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Ferda Perçin-Paçal
Istanbul University, Institute of Experimental Medicine Research, Şehremini, TR-34093 Istanbul, Turkey.

Selçuk Altinsaçli
Istanbul University, Faculty of Fisheries, Ordu Street. No: 200 34310 Laleli-Istanbul-Turkey.

Hüsamettin Balkis
Istanbul University, Faculty of Science, Department of Biology, Vezneciler, TR-34134 Istanbul, Turkey.

Correspondence:
Ferda Perçin-Paçal
Istanbul University, Institute of Experimental Medicine Research, Şehremini, TR-34093 Istanbul, Turkey.

An updated checklist of recent marine and coastal brackish water ostracods (Crustacea Ostracoda) in Turkey

Ferda Perçin-Paçal, Selçuk Altinsaçli, Hüsamettin Balkis

Abstract
A distributional checklist of total 382 marine and coastal brackish water ostracod (Crustacea) species from Turkey (the Mediterranean Sea, the Aegean Sea, the Black Sea, the Sea of Marmara, the Dardanelles Strait, and the Bosphorus Strait) are listed in this updated checklist. This checklist was generated from all studies (mainly based on published data) which were carried out in Turkish territorial marine and coastal brackish waters between the years of 1989-2014.

Keywords: Ostracoda, Crustacea, Marine, Brackish, Turkey.

1. Introduction
The Sea of Marmara is an inland sea that connects the Black Sea with the Aegean Sea and the Mediterranean Sea through the straits of the Bosphorus and the Dardanelles. The Bosphorus Strait and Dardanelles Strait are elements of the Turkish Straits. The Bosphorus Strait, a natural waterway (about 30 km long, between 28 and 110 m deep) and the Dardanelles Strait (62 km long, between 50 and 109 m deep) provides the connection between the Marmara Sea and the Aegean Sea. A two-way flow is present in both straits. The surface water current, which flows from the Black Sea to the Marmara Sea, is less salty, while the water forming the bottom current, which flows from the Marmara Sea to the Black Sea, is more salty [1-4].
Microcrustacean (0.5–2 mm) marine ostracods live in the sub-littoral, littoral, and bathyal zones. They have mostly adapted to benthic life thanks to their heavy two-piece shells, but a minority has adapted to pelagic life. Athersuch *et al* [5] data showed that habitats in which marine plants grow have richer ostracod species diversity. The majority of marine ostracod species are bisexual, while freshwater ostracod species are mostly parthenogenetic [6]. In recent years, many ostracod species thought to be parthenogenetic were found to be bisexual. Ostracods are a very common group that possesses hard shells with calcitic minerals in seas, lakes, and lagoons (in fact, many different types of aquatic habitats). Ostracods are important objects in palaeoecological research (palaeoecological and identification of biostratigraphic zones) because calcareous microfossil (valves) of ostracod species are both abundant in the sediment of brackish, freshwater, and marine environments and are an ecological indicator of aquatic environment organisms and of tsunamis or severe storms [7-8]. Datasets of checklists are also used to obtain a deeper understanding of biogeography and ecology of taxonomical groups.
Gülen *et al.* [9] listed 83 marine–brackish ostracod species and Bakır *et al.* [9] listed 263 marine–brackish ostracod species in Turkey. Many studies have been conducted in the Mediterranean Sea [11-17], in the Masoli Adriatic Sea [18-20], in the Tyrrhenian Sea [21, 22], in the Aegean Sea ([23-29], in the Black Sea [30-33], and coastal lagoons [34-35].
Living specimens and recent specimens (belonging to the Holocene Epoch) of marine and brackish benthic and pelagic ostracods have been reported in the Mediterranean Sea, the Aegean Sea, the Sea of Marmara, the Dardanelles Strait, the Bosphorus Strait, the Black Sea, and coastal lagoons. Benthic ostracods have been found in the thanatocoenoses and biocoenoses of Turkish seas (See table 2). However, despite the relatively large quantity of taxonomic data, ecologic and taxonomic knowledge of Turkish marine and brackish ostracods is still incomplete. Thus, the present initiative was taken to provide an updated checklist of ostracods in Turkish waters, as well as contributing further knowledge on the diversity of this group.

Much research has been conducted on the Ostracoda fauna in the Mediterranean Sea [36-39], the Aegean Sea [40-43], the Dardanelles Strait [44-46], the Sea of Marmara [47-50], the Bosphorus Strait [51-53], the Black Sea [54, 55], and coastal lagoons [56-61]. All these studies were carried out in Turkish territorial marine and coastal brackish waters. Ostracods are accepted by many researchers (as cited above) as being evidence for changes in palaeoenvironmental conditions in aquatic habitats. In addition to these studies by marine biologists, many studies on ostracods have been conducted by paleontologists and palaeoecologists in Turkey.

2. Material and Methods

Turkey is surrounded by sea on three sides (the Black Sea, the Aegean Sea, and the Mediterranean Sea). The Sea of Marmara connects the Black Sea to the Aegean Sea via the Bosphorus and the Dardanelles (Fig. 1). Previously published papers and unpublished data on the ostracod species in Turkish seas, lagoons, and straits were used in this study. The checklist in Table 1 contains the valid and synonymous names and their numerical codes together with the habitats of the species. The numerical codes of ostracod species and studies conducted for determining ostracods within marine and coastal brackish water are shown in Table 2.

Sorensen's Similarity Index [62, 63] was used to compare the similarity of Turkish seas and lagoons. The results of Sorensen's Similarity index are shown in Fig 2. Sorensen's Similarity Index is based on species presence using the following formulae: the index of similarity (S) = 2C/A+B, where A and B are the numbers of species in community A and B, respectively; C is the number of common species in both communities. The European Register of Marine Species [64] taxonomic data relating to marine ostracods were evaluated in this study.

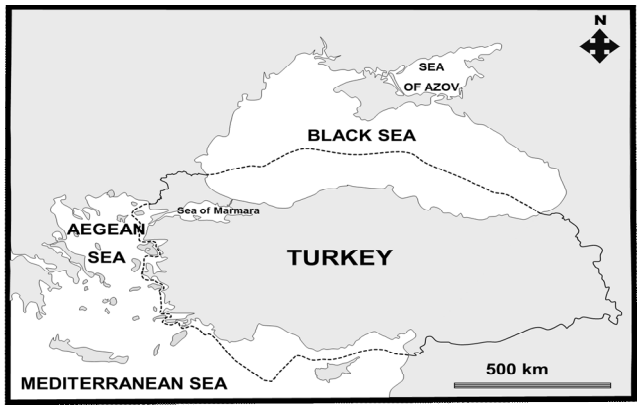

Fig 1. Map of terrestrial marine waters of Turkey.

Table 1. Updated checklist of marine and coastal brackish water ostracods of Turkey (Abbreviations: **SN:** Number of species, **MS:** Mediterranean Sea, **AS:** Aegean Sea, **DS:** Dardanelles Strait, **SOM:** Sea of Marmara, **BOS:** Bosphorus Strait, **BS:** Black Sea, **LO:** lagoonal ostracods).

