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National Inventory and Ecological status of Marine Crustaceans in Libyan Waters, Southern Mediterranean

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Abstract

The Libyan coast provides an ecological habitat supporting a diversity of marine crustaceans. This study aims to assess the diversity, spatial distribution, and ecological status of crustacean species inhabiting Libyan marine waters. Data were compiled from a comprehensive review of unpublished scientific surveys, technical reports, and biological samples collected along various parts of the Libyan coast during two main sampling periods: January 2005 to March 2006, and January 2013 to January 2017. Additional benthic samples were obtained from a shipwreck site located on a sandy seabed at a depth of 31 meters off the coast of Tripoli during both winter and summer seasons in 2020. A total of 357 crustacean species were identified, encompassing five taxonomic classes and 138 families. Species richness was highest in the eastern coastal region. The class *Malacostraca* represented the most taxonomically diverse group, comprising 62.32% of the identified families and 162 species (45% of the total species count). This was followed by *Hexanauplia*, which accounted for 31.88% of the families and included 183 species (50.83%). The majority of recorded species (94.40%) were native to Libyan waters, while 5.60% were classified as non-indigenous. These non-indigenous species, primarily localized along the coast, offer critical insights into patterns of marine bio-invasion and species establishment in the south-eastern Mediterranean Sea. This study provides a comprehensive evaluation of crustacean biodiversity along the Libyan coast, contributing significantly to baseline data for regional marine biodiversity assessments. It also highlights key distributional patterns and potential ecological implications of non-indigenous species in this underexplored sector of the Mediterranean basin.

القائمة الوطنية والوضع البيئى للقشريات البحرية فى المياه الليبية، جنوب البحر المتوسط

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يوفر الشاطي الليبي مواطن بيئية تدعم تنوعًا كبيرًا من القشريات البحرية. تهدف هذه الدراسة إلى تقييم التنوع والتوزيع المكاني والحالة البيئية لأنواع القشريات التي تعيش في المياه البحرية الليبية. تم تجميع البيانات من مراجعة شاملة لمسوحات علمية غير منشورة وتقارير فنية وعينات بيولوجية تم جمعها من مناطق مختلفة على طول الشاطي الليبي خلال فترتي أخذ عينات رئيسيتين: من يناير 2005 إلى مارس 2006،

ومن يناير 2013 إلى يناير 2017. كما تم الحصول على عينات إضافية من القاع من موقع حطام سفينة يقع على قاع رملي على عمق 31 مترًا قبالة طرابلس خلال موسمي الشتاء والصيف من عام 2020. تم تحديد ما مجموعه 357 نوعًا من القشريات، شملت خمس رتب تصنيفية و138 عائلة. وسُجل أعلى غنى في الأنواع في المنطقة الشرقية. وقد مثّلت رتبة القشريات العليا (Malacostraca) المجموعة الأكثر تنوعًا من الناحية التصنيفية، حيث شملت 62.32٪ من العائلات المحددة و162 نوعًا (45٪ من إجمالي عدد الأنواع). تلتها رتبة Hexanauplia التي شكّلت 31.88٪ من العائلات وضمّت 183 نوعًا (50.83٪). وكانت الغالبية العظمى من الأنواع المسجلة (94.4٪) من الأنواع المحلية في المياه الليبية، في حين صُنّف 5.60٪ منها كأنواع غير محلية. وتوفر هذه الأنواع غير المحلية، التي تتركز في الغالب على طول الشاطي، رؤى مهمة حول أنماط الغزو البيولوجي البحري واستقرار الأنواع في جنوب شرق البحر المتوسط. وتُعد هذه الدراسة تقييماً شاملاً لتنوع القشريات على طول الساحل الليبي، حيث تُسهم بشكل كبير في توفير بيانات أساسية لتقييم التنوع البيولوجي البحري الإقليمي. كما تسلط الضوء على أنماط التوزيع الرئيسية والتأثيرات البيئية المحتملة للأنواع غير المحلية في هذا الجزء غير المستكشف من حوض البحر المتوسط.

Introduction

The subphylum Crustacea**,** one of the most species-rich and morphologically diverse groups within the phylum Arthropoda (clade *Mandibulata*), comprises over 70,000 described species that inhabit nearly all major ecosystems on Earth *with the notable exception of the airspace* (Schram, 1986). Crustaceans are morphologically distinct from other arthropod groups such as insects, myriapods, and chelicerates by features including biramous appendages and characteristic larval forms, notably the nauplius stage in taxa such as branchiopods and copepods (Zhang, 2011).

In the Mediterranean Sea, over 30,000 crustacean species have been recorded, with diversity patterns influenced by habitat type and bathymetric gradients, within this region, amphipods are particularly abundant and ecologically significant (Zakhama-Sraieb et al., 2009). Crustaceans are also of major economic importance. Annually, more than 7.9 million tons are harvested globally for human consumption, with shrimps and prawns accounting for the majority of the catch (SOFIA, 2018).

In the Libyan marine environment, the study of crustacean biodiversity has a fragmented history. The first documented survey, conducted by Maccagno (1939), identified 18 amphipod species, this was followed by a Romanian expedition (1975–1976), which added 33 new species to the national amphipod inventory (Ţigănuş, 1984). Subsequent work by Ortiz and Petrescu (2007) expanded the list to 125 amphipod species across 27 families. A French expedition in 1966 further contributed by identifying 20 crustacean species along the Libyan coast (Rawag et al., 2004).

Additional notable studies include a 1993–1994 coastal survey that designated the area between Misurata and Abukemash as a primary crustacean fishing ground (Kashout et al., 2002), and Bazairi et al. (2013), who reported 63 alien marine species in Libyan waters, 11 of which were arthropods. Abushaala et al., (2014) documented 37 crustacean species, including 6 isopods, 23 decapods, 7 amphipods, and 1 balanomorph. More recently, Shakman et al. (2017) recorded seven new marine species along the Libyan coast, including the blue swimmer crab *Portunus segnis*. Despite these scattered contributions, a comprehensive synthesis of Libya's marine crustacean fauna is lacking. The present study aims to fill this gap by compiling and evaluating existing records to assess the diversity and distribution of marine crustaceans along the Libyan coast.

Materials and Methods

The Libyan coast, covering approximately 2,000 km along the southern Mediterranean Sea, is divided into three main regions based on topography, habitats, and environments: The Eastern region, the Gulf of Sirt, and the Western region (Shakman, 2008). Records of marine crustaceans have been collected from a variety of sources, including published articles, technical reports, grey literature, and unpublished data, over the past five decades. Additional samples were collected during surveys and awareness campaigns, specifically from two periods: January 2005 to March 2006 and January 2013 to January 2017. Furthermore, two unpublished MSc studies provided further samples: one conducted along the western coast of Libya (Bek-Benghazi, 2020), and the other focused on the Randa shipwreck located on the sandy bottom at a depth of 31 meters off the Tripoli coast during the winter and summer seasons of 2020 (Al-Mgoushi, 2020). Additionally, published information from the Libyan society of Artisanal Fishery Friends (LSAFF), https://lsaff.org.ly , of was used, which relied on local fishermen's documentation of species. The scientific names used in this study adhere to the World Register of Marine Species (WoRMS, 2020) (http://www.marinespecies.org). Some specimens were preserved and registered at the Natural History Museum, Zoology Department, University of Tripoli. The distribution of these species was recorded based on their presence in the aforementioned references as well as our own fieldwork observations.

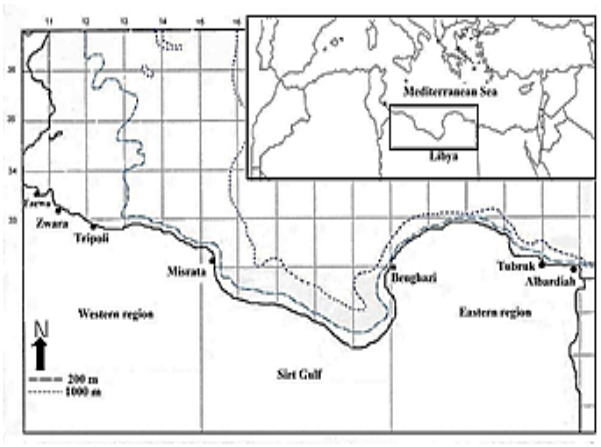

Fig 1. Sampling: Eastern region, Sirt Gulf and Western region on the Libyan coast.

Results and Discussion

In this study, a total of 357 marine crustacean species were recorded along the Libyan coast, covering 138 families (Table 1). These species were distributed across five classes, with *Malacostraca* being the most prominent, comprising 62.32% of the families. This was followed by Hexanauplia at 31.88%, while Thecostraca had the smallest representation, accounting for just 0.72% (Fig. 2).

