

MAPPING AND ASSESSING THE STATE OF ECOSYSTEMS & THEIR SERVICES IN THE OUTERMOST REGIONS

MARINE HABITATS OF MACARONESIA

TITLE/HABITAT NAME/EUNIS CODE

A1.12 Robust fucoid and/or red seaweed communities on wave exposed Atlantic littoral rock (EUNIS v2012)

Summary (Description, pressures & threats, conservation & management)

This littoral habitat is colonised by seaweeds that can tolerate the extreme conditions of very exposed to moderately exposed rocky shores. At the fringes, exposed on low spring tides, extensive forests of *Gongolaria abies-marina* may be present forming a dense canopy and providing shade and shelter for a diverse assemblage of plants and animals. The habitat is vulnerable to pressures and threats from pollution, coastal development, introduction of exotic species and harvesting of marine resources. There have been significant declines in the extent of the fringing *G.abies-marina* forests, and in areas dominated by *Gelidium canariense* as well as changes in quality. The extent of these changes has been documented around some of the Macaronesian islands.

Conservation status: VULNERABLE

Assessments of the extent of reduction in quantity and quality have been based on limited data as this has not been available for all the Macaronesian islands. If the pattern seen on those islands where data are available is repeated elsewhere, it is likely that this habitat type is in more serious condition and therefore Endangered rather than Vulnerable.

Images



Photos: (From left to right) "Punta del Hidalgo" (Tenerife) and 2 others from "Punta de Galdar" (Gran Canaria) (Canary Islands) (Canary Islands) (© Photo credit: Ricardo Haroun)



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HABITAT TYPE

EUNIS Code (Level 4, v2022)

MA 123 Seaweed communities on full salinity Atlantic littoral rock

MAES;

Marine – Marine inlets and transitional waters

Marine - Coastal

Annex 1 (Habitats Directive):

1160 Large shallow inlets and bays

1170 Reefs

8330 Submerged or partially submerged sea caves

MSFD

Littoral rock & biogenic reef

Habitat Description

This littoral habitat is colonised by seaweeds that can tolerate the extreme conditions of very exposed to moderately exposed rocky shores. Green algae, fucoids, and red algae, including coralline red algae are present. At the fringes, exposed on low spring tides, extensive forests of *Gongolaria abies-marina* (Syn. *Cystoseira abies-marina*) may be present. Known locally as “mujo Amarillo” forests, the latter develop on rocky shores which are very exposed to wave action forming a zone between 0-10m. At the end of the summer, large quantities become detached and are washed up onto the shore. There are few other macroalgal species present in these forests and limited colonisation by epiphytes, but they act as a nursery area for numerous species of the coastal marine fauna. In some areas, the red algae *Gelidium canarienses* is present in the shallow sublittoral of exposed coasts forming monospecific stands. It is a species which is endemic to the Canary Islands¹.

Algae of the genus *Gongolaira* can form a dense canopy in this habitat, also extending into the shallow sublittoral. The algae provide shade and shelter for a diverse assemblage of plants and animals. These include molluscs (most abundant being gastropods), crustaceans, sponges, echinoderms (including juvenile stages of the sea urchin *Paracentrotus lividus*), worms, tunicates and cnidarians².

The physical stresses caused by wave action often results in dwarf forms of the individual seaweeds, for example turfs of *Corallina elongata* and *Jania* spp³.

In the Canary Islands, sampling of shallow water algal assemblages on rocky substrates has revealed that the presence and abundance of frondose fucoid species was greater on exposed shores than protected shores where turf and bush-like algae were more prevalent. Differences between the islands was also apparent with the presence and abundance of fucoid species greater in the eastern islands of the archipelago⁴.

¹ Afonso-Carrillo, 2021

² Feldmann 1937, Boudouresque 1971; Afonso-Carrillo, 2021

³ Tempera et al., 2013

⁴ Tuya & Haroun, 2006



In Azores, few data have been recorded about this habitat. Mainly occupied by furoids and *G. abies marina*. The furoid beds host juvenile stages of sea urchins (e.g. *Paracentrotus lividus*) and molluscs (gastropods).