SN	Species	MS	AS	DS	SOM	BOS	BS	LO
1	*Porroecia porrecta* (Claus, 1890)		+					
2	*Metaconchoecia skogsbergi* (Iles, 1953)		+					
3	*Mikroconchoecia curta* (Lubbock, 1860)		+					
4	*Proceroecia microprocera* (Angel, 1971)		+					
5	*Archiconchoecia striata* G.W. Müller, 1894		+					
6	*Polycope demulderi* Sissingh, 1972		+					
7	*Polycope frequens* G.W. Müller, 1894		+				+	
8	*Polycope orbicularis* Sars, 1866		+					
9	*Polycope orbulinaeformis* Breman, 1976	+	+					
10	*Polycope parareticulata* Bonaduce, Ciampo & Masoli, 1976		+					
11	*Polycope reticulata* G.W. Müeller, 1894	+	+		+			
12	*Polycope tholiformis* Bonaduce, Ciampo & Masoli, 1976	+	+					
13	*Polycope tulipeformis* Çulha 2009		+					
14	*Polycope vasfiensis* Sissingh, 1972		+					
15	*Philomedes interpuncta* (Baird, 1850) Brady, 1867						+	
16	*Cytherella abyssorum* Sars, 1866		+					
17	*Cytherella alvearium* Bonaduce, Ciampo & Masoli, 1976	+	+		+			
18	*Cytherella circumpunctata* Ciampo, 1976		+					
19	*Cytherella lata* Brady, 1880				+			
20	*Cytherella maremensis* Artüz, Gülen & Kubanç, 2013				+			
21	*Cytherella scutulum* Ruggieri, 1976		+					
22	*Cytherella terquemi* Sissingh, 1972	+	+					
23	*Cytherella vandenboldi* Sissingh, 1972	+	+		+			
24	*Cytherella vulgata* Ruggieri, 1962	+	+	+	+			
25	*Cytherelloidea beckmanni* Barbeito-Gonzalez, 1971		+					
26	*Cytherelloidea sordida* (Müller, 1894)	+	+	+				
27	*Bairdia (Neonesidea) corpulenta* (Müller, 1894)		+		+	+		
28	*Bairdia (Neonesidea) formosa* (Brady, 1868)	+	+					
29	*Bairdia (Neonesidea) longevaginata* Müller, 1894	+	+		+	+		
30	*Bairdia (Neonesidea) mediterranea* Müller, 1894		+		+	+	+	
31	*Bairdia (Triebelina) raripila* (Müller, 1894)		+		+			
32	*Bairdia serrata* Müller, 1894		+					
33	*Bairdoppilata (Bairdia) supradentata* (Terquem, 1878) Sissingh, 1972		+	+	+			
34	*Neonesidea crasenticlavula* Maddocks, 1969		+					
35	*Neonesidea (Bairdia) conformis* (Terquem, 1878)	+	+					
36	*Neonesidea frequens* (Müller, 1894)			+				
37	*Neonesidea inflata* (Norman, 1862)		+					

38	*Bythocypris bosquetina* (Brady, 1866)	+	+					
39	*Bythocypris obtusata* (Sars, 1866)	+			+			
40	*Microcytherura angulosa* (Seguenza, 1880)		+		+			
41	*Microcytherura fulva* (Brady & Robertson, 1874)				+			
42	*Microcytherura nigrescens* Müller, 1894				+		+	
43	*Leptocythere bacescoi* (Rome, 1942)		+					
44	*Leptocythere bisulcata* Stancheva, 1964					+		
45	*Leptocythere bituberculata* Bonaduce, Ciampo & Masoli, 1976		+					
46	*Leptocythere castanea* (Sars, 1866)		+			+	+	
47	*Leptocythere histriana* Caraion, 1964				+		+	+
48	*Leptocythere lagunae* Hartmann, 1958		+				+	
49	*Leptocythere lacertosa* (Hirschmann, 1912)				+		+	+
50	*Leptocythere levis* (Müller, 1894)					+		
51	*Leptocythere macella* Ruggieri, 1975	+			+		+	
52	*Leptocythere multipunctata* (Seguenza, 1942)	+	+	+	+			
53	*Leptocythere pellucida* (Baird, 1850)		+		+	+	+	
54	*Leptocythere (Amnicythere) pirsagatica* (Livental 1949)					+	+	
55	*Leptocythere porcellanea* (Brady, 1869)	+					+	
56	*Leptocythere psammophila* Guillaume, 1976		+		+			
57	*Leptocythere (Amnicythere) quinquetuberculata* (Schweyer, 1949)						+	
58	*Leptocythere ramosa* (Rome, 1942)	+	+				+	
59	*Leptocythere rara* (Müller, 1894)	+				+	+	
60	*Leptocythere rastrifera* Ruggieri 1953		+		+	+		
61	*Euxinocythere bacuana* (Livental 1929)						+	
62	*Euxinocythere lopatici* (Schornikov, 1964)					+		
63	*Callistocythere adriatica* Masoli, 1968		+		+		+	
64	*Callistocythere crispata* (Brady, 1868)	+	+		+			
65	*Callistocythere diffusa* (Müller, 1894)				+		+	
66	*Callistocythere elena* Barbeito-Gonzalez, 1971				+			
67	*Callistocythere intricatoides* Ruggieri, 1953		+	+	+			
68	*Callistocythere littoralis* (G.W. Müller, 1894)		+		+	+	+	
69	*Callistocythere lobiancoi* (Müller, 1894)		+	+	+			
70	*Callistocythere mediterranea* (Müller, 1894)	+	+		+	+	+	
71	*Callistocythere montana* Doruk, 1973		+		+	+	+	
72	*Callistocythere pallida* (Müller, 1894)	+	+	+	+	+	+	
73	*Callistocythere rastrifera* (Ruggieri, 1953)							+
74	*Callistocythere vexata* Bonaduce, Ciampo & Masoli, 1976	+			+			
75	*Limnocythere inopinata* (Baird, 1843)						+	+
76	*Cytheroma karadagiensis* Dubowsky, 1939				+			
77	*Cytheroma variabilis* Müller, 1894				+		+	
78	*Cyprideis (Cyprideis) anatolica* Bassiouni 1979		+					+
79	*Cyprideis dardanallesensis* Atay 2002			+				
80	*Cyprideis pannonica* (Mehes, 1908)		+	+				
81	*Cyprideis seminulum* (Reuss, 1850)	+						
82	*Cyprideis sohni* Bassiouni, 1979				+	+		
83	*Cyprideis sorbyana* (Jones, 1856)				+			
84	*Cyprideis torosa* (Jones, 1850)	+	+	+	+	+	+	+
85	*Cyprideis quadrituberculata* Krstic 1968			+				
86	*Cyprideis trituberculata* Krstic, 1968			+	+			
87	*Cythereis tuberculata* Sars, 1865 Syn: *Robertsonites tuberculatus* (Sars, 1865)			+	+			
88	*Cytheridea acuminata* (Bosquet, 1952)	+	+	+			+	
89	*Cytheridea neapolitana* Kolmann, 1960	+	+	+	+			
90	*Cytheridea papillosa* Bosquet, 1852				+			
91	*Cytheridea paracuminata* Kollmann, 1960	+						
92	*Cuneocythere semipunctata* (Brady, 1868)				+			
93	*Cushmanidea (Pontocythere) elongata* (Brady, 1868)	+	+		+		+	
94	*Pontocythere baceseoi* (Caraion, 1960) Caraion, 1967						+	
95	*Pontocythere (Cushmanidea) elongata* (Brady, 1868)		+		+	+	+	
96	*Pontocythere turbida* Müller, 1894		+		+		+	
97	*Krithe bartonensis* (T.R. Jones, 1857)	+						
98	*Krithe keyi* Breman, 1978	+						
99	*Krithe mersinensis n.sp.* Ertekin 2005	+						
100	*Krithe monosteracensis* Sequenza, 1880	+						
101	*Krithe praetexta* (Sars, 1866)		+					
102	*Krithe reniformis* (Brady, 1868)	+			+			
103	*Krithe similis* (Müller, 1894)				+			
104	*Parakrithe dimorpha* Bonaduce, Ciampo & Masoli, 1976	+						
105	*Pseudopsammocythere kollmani* Carbonel 1966		+					
106	*Pseudopsammocythere similis* (G.W. Müller, 1894)	+	+		+			
107	*Bosquetina carinella* (Reuss, 1957)	+	+	+	+			

