Full Length Research Paper

Polymorphism of *Cyclops abyssorum mauritaniae* (Copepoda, Cyclopoidae) collected from Algeria water bodies

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Three morphotypes A, B and C were isolated after description of *Cyclops abyssorum mauritaniae* populations obtained from 46 Algerian water bodies. These are described based on their morphometric characters. Morphotype A found in six localities characterized the east of Algeria, morphotype B was collected in the west of Algeria, while morphotype C was collected in High Mountain in the North. After dissection of certain males and females, measurements of the different parts of the body illustrated by drawings were made for each morphotype. The size of morphotype B is intermediate between A and C. The outer side of the second article of the fifth thoracic leg presents a small bump only in morphotype A and C. Morphotype C is characterized by the convexity of its third, fourth and fifth thoracics anterior margin. Other differences were observed on ornamentations of the antenna basis and the coxa of the fourth leg. This subspecies, with common occurrence in the Eastern Region of Algeria and rare occurrence in the northern and western parts of the country indicates that it is dispersed in Algeria from the East to the West and North.

Key words: Algeria, Copepoda, *Cyclops abyssorum mauritaniae*, distribution, polymorphism.

INTRODUCTION

*Cyclops abyssorum mauritaniae* Lindberg 1950 is a Southern element of the Holarctic genus *Cyclops* O.F. Muller 1776. In North Africa, *C. abyssorum mauritaniae* was first reported from Morocco by Lindberg (1950) and was met for the first time in Algeria in 1992 (Akli, 1992). In Tunisia it was reported later by Toumi et al. (2013). Three populations from the Middle and High Atlas (Dayat Ifrah, Aguelmane de Sidi Ali, and Lake Ifni) have been compared (Dumont and Decraemer, 1977).

In accordance with its eurytopy, the species has been recorded as tolerating a variety of environmental conditions, such as acidic waters (Røen, 1962) and alkaline waters (Morgan, 1972). In Algeria shallow dams, this species was usually observed after eutrophication (Bidi et al., 2014). According to Krajicek et al. (2016), eutrophication represents a recent dispersion caused by man. Many morphotypes of *C. abyssorum* have been

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described by different authors. Einsle (1975) found that
the planktonic populations react quickly to the
environmental conditions changes with a change of
morphometry of the different parts of the body.

MATERIALS AND METHODS

Sampling

A total of 46 water bodies (Table 1 and Figure 1) were sampled in
different parts of Algeria with one sampling per water body except
for three localities (9, 10 and 18). Samples were collected using
plankton net of 50μm mesh size. The samples were fixed in 5%
formalin solution. Samples were collected by the author.

Dissection

For preparation, the organisms were first placed in small dishes
containing a mixture of formalin water and glycerin. The water
evaporated in 1-2 days and then specimens were dissected in the
concentrated glycerin. The cyclopoids were examined in dorsal
view. Total body length and length of antennules in relation to the
cephalothorax were measured. Other measurements on the caudal
rami, the fourth and fifth thoracic legs were made after dissection
and followed by drawings for each morphotype of *C. abyssorum
mauritaniae*. Cyclopoids were identified using the key of Dussart
(1969) (Table 2).

RESULTS AND DISCUSSION

Three Algerian morphotypes A, B and C of *C. abyssorum
mauritaniae* were identified. The morphotype A which characterises the East Algeria water bodies was the most
abundant, collected at different altitudes (25, 600 and
1090 m) in lakes and wadis. Only two females of
morphotype B was sampled in West Algeria, in wadi at 86
m altitude, while morphotype C was collected in lake in the
High Mountain (1200 m altitude), in the North. According to Holynska and Wyngaard (2019), *C. abyssorum* G. O Sars, 1863 occur in both low and high-
altitude habitats. Morphotype A (Figure 2a) is the most
robust one (2.2-2.3 mm); size of morphotype B (1.9- 2.1
mm) is intermediate between A and C (1.7-2 mm) (Figure
2b and c). Tunisian (1.6-2.2 mm) and Algerian specimens of *C. abyssorum mauritaniae* have relatively big size
compared to Morocco specimens of Aguelmane de Sidi Ali (1.4-1.74 mm) and lake Iffni (1.24-1.29 mm). From
Dayat Ifrah one adult female was isolated, suggesting a
more robust form than the animals from Aguelmane de
Sidi Ali, with shorter furcal rami (Dumont and Decraemer, 1977). Algerian specimens’ first antenna reaches the
posterior margin of the cephalothorax; those from Morocco have the first antenna that reaches the half of
the second thoracic segment; those from Tunisia exceed it. Morphotype C shows a habitus that is close to the
material of Aguelmane Sidi Ali with convexity of its
third, fourth and fifth thoracic anterior margin (Figure 2c).
Furcal rami in morphotype C (Figure 3c) are slightly
shorter (5.6 -6.9 times as long as wide) than of morphotype A and B (6 -7 times as long as wide) (Figure
3a, b). Morphotype A shows furcal rami (Figure 3a) with
thickened ridge in the dorsal side which is close to that of
Dumont material of Dayat Ifrah (Dumont and Decraemer, 1977).

