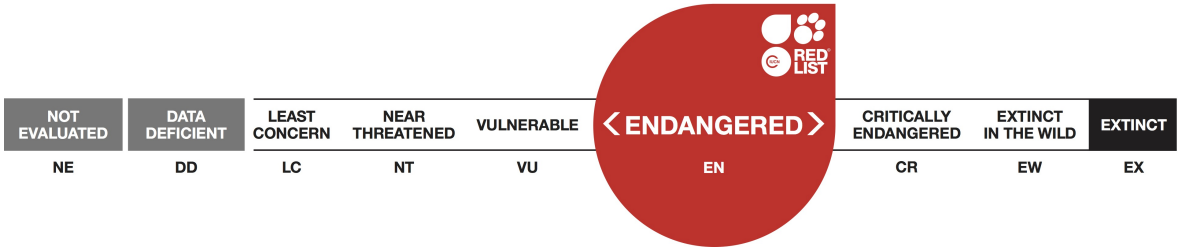
The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2008: T133142A75872554

Cladocora caespitosa, Mediterranean Pillow Coral

Assessment by: Casado de Amezua, P., Kersting, D., Linares, C.L., Bo, M., Caroselli, E., Garrabou, J., Cerrano, C., Ozalp, B., Terrón-Sigler, A. & Betti, F.



View on www.iucnredlist.org

Citation: Casado de Amezua, P., Kersting, D., Linares, C.L., Bo, M., Caroselli, E., Garrabou, J., Cerrano, C., Ozalp, B., Terrón-Sigler, A. & Betti, F. 2015. *Cladocora caespitosa. The IUCN Red List of Threatened Species 2015*: e.T133142A75872554. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T133142A75872554.en

Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Cnidaria	Anthozoa	Scleractinia	Faviidae

Taxon Name: *Cladocora caespitosa* (Linnaeus, 1767)

Regional Assessments:

- Mediterranean

Common Name(s):

- English: Mediterranean Pillow Coral, Bushy Coral, Thin Tube Coral
- Spanish: Madrépora Mediterránea

Taxonomic Source(s):

WoRMS Editorial Board. 2015. World Register of Marine Species. Available at: http://www.marinespecies.org. (Accessed: 16 April 2015).

Taxonomic Notes:

Even though the species was considered as part of the Faviidae, this affiliation has been considered dubious and the species has most recently been placed within Caryophylliidae (Romano and Cairns 2000, Cairns *et al.* 2001) and now within *Scleractinia incertae sedis* (Hoeksema and Cairns 2013).

Assessment Information

Red List Category & Criteria: Endangered A4a ver 3.1

Year Published: 2015

Date Assessed: October 1, 2014

Justification:

This species is primarily found in the Mediterranean Sea, with a small number of records from adjacent parts of the eastern Atlantic Ocean (the Atlantic coasts of Morocco and Portugal). In the Mediterranean Sea the species is widespread and can be locally abundant. This coral can form extensive banks, but can also exist as scattered, non-reef forming colonies.

This is a long lived, colonial species, with an estimated generation length of 30 years. The most extensive populations described to date, inhabiting the Adriatic Sea and Columbretes Islands, have been reported to have severely declined during the past decades, impacted by a range of threats. For example, over nine years the population in the Columbretes Islands declined by between 55 to 80%. Other subpopulations have also been impacted, including the subpopulations from the Gulf of La Spezia, Dardanelles (Marmara Sea, Turkey) and Cyprus, although quantitative measures of declines are not available. Although declines can not be measured over the past three generation lengths (~90 years), the main threat to this species, global climate change resulting in warming seawater temperatures, is expected to continue and perhaps worsen, in the near future. Populations can recover from the mortality events through recruitment of new individuals to existing colonies and the establishment of

http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T133142A75872554.en

new colonies, however the recruitment rate for this long-lived species is extremely low and not able to compensate for the increasing mortality rates. Within a three generation length that includes the past and present, it is inferred that the population will decline by at least 55% to perhaps as high as 80%, as has been documented in the banks at the Columbretes Island. Although these declines nearly reach the threshold for Critically Endangered, the non-reef forming colonies throughout the Mediterranean Sea are persisting at present levels of mortality. Therefore, this species is assessed as Endangered under criterion A4a.

Continuous monitoring of the species populations is highly recommended. This species should be re-evaluated in five years to include additional information and to determine the effects of continued or increased threats from climate change and direct anthropogenic impacts.