In terms of species diversity, *Malacostraca* again ranked highest, contributing 50% of the total diversity, followed closely by Hexanauplia at 45%. Thecostraca displayed the lowest diversity, making up only 0.28% of the total (Fig. 3).

Table 1. Marine crustacean species recorded along the Libyan coast up to March 2025 (S: Sirt Gulf, W: western region, E: eastern region, A: along the coast; N: native; NIS: non-indigenous species)

No.	Class	Family	Scientific name	Origin	Distribution	Reference
1	*Branchiopoda*	*Podonidae*	*Evadne sp* Lovén, 1836	Native	E	Contransimex, 1977
2	*Branchiopoda*	*Percnidae*	*Percnon gibbesi* (H. Milne-Edwards, 1853)	NIS	W	Shakman et al. 2019
3	*Branchiopoda*	*Podonidae*	*Evadne spinifera* P.E. Müller, 1867	Native	E	Contransimex, 1977
4	*Branchiopoda*	*Podonidae*	*Podon sp* Lilljeborg, 1853	Native	E	Contransimex, 1977
5	*Branchiopoda*	*Sididae*	*Penilia avirostris* Dana, 1849	Native	E	Contransimex, 1977
6	*Hexanauplia*	*Acartiidae*	Acartia (Acanthacartia) cagayanensis Sakaguchi & Ueda, 2020	Native	E	Contransimex, 1977
7	*Hexanauplia*	*Acartiidae*	*Acartia (Acartia) danae* Giesbrecht, 1889	Native	E	Contransimex, 1977
8	*Hexanauplia*	*Acartiidae*	*Acartia (Acartia) negligens* Dana, 1849	Native	E	Contransimex, 1977
9	*Hexanauplia*	*Acartiidae*	*Acartia (Acartiura) longiremis* (Lilljeborg, 1853)	Native	E	Contransimex, 1977
10	*Hexanauplia*	*Acartiidae*	*Acartia (Hypoacartia) adriatica* Steuer, 1910	Native	E	Contransimex, 1977
11	*Hexanauplia*	*Aegisthidae*	*Aegisthus aculeatus* Giesbrecht, 1891	Native	E	Contransimex, 1977
12	*Hexanauplia*	*Aetideidae*	*Aetideus armatus* (Boeck, 1872)	Native	E	Contransimex, 1977
13	*Hexanauplia*	*Aetideidae*	*Aetideus giesbrechti* Cleve, 1904	Native	E	Contransimex, 1977
14	*Hexanauplia*	*Aetideidae*	*Gaetanus kruppii* Giesbrecht, 1903	Native	E	Contransimex, 1977
15	*Hexanauplia*	*Aetideidae*	*Gaetanus minutus* (Sars G.O., 1907)	Native	E	Contransimex, 1977
16	*Hexanauplia*	*Aetideidae*	*Bradyidius armatus* (Vanhöffen, 1897)	Native	E	Contransimex, 1977
17	*Hexanauplia*	*Aetideidae*	*Chiridius poppei* Giesbrecht, 1893	Native	E	Contransimex, 1977
18	*Hexanauplia*	*Aetideidae*	*Euchirella messinensis messinensis* (Claus, 1863)	Native	E	Contransimex, 1977
19	*Hexanauplia*	*Aetideidae*	*Euchirella rostrata* (Claus, 1866)	Native	E	Contransimex, 1977
20	*Hexanauplia*	*Archaeobalanidae*	*Semibalanus balanoides* (Linnaeus, 1767)	Native	E	Contransimex, 1977
21	*Hexanauplia*	*Arietellidae*	*Paramisophria cluthae* Scott T., 1897	Native	E	Contransimex, 1977
22	*Hexanauplia*	*Augaptilidae*	*Augaptilus anceps* Farran, 1908	Native	E	Contransimex, 1977
23	*Hexanauplia*	*Augaptilidae*	*Haloptilus acutifrons* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
24	*Hexanauplia*	*Augaptilidae*	*Haloptilus angusticeps* Sars G.O., 1907	Native	E	Contransimex, 1977

25	*Hexanauplia*	*Augaptilidae*	*Haloptilus fertilis* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
26	*Hexanauplia*	*Augaptilidae*	*Haloptilus longicornis* (Claus, 1863)	Native	E	Contransimex, 1977
27	*Hexanauplia*	*Augaptilidae*	*Haloptilus mucronatus* (Claus, 1863	Native	E	Contransimex, 1977
28	*Hexanauplia*	*Augaptilidae*	*Haloptilus ornatus* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
29	*Hexanauplia*	*Augaptilidae*	*Haloptilus oxycephalus* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
30	*Hexanauplia*	*Augaptilidae*	*Haloptilus plumosus* (Claus, 1863)	Native	E	Contransimex, 1977
31	*Hexanauplia*	*Augaptilidae*	*Haloptilus spiniceps* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
32	*Hexanauplia*	*Augaptilidae*	*Haloptilus tenuis* Farran, 1908	Native	E	Contransimex, 1977
33	*Hexanauplia*	*Augaptilidae*	*Haloptilus validus* Sars G.O., 1920	Native	E	Contransimex, 1977
34	*Hexanauplia*	*Augaptilidae*	*Euaugaptilus hecticus* (Giesbrecht, 1892)	Native	E	Contransimex, 1977
35	*Hexanauplia*	*Augaptilidae*	*Haloptilus bulliceps* Farran, 1926	Native	E	Contransimex, 1977
36	*Hexanauplia*	*Calanidae*	*Calanoides brevicornis* (Lubbock, 1856)	Native	E	Contransimex, 1977
37	*Hexanauplia*	*Calanidae*	*Calanus finmarchicus* (Gunnerus, 1770)	Native	E	Contransimex, 1977
38	*Hexanauplia*	*Calanidae*	*Mesocalanus tenuicornis* (Dana, 1849	Native	E	Contransimex, 1977
39	*Hexanauplia*	*Calanidae*	*Nannocalanus minor* (Claus, 1863)	Native	E	Contransimex, 1977
40	*Hexanauplia*	*Calanidae*	*Nannocalanus* Sars G.O., 1925	Native	E	Contransimex, 1977
41	*Hexanauplia*	*Calanidae*	*Neocalanus gracilis* (Dana, 1852)	Native	E	Contransimex, 1977
42	*Hexanauplia*	*Calanidae*	*Neocalanus robustior* (Giesbrecht, 1888)	Native	E	Contransimex, 1977
43	*Hexanauplia*	*Candaciidae*	*Candacia armata* Boeck, 1872	Native	E	Contransimex, 1977
44	*Hexanauplia*	*Candaciidae*	*Candacia bipinnata* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
45	*Hexanauplia*	*Candaciidae*	*Candacia elongata* (Boeck, 1872	Native	E	Contransimex, 1977
46	*Hexanauplia*	*Candaciidae*	*Candacia ethiopica* (Dana, 1849)	Native	E	Contransimex, 1977
47	*Hexanauplia*	*Candaciidae*	*Candacia longimana* (Claus, 1863)	Native	E	Contransimex, 1977
48	*Hexanauplia*	*Candaciidae*	*Candacia norvegica norvegica* (Boeck, 1865)	Native	E	Contransimex, 1977
49	*Hexanauplia*	*Candaciidae*	*Candacia simplex* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
50	*Hexanauplia*	*Candaciidae*	*Candacia tenuimana* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
51	*Hexanauplia*	*Candaciidae*	*Candacia varicans* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
52	*Hexanauplia*	*Candaciidae*	*Centropages bradyi* Wheeler, 1900	Native	E	Contransimex, 1977
53	*Hexanauplia*	*Candaciidae*	*Centropages chierchiae* Giesbrecht, 1889	Native	E	Contransimex, 1977
54	*Hexanauplia*	*Centropagidae*	*Centropages hamatus* (Lilljeborg, 1853)	Native	E	Contransimex, 1977
55	*Hexanauplia*	*Centropagidae*	*Centropages kroyeri* Giesbrecht, 1893	Native	E	Contransimex, 1977
56	*Hexanauplia*	*Centropagidae*	*Centropages typicus* Krøyer, 1849	Native	E	Contransimex, 1977
57	*Hexanauplia*	*Centropagidae*	*Centropages violaceus* (Claus, 1863)	Native	E	Contransimex, 1977
58	*Hexanauplia*	*Centropagidae*	*Isias clavipes* Boeck, 1865	Native	E	Contransimex, 1977
59	*Hexanauplia*	*Clausocalanidae*	*Pseudocalanus elongatus* (Brady, 1865)	Native	E	Contransimex, 1977
60	*Hexanauplia*	*Clausocalanidae*	*Clausocalanus arcuicornis* (Dana, 1849)	Native	E	Contransimex, 1977
61	*Hexanauplia*	*Clausocalanidae*	*Clausocalanus furcatus* (Brady, 1883)	Native	E	Contransimex, 1977
62	*Hexanauplia*	*Clausocalanidae*	*Clausocalanus paululus* Farran, 1926	Native	E	Contransimex, 1977
63	*Hexanauplia*	*Clausocalanidae*	*Ctenocalanus vanus* Giesbrecht, 1888	Native	E	Contransimex, 1977
64	*Hexanauplia*	*Corycaeidae*	*Agetus flaccus* (Giesbrecht, 1891)	Native	E	Contransimex, 1977
65	*Hexanauplia*	*Corycaeidae*	*Agetus limbatus* (Brady, 1883)	Native	E	Contransimex, 1977
66	*Hexanauplia*	*Corycaeidae*	*Agetus typicus* Krøyer, 1849	Native	E	Contransimex, 1977

