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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 Data were compiled from a comprehensive review of unpublished scientific surveys, technical reports, and biological samples collected along various parts of the Libyan coast during two main sampling periods: January 2005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 البيئي للقشريات البحرية في المياه الليبية، جنوب البحر المتوسط

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يوفر الشاطئ الليبي مواطن بيئية تدعم تنوعاً كبيراً 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 الشاطئ الليبي خلال فترتي أخذ عينات رئيسيتين: من يناير 2005 إلى مارس 2006،

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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 متراً قبالة طرابلس خلال موسم الشتاء والصيف من عام 2020. تم تحديد ما مجموعه 357 نوعاً من القشريات، شملت خمس رتب تصنيفية و138 عائلة. وسُجل أعلى غنى في الأنواع في المنطقة الشرقية. وقد مثلت رتبة القشريات العليا (Malacostraca) المجموعة الأكثر تنوعاً من الناحية التصنيفية، حيث شملت 62.32% من العائلات المحددة و162 نوعاً (45% من إجمالي عدد الأنواع). تلتها رتبة Hexanauplia التي شملت 31.88% من العائلات وضمت 183 نوعاً (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 الشاطئ، 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 (Țigănuș, 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.

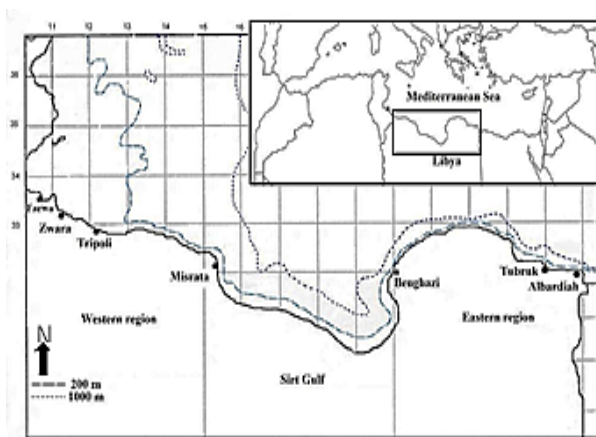


Fig 1. Sampling: Eastern region, Sirt Gulf and Western region on the Libyan coast.

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	<i>Evadne</i> sp. Lovén, 1836	Native	E	Contransimex, 1977
2	Branchiopoda	Percnidae	<i>Percnion gibbesi</i> (H. Milne-Edwards, 1853)	NIS	W	Shakman et al. 2019
3	Branchiopoda	Podonidae	<i>Evadne spinifera</i> P.E. Müller, 1867	Native	E	Contransimex, 1977
4	Branchiopoda	Podonidae	<i>Podon</i> sp. Lilljeborg, 1853	Native	E	Contransimex, 1977
5	Branchiopoda	Sididae	<i>Penilia avirostris</i> Dana, 1849	Native	E	Contransimex, 1977
6	Hexanauplia	Acartiidae	<i>Acartia</i> (Acanthacartia) <i>cagayanensis</i> Sakaguchi & Ueda, 2020	Native	E	Contransimex, 1977
7	Hexanauplia	Acartiidae	<i>Acartia</i> (Acartia) <i>danae</i> Giesbrecht, 1889	Native	E	Contransimex, 1977
8	Hexanauplia	Acartiidae	<i>Acartia</i> (Acartia) <i>negligens</i> Dana, 1849	Native	E	Contransimex, 1977
9	Hexanauplia	Acartiidae	<i>Acartia</i> (Acartiura) <i>longiremis</i> (Lilljeborg, 1853)	Native	E	Contransimex, 1977
10	Hexanauplia	Acartiidae	<i>Acartia</i> (Hypoacartia) <i>adriatica</i> Steuer, 1910	Native	E	Contransimex, 1977
11	Hexanauplia	Aegisthidae	<i>Aegisthus aculeatus</i> Giesbrecht, 1891	Native	E	Contransimex, 1977
12	Hexanauplia	Aetideidae	<i>Aetideus armatus</i> (Boeck, 1872)	Native	E	Contransimex, 1977
13	Hexanauplia	Aetideidae	<i>Aetideus giesbrechti</i> Cleve, 1904	Native	E	Contransimex, 1977
14	Hexanauplia	Aetideidae	<i>Gaetanus kruppii</i> Giesbrecht, 1903	Native	E	Contransimex, 1977
15	Hexanauplia	Aetideidae	<i>Gaetanus minutus</i> (Sars G.O., 1907)	Native	E	Contransimex, 1977
16	Hexanauplia	Aetideidae	<i>Bradydium armatus</i> (Vanhöffen, 1897)	Native	E	Contransimex, 1977
17	Hexanauplia	Aetideidae	<i>Chiridius poppei</i> Giesbrecht, 1893	Native	E	Contransimex, 1977
18	Hexanauplia	Aetideidae	<i>Euchirella messinensis messinensis</i> (Claus, 1863)	Native	E	Contransimex, 1977
19	Hexanauplia	Aetideidae	<i>Euchirella rostrata</i> (Claus, 1866)	Native	E	Contransimex, 1977
20	Hexanauplia	Archaeobalanidae	<i>Semibalanus balanoides</i> (Linnaeus, 1767)	Native	E	Contransimex, 1977
21	Hexanauplia	Arietellidae	<i>Paramisophria cluthae</i> Scott T., 1897	Native	E	Contransimex, 1977
22	Hexanauplia	Augaptilidae	<i>Augaptilus anceps</i> Farran, 1908	Native	E	Contransimex, 1977
23	Hexanauplia	Augaptilidae	<i>Haloptilus acutifrons</i> (Giesbrecht, 1893)	Native	E	Contransimex, 1977
24	Hexanauplia	Augaptilidae	<i>Haloptilus angusticeps</i> Sars G.O., 1907	Native	E	Contransimex, 1977