Previously Published Red List Assessments

2008 – Data Deficient (DD)

Geographic Range

Range Description:

Cladocora caespitosa can be considered as part of the recent fossil history of the Mediterranean Sea. Since the Pliocene *C. caespitosa* has been the only species that develops monospecific reef-like structures in the Mediterranean Basin. The oldest fossil records of banks of *C. caespitosa* are those described by Aguirre and Jiménez (1998) from the Upper Pliocene shallow marine deposit of the Almería-Nijar basin (southeastern Spain). This coral species became very common in some Quaternary peri-Mediterranean basins and diverse Holocene and Pleistocene fossil banks have been described from several areas (e.g., Cuerda *et al.* 1986, Fornós *et al.* 1996, Kühlmann 1996, Bernasconi *et al.* 1997). Furthermore, Laborel (1987) mentioned the existence of extensive dead banks of *C. caespitosa* (dated around 2500-3000 years ago) on the coasts of Tunisia and Corsica. The currently known *Cladocora caespitosa* distribution range covers the entire Mediterranean Basin and adjacent areas of the Atlantic including Olhao in Portugal and Agadir in Morocco (Zibrowius 1983, Schiller 1993). Despite the extensive distribution of dispersed colonies, only in a few locations do the colonies form beds (i.e., great numbers of distinct subspherical colonies 10–30 cm in diameter) or banks (i.e., large formations reaching several decimeters in height and covering several square meters in surface area) (Peirano *et al*. 1999). Living banks and/or beds of this coral have been recorded in: Tunisia (Zibrowius 1980); the Gulf of Atalanti and some places of the Aegean Sea (Laborel 1987); the Gulf of La Spezia, Ligurian coasts (Morri *et al*. 2000, Peirano *et al.* 2001, 2005, Rodolfo-Metalpa *et al*. 2005); in the Adriatic Sea: in Mljet National Park, other localities of the Croatian and Slovenian coasts (Schiller 1993, Kružić and Pozar-Domac 2002, Kružić and Benkovic 2008) and in the Bay of Piran (Schiller 1993); the northwestern Mediterranean: the Columbretes Islands, Medes Islands and Cap de Creus (Kersting and Linares 2012); the Levantine Sea, Cyprus (Jiménez *et al.* 2014); the Marmara and northern Aegean Sea, Turkey (Öztürk 2004, Özalp and Alparslan 2011). Large spreading banks of the species have also been found in the Balearic Islands, in the localities of Minorca (Fayos pers. comm. 2014) and Mallorca (Cap Blanc (R. Aguilar pers. comm. 2014), and at Banyuls-Sur-Mer in France (Romans pers. comm. 2014).

Some colonies of the species has also been found in Lebanon, North Israel, Lybia (Bomba bay) and Egypt (Bitar and Zibrowius, 1997; Badalamenti *et al.,* 2011; Pitacco *et al.*, 2014).

Country Occurrence:

Native: Albania; Croatia; Cyprus; France (Corsica, France (mainland)); Gibraltar; Greece; Israel; Italy (Italy (mainland), Sardegna, Sicilia); Lebanon; Libya; Monaco; Montenegro; Morocco; Slovenia; Spain (Baleares, Spain (mainland)); Syrian Arab Republic; Tunisia; Turkey (Turkey-in-Asia, Turkey-in-Europe)

FAO Marine Fishing Areas:

Native: Mediterranean and Black Sea -

http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T133142A75872554.en

Distribution Map

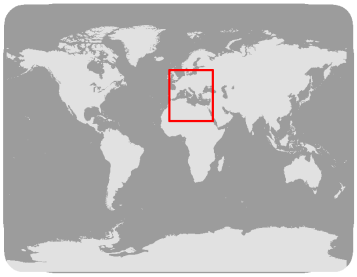
Cladocora caespitosa

NE DD LC NT VU **EN** ENDANGERED CR EW EX

Range

Extant (resident)

Compiled by:
IUCN



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

Following the available information, the most important sites known for this taxon in terms of colony cover and extent are those found in Mjlet National Park (Croatia, Adriatic Sea, Kružić and Benkovic 2008) and in the Columbretes Islands Marine Reserve (Spain, NW Mediterranean; Kersting and Linares 2012). *Cladocora caespitosa* is a long-lived species showing slow dynamics (low recruitment and natural mortality rates) (Kersting and Linares 2012, Kersting *et al.* 2014b); thus, significant impacts to its mortality rates may easily overcome its capacity to recover through recruitment (Kersting *et al.* 2014b). However, only in a very few cases have *Cladocora caespitosa* populations have been described in terms of cover, distribution, health status and population dynamics (Schiller 1993, Peirano *et al.* 2001, Kružić and Benkovic 2008, Kersting and Linares 2012, Kersting *et al.* 2013b, Kersting *et al.* 2014b). Information on both size and population trend is only available currently for the population of the Illa Grossa Bay (Columbretes Islands, NW Mediterranean; Kersting and Linares 2012; Kersting *et al.* 2013a, 2014b). Detailed information on population size and/ or structure is also available for populations of the Adriatic coasts in the islands Prvić, Pag and Iz and in the Mjlet National Park as well as for the populations inhabiting the Marmara Sea (Özalp 2013).