67	*Hexanauplia*	*Corycaeidae*	*Corycaeus clausi* Dahl F., 1894	Native	E	Contransimex, 1977
68	*Hexanauplia*	*Corycaeidae*	*Corycaeus speciosus* Dana, 1849	Native	E	Contransimex, 1977
69	*Hexanauplia*	*Corycaeidae*	*Ditrichocorycaeus brehmi* (Steuer, 1910)	Native	E	Contransimex, 1977
70	*Hexanauplia*	*Corycaeidae*	*Farranula carinata* (Giesbrecht, 1891)	Native	E	Contransimex, 1977
71	*Hexanauplia*	*Corycaeidae*	*Farranula rostrata* (Claus, 1863)	Native	E	Contransimex, 1977
72	*Hexanauplia*	*Corycaeidae*	*Onychocorycaeus giesbrechti* (Dahl F., 1894)	Native	E	Contransimex, 1977
73	*Hexanauplia*	*Corycaeidae*	*Onychocorycaeus latus* (Dana, 1849)	Native	E	Contransimex, 1977
74	*Hexanauplia*	*Corycaeidae*	*Urocorycaeus furcifer* (Claus, 1863)	Native	E	Contransimex, 1977
75	*Hexanauplia*	*Cyclopoida incertae sedis*	*Pachos punctatum* (Claus, 1863)	Native	E	Contransimex, 1977
76	*Hexanauplia*	*Ectinosomatidae*	*Microsetella norvegica* (Boeck, 1865)	Native	E	Contransimex, 1977
77	*Hexanauplia*	*Ectinosomatidae*	*Microsetella rosea* (Dana, 1847)	Native	E	Contransimex, 1977
78	*Hexanauplia*	*Eucalanidae*	*Pareucalanus attenuatus* (Dana, 1849)	Native	E	Contransimex, 1977
79	*Hexanauplia*	*Eucalanidae*	*Eucalanus elongatus elongatus* (Dana, 1848)	Native	E	Contransimex, 1977
80	*Hexanauplia*	*Euchaetidae*	*Euchaeta concinna* Dana, 1849	NIS	E	Shakman et al. 2017
81	*Hexanauplia*	*Euchaetidae*	*Euchaeta acuta* Giesbrecht, 1893	Native	E	Contransimex, 1977
82	*Hexanauplia*	*Euchaetidae*	*Euchaeta marina* (Prestandrea, 1833)	Native	E	Contransimex, 1977
83	*Hexanauplia*	*Euchaetidae*	*Euchaeta spinosa* Giesbrecht, 1893	Native	E	Contransimex, 1977
84	*Hexanauplia*	*Euchaetidae*	*Paraeuchaeta hebes* (Giesbrecht, 1888)	Native	E	Contransimex, 1977
85	*Hexanauplia*	*Fosshageniidae*	*Temoropia mayumbaensis* Scott T., 1894	Native	E	Contransimex, 1977
86	*Hexanauplia*	*Heterorhabdidae*	*Heterorhabdus papilliger* (Claus, 1863)	Native	E	Contransimex, 1977
87	*Hexanauplia*	*Heterorhabdidae*	*Heterorhabdus spinifrons* (Claus, 1863)	Native	E	Contransimex, 1977
88	*Hexanauplia*	*Laophontidae*	*Archesola sp.* Huys & Lee, 2000	Native	W	Farwa1984
89	*Hexanauplia*	*Lepadidae*	*Lepas (Anatifa) anatifera* Linnaeus, 1758	Native	E	Contransimex, 1977
90	*Hexanauplia*	*Lubbockiidae*	*Homeognathia brevis* (Farran, 1908)	Native	E	Contransimex, 1977
91	*Hexanauplia*	*Lubbockiidae*	*Lubbockia aculeata* Giesbrecht, 1891	Native	E	Contransimex, 1977
92	*Hexanauplia*	*Lubbockiidae*	*Lubbockia squillimana* Claus, 1863	Native	E	Contransimex, 1977
93	*Hexanauplia*	*Lucicutiidae*	*Lucicutia clausi* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
94	*Hexanauplia*	*Lucicutiidae*	*Lucicutia curta* Farran, 1905	Native	E	Contransimex, 1977
95	*Hexanauplia*	*Lucicutiidae*	*Lucicutia flavicornis* (Claus, 1863)	Native	E	Contransimex, 1977
96	*Hexanauplia*	*Lucicutiidae*	*Lucicutia gemina* Farran, 1926	Native	E	Contransimex, 1977
97	*Hexanauplia*	*Lucicutiidae*	*Lucicutia longiserrata* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
98	*Hexanauplia*	*Lucicutiidae*	*Lucicutia lucida* Farran, 1908	Native	E	Contransimex, 1977
99	*Hexanauplia*	*Lucicutiidae*	*Lucicutia macrocera* Sars G.O., 1920	Native	E	Contransimex, 1977
100	*Hexanauplia*	*Lucicutiidae*	*Lucicutia ovalis* (Giesbrecht, 1889)	Native	E	Contransimex, 1977
101	*Hexanauplia*	*Lucicutiidae*	*Lucicutia sp* Giesbrecht, 1898	Native	E	Contransimex, 1977
102	*Hexanauplia*	*Maeridae*	*Hamimaera hamigera* (Haswell, 1879)	NIS	E	Shakman et al. 2019
103	*Hexanauplia*	*Metridinidae*	*Metridia lucens lucens* Boeck, 1865	Native	E	Contransimex, 1977
104	*Hexanauplia*	*Metridinidae*	*Pleuromamma abdominalis abdominalis* (Lubbock, 1856)	Native	E	Contransimex, 1977
105	*Hexanauplia*	*Metridinidae*	*Pleuromamma gracilis gracilis* Claus, 1863	Native	E	Contransimex, 1977
106	*Hexanauplia*	*Metridinidae*	*Pleuromamma piseki* Farran, 1929	Native	E	Contransimex, 1977
107	*Hexanauplia*	*Miraciidae*	*Macrosetella gracilis* (Dana, 1846)	Native	E	Contransimex, 1977

