DOI 10.1285/i15910725v42p93
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CYCLOPOIDA AND HARPACTICOIDA (CRUSTACEA: COPEPODA) OF THE GULF OF GABÈS: A REVIEW

SUMMARY

This study presents a faunal list of Cyclopoida and Harpacticoida in the Gulf of Gabès waters. A total of 30 Cyclopoida and 11 Harpcticoida species belonging to 5 and 8 families, respectively, were reported in this study area. Corycaeidae is the most diversified family with 10 species including the invasive Atlantic species, *Ditrichocorycaeus amazonicus*. The Oithonidae (mainly *Oithona nana*) were dominant in the coastal waters, whereas they declined in the offshore area, most likely due to the influence of the Atlantic Tunisian Current.

HISTORY OF STUDIES

The history of studies on Copepoda in the Gulf of Gabès started in March 1970 by Bernard and Bernard (1973), who reported in the coastal waters of Jerba island 2 species of Harpacticoida (*Microsetella norvegica* Boeck, 1865 and *Euterpina acutifrons* Dana, 1847) and 5 Cyclopoida (*Oithona nana* Giesbrecht, 1893, *Corycaeus brehmi* Steuer, 1910, *Oncaea* sp., *Farranula* sp., and *Cyclopina* sp.). After 22 years and from April 1992 to march 1993, Daly Yahia and Romdhane (1994) reported the presence of two species of Harpacticoida (*Euterpina acutifrons* Dana, 1847 and *Clytemnestra rostrata* Brady, 1883) and one Cyclopoida (*Oithona nana* Giesbrecht, 1893). Since 2005, many studies on Cyclopoida and Harpacticoida in Gulf of Gabès ecosystems were performed (Drira *et al.,* 2010; 2017; Rekik *et al.,* 2012; Drira *et al.,* 2014; Ben Ltaief *et al.,* 2015; 2017; Ben Salem *et al.,* 2015; Rekik *et al.,* 2018a, b; Kmiha Megdiche *et al.,* 2019).

STUDY AREA

The Gulf of Gabes is approximately 90 km wide, with a 700 km coastline extending from *Ras kapoudia* to the Tunisian–Libyan border (Fig. 1). It presents some unique characteristics in the Mediterranean Sea such as a gently sloping bathymetry to a water depth of 50 m at around 130 km from the coastline and tidal amplitude, which is the highest in the Mediterranean Sea, exceeding 1.7 m (Aloulou *et al.,* 2012). The Gulf of Gabès plays an important role in Tunisian economy as a well-known fishing reserve and an important nursery for various fish species (DGPA, 2015; Enajjar *et al.,* 2015).

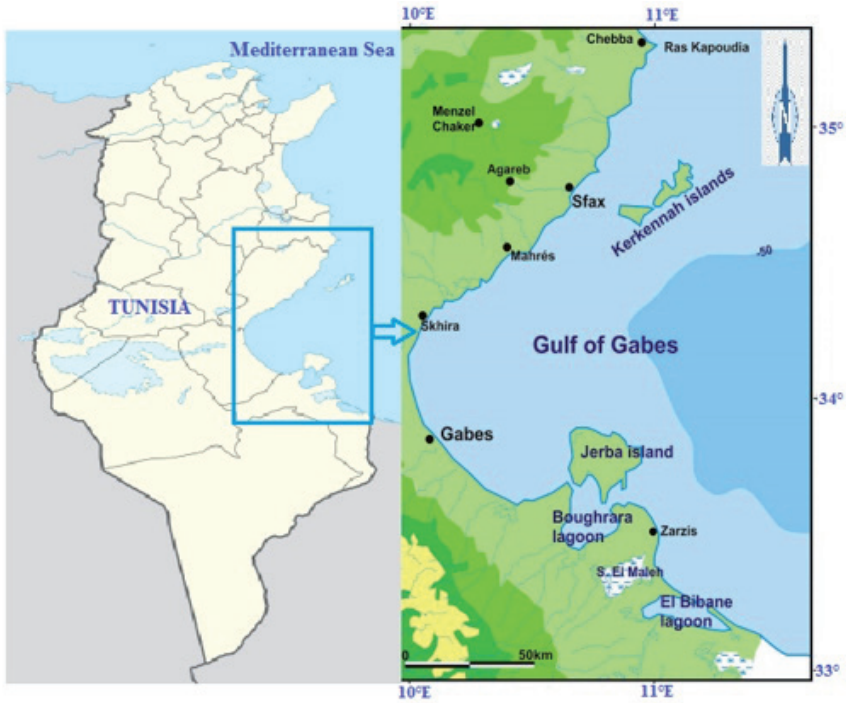

Fig. 1. Localization of the gulf of Gabès.