108	*Bosquetina dentata* (Müller, 1894)		+		+			
109	*Bosquetina rhodiensis* Sissingh, 1972	+	+					
110	*Bosquetina tarentina* (Baird, 1850)	+						
111	*Occultocythereis dohrni* (Puri, 1963).		+					
112	*Basslerites teres* (Brady, 1869)	+						
113	*Basslerites berchoni* (Brady, 1869)	+	+	+	+		+	
114	*Acantocythereis ascolii* (Puri 1963)		+		+		+	
115	*Acantocythereis (Trachyleberis) hystrix* (Reuss, 1850)	+	+	+	+			
116	*Acantocythereis (Cythereis) dunelmensis* (Norman, 1865)		+		+			
117	*Cythereis polygonata* Rome, 1942		+					
118	*Carinocythereis antiquata* (Baird, 1850)	+	+	+	+	+	+	
119	*Carinocythereis carinata* (Roemer, 1838)	+	+	+	+	+	+	+
120	*Carinocythereis meulenkampi* Sissingh 1972		+		+			
121	*Carinocythereis quadridentata* (Baird 1850)	+	+	+	+	+		
122	*Carinocythereis rhombica* Stambolidis, 1982		+	+	+			+
123	*Celtia quadridentata* (Baird, 1850)	+	+		+			
124	*Bathycythere mediterranea* Ertekin 2005	+						
125	*Bathycythere vanstraateni* Sissingh, 1971	+						
126	*Cistacythereis caelatura* Uliczny, 1969	+						
127	*Cistacythereis (Carinocythereis) pokornyi* Ruggieri 1981	+						
128	*Costa batei* (Brady 1866)	+	+		+			
129	*Costa edwardsii* (Roemer, 1838)	+	+	+	+	+	+	
130	*Costa (Trachyleberis) hamata* (Mueller, 1894) Rome, 1965						+	
131	*Costa punctatissima* Ruggieri, 1962	+	+		+			
132	*Costa tricostata* Reuss, 1850		+		+		+	
133	*Hiltermannicythere emaciata* (Brady, 1867)	+					+	
134	*Hiltermannicythere (Carinocythereis) rubra* (Müller, 1894)	+	+	+	+		+	
135	*Hiltermannicythere turbida* (Müller, 1894)		+	+	+			
136	*Falunia plicatula* (Reuss 1850)		+			+	+	
137	*Falunia (Hiltermanicythere) rugosa* (Costa 1853) Sissingh, 1972	+	+			+		
138	*Olimfalunia (Celtia) quadridentata* (Baird)		+					
139	*Pterygocythereis ceratoptera* (Bosquet, 1852)		+	+	+			
140	*Pterygocythereis (Cythereis) jonesii* (Baird, 1850)		+	+	+	+	+	
141	*Tegmenia (Falunia) rugosa* (Costa, 1853)	+			+			
142	*Trachyleberis (Acantocythereis) hystrix* (Reuss, 1849)				+			
143	*Buntonia dertonensis* (Ruggieri, 1954)	+	+					
144	*Buntonia giesbrechti* (Müller, 1894)		+	+	+			
145	*Buntonia subulata* Ruggieri, 1954		+		+			
146	*Buntonia sublatissima* (Neviani, 1906)	+	+	+	+			
147	*Buntonia textilis* Bonaduce, Ciampo & Masoli, 1976	+	+					
148	*Rectobuntonia inflata* Colalongo & Pasini, 1980	+						
149	*Henryhowella sarsi* (Müller, 1894)	+	+		+			
150	*Echinocytherei skeyseri* Stambolidis, 1982		+					
151	*Echinocythereis laticarina* (Brady, 1868)		+		+			
152	*Tyrrhenocythere amnicola* (Sars 1887)		+			+	+	
153	*Heterocythereis albomaculata* (Baird, 1838)	+	+		+		+	+
154	*Aurila amygdala* (Stephenson, 1944)					+		
155	*Aurila arborescens* (Brady, 1865)							+
156	*Aurila convexa* (Baird, 1850)	+	+	+	+	+	+	+
157	*Aurila ducasseae*Moyes 1961	+						
158	*Aurila maculosa*Uliczny, 1969		+					
159	*Aurila prasina* Barbeito-Gonzalez, 1971		+		+		+	+
160	*Aurila oblanga* (Moyes, 1965) Ducasse & Moyes, 1971		+					
161	*Aurila speyeri* (Brady, 1868	+	+		+		+	
162	*Aurila vena* (Seguenza 1883)		+					
163	*Aurila woodwardii* (Brady, 1868)	+	+		+			
164	*Caudites calceolatus* (Costa, 1853)		+					
165	*Tenedocythere (Quadracythere) prava* (Baird, 1850)	+	+	+	+			
166	*Orionina bireticulata* Doruk 1974				+			
167	*Urocythereis britannica* Athersuch, 1977		+	+	+	+	+	+
168	*Urocythereis colum* Athersuch, 1977	+	+					
169	*Urocythereis crenulosa* (Terquem 1878)			+				
170	*Urocythereis distinguenda* Athersuch, 1978	+	+					
171	*Urocythereis favosa* (Roemer, 1838)	+	+		+	+		
172	*Urocythereis margaritifera* (Müller, 1894)	+	+		+	+		
173	*Urocythereis oblonga* (Brady, 1866)		+	+			+	
174	*Urocythereis neapolitana* Athersuch, 1977		+		+			
175	*Urocythereis phantastica* Athersuch & Ruggieri 1975	+	+					
176	*Urocythereis sororcula* (Seguenza, 1880)	+	+					
177	*Cytheretta adriatica* Ruggieri, 1952	+	+		+			+