Population genetic studies of the species in the western Mediterranean basin (Casado-Amezúa *et al*. 2014) suggest that populations of *Cladocora caespitosa* are highly dependent on self-recruitment. On the other hand, the genetic connectivity among the populations seems to be related to sporadic dispersal events. These features indicate a reduced resilience of the populations mainly driven by the high levels of self-recruitment. ***Cladocora caespitosa* population from Columbretes Islands** Size The *Cladocora caespitosa* population in the Illa Grosa Bay (Columbretes Islands) is formed by a combination of banks and separate colonies (beds) with a highly aggregated distribution between 5 and 30 m of depth. The cumulative cover area of *C. caespitosa* in the bay was estimated to be approximately 2,900 m^2. Regarding the growth rates obtained for this population (~ 2.5 mm $year^{-1}$) some of the coral colonies in the Columbretes could reach ages up to 300 years (Kersting and Linares 2012). Population trends The population in the Illa Grossa Bay has lost between 55 % and 80 % of its cover due to recurrent mortalities related to warming and extreme summer temperatures (Kersting *et al*. 2013b). This climate-induced necrosis has been recorded over nine summers from 2003 to 2012, in two mortality periods (2003-2006 and 2008-2012). The first mortality period and especially the summer of 2003 triggered high necrosis values in this population, while impacts over the second period were milder. This shows that extreme hot summers such as in 2003 have a significant impact on this population. Furthermore, the summer of 2003 had delayed effects in the following summers resulting in an increase in the recorded necrosis rates, even if seawater temperature showed mild thermal anomalies (Kersting *et al.* 2013b). Given these results and the increase in frequency and persistence of extreme events projected for the 21st century in the Mediterranean Sea (Déqué 2007, Diffenbaugh *et al*. 2007), recurrent mortality episodes could likely be repeated and will threaten this species, which, due to its slow dynamics, will most likely not be able to cope with elevated mortality rates (Kersting *et al*. 2014b). This population is also being impacted by two invasive algae (*Caulerpa racemosa* and *Lophocladia lallemandii*). Even if no lethal effects of these algae have been detected on *Cladocora caespitosa* in Columbretes, sublethal effects derived of the algal invasion on other stages of the life cycle of *C. caespitosa*, like recruitment and juvenile survival, cannot be disregarded (Kersting *et al*. 2014a). **Populations of *Cladocora caespitosa* in the Adriatic Sea** Size The most extensive population of the species occurs in Veliko Jezero (Mljet National Park, southern Adriatic) at 6-18 m depth, where the bank has a large coverage of 650 m^2

(Kružić and Pozar-Domac 2003). Average coral growth rate has been estimated on a range of 1.92-4.19 mm/ year; and the age of the banks has been estimated to be 46-312 years (Kružić and Pozar-Domac 2002). Three other banks of the species have been described in the Adriatic Sea. The banks close to Prvić Island (Kvarner region, N Adriatic Sea) occur between 11-19 m depth and cover a size of about 190 m^2. Its average growth rate has been estimated in 3.08 mm/year, and the age of the bank estimated at 194 years. The bank near Pag Island (central Adriatic), occurs between 15-21 m depth and covers 120 m^2. Its average coral growth rate has been estimated in 3.06 mm/ year and age estimated of the bank in 294 years. (Kružić and Benković 2008). More recently, a bank near Iz Island (central Adriatic) has been described, occurring between 12-16 m depth and covering an area of 150 m^2 (Kružić and Požar-Domac 2007). Population trends Anthropogenic activities such as industrial and sewage discharges, trawling and other, fishing activities and coastal works development have caused a major decline of *Cladocora caespitosa* in the eastern Adriatic Sea during the last decades. A negative correlation has been observed in this populations between sea surface temperature and coral carbonate density (Kružić *et al.* 2012), that would mean an attenuation of calcification probably due to an inhibition of the photosynthetic process carried out by zooxanthellate at higher temperatures. During 1954-1958 high input of phosphates into the seawater decreased coral growth on the Mljet coral bank in the Veliko Jezero Lake. This event was related to the experimental fertilization of Mljet's Veliko Jezero Lake in 1953, in which, around 17 tons of phosphates (117 kg/hectare) were discharged into the lake. During the summers 1997 and 1998, the increased temperatures caused polyp necrosis in 10% colonies at the Mljet bank (Kružić *et al.* 2012) During 2001-2005 more than 90% of *Cladocora caespitosa* colonies from the bank near Iz Island died in the vicinity of tuna farms. This might be due the increase on nitrites and nitrates concentrations. This increase in nutrients enhanced phytoplankton and macroalgal blooms, thus decreasing the light available for the benthic communities. Increased levels of nutrients also led to higher levels of filamentous algae. **Populations of *Cladocora caespitosa* from the Marmara Sea**

Size Populations in the Dardanelles and Marmara Sea are formed by beds of colonies varying from 8-96 cm diameter. The colonies occur at 2-23 m depth and the total spreading area that colonies covered in Dardanos region is 27 m^2. In Soğandere region the total area is 3 m^2. The total coverage for the other areas is less than 2 m^2. In the Dardanelles (Marmara Sea) there are many individual *Cladocora caespitosa* colonies, not forming a large coral bank. Unlike colonies found in the Mediterranean sea, colonies in this area are not closely ordered and the formation could not be considered as a big bank reef of *Cladocora caespitosa* (Özalp 2013).