108	*Hexanauplia*	*Monstrillidae*	*Cymbasoma specchii* Suárez-Morales, Goruppi, de Olazabal & Tirelli, 2017	Native	E	Contransimex, 1977
109	*Hexanauplia*	*Mormonillidae*	*Mormonilla phasma* Giesbrecht, 1891	Native	E	Contransimex, 1977
110	*Hexanauplia*	*Oithonidae*	*Oithona brevicornis brevicornis* Giesbrecht, 1891	Native	E	Contransimex, 1977
111	*Hexanauplia*	*Oithonidae*	*Oithona hebes* Giesbrecht, 1891	Native	E	Contransimex, 1977
112	*Hexanauplia*	*Oithonidae*	*Oithona linearis* Giesbrecht, 1891	Native	E	Contransimex, 1977
113	*Hexanauplia*	*Oithonidae*	*Oithona nana* Giesbrecht, 1893	Native	E	Contransimex, 1977
114	*Hexanauplia*	*Oithonidae*	*Oithona plumifera* Baird, 1843	Native	E	Contransimex, 1977
115	*Hexanauplia*	*Oithonidae*	*Oithona robusta* Giesbrecht, 1891	Native	E	Contransimex, 1977
116	*Hexanauplia*	*Oithonidae*	*Oithona setigera* (Dana, 1849)	Native	E	Contransimex, 1977
117	*Hexanauplia*	*Oithonidae*	*Oithona similis* Claus, 1866	Native	E	Contransimex, 1977
118	*Hexanauplia*	*Oncaeidae*	*Triconia conifera* (Giesbrecht, 1891)	Native	E	Contransimex, 1977
119	*Hexanauplia*	*Oncaeidae*	*Oncaea curta* Sars G.O., 1916	Native	E	Contransimex, 1977
120	*Hexanauplia*	*Oncaeidae*	*Oncaea media* Giesbrecht, 1891	Native	E	Contransimex, 1977
121	*Hexanauplia*	*Oncaeidae*	*Oncaea mediterranea* (Claus, 1863)	Native	E	Contransimex, 1977
122	*Hexanauplia*	*Oncaeidae*	*Oncaea ornata* Giesbrecht, 1891	Native	E	Contransimex, 1977
123	*Hexanauplia*	*Oncaeidae*	*Oncaea tenella* Sars G.O., 1916	Native	E	Contransimex, 1977
124	*Hexanauplia*	*Oncaeidae*	*Oncaea venusta* Philippi, 1843	Native	E	Contransimex, 1977
125	*Hexanauplia*	*Oncaeidae*	*Oncaea sp* Philippi, 1843	Native	E	Contransimex, 1977
126	*Hexanauplia*	*Oncaeidae*	*Triconia dentipes* (Giesbrecht, 1891)	Native	E	Contransimex, 1977
127	*Hexanauplia*	*Oncaeidae*	*Triconia minuta* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
128	*Hexanauplia*	*Oncaeidae*	*Triconia similis* (Sars G.O., 1918)	Native	E	Contransimex, 1977
129	*Hexanauplia*	*Paracalanidae*	*Calocalanus contractus* Farran, 1926	Native	E	Contransimex, 1977
130	*Hexanauplia*	*Paracalanidae*	*Calocalanus longisetosus* Shmeleva, 1965	Native	E	Contransimex, 1977
131	*Hexanauplia*	*Paracalanidae*	*Calocalanus pavo* (Dana, 1852)	Native	E	Contransimex, 1977
132	*Hexanauplia*	*Paracalanidae*	*Calocalanus plumulosus* (Claus, 1863)	Native	E	Contransimex, 1977
133	*Hexanauplia*	*Paracalanidae*	*Calocalanus styliremis* Giesbrecht, 1888	Native	E	Contransimex, 1977
134	*Hexanauplia*	*Paracalanidae*	*Calocalanus tenuis* Farran, 1926	Native	E	Contransimex, 1977
135	*Hexanauplia*	*Paracalanidae*	*Mecynocera clausi* Thompson I.C., 1888	Native	E	Contransimex, 1977
136	*Hexanauplia*	*Paracalanidae*	*Paracalanus aculeatus* Giesbrecht, 1888	Native	E	Contransimex, 1977
137	*Hexanauplia*	*Paracalanidae*	*Paracalanus nanus* Sars G.O., 1925	Native	E	Contransimex, 1977
138	*Hexanauplia*	*Paracalanidae*	*Paracalanus parvus parvus* (Claus, 1863)	Native	E	Contransimex, 1977
139	*Hexanauplia*	*Paracalanidae*	*Paracalanus pygmaeus* (Claus, 1863	Native	E	Contransimex, 1977
140	*Hexanauplia*	*Parapontellidae*	*Parapontella brevicornis* (Lubbock, 1857)	Native	E	Contransimex, 1977
141	*Hexanauplia*	*Peltidiidae*	*Clytemnestra scutellata* Dana, 1847	Native	E	Contransimex, 1977
142	*Hexanauplia*	*Peltidiidae*	*Goniopsyllus rostratus* Brady, 1883	Native	E	Contransimex, 1977
143	*Hexanauplia*	*Phaennidae*	*Phaenna spinifera* Claus, 1863	Native	E	Contransimex, 1977
144	*Hexanauplia*	*Phaennidae*	*Xanthocalanus minor* Giesbrecht, 1893	Native	E	Contransimex, 1977
145	*Hexanauplia*	*Pontellidae*	*Anomalocera patersonii* Templeton, 1837	Native	E	Contransimex, 1977
146	*Hexanauplia*	*Pontellidae*	*Pontella lobiancoi* (Canu, 1888	Native	E	Contransimex, 1977
147	*Hexanauplia*	*Pontellidae*	*Pontella mediterranea* (Claus, 1863)	Native	E	Contransimex, 1977
148	*Hexanauplia*	*Pontellidae*	*Pontella atlantica* (Milne Edwards, 1840)	Native	E	Contransimex, 1977
149	*Hexanauplia*	*Pontellidae*	*Pontellina plumata* (Dana, 1849	Native	E	Contransimex, 1977

150	*Hexanauplia*	*Rataniidae*	*Ratania flava* Giesbrecht, 1893	Native	E	Contransimex, 1977
151	*Hexanauplia*	*Rhincalanidae*	*Rhincalanus nasutus* Giesbrecht, 1888	Native	E	Contransimex, 1977
152	*Hexanauplia*	*Sapphirinidae*	*Copilia mediterranea* (Claus, 1863)	Native	E	Contransimex, 1977
153	*Hexanauplia*	*Sapphirinidae*	*Copilia mirabilis* Dana, 1852	Native	E	Contransimex, 1977
154	*Hexanauplia*	*Sapphirinidae*	*Copilia quadrata* Dana, 1849	Native	E	Contransimex, 1977
155	*Hexanauplia*	*Sapphirinidae*	*Copilia vitrea* (Haeckel, 1864)	Native	E	Contransimex, 1977
156	*Hexanauplia*	*Sapphirinidae*	*Sapphirina* Thompson J., 1829	Native	E	Contransimex, 1977
157	*Hexanauplia*	*Sapphirinidae*	*Vettoria granulosa* (Giesbrecht, 1891)	Native	E	Contransimex, 1977
158	*Hexanauplia*	*Sapphirinidae*	*Sapphirina angusta* Dana, 1849	Native	E	Contransimex, 1977
159	*Hexanauplia*	*Sapphirinidae*	*Sapphirina auronitens sinuicauda* Lehnhofer, 1929	Native	E	Contransimex, 1977
160	*Hexanauplia*	*Sapphirinidae*	*Sapphirina auronitens* Claus, 1863	Native	E	Contransimex, 1977
161	*Hexanauplia*	*Sapphirinidae*	*Sapphirina bicuspidata* Giesbrecht, 1891	Native	E	Contransimex, 1977
162	*Hexanauplia*	*Sapphirinidae*	*Sapphirina darwinii* Haeckel, 1864	Native	E	Contransimex, 1977
163	*Hexanauplia*	*Sapphirinidae*	*Sapphirina intestinata* Giesbrecht, 1891	Native	E	Contransimex, 1977
164	*Hexanauplia*	*Sapphirinidae*	*Sapphirina iris* Dana, 1849	Native	E	Contransimex, 1977
165	*Hexanauplia*	*Sapphirinidae*	*Sapphirina lactens* Giesbrecht, 1893	Native	E	Contransimex, 1977
166	*Hexanauplia*	*Sapphirinidae*	*Sapphirina maculosa* Giesbrecht, 1893	Native	E	Contransimex, 1977
167	*Hexanauplia*	*Sapphirinidae*	*Sapphirina metallina* Dana, 1849	Native	E	Contransimex, 1977
168	*Hexanauplia*	*Sapphirinidae*	*Sapphirina nigromaculata* Claus, 1863	Native	E	Contransimex, 1977
169	*Hexanauplia*	*Sapphirinidae*	*Sapphirina opalina* Dana, 1849	Native	E	Contransimex, 1977
170	*Hexanauplia*	*Sapphirinidae*	*Sapphirina ovatolanceolata* Dana, 1849	Native	E	Contransimex, 1977
171	*Hexanauplia*	*Sapphirinidae*	*Sapphirina splendens* Dana, 1852	Native	E	Contransimex, 1977
172	*Hexanauplia*	*Scalpellidae*	*Scalpellum scalpellum* (Linnaeus, 1767)	Native	W	Sogreah, 1977
173	*Hexanauplia*	*Scolecitrichidae*	*Pseudoamallothrix obtusifrons* (Sars G.O., 1905)	Native	E	Contransimex, 1977
174	*Hexanauplia*	*Scolecitrichidae*	*Scolecithricella minor* (Brady, 1883)	Native	E	Contransimex, 1977
175	*Hexanauplia*	*Scolecitrichidae*	*Scolecithrix bradyi* Giesbrecht, 1888	Native	E	Contransimex, 1977
176	*Hexanauplia*	*Scolecitrichidae*	*Scolecithrix danae* (Lubbock, 1856)	Native	E	Contransimex, 1977
177	*Hexanauplia*	*Scolecitrichidae*	*Pseudoamallothrix ovata* (Farran, 1905)	Native	E	Contransimex, 1977
178	*Hexanauplia*	*Scolecitrichidae*	*Scolecithricella spinacantha* Wilson C.B., 1942	Native	E	Contransimex, 1977
179	*Hexanauplia*	*Scolecitrichidae*	*Scolecithricella vittata* (Giesbrecht, 1893)	Native	E	Contransimex, 1977
180	*Hexanauplia*	*Sphaeromatidae*	*Paradella dianae* (Menzies, 1962)	NIS	E	Shakman et al. 2019
181	*Hexanauplia*	*Spinocalanidae*	*Spinocalanus magnus* Wolfenden, 1904	Native	E	Contransimex, 1977
182	*Hexanauplia*	*Subeucalanidae*	*Subeucalanus crassus* (Giesbrecht, 1888)	Native	E	Contransimex, 1977
183	*Hexanauplia*	*Subeucalanidae*	*Subeucalanus monachus* (Giesbrecht, 1888)	Native	E	Contransimex, 1977
184	*Hexanauplia*	*Tachidiidae*	*Euterpina acutifrons* (Dana, 1847)	Native	E	Contransimex, 1977
185	*Hexanauplia*	*Temoridae*	*Temora longicornis* (Müller O.F., 1785)	Native	E	Contransimex, 1977
186	*Hexanauplia*	*Temoridae*	*Temora stylifera* (Dana, 1849)	Native	E	Contransimex, 1977
187	*Hexanauplia*	*Verrucidae*	*Verruca stroemia* (O.F. Müller, 1776)	Native	E	Contransimex, 1977
188	*Malacostraca*	*Alpheidae*	*Alpheus dentipes* (Coutière, 1905)	Native	W	Abushaala et al.2014
189	*Malacostraca*	*Alpheidae*	*Alpheus glaber* (Olivi, 1792)	Native	W	Abushaala et al.2014
190	*Malacostraca*	*Alpheidae*	*Alpheus* Fabricius, 1798	Native	W	Abushaala et al.2014
191	*Malacostraca*	*Alpheidae*	*Athanas nitescens* (Leach, 1814)	Native	W	Abushaala et al.2014