Traditionally the rocky shores from the infralittoral to the upper circalittoral zone of southern coast of Madeira was dominated by *G. abies-marine* accompanied by other large habitat-forming species, such as *Cystoseira* spp., *Ericaria* spp., and *Sargassum* spp.⁵. Due to a drastic decline, these communities were replaced by coralline crustose algae, *Sargassum vulgare*, *Asparagopsis taxiformis*, *Padina pavonica* and other Dictyotales. The remnant communities are restricted to intertidal rockpools, and mainly composed by mainly *Cystoseira humilis*, *C. foeniculacea* and *Sargassum* spp.⁵.

ECOSYSTEM SERVICES

- Regulation & maintenance

The carbon storage potential of this habitat type has not been explored however studies from elsewhere indicate that carbon captured in intertidal macroalgae may be exported to the offshore environment where they may be incorporated into sediments once decomposed and therefore contribute to the long-term storage potential of such sediments⁵.

- Provisioning

This habitat acts as a shelter, nursery area and food source for numerous fishes and invertebrates particularly in areas which are only exposed on low tides and which support algal forests⁶.

- Cultural

In the past some species (limpets, algae) were collected for food and the alginate industry.

GEOGRAPHIC OCCURRENCE

Presence in Macaronesian archipelagos

REGION	Present	Absent	Unknown
Azores	YES		
Canary Islands	YES		
Madeira	YES		

Distribution and extent across Macaronesian region

(using Red List criteria, thresholds and categories)

Azores

A 2022 survey has recorded 143.23km² on Sao Miguel and small area (less than 0.5km²) around Terceira.

Canary Islands

⁵ Bernal-Ibáñez et al., 2021

⁵ EEA, 2022

⁶ Feldmann 1937; Boudouresque 1971; Afonso-Carrillo, 2021



Exposed rocky shores with communities dominated by *Gongolaria* were reported as widespread along the lower fringes of the littoral zone in the 1990s, with dense areas mainly in the NW coast of the islands where it colonised a zone to around 10m depth⁷. Rocky exposed coasts with *Gelidium canariense* also only visible on low spring tides, have been recorded on the north facing coasts of La Palma, La Gomera, Tenerife and Gran Canaria⁸. This species is endemic to the Canary Islands with the type locality at Puerto de la Cruz.

Data from 1985 surveys⁹ reported the extent of this habitat around Gran Canaria (25.67km²); Tenerife (32.98km²); El Hierro (33.24km²); La Gomera (22.5km²); La Palma (55.34km²); Lanzarote (56.41km²); and Fuerteventura (25.48km²).

Madeira archipelago

No descriptions found.

Extent of Occurrence (EOO)	Area of Occupancy (AOO)	Most recent estimated total area	Comment
The area of sea bounded by the Macaronesian islands exceeds 50,000km ² therefore no habitats present on any of the island groups would qualify as having a restricted geographical distribution. Restricted distribution may apply if considered at the level of island groups for habitats that are present only in Madeira or the Azores but that is not the case for this habitat type ¹⁰ .	Present in >50 locations in 1985 surveys therefore Least Concern at the time of these surveys	Just over 395km ²	Data from 1985 for Canary Islands, and from 2022 for two islands of the Azores. No data for Madeira.

⁷ Medina, Haroun & Wildpret, 1995.

⁸ Wildpret et al., 1987.

