorded by deep submersible (Lindberg and Lockhart, 1993). This paper describes the first observations for *C. affinis*.

MATERIALS AND METHODS

In 1994, between 13 and 22 June, 6 *Nautile* dives were made at Menez Gwen hydrothermal vent site, 37°50′N, 31°31′W. During these dives, observations of the hydrothermal vent fauna, as well as the surrounding bathyal fauna, were made and video-recorded at depths between 700 and 1,000 m. Whenever possible, specimens were collected with the submersible's articulated arm.

Baited fish traps of the model described by Biscoito (1993) were deployed on 3 dates (13, 21 June and 2 July 1994) in the close vicinity of the active vent field. The traps, in sets of 2, were baited with entrails of the black scabbard fish (*Aphanopus carbo* Lowe) and deployed for 24 h at depths of ~850 m. Each set of traps was attached to a larger pyramidal trap that was hung ~1 m above the sea floor. The whole structure was equipped with an acoustic release and floating devices for recovery at the surface.

Carapace length (CL) and width (CW) was measured to the nearest millimeter for all specimens of *C. affinis*

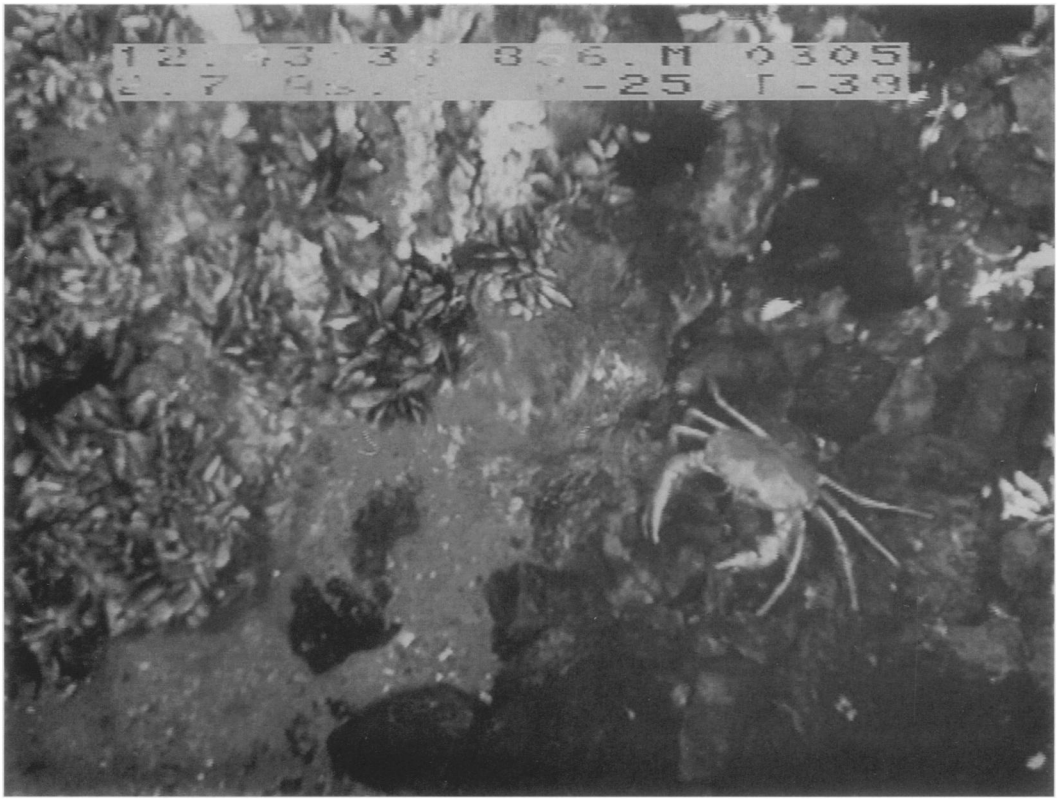

Fig. 1. *Chaceon affinis* at Menez Gwen hydrothermal vent site (866-m depth), near beds of *Bathymodiolus*.

collected. The overall crab wet weight was recorded for the first catch.

Water temperature was recorded by the temperature probe of the submersible and in one case with a HOBO probe left on the bottom for 8 days.

RESULTS

Dive Observations

Chaceon affinis was observed during 5 dives of the *Nautile*. Most of the specimens were observed in the border of the active field, very near the mussel patches (Fig. 1), on rocky bottom. On one occasion, one specimen was observed eating from a dead open shell of *Bathymodiolus* sp., less than 20 cm away from live specimens. A few others were observed a little farther away, over pillow lavas.

In general, the specimens showed very little activity, unless disturbed by the arm of the submersible. In this case, they adopted a defensive posture, facing the arm with the first legs and chelipeds extended. They ran away if an attempt to capture was made.

Two temperature measurements were obtained: 8.8°C on the pillow lavas, well off the active field, where a specimen was standing, and 20°C very near the mussel patch, where another specimen was found.