192	*Malacostraca*	*Ampeliscidae*	*Ampelisca* Krøyer, 1842	Native	W	Abushaala et al.2014
193	*Malacostraca*	*Ampeliscidae*	*Ampelisca diadema* (Costa, 1853)	Native	W	Sogreah, 1977
194	*Malacostraca*	*Anthuridae*	*Apanthura sandalensis* Stebbing, 1900	NIS	E	Shakman et al. 2019
195	*Malacostraca*	*Anthuridae*	*Anthura gracilis* (Montagu, 1808)	Native	W	Abushaala et al.2014
196	*Malacostraca*	*Apseudidae*	*Apseudopsis latreillii* (Milne Edwards, 1828)	Native	W	Farwa1984
197	*Malacostraca*	*Arcturidae*	*Astacilla dilatata* (Sars, 1882)	Native	W	Abushaala et al.2014
198	*Malacostraca*	*Arcturidae*	*Astacilla spinata* (Menzies & Kruczynski, 1983)	Native	W	Farwa1984
199	*Malacostraca*	*Bodotriidae*	*Bodotria* Goodsir, 1843	Native	W	Farwa1984
200	*Malacostraca*	*Calappidae*	*Calappa granulata* (Linnaeus, 1758)	Native	W	Sogreah, 1977
201	*Malacostraca*	*Callianassidae*	*Callianassa subterranea* (Montagu, 1808)	Native	W	Farwa1984
202	*Malacostraca*	*Callianassidae*	*Scallasis spinophthalma* (K. Sakai, 1970)	Native	W	Farwa1984
203	*Malacostraca*	*Caprellidae*	*Caprella scaura* Templeton, 1836	NIS	W	*Al-Mgoushi, 2023*
204	*Malacostraca*	*Carcinidae*	*Carcinus maenas* (Linnaeus, 1758)	Native	E	Daw.1999
205	*Malacostraca*	*Carcinidae*	*Carcinus aestuarii* Nardo, 1847	Native	W	*Al-Mgoushi, 2023*
206	*Malacostraca*	*Cymothoidae*	*Anilocra sp* Leach, 1818	Native	W	Farwa1984
207	*Malacostraca*	*Cymothoidae*	*Nerocila sp* Leach, 1818	Native	W	Sogreah, 1977
208	*Malacostraca*	*Cymothoidae*	*Nerocila bivittata* (Risso, 1816)	Native	E	Daw.1999
209	*Malacostraca*	*Dexaminidae*	*Polycheria sp* Haswell, 1879	Native	W	Abushaala et al.2014
210	*Malacostraca*	*Dexaminidae*	*Dexamine sp* Leach, 1814	Native	W	Abushaala et al.2014
211	*Malacostraca*	*Diogenidae*	*Diogenes pugilator* (P. Roux, 1829)	Native	W	Farwa1984
212	*Malacostraca*	*Diogenidae*	*Paguristes eremita* (Linnaeus, 1767)	Native	W	Sogreah, 1977
213	*Malacostraca*	*Diogenidae*	*Dardanus arrosor* (Herbst, 1796)	Native	W	Sogreah, 1977
214	*Malacostraca*	*Dorippidae*	*Medorippe lanata* (Linnaeus, 1767)	Native	W	Sogreah, 1977
215	*Malacostraca*	*Dromiidae*	*Dromia personata* (Linnaeus, 1758)	Native	W	Sogreah, 1977
216	*Malacostraca*	*Epialtidae*	*Lissa chiragra* (Fabricius, 1775)	Native	W	Sogreah, 1977
217	*Malacostraca*	*Epialtidae*	*Pisa nodipes* Leach, 1815	Native	W	Sogreah, 1977
218	*Malacostraca*	*Eriphiidae*	*Eriphia verrucosa* (Forskal, 1775)	Native	A	Daw.1999
219	*Malacostraca*	*Ethusidae*	*Ethusa mascarone* (Herbst, 1785)	Native	W	Sogreah, 1977
220	*Malacostraca*	*Euphausiidae*	*Euphausia brevis* Hansen, 1905	Native	E	Contransimex, 1977
221	*Malacostraca*	*Euphausiidae*	*Euphausia hemigibba* Hansen, 1910	Native	E	Contransimex, 1977
222	*Malacostraca*	*Euphausiidae*	*Euphausia krohnii* (Brandt, 1851)	Native	E	Contransimex, 1977
223	*Malacostraca*	*Euphausiidae*	*Euphausia spinifera* G.O. Sars, 1885	Native	E	Contransimex, 1977
224	*Malacostraca*	*Euphausiidae*	*Meganyctiphanes norvegica* (M. Sars, 1857)	Native	E	Contransimex, 1977-
225	*Malacostraca*	*Euphausiidae*	*Nyctiphanes sp* Sars, 1883	Native	E	Contransimex, 1977
226	*Malacostraca*	*Euphausiidae*	*Stylocheiron abbreviatum* G.O. Sars, 1883	Native	E	Contransimex, 1977
227	*Malacostraca*	*Euphausiidae*	*Stylocheiron elongatum* G.O. Sars, 1883	Native	E	Contransimex, 1977
228	*Malacostraca*	*Euphausiidae*	*Stylocheiron longicorne* G.O. Sars, 1883	Native	E	Contransimex, 1977
229	*Malacostraca*	*Euphausiidae*	*Stylocheiron maximum* Hansen, 1908	Native	E	Contransimex, 1977
230	*Malacostraca*	*Euphausiidae*	*Stylocheiron sp* G.O. Sars, 1883	Native	E	Contransimex, 1977
231	*Malacostraca*	*Euphausiidae*	*Thysanoessa gregaria* G.O. Sars, 1883	Native	E	Contransimex, 1977
232	*Malacostraca*	*Euphausiidae*	*Thysanopoda aequalis* Hansen, 1905	Native	E	Contransimex, 1977
233	*Malacostraca*	*Euryplacidae*	*Eucrate crenata* (De Haan, 1835)	NIS	A	Shakman et al. 2019