⁹ Wildpret et al., 1987

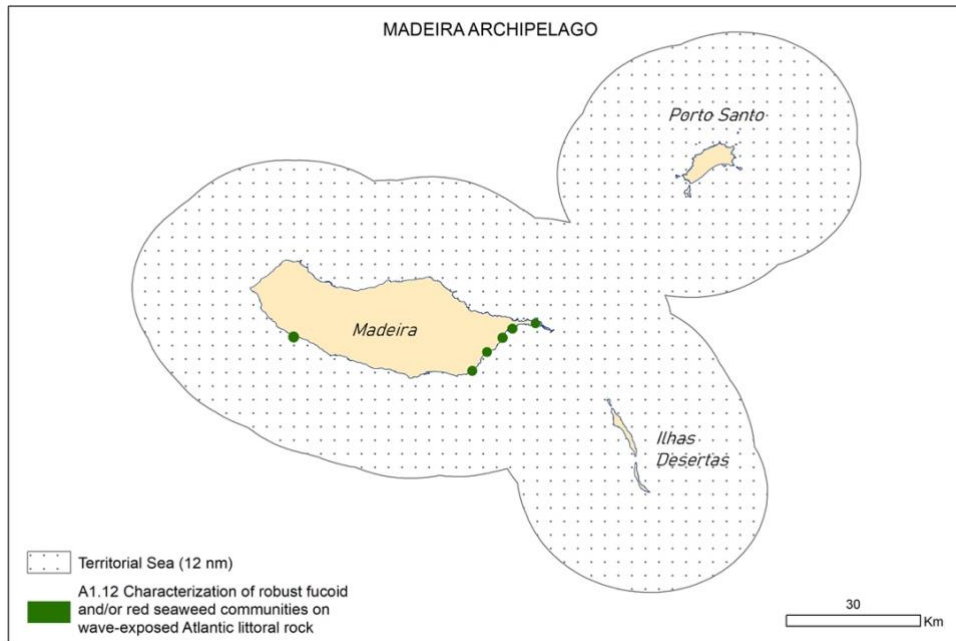
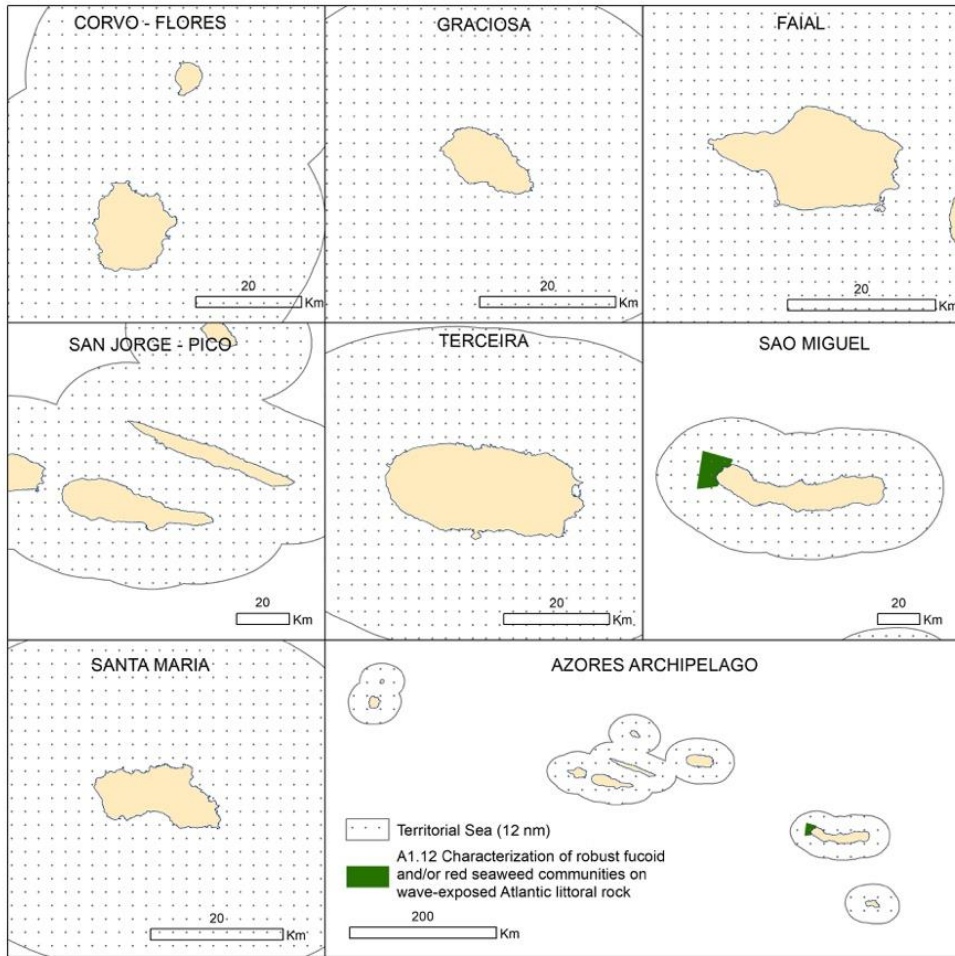
¹⁰ Estimated sea area enclosed by Madeira (3,935.64km²), Azores (48,217.39km²) and the Canarias (63,566.25km²) and all the Macaronesian islands (688,986km²).