One specimen was captured with the submersible very near an active smoker at a depth of 850 m. This specimen was a female (Museu Municipal do Funchal MMF 26874) measuring 112 mm CL and 125 mm CW.

Trap Data

A total of 35 females and 31 males of *C. affinis* was caught in the fish traps. All females were nonovigerous. The average size of the specimens collected was 94 mm CL and 115 mm CW for males and 81 mm CL and 98 mm CW for females. Size distribution frequencies for the specimens collected are shown in Fig. 2.

Two males and one female were parasitized by an unidentified rhizocephalan. One female was found with several cirripeds (*Poecillasma*

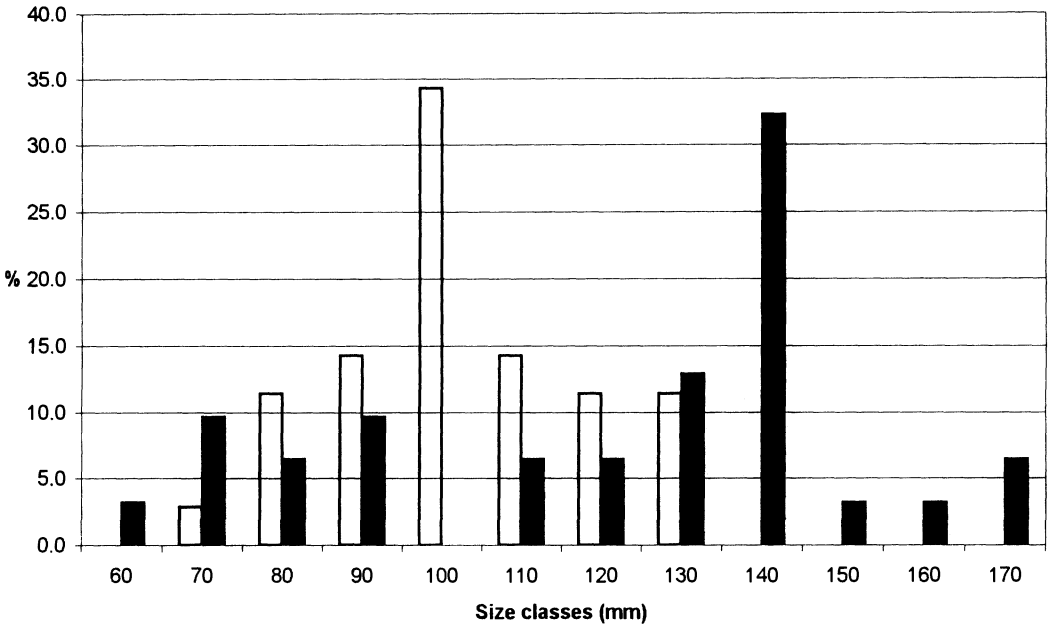

Fig. 2. Size distribution frequencies (CW) for females and males (solid black) of *Chaceon affinis* collected at Menez Gwen hydrothermal vent site (866-m depth).

cf. *kempferi* Darwin) on the carapace and pereiopods.

The two traps laid down on 13 June caught 54 specimens, weighing 25 kg wet weight.

Discussion

It was no surprise to find *C. affinis* in the area observed. Although this species has not been collected previously in this part of the Mid-Atlantic Ridge, it has been recorded from several locations around the islands of the Azores (Manning and Holthuis, 1981), which are not very far from Menez Gwen. The depth at which the sampling was made is also well inside the known depth range for this species.

The presence of many specimens in the inner periphery of a hydrothermal vent site seems to indicate that *C. affinis* can profit from the abundance of biomass available in this particular environment. Although this could not be established by stomach content analyses, the observations, especially that of the specimen feeding on a hydrothermal mussel, corroborate the hypothesis that *C. affinis* can feed on hydrothermal vent organisms.

The number of crabs caught per trap was extremely high. In the case of the catch of 13 June, the yield was 27 crabs or 12.5 kg per trap. This figure is eight times higher than the average yield obtained on the slope of the island of Madeira (32°17′N, 16°54′W) at a similar depth and with similar traps and baits (Biscoito, unpublished). This extraordinary abundance may be associated with the abundance of food potentially available in the hydrothermal vent field, which in turn may support a large population of crabs in its vicinity.

Although the hydrothermal vent communities are important potential food sources, especially when compared with the paucity of food characteristic of oceanic ridges, not many organisms from the typical bathyal fauna are seen inside active vent fields. This was observed with fishes on the East Pacific Rise and the Galapagos Ridge (Geistdoerfer, 1988). In the present case, of the 10 species of fish recorded from Menez Gwen, only two were within the inner periphery of the active vent field (Saldanha and Biscoito, 1997). Of the invertebrate bathyal megafauna, only *C. affinis* and two undetermined shrimps (*Plesionika* sp. and *Periclimenes* sp.) were caught inside the vent field. As pointed out by Geistdoerfer (1988), this may be due to the intolerance of the bathyal faunas to the physicochemical conditions created by the vent fluids (high temperature, methane, sulphides,

etc.). In the present case, *C. affinis* seems to tolerate well these environmental conditions. The specimen seen near the mussel beds, where the water temperature reached 20°C, was in fact being bathed by water mixed with hydrothermal vent fluids. These fluids are in general rich in CH_4 and H_2, with a low concentration of sulphides (Colodner *et al.*, 1993).