234	*Malacostraca*	*Galatheidae*	*Galathea* Fabricius, 1793	Native	W	*Al-Mgoushi, 2023*
235	*Malacostraca*	*Gammaridae*	Gammarus oceanicus (Segerstråle, 1947)	NIS	W	*this study*
236	*Malacostraca*	*Gammaridae*	*Gammarus zaddachi* Sexton, 1912	NIS	W	*Al-Mgoushi, 2023*
237	*Malacostraca*	*Ischyroceridae*	Jassa slatteryi (Conlan, 1990)	NIS	W	*Al-Mgoushi, 2023*
238	*Malacostraca*	*Epialtidae*	Pisa armata (Latreille, 1803)	Native	W	*Al-Mgoushi, 2023*
239	*Malacostraca*	*Epialtidae*	Acanthonyx lunulatus (Risso, 1816)	Native	W	*Aboaisha, 2025*
240	*Malacostraca*	*Gammaridae*	*Gammarus locusta* (Linnaeus, 1758)	Native	E	Daw.1999
241	*Malacostraca*	*Gammaridae*	*Gammarus sp* Fabricius, 1775	Native	W	Abushaala et al.2014
242	*Malacostraca*	*Gammaridae*	*Gammarus spelaeus* Martynov, 1931	Native	W	Sogreah, 1977
243	*Malacostraca*	*Goneplacidae*	*Goneplax rhomboides* (Linnaeus, 1758)	Native	W	Sogreah, 1977
244	*Malacostraca*	*Grapsidae*	*Pachygrapsus sp.*	Native	W	Abushaala et al.2014
245	*Malacostraca*	*Grapsidae*	*Pachygrapsus marmoratus* (Fabricius, 1787)	Native	W	Al-Mgoushi, 2020
246	*Malacostraca*	*Hippolytidae*	*Hippolyte sp* Leach, 1814	Native	W	Abushaala et al.2014
247	*Malacostraca*	*Homolidae*	*Homola barbata* (Fabricius, 1793)	Native	W	Sogreah, 1977
248	*Malacostraca*	*Hyperiidae*	*Hyperoche medusarum* (Kröyer, 1838)	Native	E	Contransimex, 1977
249	*Malacostraca*	*Idoteidae*	*Idotea spasskii* Gurjanova, 1950	Native	W	Farwa1984
250	*Malacostraca*	*Inachidae*	*Achaeus cranchi* (Leach, 1817)	Native	W	Abushaala et al.2014
251	*Malacostraca*	*Inachidae*	*Inachus thoracicus* P. Roux, 1830 [in P. Roux, 1828-1830]	Native	W	Sogreah, 1977
252	*Malacostraca*	*Inachidae*	*Inachus sp* Weber, 1795	Native	E	Contransimex, 1977
253	*Malacostraca*	*Inachidae*	*Macropodia rostrata* (Linnaeus, 1761)	Native	E	Contransimex, 1977
254	*Malacostraca*	*Inachidae*	*Macropodia tenuirostris* (Leach, 1814)	Native	W	Al-Mgoushi, 2020e
255	*Malacostraca*	*Inachidae*	*Inachus dorsettensis* (Pennant, 1777)	Native	W	Sogreah, 1977
256	*Malacostraca*	*Inachidae*	*Macropodia longirostris* (Fabricius, 1775)	Native	W	Sogreah, 1977
257	*Malacostraca*	*Ischyroceridae*	*Jassa spinipes* (Johnston, 1829)	Native	W	Farwa1984
258	*Malacostraca*	*Ischyroceridae*	*Ericthonius sp* H. Milne Edwards, 1830	Native	W	Farwa1984
259	*Malacostraca*	*Leptocheliidae*	*Chondrochelia savignyi* (Kroyer, 1842)	Native	W	Al-Mgoushi, 2020
260	*Malacostraca*	*Lestrigonidae*	*Lestrigonus latissimus* (Bovallius, 1889)	Native	E	Contransimex, 1977
261	*Malacostraca*	*Lestrigonidae*	*Lestrigonus schizogeneios* (Stebbing, 1888	Native	E	Contransimex, 1977
262	*Malacostraca*	*Leucothoidae*	*Leucothoe spinicarpa* (Abildgaard,1789)	Native	W	Abushaala et al.2014
263	*Malacostraca*	*Limnoriidae*	*Limnoria tripunctata* (Menzies, 1951)	Native	W	Abushaala et al.2014
264	*Malacostraca*	*Lophogastridae*	*Lophogaster typicus* M. Sars, 1857	Native	W	Sogreah, 1977
265	*Malacostraca*	*Lysianassidae*	*Lysianassa longicornis* (Lucas, 1846)	Native	W	Abushaala et al.2014
266	*Malacostraca*	*Maeridae*	*Elasmopus sp* Costa, 1853	Native	W	Abushaala et al.2014
267	*Malacostraca*	*Maeridae*	*Elasmopus rapax* Costa, 1853	Native	W	Sogreah, 1977
268	*Malacostraca*	*Majidae*	*Maja crispata* (Risso, 1827)	Native	W	Sogreah, 1977
269	*Malacostraca*	*Majidae*	*Paramaya spinigera* (De Haan, 1837 [in De Haan, 1833-1850])	Native	W	Sogreah, 1977
270	*Malacostraca*	*Majidae*	*Maja squinado* (Herbst, 1788)	Native	W	Abushaala et al.2014
271	*Malacostraca*	*Micronisciidae*	*Micronisciis sp* Müller, 1871	Native	E	Contransimex, 1977
272	*Malacostraca*	*Mysidae*	*Mysidae sp* Haworth, 1825	Native	E	Daw.1999
273	*Malacostraca*	*Mysidae*	*Anchialina agilis* (G.O. Sars, 1877)	Native	E	Contransimex, 1977
274	*Malacostraca*	*Mysidae*	*Gastrosaccus spinifer* (Goës, 1864)	Native	E	Contransimex, 1977

275	*Malacostraca*	*Mysidae*	*Leptomysis mediterranea* G.O. Sars, 1877	Native	E	Contransimex, 1977
276	*Malacostraca*	*Mysidae*	*Mysis relicta* Lovén, 1862	Native	E	Contransimex, 1977
277	*Malacostraca*	*Mysidae*	*Schistomysis ornata* (G. O. Sars, 1864)	Native	E	Contransimex, 1977
278	*Malacostraca*	*Mysidae*	*Siriella thompsonii* (H. Milne Edwards, 1837)	Native	E	Contransimex, 1977
279	*Malacostraca*	*Nannastacidae*	*Cumella (Cumella) limicola* Sars, 1879	Native	E	Contransimex, 1977
280	*Malacostraca*	*Nebaliidae*	*Nebalia abyssicola* Ledoyer, 1997	Native	W	Farwa1984
281	*Malacostraca*	*Nephropidae*	*Nephrops norvegicus* (Linnaeus, 1758)	Native	W	Sogreah, 1977
282	*Malacostraca*	*Nephropidae*	*Nephrops sp* Leach, 1814 [in Leach, 1813-1815]	Native	E	Contransimex, 1977
283	*Malacostraca*	*Oregoniidae*	*Hyas sp* Leach, 1814	Native	W	Abushaala et al.2014
284	*Malacostraca*	*Oregoniidae*	*Hyas araneus* (Linnaeus, 1758)	NIS	w	omer
285	*Malacostraca*	*Oxycephalidae*	*Streetsia challengeri* Stebbing, 1888	Native	E	*Aboaisha, 2025*
286	*Malacostraca*	*Paguridae*	*Anapagurus laevis* (Bell, 1845)	Native	W	Farwa1984
287	*Malacostraca*	*Paguridae*	*Anapagurus* Henderson, 1886	Native	W	Abushaala et al.2014
288	*Malacostraca*	*Paguridae*	*Pagurus cuanensis* Bell, 1845	Native	W	Farwa1984
289	*Malacostraca*	*Paguridae*	*Pagurus similimanus* (Balss, 1921)	Native	W	Sogreah, 1977
290	*Malacostraca*	*Paguridae*	*Pagurus bernhardus* (Linnaeus, 1758)	Native	E	Contransimex, 1977
291	*Malacostraca*	*Paguridae*	*Pagurus peruensis* Balss, 1921	Native	W	Sogreah, 1977
292	*Malacostraca*	*Paguridae*	*Pagurus prideaux* Leach, 1815 [in Leach, 1815-1875]	Native	W	Sogreah, 1977
293	*Malacostraca*	*Paguridae*	*Pagurus spighti* McLaughlin & Haig, 1993	Native	E	Contransimex, 1977
294	*Malacostraca*	*Paguridae*	*Pagurus* Fabricius, 1775	Native	W	Sogreah, 1977
295	*Malacostraca*	*Palaemonidae*	*Palaemon serratus* (Pennant, 1777)	Native	A	Daw.1999
296	*Malacostraca*	*Palinuridae*	*Palinurus mauritanicus* Gruvel, 1911	Native	E	Contransimex, 1977
297	*Malacostraca*	*Pandalidae*	*Plesionika edwardsii* (J.F. Brandt in von Middendorf, 1851)	Native	W	Sogreah, 1977
298	*Malacostraca*	*Parthenopidae*	*Derilambrus angulifrons* (Latreille, 1825)	Native	W	Sogreah, 1977
299	*Malacostraca*	*Parthenopidae*	*Parthenope sp* Weber, 1795	NIS	W	Al-Mgoushi, 2020
300	*Malacostraca*	*Parthenopidae*	*Parthenopoides massena* (P. Roux, 1830 [in P. Roux, 1828-1830])	Native	W	Sogreah, 1977
301	*Malacostraca*	*Parthenopidae*	*Spinolambrus macrochelos* (Herbst, 1790 [in Herbst, 1782-1790])	Native	W	Sogreah, 1977
302	*Malacostraca*	*Penaeidae*	*Parapenaeus longirostris* (H. Lucas, 1846)	Native	A	Sogreah, 1977
303	*Malacostraca*	*Penaeidae*	*Penaeus kerathurus* (Forskål, 1775)	Native	A	Sogreah, 1977
304	*Malacostraca*	*Phliantidae*	*Pereionotus testudo* (Montagu, 1808)	NIS	W	Al-Mgoushi, 2020
305	*Malacostraca*	*Phronimidae*	*Phronima sedentaria* (Forskål, 1775)	Native	E	Contransimex, 1977
306	*Malacostraca*	*Phronimidae*	*Phronima stebbingi* Vosseler, 1901	Native	E	Contransimex, 1977
307	*Malacostraca*	*Phronimidae*	*Phronimella elongata* (Claus, 1862)	Native	E	Contransimex, 1977
308	*Malacostraca*	*Phronimidae*	*Phrosina semilunata* Risso, 1822	Native	E	Contransimex, 1977
309	*Malacostraca*	*Phrosinidae*	*Primno macropa* Guérin-Méneville, 1836	Native	E	Contransimex, 1977
310	*Malacostraca*	*Pilumnidae*	*Pilumnus hirtellus* (Linnaeus, 1761)	Native	W	Sogreah, 1977
311	*Malacostraca*	*Pilumnidae*	*Pilumnus sp* Leach, 1816	NIS	w	omer
312	*Malacostraca*	*Plagusiidae*	*Plagusia squamosa* (Herbst, 1790)	NIS	A	Shakman et al. 2017
313	*Malacostraca*	*Platyscelidae*	*Platyscelus ovoides* (Risso, 1816)	Native	E	Aboaisha, 2025
314	*Malacostraca*	*Podoceridae*	*Podocerus sp* Leach, 1814	Native	W	Farwa1984
315	*Malacostraca*	*Polybiidae*	*Liocarcinus depurator* (Linnaeus, 1758)	Native	W	Sogreah, 1977