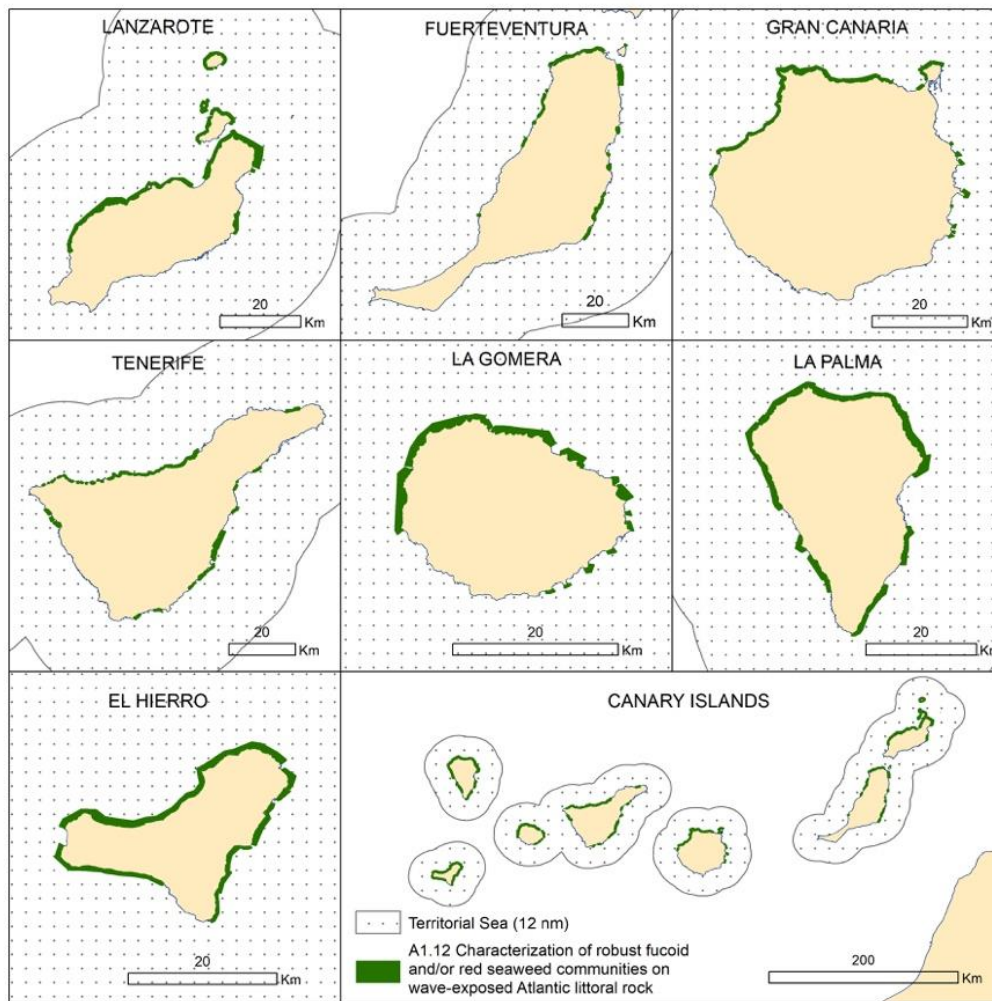


Distribution maps

This habitat is present on exposed coasts of all the Macaronesian islands. Distribution obtained from experts and literature collected through SeaSketch survey.