RESULTS AND DISCUSSION

A total of 30 Cyclopoida species belonging to 5 families, and 11 Harpacticoida species belonging to 8 families are listed in Table 1. Daly-Yahia *et al.* (2004) observed 17 species of Cyclopoida and 5 species of Harpacticoida in the Bay of Tunis. Razouls *et al.* (2005-2020) reported a total of 55 Cyclopoida and Harpcticoida in the area of the Mediterranean Sea which includes the Gulf of Gabès. Along the northern coast of Africa, copepod species richness seems not to follow an eastward gradual decrease. In fact, along the Mediterranean Moroccan coast, 58 copepod species (34 Calanoida, 19 Cyclopoida and 5 Harpacticoida) were observed by Berraho *et al.* (2016). Khelifi-Touhami et al. (2007) in the Gulf of Annaba and El Kala (east coast of Algeria) showed a specific richness reaching 143 copepod species (81 Calanoida, 54 Cyclopoida, and 8 Harpacticoida).

Corycaeidae is the most diversified family among Cyclopoida, with 10 species. Among the described taxa, only the cyclopoid *Pachos tuberosum* Giesbrecht, 1891 was classified as endemic species in the Mediterranean Sea (Razouls *et al.,* 2005-2020). The invasive Atlantic species, *Ditrichocorycaeus amazonicus* Dahl, 1894, was recorded mainly in the offshore region of the Gulf of Gabès. This could depend by transport in ballast waters (Razouls *et al.,* 2005-20) being the species typical of America and only present in gulf of Gabes out of its native geographic distribution.

Small copepods, particularly Oithonidae (mainly *Oithona nana*), were observed to largely dominate copepod communities in the Gulf of Gabès (Rekik *et al.,* 2012; Drira *et al.,* 2014). The adoption of a successful reproductive strategy combined with an omnivorous diet, lower metabolic needs and tolerance to pollution are certainly behind the prominence of small planktonic copepods in the inshore region of the Gulf of Gabès (Ben Ltaief *et al.,* 2015). However, in the open sea region of the Gulf of Gabès, where exchange of water masses is active and under the influence of the Atlantic, Oithonidae density declined significantly, providing place to offshore copepod species such as the calanoid *Nannocalanus minor* Claus, 1863 (Ben Ltaief *et al.,* 2015).

Table 1. List of the Cyclopoida and Harpacticoida species in the Gulf of Gabès observed by the following literature: 1: Drira *et al.,* 2010, 2 : Rekik *et al.,* 2012, 3 : Drira *et al.,* 2014, 4 : Ben Ltaief *et al.,* 2015, 5 : Ben Salem *et al.,* 2015, 6 : Ben Ltaief *et al.,* 2017, 7 : Drira *et al.,* 2017, 8 : Rekik *et al.,* 2018a, 9 : Rekik *et al.,* 2018b, 10 : Kmiha Megdiche *et al.,* 2019.