Population trends According to the latest observations performed in the late 2013 (B. Özalp pers. obs.), the necrosed extent of the colonies is about 50% of the colony area. It is thought that the physico-chemical conditions and the seasonal abnormal changes have an effect on this problem. Although short-term surveys show an increase in bleaching, more extensive scientific investigation focusing on population dynamics and colony condition and regular monitoring of ecological features need to be undertaken in the coming years.

Other relevant information from smaller populations of *Cladocora caespitosa*

Beds of *Cladocora caespitosa* have been also found in the Gulf of La Spezia (northern Tyrrhenian Sea) in the localities of Fiascherino Bay, Punta Bianca and Bocca di Magra. Beds of the species are mainly formed by colonies within a range of 20-65 cm in diameter (Periano *et al.* 1999). Colonies from this population have been found to range from 9-63 years old. A bank of *Cladocora caespitosa* has been

recorded in the Gulf of La Spezia (Morri *et al*. 2000) however with no population information available. A three years monitoring study of the colonies at Fiascherino Bay during period 1997-1999 period showed at the end of the study about 50% of the colonies completely dead (Rodolfo-Metalpa *et al*. 2005), associated with an increase on seawater temperature during the summer period.

Monitoring studies of *Cladocora caespitosa* populations in Cyprus have shown that some beds have been heavily impacted by warming events in 2010 and 2012, with a high percentage of necrosed colonies (Jimenez pers. comm. 2014).

Populations of *C. caespitosa* around Medes Islands and Cap de Creus (NW Mediterranean Sea), comprise disperse colonies, and are not currently impacted by climate-induced mortality and invasive species. However, it is important to note that they are found at deeper waters, below 20-25 m depth, where the incidence of these and other impacts is lower and the recorded mortality of the colonies is almost nil (Kersting and Linares pers. comm. 2014).

Large spreading banks of the species have been found in the Balearic Islands, in the localities of Cala Galdana (Minorca; at 5-10 m depth, Fayos pers. comm.) and Cap Blanc (Mallorca, 36 m depth, R. Aguilar pers. comm. 2014), as well as in Banyuls in France (Romans pers. comm. 2014), however with no population data available.

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

Cladocora caespitosa occurs on a wide range of substratum, a range of depths (commonly from 5 to 40 m depth), and hydrodynamic conditions (Zibrowius 1980). In Cyprus, the species occurs in the first meters of depth (1-5 m) (Hadjioannou pers. comm. 2015), whilst in several western Mediterranean locations, such as Medes Islands and Cap de Creus, the species is commonly found below 20 m depth in dim light conditions (Kersting 2013). The capacity of the species to tolerate a range of environments and to withstand seasonal abiotic factors such as temperature and light, typical of temperate seas as the Mediterranean, is probably related to the ability of this species to regulate autotrophy and heterotrophy depending on the environmental light conditions, as suggested by Hoogenboom *et al*. (2010).

Cladocora caespitosa may occur in a wide range of habitats, from shallow photophilic communities to circalitoral assemblages, however, the equilibrium between hydrodynamic protection and high water exchange through strong currents seems to enhance the development of extensive *C. caespitosa* populations, as occurs in the Mjlet National Park and Columbretes Islands (Kružić and Benkovic 2008, Kesting and Linares 2012).

The high prevalence of macroalgae has been considered a limiting factor in the development of this coral (e.g., Peirano *et al.* 1998, Rodolfo-Metalpa *et al*. 1999). However, the coral has been shown to be able to successfully compete with those algae in some localities, as happens in the Illa Grossa Bay where algal cover is high and most of the coral colonies and banks occur within the infralitoral photophilic algal community (Kersting and Linares 2012, Kersting 2013); whilst in other localities such the Adriatic and Marmara seas, the presence of algae (mainly *C. racemosa*) has been observed to impact the growth of the species (B. Özalp pers. comm. 2014, Kružić and Požar-Domac 2007). The sexual reproduction of the species has been recorded *in situ* in the Adriatic Sea (Kružic *et al*. 2008), where the coral has been

described as hermaphroditic at colony and polyp levels. Spawning has been observed to occur coinciding with increasing Summer water temperature and correlated with the lunar cycle. Eggs are released by the polyps in a mucus coating as clumps of eggs, that binds them together, while sperm are freely released (Kružic *et al*. 2008). In the western Mediterranean, histological analyses have shown that the coral is gonochoric (Kersting *et al*. 2013c). Spawning time has been observed to differ significantly between the Adriatic Sea and the western Mediterranean; in the former, spawning was observed at the beginning of Summer, coinciding with rising sea water temperatures (Kružic *et al*. 2008), whilst in the western Mediterranean spawning seems to occur at the end of the Summer coinciding with the cooling of sea water temperature (Kersting *et al*. 2013c). These notable differences on reproductive biology between these two regions should be further investigated. Based on average sizes and growth rates of the species, we assume that average generation length is 30 years. Average longevity is not known, but likely to be more than 100 years. In the Adriatic Sea and Columbretes Islands, colonies of already 300 years have been described.