PRESSURES AND THREATS

This is a relatively robust habitat as it develops on wave exposed rocky shores. It is nevertheless vulnerable to pressures and threats from pollution, coastal development, introduction of exotic species and harvesting of marine resources. Coastal development, particularly linked to tourism, as well as pollution from waste water effluent has had a significant impact, most notably on the fringing *G.abies-marina* forests. Increasing sea water temperatures and therefore climate change effects are also believed to have played a part in their regression¹¹. The recent occurrence and expansion in the Azores of the brown macroalga *Rugulopteryx okamurae* which is native to the North-western Pacific is an example of recently arrived invasive species which is smothering benthic biotic and posing a serious threat to the benthic ecosystems across the region¹²

Whilst there is only minimal harvesting of resources from this habitat type in some locations in the Azores (where limpets are collected), concern has been expressed about the impact of excess fishing in nearshore waters resulting in increased populations of sea urchins (*Diadema*

¹¹ Alfonso-Carrillo, 2006

¹² Faria et al., 2021; García-Gómez et al., 2021



antillarum). The subsequent increased grazing pressure could have a severe impact on species such as *G. abies-marina*.¹³

The littoral habitat is also very susceptible to trampling taking a long time to recover while one potential impact of eutrophication could be the substitution of the main community by nitrophilic algae such as *Ulva* spp.

Pressure indicators ¹⁴	Current pressures	Likely future pressures
Habitat conversion and degradation <ul style="list-style-type: none"> - Urban coastal development - Physical disturbance (trawling, dredging, trampling etc.) 	x x	x x
Climate change <ul style="list-style-type: none"> - Global warming and sea level rise 	x	x
Pollution and nutrient enrichment <ul style="list-style-type: none"> - Poorly managed waste/dredge disposal - Sewage discharge - Acute pollution incidents - Thermal stress - Eutrophication 	x x x x x	x x x
Over-exploitation <ul style="list-style-type: none"> - Harvesting of marine resources 	x	
Introduction of invasive alien species <ul style="list-style-type: none"> - Introduction of exotic species 	x	x

TRENDS

Trends in quantity and quality (recent / historic)

There is qualitative and some quantitative information on trends in some of the assemblages associated with this habitat type, particularly *G.abies-marina* forests, and shorelines in the Canary Islands supporting extensive areas of the red algae *Gelidium canariense*.

Both historical observations and studies carried out in recent decades of the fringing *G.abies-marina* forests indicate that there has been a very significant reduction in their extent across the Macaronesian islands. Extensive underwater forests of *G.abies-marina* in the shallow sublittoral were certainly present in the Canary Islands in the early 1900s¹⁵ as well as in the 1970s and 1980s¹⁶. By the 1990s regression of *G. abies-marina* communities had been observed and linked to industrial and urban discharges and possibly also linked to an increase in the population of the long-spined sea urchin (*Diadema antillarum*)¹⁷. There has since been a significant decline in both vertical and horizontal distribution. The forests have been reduced to a narrow strip near the surface and found mainly in small sections of the northern coasts of the islands ¹⁸. In Gran

¹³ Wildpret, 1985

¹⁴ Pressure indicators for marine inlets, transitional waters, coastal ecosystems, shelf and ocean waters. From Teller et al., 2018. Mapping and Assessment of Ecosystems and their Services: An analytical framework for ecosystem condition. Publications office of the European Union, Luxembourg.

¹⁵ Sauvageau, 1912

¹⁶ Lawson & Norton, 1971, Afonso-Carrillo, 2021

¹⁷ Median et al. 1995

¹⁸ Rodriguez et al., 2008



Canaria and in the western islands (La Palma, El Hierro, La Gomera and Tenerife) studies indicate losses of more than 90% of the area they occupied 30 years ago.

Another assemblage which has declined is that dominated by *Gelidium canariense*. On the northern rocky shores of Tenerife, *Gelidium canariense*, underwater forests were very common and could be seen exposed on low tides. This species was so abundant that in the 1950s and 1960s it was collected for the extraction of agar. Whilst still present as dense “mujo negro” forests in the 1980s it had practically disappeared by the early 1990s to be replaced by other red algae (initially the “false gelidio” *Pterocladia capillacea* and now crustose coralline algae). At Puerto de la Cruze, the type locality for this species, it occupied the entire coast in 1987 and by 2019 its distribution had reduced by 93%. At Carachico the decrease in the population was of the order of 84% and by 45% at Buenavista¹⁹. Studies indicate that the decline is negatively correlated with environmental variables related to climate change in particular increases in sea surface temperature and ultraviolet radiation.