316	*Malacostraca*	*Polybiidae*	*Macropipus tuberculatus* (P. Roux, 1830 [in P. Roux, 1828-1830])	Native	W	Sogreah, 1977
317	*Malacostraca*	*Polybiidae*	*Necora puber* (Linnaeus, 1767)	Native	E	Contransimex, 1977
318	*Malacostraca*	*Polybiidae*	*Macropipus* Prestandrea, 1833	Native	W	Sogreah, 1977
319	*Malacostraca*	*Porcellanidae*	*Porcellana platycheles* (Pennant, 1777)	Native	E	Contransimex, 1977
320	*Malacostraca*	*Portunidae*	*Portunus segnis* Forsskål, 1775	NIS	A	Shakman et al. 2019
321	*Malacostraca*	*Scinidae*	*Scina borealis* (G.O. Sars, 1883)	Native	E	Contransimex, 1977
322	*Malacostraca*	*Scinidae*	*Scina crassicornis* (Fabricius, 1775)	Native	E	Contransimex, 1977
323	*Malacostraca*	*Scyllaridae*	*Scyllarus sp* Fabricius, 1775	Native	E	Contransimex, 1977
324	*Malacostraca*	*Sergestidae*	*Sergestes sp* H. Milne Edwards, 1830	Native	E	Contransimex, 1977
325	*Malacostraca*	*Sicyoniidae*	*Sicyonia carinata* (Brünnich, 1768)	Native	E	Contransimex, 1977
326	*Malacostraca*	*Sphaeromatidae*	*Lekanesphaera rugicauda* (Leach, 1814)	Native	W	Abushaala et al.2014
327	*Malacostraca*	*Sphaeromatidae*	*Cymodoce truncata* Leach, 1814	Native	W	Sogreah, 1977
328	*Malacostraca*	*Sphaeromatidae*	*Isocladus spiniger* (Dana, 1853)	Native	W	Farwa1984
329	*Malacostraca*	*Sphaeromatidae*	*Sphaeroma serratum* (J. C. Fabricius, 1787)	Native	A	Sogreah, 1977
330	*Malacostraca*	*Sphaeromatidae*	*Dynamene sp* Leach, 1814	Native	W	Farwa1984
331	*Malacostraca*	*Squillidae*	*Erugosquilla massavensis* (Kossmann, 1880)	NIS	E-S	Shakman et al. 2019
332	*Malacostraca*	*Squillidae*	*Squilla mantis* (Linnaeus, 1758)	Native	A	Sogreah, 1977
333	*Malacostraca*	*Squillidae*	*Squilla sp* Fabricius, 1787	Native	E	Contransimex, 1977
334	*Malacostraca*	*Squillidae*	*Rissoides desmaresti* (Risso, 1816)	Native	W	Sogreah, 1977
335	*Malacostraca*	*Talitridae*	*Orchestia gammarellus* (Pallas, 1766)	Native	A	Sogreah, 1977
336	*Malacostraca*	*Talitridae*	*Talitrus saltator* (Montagu, 1808)	Native	W	Farwa1984
337	*Malacostraca*	*Tanaididae*	*Tanais dulongii* (Audouin, 1826)	Native	W	Abushaala et al.2014
338	*Malacostraca*	*Tanaididae*	*Tanais sp* Latreille, 1831	Native	W	Abushaala et al.2014
339	*Malacostraca*	*Upogebiidae*	*Upogebia deltaura* (Leach, 1816	Native	W	Farwa1984
340	*Malacostraca*	*Upogebiidae*	*Upogebia pusilla* (Petagna, 1792)	Native	W	Sogreah, 1977
341	*Malacostraca*	*Upogebiidae*	*Upogebia sp* Leach, 1814 [in Leach, 1813-1815]	Native	W	Farwa1984
342	*Malacostraca*	*Xanthidae*	*Xantho spinigera* White, 1847	Native	W	Sogreah, 1977
343	*Malacostraca*	*Xanthidae*	*Xantho sp* (Herbst, 1790)	Native	W	Aboaisha, 2025
344	*Ostracoda*	*Bythocytheridae*	*Sclerochilus littoralis* (Thomson, 1879) Eagar, 1971	Native	E	Contransimex, 1977
345	*Ostracoda*	*Candonidae*	*Pseudocandona pumilis* Würdig & Pinto, 1999	NIS	W	Al-Mgoushi, 2020
346	*Ostracoda*	*Cypridinidae*	*Macrocypridina castanea* (Brady, 1897)	Native	E	Contransimex, 1977
347	*Ostracoda*	*Halocyprididae*	*Conchoecissa imbricata* (Brady, 1880)	Native	E	Contransimex, 1977
348	*Ostracoda*	*Halocyprididae*	*Discoconchoecia elegans* (Sars, 1866)	Native	E	Contransimex, 1977
349	*Ostracoda*	*Halocyprididae*	*Obtusoecia obtusata* (Sars, 1866)	Native	E	Contransimex, 1977
350	*Ostracoda*	*Halocyprididae*	*Orthoconchoecia haddoni* (Brady & Norman, 1896)	Native	E	Contransimex, 1977
351	*Ostracoda*	*Halocyprididae*	*Conchoecia sp* Dana, 1849	Native	E	Contransimex, 1977
352	*Ostracoda*	*Leptocytheridae*	*Leptocythere pellucida* (Baird, 1850) Sars, 1925	Native	E	Contransimex, 1977
353	*Ostracoda*	*Philomedidae*	*Philomedes gibbosa* Dana, 1853	Native	E	Contransimex, 1977
354	*Thecostraca*	*Tetraclitidae*	*Tetraclita rufotincta* Pilsbry, 1916	NIS	E	Shakman et al. 2019
355	*Thecostraca*	*Balanidae*	*Balanus sp* Costa, 1778	Native	w	omer
356	*Thecostraca*	*Balanidae*	*Amphibalanus eburneus* (Gould, 1841)	NIS	w	This study