Order	Family	Species	Authors
Cyclopoida	Oithonidae	*Oithona nana* Giesbrecht, 1893	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
		Oithona similis Claus, 1866	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
		Oithona plumifera Baird, 1843	1, 3, 4, 6, 7, 9, 10
		Oithona robusta Giesbrecht, 1891	3
		Oithona linearis Giesbrecht, 1891	6, 9
		Oithona attenuata Farran, 1913	6
		Oithona brevicornis Giesbrecht, 1891	7
		Oithona setigera Dana, 1849	10
	Corycaeidae	*Agetus limbatus* Brady, 1883	1, 3
		Corycaeus clausi Dahl, 1894	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
		Corycaeus giesbrechti Dahl, 1894	6
		Corycaeus speciosus Dana, 1849	1, 2 , 3, 6, 7, 9, 10
		Corycaeus latus Dana, 1849	3, 4, 6, 7
		Farranula carinata Giesbrecht, 1891	1, 3
		Farranula gracilis Dana, 1849	6
		Farranula rostrata Claus, 1863	1, 3, 4, 6, 8
		Onychocorycaeus ovalis Claus, 1863	4, 6
		Ditrichocorycaeus amazonicus Dahl F, 1894	6
	Oncaeidae	*Triconia conifera* Giesbrecht, 1891	1, 2, 3, 5, 6, 7, 8, 9, 10
		Triconia minuta Giesbrecht, 1893	7, 10
		Oncaea mediterranea Claus, 1863	1, 2, 3, 4, 6, 7, 8, 9, 10
		Oncaea notopus Giesbrecht, 1891	1, 3
		Oncaea venusta Philippi, 1843	4, 6
		Oncaea clevei Früchtl, 1923	4, 6
		Oncaea media Giesbrecht, 1891	6
		Conaea rapax Giesbrecht, 1891	3, 9
	Incertae sedis	*Pachos tuberosum* Giesbrecht, 1891	4
	Sapphirinidae	*Sapphirina darwinii* Haeckel, 1864	6
		Sapphirina intestinata Giesbrecht, 1891	6
		Sapphirina nigromaculata Claus, 1863	6

Harpacticoida	Tachidiidae	*Euterpina acutifrons* Dana, *1847*	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
	Ectinosomatidae	*Microsetella rosea* Dana, 1847	1, 2, 3, 4, 6, 8, 9
		Microsetella norvegica Boeck, 1865	1, 2, 3, 4, 5, 6, 8, 9
	Miraciidae	*Macrosetella gracilis* Dana, 1846	6
	Peltidiidae	*Clytemnestra scutellata* Dana, 1847	1, 2, 3, 5, 7, 8, 9, 10
	Tisbidae	*Tisbe battagliai* Volkmann-Rocco, 1972	2, 5, 6, 7, 8
		Tisbe furcata furcata Baird, 1837	10
	Harpacticidae	*Harpacticus littoralis* Sars G.O., 1910	7, 10
		Tigriopus sp. Norman, 1869	10
	Aegisthidae	*Aegisthus aculeatus* Giesbrecht, 1891	3
	Metidae	*Metis ignea* Philippi, 1843	8

REFERENCES

Aloulou F., Elleuch B., Kallel M., 2012 – Benthic foraminiferal assemblages as pollution proxies in the northern coast of Gabes Gulf, Tunisia. *Environmental Monitoring and Assessment* **184**: 777-795.

Béjaoui B., Rais S., Koutitonsky V., 2004 – Modélisation de la dispersion du phosphogypse dans le golfe de Gabès. *Bulletin de l'Institut National des Sciences et Technologie de la Mer de Salammbô* **31**: 103-109.

Berraho A., Abdelouahab H., Charib S., Essarraj S., Larissi J., Abdellaoui B., Christou E.D., 2016 – Copepod community along the Mediterranean coast of Morocco (Southwestern Alboran Sea) during spring. *Mediterranean Marine Science* DOI: http://dx.doi.org/10.12681/mms.1733.

Ben Ltaief T., Drira Z., Devenon J.L., Hamza A., Ayadi H., Pagano M., 2017 – How could thermal stratification affect horizontal distribution of depth- integrated metazooplankton communities in the Gulf of Gabes (Tunisia)? *Marine Biology Research* **13**(3): 269-287.

Ben Ltaief T., Drira Z., Hannachi I., Bel Hassen M., Hamza A., Pagano M., Ayadi H., 2015 – What are the factors leading to the success of small planktonic copepods in the Gulf of Gabes, Tunisia? *Journal of the Marine Biological Association of the United Kingdom* **95**(4): 747-761.