Systems: Marine

Use and Trade

The species is not used for commercial purposes

Threats (see Appendix for additional information)

Cladocora caespitosa is a long-lived species showing slow dynamics, therefore being highly limited in its capability of recovery from impacts of diverse nature (Kersting *et al.* 2014b).

Cladocora caespitosa mass mortalities related to seawater warming and summer heat waves have been reported in several Mediterranean sites (Perez *et al*. 2000, Rodolfo-Metalpa *et al.* 2005, Garrabou *et al.* 2009, Kružić *et al*. 2012, Kersting *et al*. 2013b, Hadjioannou pers. comm. 2015). Increasing sea water temperature in shallow waters, as well as short times recorded between mortality events have severe consequences for the viability of the affected *C. caespitosa* populations. These populations also show a dramatic decrease in its biomass, along with a very slow recovery.

Seawater temperatures recorded during the summer 2003 were the warmest in the last 30 years (Garrabou *et al*. 2009). During these years, not only were temperatures high, but the warm and stable conditions lasted for an unusually long time (more than one month). In the case of Columbretes Islands population, a positive correlation between temperature and mortality rates in *Cladocora caespitosa* colonies was observed over this period (Kersting *et al.* 2013b). These recurrent mortalities are expected to affect over 50% of the colony cover in this area during the next decade (Kersting *et al*. 2013b).

The presence of the invasive algae *Caulerpa racemosa* has been reported in Mjlet National Park (Kružić *et al.* 2012), Columbretes Islands (Kersting *et al*. 2014a) and Dardanos region (B. Özalp pers. comm. 2013), and the spread of these invasive algae over the most important known populations of this coral is concerning. In the case of Columbretes Island population, another invasive algal species has been also observed, *Lophocladia lallemandii*.

No lethal effects derived from *C. racemosa* and *L. lallemandi* invasions have been detected in the *C. caespitosa* population from the Columbretes Islands, being the adult colonies of this species capable to

successfully compete with the algae. However sublethal effects derived of the algal invasion on other stages of the life cycle of *C. caespitosa*, like recruitment and juvenile survival cannot be disregarded (Kersting *et al.* 2014a)

In some areas around the Dardanos region, *C. racemosa* occurs at shallow depths down to 18 m. Populations of *C. caespitosa* of this region have been badly impacted by this invasive algae. In some instances colonies of the coral are completely covered by the algae, causing negative effects such as tissue necrosis (B. Özalp pers. comm. 2013). A more intensive study is being undertaken at this site in order to distinguish between the potential damage of increasing seawater temperature and algae coverage of the colonies.

Negative impacts resulting from eutrophication have been described in some *C. caespitosa* populations (e.g., Croatia and Cyprus; Kružić and Požar-Domac 2007, Hadjioannou pers.comm. 2015). Anthropogenic activities such as industrial and sewage discharges, trawling and other fishing activities and coastal development have caused a major decline of *Cladocora caespitosa* in the eastern Adriatic Sea. In the eastern Adriatic Sea, the high input of phosphates during 1954-1958 into the seawater decreased coral growth on the Mljet coral bank in the Veliko Jezero Lake. This event was related to the experimental fertilization of Mljet's Veliko Jezero Lake in 1953, in which around 17 tonnes of phosphates (117 kg per hectare) were discharged into the lake, thus increasing nitrites and nitrates concentrations and enhancing phytoplankton and algal blooms.

Trawling and dredging are probably the most destructive impacts currently affecting marine bioconstructors, including the coral *Cladocora caespitosa,* resulting in physical damage to coral colonies and habitat destruction. Small scale line fisheries, such as in the Dardanelles Strait, cause localized impacts as a result of boat anchors.

High sedimentation rates due to beach replenishing or dredging may cause the collapse of colonies. On the other hand, increase of water turbidity may be accompanied by an elevation of the deepest limit of distribution of this coral.

Conservation Actions **(see Appendix for additional information)**

There are no direct conservation measures in place for this species. The species is present within protected areas in the Mediterranean, such as Columbretes Islands, Mljet Islands, Cape Palos and Cabo de Gata. In general, the main conservation actions for *C. caespitosa* should be:

• Extend the current knowledge on the taxonomy, distribution, population, and ecology of the species, especially at known localities where the information is lacking.

• Identify and describe new sub-populations.

• Ensure the protection of the main subpopulations of *C. caespitosa* identified to date. At these locations, damage to the colonies by threats such as anchoring, fishing, recreational diving, dredging activities, should be controlled.

• Information on the main traits of *Cladocora caespitosa* populations, their health status and local threats is lacking for most sites. Once this information is available, long-term monitoring programs of biotic and abiotic factors should be implemented in order to monitor population trends, especially relevant in the actual context of global change impacts.

Another important conservation action for this species is to include the species under protection by national laws, EU Directives and international conventions in the protection lists. Despite the rapid

decline of shallow *Cladocora caespitosa* populations, currently this species is only included in the Annex 1 of Habitats Directive (Directive 92/43/CEE) under Habitat 1170 “Reefs” and listed on CITES Appendix II.