178	*Cytheretta judaea* (Brady, 1868)		+					
179	*Cytheretta jurinei* (von Munster 1830)				+			
180	*Cytheretta semiornata*, (Egger, 1858)	+						
181	*Cytheretta subradiosa* (Roemer, 1836)	+	+		+			
182	*Loculicytheretta pavonia* (Brady, 1866)	+	+					
183	*Microcythere obliqua* (Müller, 1894)		+					
184	*Hirschmannia viridis* (O.F. Müller, 1785)	+						
185	*Loxoconcha affinis* (Brady, 1866)		+					
186	*Loxoconcha agilis* Ruggieri, 1967	+	+		+		+	
187	*Loxoconcha alata* Brady, 1868	+	+		+			
188	*Loxoconcha ancilla* Stancheva, 1964					+		
189	*Loxoconcha bairdi* (Müller, 1894)	+	+		+			
190	*Loxoconcha bonaducei* Ciampo, 1971		+					
191	*Loxoconcha bulgarica* Caraion, 1961				+			
192	*Loxoconcha concentrica* Bonaduce, Ciampo & Masoli, 1976	+						
193	*Loxoconcha elliptica* Brady, 1868	+		+				+
194	*Loxoconcha exagona* Bonaduce, Ciampo & Masoli, 1976	+	+		+			
195	*Loxoconcha gibberosa*Terquem, 1878		+		+			
196	*Loxoconcha gibboides*Livental, 1949					+	+	
197	*Loxoconcha granulata* Sars, 1866	+	+		+	+	+	
198	*Loxoconcha lepida* Stepanaitys, 1962					+	+	
199	*Loxoconcha littoralis* G. W. Muller 1894				+		+	
200	*Loxoconcha mediterranea* Müller, 1894		+		+	+		
201	*Loxoconcha minima* Müller, 1894	+			+		+	
202	*Loxoconcha micra* Barbeito-Gonzalez 1971		+					
203	*Loxoconcha napoliana* Puri, 1963	+	+		+			
204	*Loxoconcha nea* Barbeito & Gonzales, 1971	+			+			
205	*Loxoconcha impressa* (Baird, 1850)		+					+
206	*Loxoconcha (Sagmatocythere) napoliana* Puri, 1963	+	+					
207	*Loxoconcha obliquata*Sequenza 1880		+		+	+		
208	*Loxoconcha ovulata* (Costa, 1853)	+	+				+	
209	*Loxoconcha parallela* Müller, 1894		+					
210	*Loxoconcha (Phlyctocythere) pellucida* Müller, 1894		+		+			
211	*Loxoconcha pontica* Klie, 1937		+		+		+	
212	*Loxoconcha punctatella* (Reuss, 1850)		+					
213	*Loxoconcha rhomboidea* (Fischer, 1855)	+	+	+	+	+	+	
214	*Loxoconcha rubritincta* Ruggieri, 1964	+	+					
215	*Loxoconcha sublepida* Stancheva, 1989						+	
216	*Loxoconcha stellifera* Müller, 1894	+	+		+		+	+
217	*Loxoconcha tumida* Chapman, 1902	+	+		+	+	+	
218	*Loxoconcha turbida* Müller, 1912		+	+				
219	*Loxoconcha tamarindus* (Jones, 1857)		+					+
220	*Loxoconcha variesculpta* Ruggieri 1962		+					
221	*Loxoconcha versicolor*, Muller, 1900		+		+			
222	*Sagmatocythere versicolor* (Müller, 1894)		+					
223	*Neocytherideis bradyi* Athersuch 1982	+	+					
224	*Neocytherideis complicata* (Ruggieri, 1953)	+	+					
225	*Neocytherideis cylindrica* (Brady, 1868) Syn: Neocopytus cylindricus	+	+					
226	*Neocytherideis foveolata* (Brady, 1870)	+						
227	*Neocytherideis fasciata* (Brady & Robertson, 1874)	+	+					
228	*Neocytherideis subspiralis* (Brady, Crosskey & Robertson, 1874)	+	+					
229	*Neocytherideis subulata* (Brady, 1868)		+					+
230	*Procytherideis complicata* (Ruggieri, 1953)	+						
231	*Paracytheridea bilocunosa* (Speyer 1863)				+			
232	*Paracytheridea depressa* Müller, 1894	+	+	+	+	+		
233	*Paracytheridea parallia* Barbeito-Gonzales, 1971	+	+	+	+		+	
234	*Eucythere prava* Brady & Robertson, 1869						+	
235	*Eucytherura bulgarica* Klie, 1937		+					
236	*Eucytherura complexa* (Brady, 1866)		+					
237	*Eucytherura gibbera* Müller, 1894		+					
238	*Eucytherura mistrettai* Sissingh, 1972		+					
239	*Hemicytherura bulgarica* Klie, 1937				+		+	
240	*Hemicytherura cellulosa* (Norman, 1865)				+			
241	*Hemicytherura videns* (Müller, 1894)				+			
242	*Pseudocytherura calcarata* (Seguenza, 1880)	+	+	+	+		+	
243	*Pseudocytherura pontica* Dubovsky, 1939				+		+	
244	*Semicytherura acuminata* (Müller, 1894)	+	+		+			
245	*Semicytherura aenariensis* Bonaduce, Ciampo & Masoli, 1976	+						
246	*Semicytherura acuta* (Müller, 1912)				+			
247	*Semicytherura acuticostata* (Sars, 1866)	+			+	+		

248	*Semicytherura alifera* Ruggieri, 1959		+					
249	*Semicytherura amorpha* Bonaduce, Ciampo & Masoli, 1976				+		+	
250	*Semicytherura cribiformis* (Müller, 1894)		+		+			
251	*Semicytherura diafora* Barbeito-Gonzalez, 1971		+		+			
252	*Semicytherura dispar* (Müller, 1894)		+			+	+	
253	*Semicytherura incongruens* (Müller, 1894)	+		+	+			
254	*Semicytherura inversa* (Seguenza, 1880)	+	+	+	+			
255	*Semicytherura mediterranea* (Müller, 1894)		+					
256	*Semicytherura paradoxa* (Müller, 1894)		+		+			
257	*Semicytherura psila* Barbeito-Gonzalez, 1971		+					
258	*Semicytherura rarecostata* Bonaduce, Ciampo & Masoli, 1976				+		+	
259	*Semicytherura rara* (Müller, 1894)		+				+	
260	*Semicytherura ruggierii* (Pucci, 1956)	+	+		+	+	+	
261	*Semicytherura sella* (Sars, 1866)	+						
262	*Semicytherura stilifera* Bonaduce, Ciampo & Masoli, 1976				+			
263	*Semicytherura sulcata* (Müller, 1894)	+	+	+	+	+		+
264	*Semicytherura tergestina* Masoli, 1968				+			
265	*Semicytherura ventricosa* (Müller, 1894)		+					
266	*Cytheropteron alatum* Sars, 1866		+		+			
267	*Cytheropteron grossoalatum* n.sp. Ertekin 2005	+						
268	*Cytheropteron latissimum* (Norman, 1865)		+		+			
269	*Cytheropteron latum* Müller, 1894		+	+	+			
270	*Cytheropteron monoceros* Bonaduce, Ciampo & Masoli, 1976		+					
271	*Cytheropteron punctatum* Brady, 1868		+		+			
272	*Cytheropteron pseudoalatum*Colalongo et Passini, 1980	+						
273	*Cytheropteron rotundatum* Müller, 1894	+	+		+			
274	*Cytheropteron ruggierii* Pucci, 1955				+			
275	*Cytheropteron vespertilio* (Reuss, 1850)				+			
276	*Xestoleberis acutipenis* Caroion 1963		+				+	
277	*Xestoleberis aurantia* (Baird, 1838)	+	+		+	+	+	
278	*Xestoleberis communis* (Müller, 1894)	+	+	+	+	+	+	
279	*Xestoleberis cornelii* Caraion, 1963		+		+		+	
280	*Xestoleberis decipiens* G.W. Müller, 1894	+	+		+		+	
281	*Xestoleberis depressa* Sars, 1866	+	+	+	+	+	+	
282	*Xestoleberis dispar* Müller, 1894	+	+	+			+	
283	*Xestoleberis margaritea* (Brady, 1866)	+	+		+		+	
284	*Xestoleberis margaritopsis* Rome, 1942		+		+		+	
285	*Xestoleberis pellucida* (Müller, 1894)		+		+			
286	*Xestoleberis plana* (Müller, 1894)		+		+		+	
287	*Xestoleberis reymenti* Ruggieri 1967		+					
288	*Xestoleberis ventricosa* (Müller, 1894)	+	+					
289	*Bythocythere (Bythocypris) minima* Bonaduce, Ciampo & Masoli, 1976		+	+	+		+	
290	*Bythocythere turgida* Sars, 1866		+		+		+	
291	*Monoceratina oblita* Bonaduce, Ciampo & Masoli, 1976		+		+			
292	*Monoceratina mediterranea* Sissingh, 1972	+	+		+			
293	*Pseudocythere caudata* Sars, 1866	+	+					
294	*Sclerochilus contortus* (Norman, 1862)		+		+	+	+	
295	*Sclerochilus gewemülleri* Dubowsky, 1939						+	
296	*Cytherois fischeri* (Sars, 1866)	+	+					+
297	*Cytherois frequens* Müller,1894		+		+			
298	*Paracytherois ensiforme* (Brady, 1868)				+			
299	*Paracytherois flexuosa* (Brady, 1867)	+	+					
300	*Paracytherois mediterranea* Bonaduce, Ciampo & Masoli, 1976				+			
301	*Paradoxostoma angustum* Müller, 1894		+					
302	*Paradoxostoma ensiforme* Brady, 1868				+			
303	*Paradoxostoma guttatum* Schornikov, 1965						+	
304	*Paradoxostoma fuscum* G.W. Müller, 1894	+			+		+	
305	*Paradoxostoma intermedium* G.W. Müller, 1894		+				+	
306	*Paradoxostoma mediterraneum* Müller, 1894						+	
307	*Paradoxostoma rarum* Müller, 1894		+					
308	*Paradoxostoma simile* G.W. Müller, 1894		+		+	+	+	
309	*Paradoxostoma taeniatum* G.W. Müller, 1894				+			
310	*Paradoxostoma triste* G.W. Müller, 1894			+	+	+	+	
311	*Parvocythere hartmanni* Marinov, 1962						+	
312	*Macrocypris adriatica* (Breman, 1975)				+			
313	*Macrocypris ligustica* Bonaduce, Masoli &Pugliese 1977	+						
314	*Macrocypris (Macrocyprina) succinea* Müller, 1894		+					
315	*Argilloecia acuminata* Müller, 1894	+			+		+	
316	*Argilloecia conoidea* Sars, 1923	+	+		+	+		
317	*Argilloecia minor* G.W. Müller, 1894				+		+	