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

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

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

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

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

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

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

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

357	Thecostraca	Balanidae	<i>Perforatus perforatus</i> (Bruguière, 1789)	Native	w	This study
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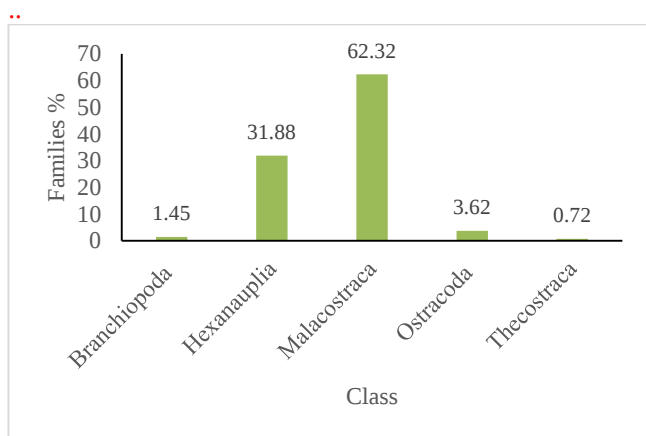


Fig. 2. The percentage of families in the Libyan coast

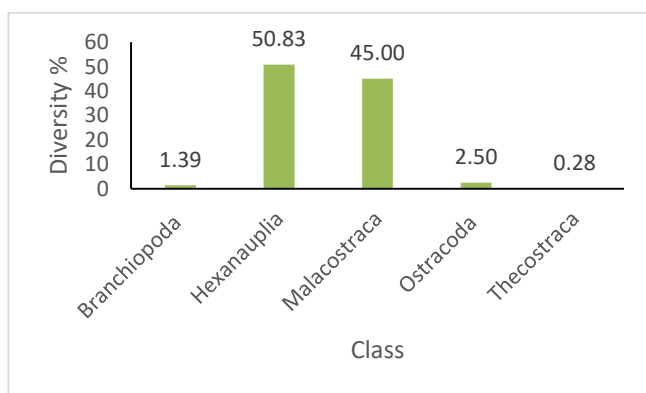


Fig. 3. Diversity of marine crustaceans in the Libyan coast

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).

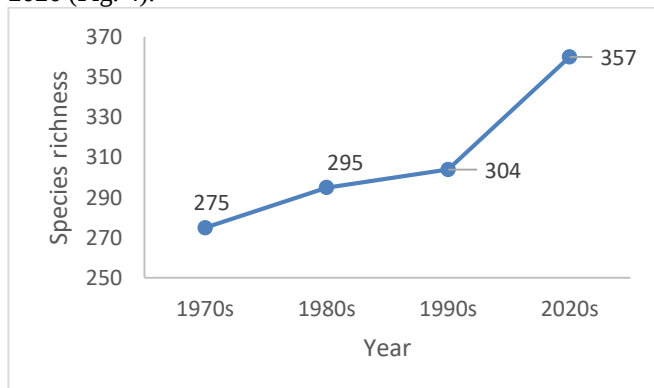


Fig 4. The trend of marine crustacean species reported from the Libyan coast

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).

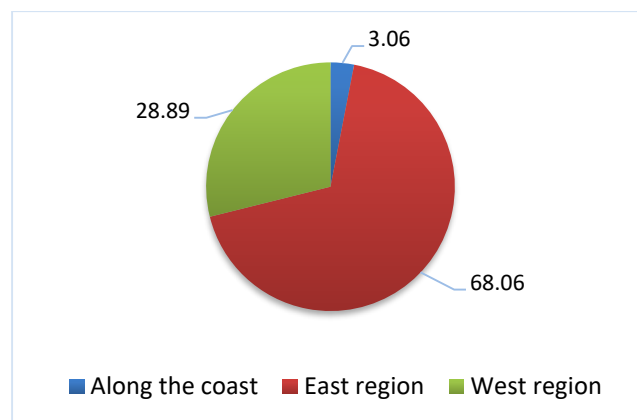


Fig 5. Distribution of marine crustacean species in main regions on the Libyan coast

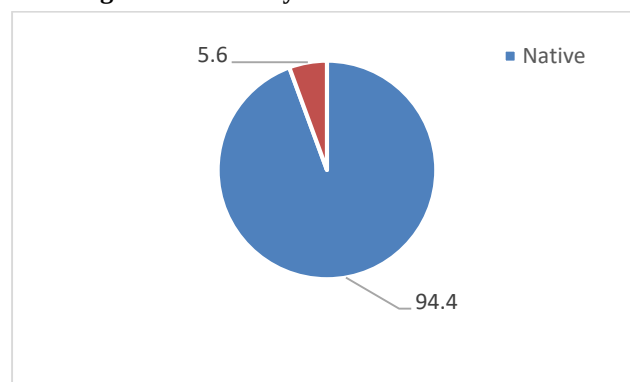


Fig. 6. The percentage of non-indigenous species along the Libyan coast

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 (Țigănuș, 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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