Credits

Assessor(s): Casado de Amezua, P., Kersting, D., Linares, C.L., Bo, M., Caroselli, E., Garrabou, J., Cerrano, C., Ozalp, B., Terrón-Sigler, A. & Betti, F.

Reviewer(s): Fine, M., Allen, D.J. & Otero Villanueva, M.

Contributor(s): Kružić, P., Zavalaga, C., Templado, J., Jimenez, C., Chefaoui, R. & Kersting, D.

http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T133142A75872554.en

Bibliography

Aguirre, J. and Jiménez, A.P. 1998. Fossil analogues of present-day Cladocora caespitosa coral banks: sedimentary setting, dwelling community, and taphonomy (Late Pliocene, W Mediterranean). *Coral Reefs* 17: 203-213 pp.

Badalamenti, F., Ben Amer, I., Dupuy De La Grandrive, R., Foulquie, M., Milazzo, M., Sghaier, Y.R., Gomei, M. and Limam, A. 2011. Scientific field survey report for the development of Marine Protected Areas in Libya.: 32 p.

Bernasconi MP, Corselli C, Carobene L. 1997.) A bank of the scleractinian coral Cladocora caespitosa in the Pleistocene of the Crati valley (Calabria, southern Italy): growth versus environmental conditions. . *Bolletino Società Paleontologica Italiana* 36: 53-61.

Bitar, G. and Zibroius, H. 1997. Scleractinian corals from Lebanon, Eastern Mediterranean, including a non-lessepsian invading species (Cnidaria: Scleractinia). *Scientia Marina* 61(2): 227-231 pp.

Cairns, S.D. 2001. A generic revision and phylogenetic analysis of the Dendrophylliidae (Cnidaria: *Scleractinia*). *Smithsonian Contributions to Zoology* 615: 42 p.

Casado-Amezua, P., Kersting, D.K., Templado, J. and Machordom A. 2014. Regional genetic differentiation among populations of Cladocora caespitosa in the Western Mediterranean. *Coral Reefs* 10.1007/s00338-014-1195-5.

Cebrian, E., Linares, C., Marschal, C. and Garrabou, J. 2012. Exploring the effects of invasive algae on the persistence of gorgonian populations. *Biological Invasions* 14: 2647–2656 pp.

Déqué, M., Rowell, D.P., Lüthi, D., Giorgi, G., Christensen, J.H., Rockel, B., Jacob, D., Kjellström, E., de Castro, M. and van den Hurk, B. 2007. intercomparison of regional climate simulations for Europe: assessing uncertainties in model predictions. *Climatic Change* 81: 53-70 pp.

Diffenbaugh, N.S., Pal, J.S., Giorgi, F. and Gao, X. 2007. Heat stress intensification in the Mediterranean climate change hotspot. *Geophysical Research Letters* 34(6).

Esteban, M. 1996. An overview of Miocene reefs from Mediterranean areas: General trends and facies models. In: E.K. Franseen, M. Esteban, W.C. Ward & J.M. Rouchy (ed.), *Models for carbonate stratigraphy from Miocene Reef Complexes of the Mediterranean regions.* , pp. 3-53. SEPM (Society for Sedimentary Geology).

Fabricius K. 2005. Effects of terrestrial runoff on the ecology of corals and coral reefs: review and synthesis. *Marine Pollution Bulletin* 50: 125-146.

Fornos, J.J., Baron, A. and Pons, G.X. 1996. Holocene hermatypic coral banks (Cladocora caespitosa) in Es Gran zone (Menorca, western Mediterranean). *Geogaceta* 20: 303-306.

Garrabou, J., Coma, R., Benssoussan, N., Chevaldonné, P., Cigliano, M., Diaz, D., Harmelin, J.G., Gambi, M.C., Kersting, D.K., Ledoux, J.B., Lejeusne, C., Linares, C., Marschal, C., Pérez, T., Ribes, M., Romano, J.C., Serrano, E., Teixido, N., Torrents, O., Zabala, M., Zuberer, F. and Cerrano, C. 2009. Mass mortality in NW Mediterranean rocky benthic communities: effects of the 2003 heat wave. *Global Change Biology* 15: 1090–1103 pp.

Hoeksema, B. and Cairns, S. 2013. *Cladocora caespitosa* (Linnaeus, 1767).

Hoeksema, B.and Cairns, S. 2013. *Cladocora* Ehrenberg, 1834. Available at: http://www.marinespecies.org/aphia.php?p=taxdetails&id=135087.

Hoogenboom, M.O., Connolly, S.R. and Anthony, K.R.N. 2008. Interactions between morphological and physiological plasticity optimize energy acquisition in corals. *Ecology* 89: 1144-1154 pp.

IUCN. 2015. The IUCN Red List of Threatened Species. Version 2015.2. Available at: www.iucnredlist.org. (Accessed: 23 June 2015).