318	*Argilloecia robusta* Bonaduce, Ciampo & Masoli, 1976				+			
319	*Pontocypris (Erythrocypris) acuminata* Ulrich, 1891		+		+		+	
320	*Pontocypris (Propontocypris) intermedia* Brady, 1868		+					
321	*Pontocypris mytiloides* (Norman, 1862) Brady, 1867		+					
322	*Pontocypris (Erythrocypris) rara* (Müller, 1894) Maddocks, 1969		+					
323	*Pontocythere acuminata* (Bosquet1852)			+				
324	*Pontocythere (Cushmanidea) elongata* (Brady, 1868) Oertli, 1956	+		+	+			+
325	*Pontocythere turbida* Müller, 1894 (Müller, 1894) Morkhoven, 1963	+	+					
326	*Propontocypris dispar* G.W. Müller, 1894	+	+	+	+	+		
327	*Propontocypris pirifera* (G.W. Müller, 1894)	+	+		+	+		
328	*Darwinula cylindrica* (Straub, 1952)	+	+		+			
329	*Darwinula stevensoni* (Brady & Robertson, 1870)			+				+
330	*Ilyocypris biplicata* (Koch, 1838)							+
331	*Ilyocypris bradyi* G.O. Sars, 1890			+				+
332	*Ilyocypris decipiens* Masi, 1905							+
333	*Ilyocypris gibba* (Ramdohr, 1808)			+	+			+
334	*Ilyocypris inermis* Kaufmann, 1900						+	
335	*Mediocypris candonaeformis* (Straub 1952)				+			
336	*Pseudocandona compressa* (Koch, 1838),							+
337	*Pseudocandona marchica* (Hartwig, 1899)							+
338	*Pseudocandona (Candona) rostrata* (Brady & Norman, 1889)				+			
339	*Candona angulata* G.W. Müller, 1900						+	+
340	*Candona candida* (O.F. Müller, 1776)			+				
341	*Candona (Candona) burdurensis* Freels, 1980				+			
342	*Candona (Caspiolla) fastigata* Freels 1980				+			
343	*Candona neglecta* Sars, 1887				+			+
344	*Candona parallela pannocica* Zalanyi 1959) Syn: *Pseudocandona albicans* (Brady,1864)			+	+	+		+
345	*Candona schweyeri* Schornikov, 1964						+	
346	*Fabaeformiscandona fabaeformis* (Fischer, 1851)							+
347	*Herpetocypris chevreuxi* (Sars, 1896)							+
348	*Psychrodromus olivaceus* (Brady & Norman, 1889)							+
349	*Aglaiocypris (Paracypris) complanata* Brady & Robertson, 1869		+		+			
350	*Aglaiocypris rara* G. W. Müller, 1894		+		+			
351	*Paracypris polita* Sars,1966						+	
352	*Paracypris sklira* Barbeito-Gonzales, 1971		+		+			
353	*Cyclocypris globosa* (Sars, 1863)		+					
354	*Cypria ophthalmica* (Jurine, 1820)							+
355	*Cypris pubera* O.F. Müller, 1776							+
356	*Heterocypris incongruens* (Ramdohr, 1808)						+	+
357	*Heterocypris kilitbahirensis* Atay& Tunoğlu 2002			+				
358	*Heterocypris salina* (Brady, 1868) Syn: *Cyprinotus salinus*			+	+		+	+
359	*Eucypris dulcifons* Diebel & Pietrzeniuk, 1969							+
360	*Eucypris hamadensis* Hartmann, 1964							+
361	*Eucypris lilljeborgi* (G.W. Müller, 1900)							+
362	*Eucypris mareotica* (Fischer, 1855) Syn: *Eucypris inflata* (Sars 1903)							+
363	*Eucypris virens* (Jurine, 1820)							+
364	*Tonnacypris lutaria* (Koch, 1838) Syn. *Eucypris lutaria*							+
365	*Eucyprinotus (Eucypris) rostratus* (Sywula, 1966)							+
366	*Prionocypris zenkeri* (Chyzer & Toth, 1858) Syn: *Eucypris zenkeri*							+
367	*Cypridopsis hartwigi* G.W. Müller, 1900							+
368	*Cypridopsis vidua* (O. F. Müller, 1776) Syn: *Cypridopsis parva*)						+	+
369	*Physocypria kraepelini* G.W. Müller 1903 Syn. *Physocypria klie*)							+
370	*Potamocypris arcuata* (Sars, 1903) Syn: *Potamocypris longisetosa* Bronshtein, 1928							+
371	*Potamocypris variegata* (Brady & Norman, 1889)							+
372	*Potamocypris villosa* (Jurine 1820)							+
373	*Potamocypris steueri* Klie, 1935						+	+
374	*Potamocypris zschokkei* (Kaufmann, 1900) Syn: Potamocypris wolfi (Brehm, 1920)							+
375	*Sarscypridopsis aculeata* (Costa, 1847)							+
376	*Eucythere (Eucythere) declivis* (Norman, 1865) Brady, 1868						+	
377	*Palmoconcha agilis* (Ruggieri, 1967)						+	
378	*Cytheroma marinovi* Schornikov, 1967						+	
379	*Amnicythere olivia* (Livental, 1938)						+	
380	*Tyrrhenocythere filipescui* (Hanganu)						+	
381	*Candona* (*Caspiolla*) *liventalina* (Evlachova, 1939).						+	
382	*Candona* (Pontoniella) *srebarnensis* Stancheva 1981.						+	
		135	222	60	181	54	98	56