Ben Salem Z., Drira Z., Ayadi H., 2015 – What factors drive thevariations of phytoplankton, ciliate and mesozooplankton communitiesin the polluted southern coast of Sfax, Tunisia? *Environmental Science and Pollution Research International* **22**: 11764-11780.

Bernard M., Bernard F., 1973 – Premier examen du plancton végétal et animal des parages de l'île de Djerba. *Rapport de la Commission internationale pour l'exploration scientifique de la Mer Méditerranée* **21**: 503-506.

DGPA, 2015 – *Annuaire des Statistiques des Pêches en Tunisie (Année 2015)*. Direction Générale de la Pêche et de l'Aquaculture, Tunis: 120 pp.

Daly Yahia M.N., Romdhane M.S., 1994 – Contribution à la connaissance des cycles saisonniers des Copépodes pélagiques (Mer de Bou Grara). *Bulletin de la Société Tunisienne de Science Naturelle Tunis* **10**: 1-10.

Daly Yahia M.N., Souissi S., Daly Yahia-Kéfi O., 2004 – Spatial and Temporal Structure of Planktonic Copepods in the Bay of Tunis (Southwestern Mediterranean Sea). *Zoological Studies* **43**(2): 366-375.

Drira Z., Kmiha Megdiche S., Sahnoun H., Tedetti M., Pagano M., Ayadi H., 2017 – Copepod assemblages as a bioindicator of environmental quality in three coastal areas under contrasted anthropogenic inputs (Gulf of Gabes, Tunisia). *Journal of the Marine Biological Association of the United Kingdom* ***volume***: 1-7.

Drira Z., Bel Hassen M., Ayadi H., Aleya L., 2014 – What factors drive copepod community distribution in the Gulf of Gabes, Eastern Mediterranean Sea? *Environmental Science and Pollution Research* **21**: 2918–2934.

Drira Z., Belhassen M., Ayadi H., Hamza A., Zarrad R., Bouain A., Aleya L., 2010 – Copepod community structure related to environmental factors from a summer cruise in the Gulf of Gabes (Tunisia, eastern Mediterranean Sea). *Journal of the Marine Biological Association of the UK* **90**(1): 145-157.

Enajjar S., Saidi B., Bradai M.N., 2015 – The gulf of Gabes (central Mediterranean Sea): a nursery area for sharks and batoids (Chondrichthyes: Elasmobranchii). Cahier de Biologie Marine **56**,143-150.

Khelifi-Touhami M., Semroud R., Hamdi E., Ounissi M., Haridi A., 2007– The planktonic copepod communities from the southern Mediterranean Sea (Algeria, Tunisia) with a redescription of *Paracalanus indicus* Wolfenden 1905 (Copepoda: Calanoida). *Cahiers de Biologie Marine* **48**: 327-337.

Kmiha Megdiche S., Drira Z., Pagano M., Ayadi H., 2019 – Changes in Copepod Community Between Two Contrasting Samplings in a Highly Polluted Mediterranean Coastal Zone (Sfax Bay, Tunisia). *Oceanography and Fisheries Open Access journal* **10**(2): 555785.

Razouls C., de Bovée F., Kouwenberg J., Desreumaux N., 2005-2020 – Diversity and Geographic Distribution of Marine Planktonic Copepods. Sorbonne University, CNRS. Available at http://copepodes.obs-banyuls.fr/en.

Rekik A., Drira Z., Guermazi W., Elloumi J., Maalej S., Aleya L., Ayadi H., 2012 – Impacts of an uncontrolled phosphogypsum dumpsite on summer distribution of phytoplankton, copepods and ciliates in relation to abiotic variables along the near-shore of the southwestern Mediterranean coast. *Marine Pollution Bulletin* **64**, 336-346.

Rekik A., Ayadi H., Elloumi J., 2018a – Spatial and inter-annual variability of proto- and metazooplankton during summer around the Kneiss Islands (Tunisia, Central Mediterranean Sea). *Applied Water Science* **8**(4): 99.

Rekik A., Ayadi H., Elloumi J., 2018b – Distribution of the plankton assemblages during the winter and summer along the southern coast of the Kerkennah Islands (Tunisia, Eastern Mediterranean Sea). *Marine Ecology* **39**: e12494.