Jímenez, C., Hadjioannou, L., Petrou, A., Nikolaidis A., Evriviadou, M., Lange, M. A. 2014. Mortality of the scleractinian coral Cladocora caespitosa during a warming event in the Levantine Sea (Cyprus). . *Reg Environ Change* DOI 10.1007/s10113-014-0729-2.

Kersting DK. 2013. Ecology and conservation of the endemic mediterranean coral Cladocora caespitosa. . Universitat de Barcelona .

Kersting, D.K. and Linares, C. 2012. Cladocora caespitosa bioconstructions in the Columbretes Islands Marine Reserve (Spain, NW Mediterranean): distribution, size structure and growth. *Marine Ecology* 33: 427-436 pp.

Kersting DK, Ballesteros E, De Caralt S, Linares C. 2014a. Invasive macrophytes in a marine reserve (Columbretes Islands, NW Mediterranean): spread dynamics and interactions with the endemic scleractinian coral Cladocora caespitosa. . *Biological Invasions.* : DOI 10.1007/s10530-013-0594-9.

Kersting, D.K., Bensoussan, N., Linares, C. 2013a. Long-Term Responses of the Endemic Reef-Builder Cladocora caespitosa to Mediterranean Warming. *PLoS ONE* 8(8): e70820.

Kersting DK, Casado C, López-Legentil S, Linares C (b). 2013b. Unexpected patterns in the sexual reproduction of the Mediterranean scleractinian coral Cladocora caespitosa. . *Marine Ecology Progress Series* 486: 165-171.

Kersting DK, Teixidó N, Linares C. 2014b. Recruitment and mortality of the temperate coral Cladocora caespitosa: implications for the recovery of endangered populations. *Coral Reefs.* : DOI: 10.1007/s00338-014-1144-3.

Kružić P, Benković L. 2003. Banks of the coral Cladocora caespitosa (Anthozoa, Scleractinia) in the Adriatic Sea (Croatia). . *Marie Ecology* 29: 125-139.

Kružić P, Pozar-Domac. 2002. Skeleton growth rates of coral bank of Cladocora caespitosa (anthozoa, Scleractinia) in lake Veliko jezero (Mljet National Park). . *Periodicum biologorum* 104: 123-129.

Kružić P, Pozar-Domac A. 2007. Impact of tuna farming on the banks of the coral Cladocora caespitosa in the Adriatic Sea. . *Coral reefs* 26: 665.

Kružić P, Sršen P, Benković L. 2012. The impact of seawater temperature on coral growth parameters of the colonial coal Cladocora caespitosa (Anthozoa, Scleracinia) in the Eastern Adriatic Sea. . *Facies* 58(477-491).

Kühlman DHH, Chitiroglou H, Koutsoubas D, Koukouras A. 1991. Korallenriffe im Mittelmeer? *Naturwissenschaftliche Rundschau* 44: 316.

Kühlmann K, Dietrich HH, Reitner J, Neuweiler Fritz, et al. 1996. Preliminary report on Holocene submarine accumulations of Cladocora caespitosa (L. 1767) in the Mediterranean). Global and regional controls on biogenic sedimentation. . *Reef Evolution.* .

Laborel J. 1987. Marine biogenic constructions in the Mediterranean: a review. . *Scientific reports of the Port Cros National Park* 13: 97-126.

Morri C. 2000. Cladocora caespitosa: a colonial zooxanthellate Mediterranean coral showing constructional ability. . *Reef Encounter*.

Morri C, Peirano A, Bianchi NC. 2001. Is the Mediterranean coral Cladocora caespitosa an indicator of climatic change? . *Archivio di Oceanografia e Limnologia* 22: 139-144.

Özalp HB, Alparslan M. 2011. The first record of Cladocora caespitosa (Linnaeus, 1767) (Anthozoa, Scleractinia) from the marmara Sea. . *Turkish Journal of Zoology* 35: 701-705.

Öztürk, B. 2004. Marine Life of Turkey in the Aegean & Mediterranean Sea. . *Turkish Marine Research Foundation: Istanbul.*: 48pp.

Peirano A, abate M, Cerrati G, Difesca V, Peroni C, Rodolfo-Metalpa R. 2005. Monthky variations in calix growth, polyp tissue, and density banding of the Mediterranean scleractinian Cladocora caespitosa (L.). *Coral Reefs* 24: 404-409.

Peirano A, Morri C, Bianchi CN. 1999. Skeleton growth and density patterns of the temperature, zooxanthellate scleractinian Cladocora caespitosa from the Ligurian Sea (NW Mediterranean). . *Marine Ecology Progress Series* 185: 195-201.

Pitacco, V., Orlando-Bonaco, M., Mavric, B and Lipej, L. 2014. Macrofauna associated with a bank of Cladocora caespitosa (Anthozoa, Scleractinia) in the gulf of Trieste (N Altantic). *ANNALES · Ser. hist. nat.* 24(1): 1-14.

Romano, S.L. and Cairns, S.D. 2000. Molecular phylogenetic hypothesis for the evolution of scleractinian corals. *Bulletin of Marine Sciences* 67: 1043-1068.