Table 2. Numerical codes of ostracod species and studies conducted for determining marine and coastal brackish water ostracods

Seas and Lagoons	Numerical code number of ostracod species	Conducted studies in marine and coastal brackish water of Turkey (Number in the references)
Mediterranean Sea	9, 11, 12, 17, 22-24, 26, 28, 29, 35, 38, 39, 51, 52, 55, 58, 59, 64, 70, 72, 74, 81, 84, 88, 89, 91, 93, 97-100, 102, 104, 106, 107, 109, 110, 112, 113, 115, 118, 119, 121, 123-128, 131, 133, 134, 137, 141, 143, 146-149, 153, 156, 157, 161, 163, 165, 168, 170-172, 175-177, 180-182, 184, 186, 187, 189, 192- 194, 196, 201, 203, 204, 206, 208, 213, 214, 216, 217, 223-228, 230, 232, 233, 242, 244, 245, 247, 253, 254, 260, 261, 263, 267, 272, 273, 277, 278, 280-283, 288, 292, 293, 298, 299, 304, 313, 315, 324- 327.	34, 37-39, 65-70.
Aegean Sea	1- 14, 16- 18, 21-35, 37, 38, 40, 43, 45, 46, 48, 52, 53, 56, 58, 60, 63, 64, 67-72, 78, 80, 84, 88, 89, 93, 95, 96,101, 105-109, 111, 113-123, 128, 129, 131, 132, 134- 140, 143-147, 149-153, 156, 158-165, 167, 168, 170-178, 181-183, 185- 187, 189, 190, 194, 195, 197, 200, 202, 203, 205-214, 216- 225, 227-229, 232, 233, 235- 238, 242, 244, 248, 250-152, 254-257, 259, 260, 261, 263, 265, 266, 268- 271, 273, 276-294, 296-297, 299, 301, 305, 307, 308, 314, 319-322, 325-328, 349, 350, 352, 353.	40- 43, 71- 80
Dardanelle Strait	24, 26, 33, 36, 52, 67, 69, 72, 79, 80, 84-89, 107, 113, 115, 118, 119, 121, 122, 129, 134, 135, 139, 140, 144, 146, 156, 165, 167, 169,173, 193, 213, 218, 232, 233, 242, 253, 254, 263, 269, 278, 281, 282, 289, 310, 323, 324, 326, 329, 331, 333, 340, 344, 357, 358.	44- 46
Sea of Marmara	11, 17, 19, 20, 23, 24, 27, 29 -31, 33, 39- 42, 47, 49, 51- 53, 56, 60, 63- 72, 74, 76, 77, 82-84, 86, 87, 89, 90, 92, 93, 95, 96, 102, 103, 106-108, 113- 116, 118-123, 128, 129, 131, 132, 134, 135, 139- 142, 144-146, 149, 151, 153, 156, 159, 161, 163, 165-167, 171, 172, 174, 177, 179, 181, 186, 187, 189, 191, 194, 195, 199-201, 203, 204, 207, 210, 211, 213, 216, 217, 221, 231-233, 239-244, 246, 247, 249-251, 253, 254, 256, 258, 260, 262-264, 266, 268, 269, 271, 273-275, 277-281, 283-286, 289- 292, 294, 297, 298, 300, 302, 304, 308-310, 312, 315-319, 324, 326-328, 333, 335, 338, 341-344, 349, 350, 352, 358.	47-50, 81-90
Bosphorus Strait	27, 28, 30, 44, 46, 50, 53, 54, 59, 60, 62, 68, 70-72, 82, 84, 95, 118, 119, 121, 129, 136, 137, 140, 152, 154, 156, 167, 171, 172, 188, 196-198, 200, 207, 213, 217, 232, 247, 252, 260, 263, 276, 277, 278, 281, 294, 308, 310, 316, 326, 327, 344.	51-53, 91, 92
Black Sea	7, 15, 30, 42, 46-48, 51, 53, 54, 57-59, 61, 63, 65, 68, 70, 72, 75, 77, 84, 88, 93-96, 114, 118, 119, 129, 130,134, 136, 140, 152, 153, 156, 159, 161, 167, 186, 196, 197, 199, 201, 208, 211, 213, 215-217, 233, 234, 239, 242, 243, 249, 251, 258-260, 276-280, 282-284, 286, 290, 294, 295, 303-306, 308, 310, 311, 315, 317, 310, 334, 345, 351, 354, 356, 358, 368, 373, 376- 382	54, 55, 93-102
Lagoon of Turkey	47, 49, 73, 75, 78, 84, 119, 122, 153, 155, 156, 159, 167, 177, 193, 205, 216, 219, 229, 263, 296, 324, 329- 333, 336, 337, 339, 343, 344, 346-348, 354-356, 358-375	8, 56-61, 103-108

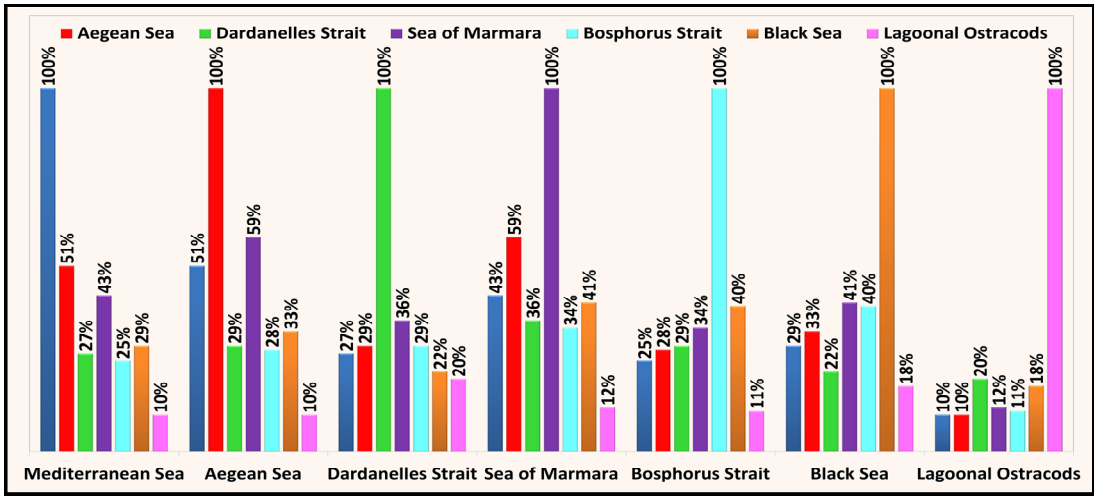

Fig 2. Similarity percentages of the seas and lagoons according to Sorensen's Similarity Index.

Gülen *et al.* [51]; listed 83 ostracod species in seas surrounding Turkey, while Bakır *et al.* [10], listed 263 ostracod species known to exist in Turkey. Fig 3 shows all comparative Ostracoda records belonging to marine and coastal brackish water of Turkey.