357	*Thecostraca*	*Balanidae*	*Perforatus perforatus* (Bruguière, 1789)	Native	w	This study

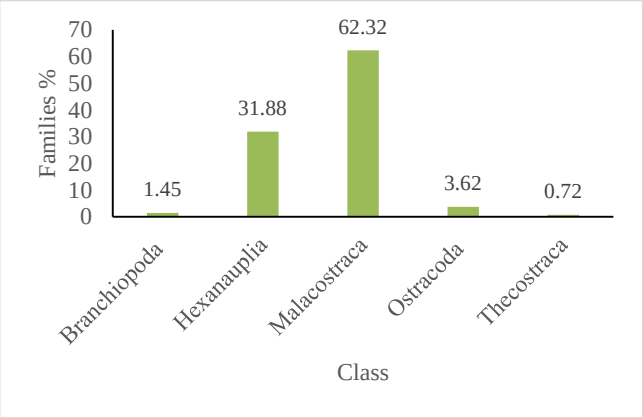

Fig. 2. The percentage of families in the Libyan coast

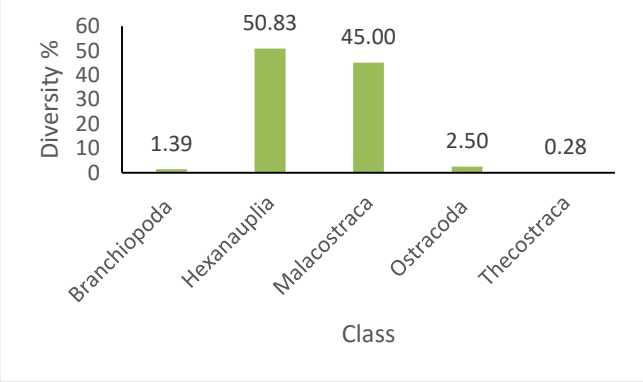

Fig. 3. Diversity of marine crustaceans in the Libyan coast

The number of marine crustaceans from the Libyan coast was different over the past decades, the number was 275 species in 1970s and have been reached to 360 species in 2020 (Fig. 4).

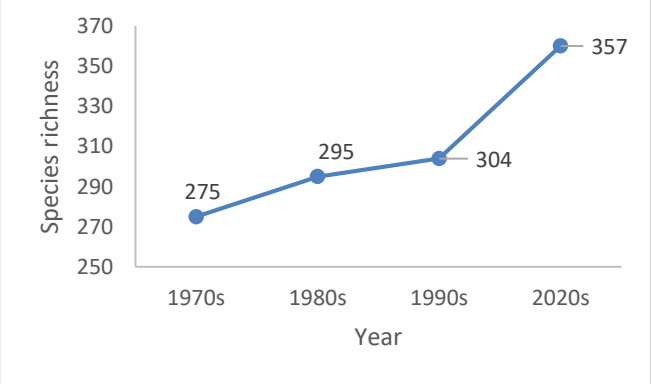

Fig 4. The trend of marine crustacean species reported from the Libyan coast

percentages were observed along the coast at just 3.06% (Fig. 5). Regarding the 357 marine crustacean species in the same region, native species made up the largest proportion, comprising 94.4%, while non-indigenous species represented a small fraction, with only 5.60% (Fig. 6).

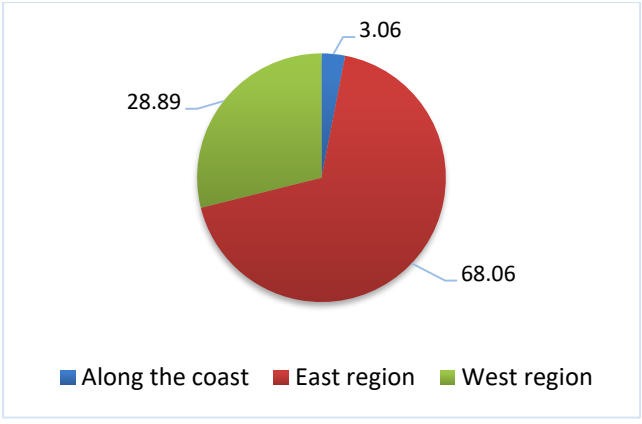

Fig 5. Distribution of marine crustacean species in main regions on the Libyan coast

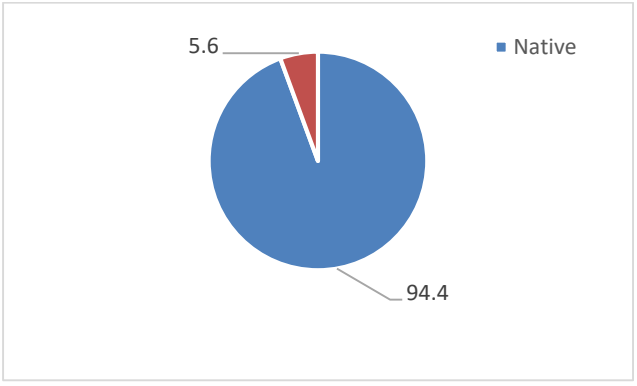

Fig. 6. The percentage of non-indigenous species along the Libyan coast

Discussion

The southern Mediterranean coast, particularly Libya, hosts a remarkable diversity of ecosystems. Yet, despite this ecological richness, detailed scientific studies remain limited especially in the Gulf of Sirte, a region that has received little focused research attention (Shakman, 2008). Much of the area's marine biodiversity, particularly among invertebrates, remains poorly documented. To address this knowledge gap, the present study records 360 marine crustacean species along the Libyan coast (see Table 1). The collection, identification,

and classification of these species are essential for understanding biodiversity patterns, guiding conservation priorities, and supporting the sustainable exploitation of commercially valuable species.

The recorded species span five major crustacean classes. *Malacostraca* is the most dominant, comprising 162 species (62.32%). *Hexanauplia* follows, with 183 species across 44 families, accounting for 50.38% of the total diversity. Other classes are represented by significantly fewer species, as illustrated in Figs 2 and 3.

Scientific documentation of Libyan crustacean's dates back to 1939, when Macaño first recorded 18 marine species. Subsequent surveys expanded the known diversity: a Romanian expedition (1975–1976) added 33 species (Ţigănuş, 1984); Ortiz and Petrescu (2007) documented 125 species from 27 families; and a French expedition in 1966 identified an additional 20 species (Rawag et al., 2004).

The rate of species documentation has varied over the decades. The 1970s marked a peak in newly reported species, with declines observed in the 1980s and 1990s. By 2020, the total number of recorded species had reached 350 (Fig 3). Geographically, species richness is highest along the eastern Libyan coast, which accounts for 70.28% of all documented species. In contrast, the Gulf of Sirte and western coastal zones exhibit significantly lower diversity, together representing just 0.28% of the total (Fig 4). Previous studies, including Cachot et al. (2002), identified the area between Misrata and Abu Kamsha as the most productive zone for crustacean fisheries.

A distinction is also made between native and non-native species. The eastern region supports the highest proportion of native species (97.05%), while non-native species remain relatively rare only 10 of the 360 recorded species (Fig 5). Additional regional studies have enriched the crustacean database: Bazairi et al. (2013) reported 11 arthropod species, and Abu Shaala et al. (2014) identified 37 species in western Libya, including six isopods, 23 decapods, seven amphipods, and one elasmobranch. Notably, Shakman et al. (2017) reported the first occurrence of the blue swimming crab (*Portunus segnis*), and Amira and Altoomb (2018) documented eight species from 13 families in Ain Ziana Lake.

All specimens collected during this study have been preserved and cataloged at the Natural History Museum, Department of Zoology, University of Tripoli. Species distribution patterns were determined through both literature review and field observations. The confirmed presence of 357 crustacean species most concentrated in the eastern coastal region underscores the ecological importance of this area. Native species remain dominant, particularly in the east (94.4%), while non-native species are still limited in both diversity and distribution.

This comprehensive assessment lays a vital foundation for understanding crustacean biodiversity along the Libyan coast. It emphasizes the urgent need for continued monitoring especially of non-native species and highlights the importance of sustained research efforts to inform conservation and ensure the sustainable management of this ecologically and economically significant group. By consolidating all known marine crustacean species into a single reference list, this study facilitates species identification and status assessment, helping to close existing knowledge gaps in one of the Mediterranean's most critical yet understudied marine regions.

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