Differences between these three morphotypes were
observed in spine ornamentation of the antennary
basipodite. The antennary basipodite in caudal view
(Figure 4a, c and e) is shown in both morphotypes’
proximal spinules; on the lateral rim, it is composed of 6
long spinules slightly incurved in morphotype A, 8
spinules in morphotype B and 3 little spinules in
morphotype C. Oblique row of spinules next to proximal
row on lateral rim is composed of 7 elongated spinules in
morphotype A, 4 spinules in morphotype B and 7
spinules in morphotype C. Longitudinal row along lateral
rim is arranged in one curved row of small spinules (10
spinules) of equal size in morphotype A and one
continuous row of spinules (7spinules) in morphotype C,
in morphotype B, longitudinal row along lateral rim is absent. Frontal spine pattern of antennary (Figure 4b, f)
consists of group of oblique spinules (4) near the base in
morphotype A and C, frontal basipodite antenna without
spinules (3d).

In all morphotypes, formula of exopodite 3 (P1-P4) is:
3- 4- 3- 3; the endopodite 3 of the fourth leg is 2 to 2.5
times as long as broad. The internal apical spine is 2
times as long as the external apical spine (Figure 5a, b
and c). Caudal spine ornamentation of P4 coxopodite
(Figure 6a, b and c) composed of intermittent row of
spinules along distal rim is arranged differently in both
morphotypes; (4+5) in morphotype A, (11+1)
in morphotype B and (4+4) in morphotype C. Along
proximal rim of P4 coxopodite, spinules are arranged in
two rows with different size, consisting of 17 spinules
in morphotype A, 22 spinules in morphotype B and 16
spinules in morphotype C. On lateral rim, a row of
numerous fine spicules comb like exists only in
morphotype A. The connecting plate of P4 carries two
rows of long hair; it is an ornamentation which is identical
to all the morphotypes. The outer side of the second
article of the fifth thoracic leg presents a small bump in
morphotype A and C (Figure 7a and c) with 4 to 5 small
spines for morphotype A (Figure 7a) and 3 to 4 small
spines for morphotypes B and C (Figure 7b and c).

Conclusion

In the 46 water bodies sampled, *C. abyssorum
mauritaniae* existed only in eight localities with
considerable morphological plasticity. Morphological
characters of morphotype A are stable in all its localities;
for morphotype C, any morphological differences in
samples taken at different time were found. These suggest that morphotypes character differences are not local neither temporal, and are due to fragmented dispersion of *C. abyssorum mauritaniae*. This subspecies
**Figure 1.** Sampled localities (numbers) in water bodies of Algeria.

**Table 2.** Material examined (Number(s) refer to the localities.

| **Cyclops abyssorum mauritaniae (Morphotype A)** |   |
|-----------------------------------------------|---|
| 22                                           | Several males, several females. |
| 23                                           | Several males, several females. |
| 24                                           | Several males, several females, copepodites. |
| 30                                           | One female. |
| 31                                           | One female, copepodites. |
| 35                                           | Several males, several females |

**Cyclops abyssorum mauritaniae (Morphotype B)**

8 Two females

**3-Cyclops abyssorum mauritaniae (Morphotype C)**

18 One male, several females

is well represented in the Eastern Region of Algeria and rare in the North and West regions, indicating that it originated in the East and began spreading to north and west Algeria taking different forms. *C. abyssorum*
Figure 2. *C. abyssorum mauritaniae* Lindberg 1950. Habitus: a: morphotype A; b: morphotype B; c: morphotype C.

Figure 3. *C. abyssorum mauritaniae* Lindberg 1950. Furca: a: morphotype A; b: morphotype B; c: morphotype C.
Figure 4. *C. abyssorum mauritaniae* Lindberg 1950. Surface ornamentation of antennal basis: Caudal surface (a) and frontal surface (b) of morphotype A, caudal surface (c) and frontal surface (d) of morphotype B; caudal surface (e) and frontal surface (f) of morphotype C.

Figure 5. *C. abyssorum mauritaniae* Lindberg 1950. Fourth leg (P4): a, morphotype A; b: morphotype B; c: morphotype C.
Figure 6. *C. abyssorum mauritaniae* Lindberg 1950. Caudal surface ornamentation of P4 coxa and connecting plate of the fourth legs (P4): a: morphotype A; b: morphotype B; c: morphotype C.
Figure 7. *C. abyssorum mauritaniae* Lindberg 1950. Fifth thoracic segment (Th5), fourth leg (P5) and genital segment: a: morphotype A; b: morphotype B; c: morphotype C.

*mauritaniae* is one of the relatively poorly known representatives of the Holarctic genus *Cyclops*. A study on the geographic variation of the morphological characters in this North African taxon might have been a very interesting.

**CONFLICT OF INTERESTS**

The authors have not declared any conflict of interests.

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