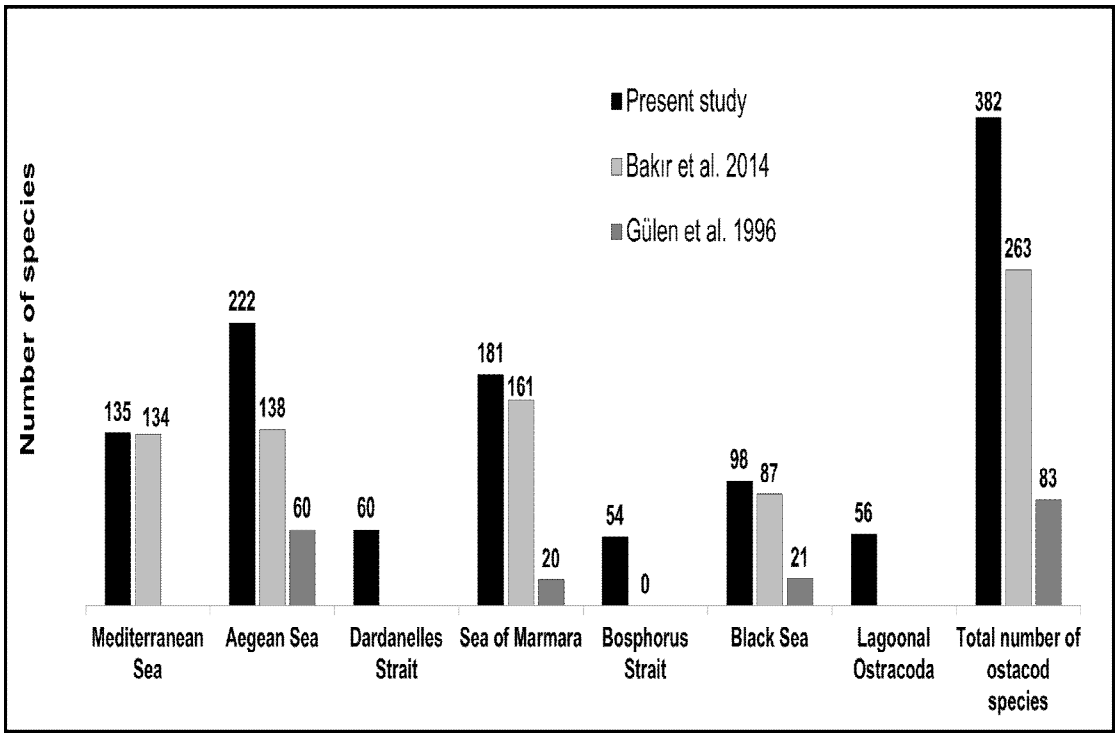

Fig 3. Comparative list of ostracod species recorded in marine and coastal brackish waters of Turkey (Bakır *et al.* [10], Gülen *et al.* [51], the present study)

3. Results and Discussion

382 ostracod species from 105 genera in Turkey are listed in Table 1. Some of these observed ostracod species are separated according to different genera: species 37, 22, 18, 13, and 12 are of the genera *Loxoconcha* (9.84%), *Semicytherura* (5.85%), *Leptocythere* (4.78%), *Xestoleberis* (3.45%), and *Callistocythere* (3.19%), respectively. Fig 4 shows the classification of marine and coastal brackish ostracod species determined in the seas and lagoons of Turkey according to depth zones and salinity rates. Fig 5 shows the number of species belonging to ostracod genera that live in marine and coastal brackish water of Turkey.

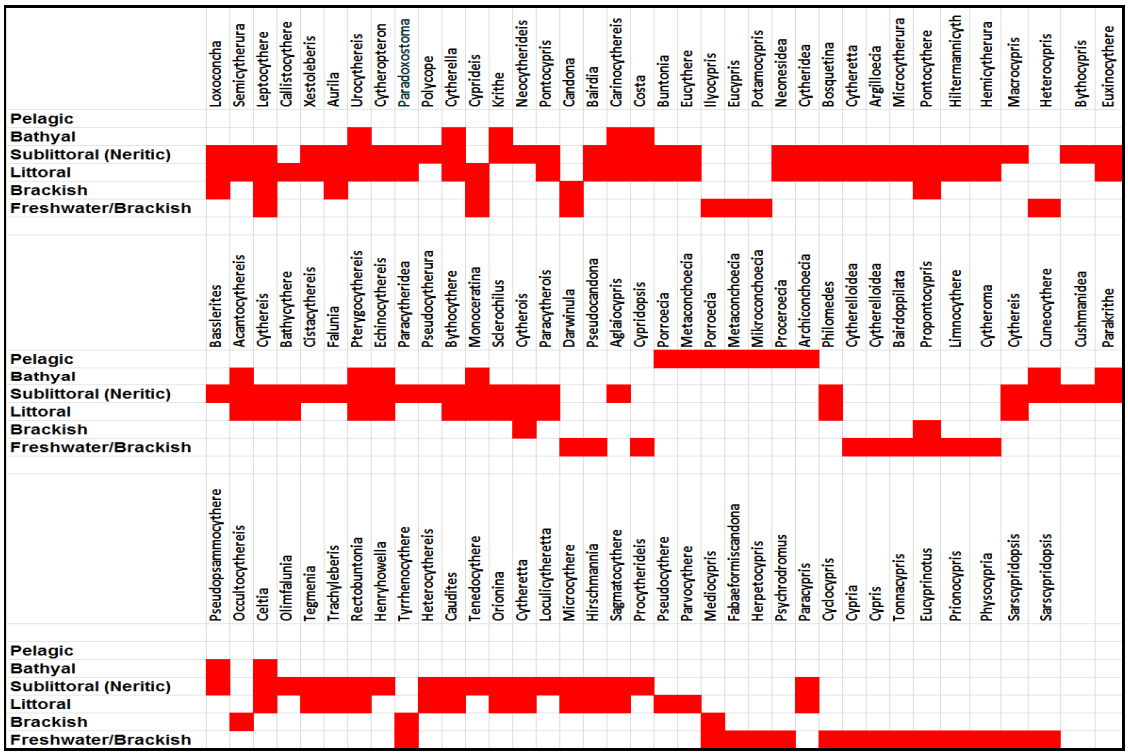

Fig 4. Classification of marine and coastal brackish ostracod species determined in the seas and lagoons of Turkey according to depth zones and salinity rates.