These findings must be considered as preliminary. Further research should be carried out in order to quantify the transfer of energy from the hydrothermal vent system to the surrounding environment and to study the adaptations of the bathyal faunas to the hydrothermal vent environmental conditions.

ACKNOWLEDGEMENTS

The authors are greatly indebted to D. Desbruyères and A.-M. Alayse-Danet, Chief-Scientists of DIVA 2 expedition; colleagues of the expedition's scientific team; the captain, officers, and crew of N/O *Nadir*; and the pilots and crew of the deep submersible *Nautile* for all the help and collaboration provided on board. We also thank Philipe Crassous for providing technical assistance with the trap sets, Theiry Comtet for assisting in the handling of material collected, and Patrick Briand in obtaining the videos and color video prints. João Gonçalves helped with the catches during the second leg of the cruise, and Ted Gerrard revised the English. The authors are particularly grateful to Dr. Raymond B. Manning for reading the manuscript and giving useful suggestions.

This work was sponsored by the European Union MAST 2 Programme, Project MARFLUX-ATJ, Contract Number MAST-MAS2 CT93 0070.

LITERATURE CITED

Biscoito, M. 1993. An account on the shrimps of the family Pandalidae (Crustacea, Decapoda, Caridea) in Madeiran waters.—*In:* Proceedings of the 5th Symposium "Fauna and Flora of the Cape Verde Islands," Leiden, 4–7 October 1989. Courrier Forschungsinstitut Senckenberg 159: 321–325.

Colodner, D., J. Lin, K. Von Damm, L. Buttermore, R. Kozlowski, J.-L. Charlou, J. P. Donval, C. Wilson, and The Lucky Strike Team. 1993. Chemistry of Lucky Strike hydrothermal fluids: initial results.—EOS, American Geophysical Union Transactions 74: 99.

Desbruyères, D., A.-M. Alayse, E. Antoine, G. Barbier, F. Barriga, M. Biscoito, P. Briand, J.-P. Brulport, T. Comtet, L. Cornec, P. Crassous, P. Dando, M. C. Fabri, H. Felbeck, F. Lallier, A. Fiala-Médioni, J. Gonçalves, F. Ménard, J. Kerdoncuff, J. Patching, L. Saldanha, and P.-M. Sarradin. 1994. New information on the ecology of deep-sea vent communities in the Azores Triple Junction area: Preliminary Results of the Diva 2 Cruise (May 31–July 4, 1994).—InterRidge News 3(2): 18–19.

Fouquet, Y., J.-L. Charlou, I. Costa, J.-P. Donval, J. Radford-Knoery, H. Pellé, H. Ondréas, N. Lourenço, M. Segonzac, and M. K. Tivey. 1994. A detailed study of the Lucky Strike hydrothermal site and discovery of a new hydrothermal site: Menez Gwen; Preliminary results of the DIVA 1 cruise (5–29 May, 1994).—InterRidge News 3(2): 14–17.

Geistdoerfer, P. 1988. Les peuplements ichthyologiques liés aux sites hydrothermaux et vivant à leur péripherie.—Oceanologica Acta, special number, pp. 125–130.

González, J. A., J. I. Santana, and V. Fernández-Vergaz. 1996. The family Geryonidae (Decapoda, Brachyura) in the Canary Islands.—Crustaceana 69: 627–635.

Hastie, L. C. 1995. Deep-water geryonid crabs: A continental slope resource.—Oceanography and Marine Biology 33: 561–584.

Lindberg, W. J., and F. D. Lockhart. 1993. Depth-stratified population structure of geryonid crabs in the eastern Gulf of Mexico.—Journal of Crustacean Biology 13: 713–722.

Manning, R. B., and L. B. Holthuis. 1981. West African brachyuran crabs (Crustacea: Decapoda).—Smithsonian Contributions to Zoology 306: 1–379.

———, and ———. 1989. Two new genera and nine new species of geryonid crabs (Crustacea, Decapoda, Geryonidae).—Proceedings of the Biological Society of Washington 102: 50–77.

Saldanha, L., and M. Biscoito. 1997. Fishes of the Lucky Strike and Menez Gwen hydrothermal vent sites (Mid-Atlantic Ridge).—Boletim do Museu Municipal do Funchal 49: 189–206.

RECEIVED: 20 November 1998.
ACCEPTED: 26 February 1999.