Schiller, Ch. 1993. Ecology of the symbiotic coral Cladocora caespitosa (L.) (Faviidae, Scleractinia) in the Bay of Piran (Adriatic Sea): I. Distribution and Biometry. *Marine Ecology* 14: 205-219 pp.

Zibrowius, H. 1980. *Les scleractiniaires de la mediterranee et de l'atlantique nordoriental. Memoires de l'Institut Oceanographique*.

Zibrowius H. 1983. Nouvelles données sur la distribution de quelques scleractiniaires “méditerraneens” a l’ est et a l’ ouest du détroit de Gibraltar. Rapports et Proces- Verbaux des Reunions Commission Internationale pour l’Exploration Scientifique de la Mer Mediterranee Monaco, 28.

Citation

Casado de Amezua, P., Kersting, D., Linares, C.L., Bo, M., Caroselli, E., Garrabou, J., Cerrano, C., Ozalp, B., Terrón-Sigler, A. & Betti, F. 2015. *Cladocora caespitosa. The IUCN Red List of Threatened Species 2015*: e.T133142A75872554. http://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T133142A75872554.en

Disclaimer

To make use of this information, please check the Terms of Use.

External Resources

For Images and External Links to Additional Information, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.2. Marine Neritic - Subtidal Rock and Rocky Reefs	Resident	Suitable	Yes

Threats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Threat	Timing	Scope	Severity	Impact Score
1. Residential & commercial development -> 1.1. Housing & urban areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
1. Residential & commercial development -> 1.2. Commercial & industrial areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
1. Residential & commercial development -> 1.3. Tourism & recreation areas	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
4. Transportation & service corridors -> 4.3. Shipping lanes	Ongoing	Minority (50%)	Unknown	Unknown
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.1. Intentional use: (subsistence/small scale)	Ongoing	Majority (50-90%)	Rapid declines	Medium impact: 7
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.3. Unintentional effects: (subsistence/small scale)	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 2. Species Stresses -> 2.2. Species disturbance		
5. Biological resource use -> 5.4. Fishing & harvesting aquatic resources -> 5.4.6. Motivation Unknown/Unrecorded	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		

6. Human intrusions & disturbance -> 6.1. Recreational activities	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
8. Invasive & other problematic species & genes -> 8.1. Invasive non-native/alien species -> 8.1.1. Unspecified species	Ongoing	Majority (50-90%)	Slow, significant declines	Medium impact: 6
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.2. Competition		
9. Pollution -> 9.1. Domestic & urban waste water -> 9.1.3. Type Unknown/Unrecorded	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.3. Type Unknown/Unrecorded	Ongoing	Minority (50%)	Slow, significant declines	Low impact: 5
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.2. Species disturbance		
11. Climate change & severe weather -> 11.3. Temperature extremes	Ongoing	Whole (>90%)	Rapid declines	High impact: 8
	Stresses:	1. Ecosystem stresses -> 1.1. Ecosystem conversion 1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.8. Other		

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions in Place
In-Place Land/Water Protection and Management
Occur in at least one PA: Yes

Conservation Actions Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Actions Needed
1. Land/water protection -> 1.1. Site/area protection
2. Land/water management -> 2.1. Site/area management
2. Land/water management -> 2.3. Habitat & natural process restoration
3. Species management -> 3.2. Species recovery

Conservation Actions Needed
3. Species management -> 3.4. Ex-situ conservation -> 3.4.2. Genome resource bank
4. Education & awareness -> 4.1. Formal education
4. Education & awareness -> 4.2. Training
4. Education & awareness -> 4.3. Awareness & communications
5. Law & policy -> 5.1. Legislation -> 5.1.1. International level
5. Law & policy -> 5.1. Legislation -> 5.1.2. National level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.1. International level
5. Law & policy -> 5.4. Compliance and enforcement -> 5.4.2. National level

Research Needed

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Research Needed
1. Research -> 1.1. Taxonomy
1. Research -> 1.2. Population size, distribution & trends
1. Research -> 1.3. Life history & ecology
1. Research -> 1.5. Threats
1. Research -> 1.6. Actions
3. Monitoring -> 3.1. Population trends

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): No
Extreme fluctuations in area of occupancy (AOO): No
Estimated extent of occurrence (EOO) (km^2): 2500000
Continuing decline in extent of occurrence (EOO): Yes
Extreme fluctuations in extent of occurrence (EOO): Yes
Lower depth limit (m): 40
Upper depth limit (m): 5
Population
Population severely fragmented: No

Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 30

The IUCN Red List Partnership

The IUCN Red List of Threatened Species™ is produced and managed by the IUCN Global Species Programme, the IUCN Species Survival Commission (SSC) and The IUCN Red List Partnership. The IUCN Red List Partners are: BirdLife International; Botanic Gardens Conservation International; Conservation International; Microsoft; NatureServe; Royal Botanic Gardens, Kew; Sapienza University of Rome; Texas A&M University; Wildscreen; and Zoological Society of London.