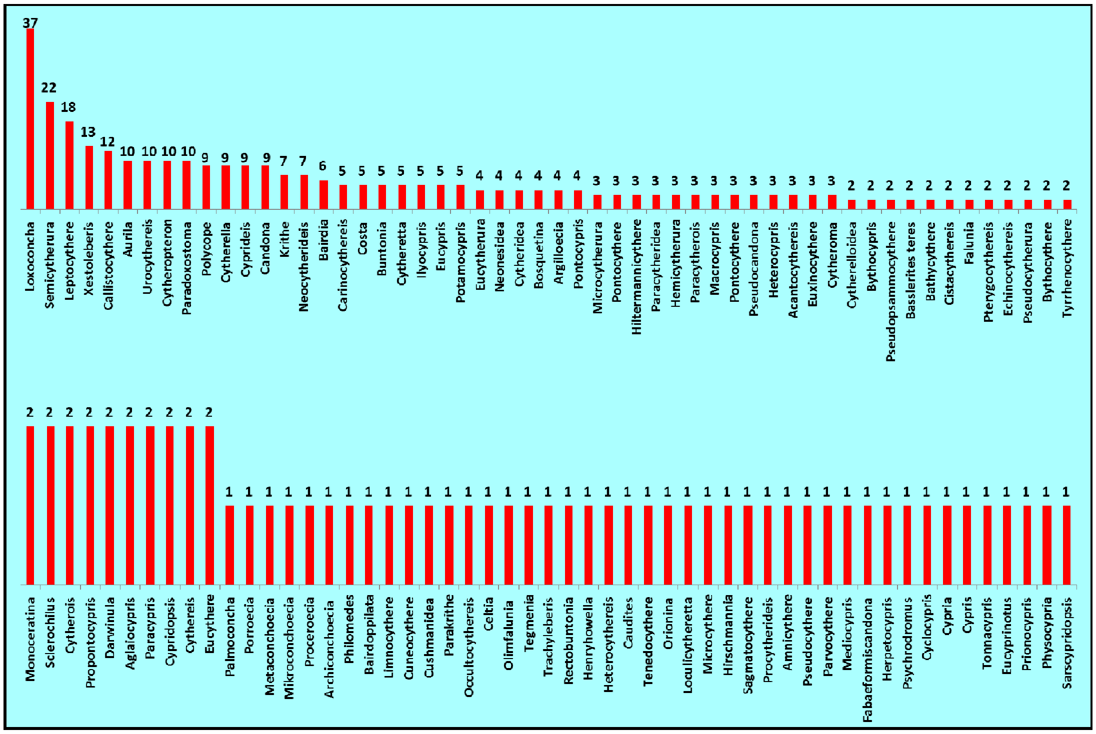

Fig 5. The number of species belonging to ostracod genera that live in marine and coastal brackish water of Turkey

According to these results, 59% faunal similarity was observed in the fauna of the Aegean and the Marmara Sea. A similar ratio of 51% was observed in the Aegean and the Mediterranean. The results show that faunal similarity ratio is highest between interconnected seas.

Lagoons are areas of physical and biological transition among the land, freshwater, and the sea. They therefore have harsh and varied environmental conditions, such as changes in salinity. The environments of lagoons are not stable for many ostracod species, and thus lagoons are not so rich in species diversity. As a consequence, the faunal similarity rate for the Ostracoda is low between lagoons and the sea.

Low faunal similarity was observed between the Dardanelles and the Bosphorus and the Turkish seas because these straits have a smaller volume than the seas. Very few studies have been conducted on the Ostracoda fauna in these straits. As a result, low faunal similarity levels have been determined between the seas and the two straits.

Of a total of 382 ostracod species, 222 (58.11 %), 181 (47.3%), 135 (35.34%), 98 (26.65 %), 60 (15.70%), 56 (14.65%), and 54 (14.30 %) were found in the Aegean Sea (which represented the greatest diversity of species), the Marmara Sea, the Mediterranean Sea, the Black Sea, the Dardanelles Strait, coastal lagoons, and the Bosphorus Strait, respectively.

Numerous studies have been conducted on the Aegean and Marmara seas, resulting in more ostracod species being determined in these two seas than others. A larger number of species in the Mediterranean Sea could yet increase if more studies are made. *Cyprideis torasa* and *Loxoconcha elliptica* are the most common and predominant ostracod species in Turkey [59, 106, 107]. Ostracod species richness is much higher than expected in lagoons because many freshwater ostracods can live in oligosaline waters that are fed by freshwater sources.

The diversity of ostracod species is significantly lower in lagoons than in non-marine and marine ecosystems [109]. More than 65,000 living and fossil ostracod taxa (subspecies and synonymies) have been described [110-111] and updates; Ikeya *et al.* [112]. Only about half of the estimated 20,000 living species have been formally described [113], with the majority from marine and transitional waters; some 2000 subjective species come from non-marine waters [114].

Many mega-projects have been carried out since the region's severe earthquake in 1999 in order to solve the transportation problems of the mega-metropolis, Istanbul. The obtained core samples during the planned projects for the construction of bridges (across the Istanbul (Bosphorus) and Çanakkale (Dardanelles) straits and the Gulf of Izmit) and the sub-sea tunnel (under the Bosphorus Strait) have provided important paleontological and palaeoecological information on marine sediments. Most of this research has been conducted on marine ostracods in the Marmara Sea, since so many ostracodologists are located in universities in the Marmara region.

Ideally, radiocarbon dating (e.g., 14C yr. BP) should be carried out on the organic material found in sediment cores in all palaeoecological and paleontological studies, and results obtained converted to calendar year. The radiocarbon C14 method of dating is the ideal test to determine the age of sedimentary organic materials that exist in sample cores in palaeoecological and paleontological studies. According to Bassler-Veit *et al.* [104], ecological characteristics of lagoons and ostracod species can be evaluated solely from ostracod shells; they did not perfume C14 radiocarbon dating. Yet, this study is presented as a Holocene Epoch study equivalent to other palaeoecological studies that do contain C14 radiocarbon dating. Ecological evaluations have shown that Bassler-Veit *et al.* [104] ecological assessments are neither clear nor adequate since an age determination analysis was not performed. Therefore, it is not clear in their study which ostracod species belong to the Holocene Epoch. Data from radiocarbon dating, which is based on organic material found in the core sediment and the presence of ostracod shells in the same sediment, are an important for lithostratigraphical assessments. Many taxonomic and ecological assessments on fossil or subfossil ostracod shells (as if these samples were living organisms)

were made for Bassler-Veit *et al*. [104] and other researchers examining the same subject using similar methodsand other researchers examining the same subject using similar methods. Ostracodologists know that fossil or subfossil shells within Holocene sediments belonging to dead (in the recent or further past) ostracod species have similar characteristics and shapes. Unfortunately, ornamentation studies in Turkey, like Bassler-Veit *et al.* [104], have been performed without any radiocarbon dating analysis, identifying ostracods by looking at ornamentations on the shell. Furthermore, in Turkey, unfortunately, like the Bass-Veit *et al.* study[104], other research groups working on the ecology of brackish-marine ostracod species generally do not cooperate with each other.

Unfortunately, there is currently no close cooperation between scientists working on benthic fauna in Turkey. Also, interdisciplinary benthic studies have been performed in the marine and coastal brackish waters of Turkey, intradisciplinary studies on the benthic marine and coastal brackish water ostracod species have not been performed. Problems concerning the lack of cooperation in the intradisciplinary scientific studies must be evaluated by other relevant social science disciplines. The Ostracoda checklist study performed by Bakır *et al.* [10], for example, should be updated since no ostracodologist contributed to it, neither from Turkey nor from other countries. It should not be forgotten that faunal checklists are important taxonomic scientific documents requiring the compilation of extensive datasets. If ostracodologists had been able to contribute to this study, Bakır *et al*. [10] could have given much more detail and complete information about the marine and coastal brackish fauna of Turkey.

In conclusion, although numerous studies have been conducted on marine and coastal brackish ostracods, further ecological and faunistic studies should be conducted in the future to provide additional information on marine ostracod fauna, especially in the Aegean Sea, the Mediterranean Sea, and the Black Sea. The number of publications on marine ecology is rather limited, thus more detailed studies on the ecology of marine and coastal brackish water ostracods in Turkey should be conducted. Assessments belonging on these scientific issues are only reflects our personal beliefs and free thoughts.

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