Examination of herbarium specimens of several species of macroalgae collected in the 1960s including *G. abies-marina* and *Gelidium canariense* indicates that there has been a shift in size of some of these species with the length of the thallus seeming to correlate with anomalies of warming or cooling that have occurred in exception years²⁰.

In Madeira there has been a dramatic change in the distribution and extension of Sargassaceae species in the last decades. Abundance estimates since the 1970s reveal that some previously abundant species have become a rarity along the southeastern coast and apparently restricted to intertidal rockpools in specific locations²¹. *G. abies-marina*, for example was recorded as dominant at Funchal, Reis Magos, Machico and Caniçal in a 1974 survey. In a 2021 report it was only present in the first three locations and absent from the latter two. The decline seems to have occurred in a period of greater urbanization and tourism development. It has been attributed to debris/sedimentation generated from the construction works, urban waste water discharges as well as urbanization and changes in agricultural practices inland which have led to increased run off during flooding.

In the Azores, a decline has been reported over the last 10 years, but there is little historical data to make quantitative comparisons²².

CONSERVATION AND MANAGEMENT

Several of the main species of algae that are characteristic of this habitat (*Cystoseira* species, *Gelidium* spp. and *Gracilaria cervicornis*) were listed as vulnerable in in the 2001 Canary Islands Regional Catalogue of Endangered Species²³. In the more recent Catalogue (Law 4/2010: BOE no. 150 of June 21, 2010), *G. abies-marina* and *Gelidium canariense* were only noted in new section of species not considered to be endangered but worthy of attention due to their ecological importance in the Canary Islands Network of Protected Natura Spaces or Natura 2000

¹⁹ Alfonso et al., 2021

²⁰ Sansón et al., 2013; Afonso-Carrillo, 2021

²¹ Bernal-Ibáñez et al., 2021

²² pers comm – submission by Gustavo Oliveira e Meneses Martins

²³ Boletín Oficial de Canarias núm. 97, miércoles 1 de agosto 2001. <http://www.gobiernodecanarias.org/boc/2001/097/boc-2001-097-004.pdf>



sites. They are however listed in the Spanish Catalogue of Endangered Species published in 2019.

ASSESSMENT OF CONSERVATION STATUS WITHIN THE EU

Robust furoid and/or red seaweed communities on wave-exposed Atlantic littoral rock have been assessed as **Least Concern** in the EU according to the European Red List of Habitats (published 2016).

ASSESSMENT OF CONSERVATION STATUS WITHIN MACARONESIA

Criterion A – Reduction in quantity. Both historical observations and studies carried out in recent decades of the fringing *G.abies-marina* forests indicate that there has been a very significant reduction in their extent across the Macaronesian islands (eg. in the Canary Islands up to 93% in some locations and between 45-84% in others, and from 'dominant' to 'present' in locations on the south coast of Madeira). Reductions have also been reported although not documented quantitatively in some of the other Macaronesian islands. If similar reductions are confirmed for other Macaronesian islands this habitat would qualify as Endangered however given the data gaps, at the present time it is assessed as VULNERABLE.

Criterion B – Restricted geographical distribution. This habitat exceeds minimum EOO and AOO thresholds therefore LEAST CONCERN under criterion B.

Criterion C/D – Reduction in quality. There has been a significant reduction in quality of this habitat through loss/changes in the morphology of the characteristic species associations of *G.abies-marina* and *G.canariense* in some locations. There has also been expansion of Sargassaceae species and recent occurrence and expansion of non-native smothering brown algae into this habitat in some locations. These changes have not been quantified therefore at the present time this habitat is assessed as DATA DEFICIENT under criterion C/D.

Criterion E – Risk of collapse. There has been no quantitative analysis estimating the probability of collapse of this habitat therefore it is assessed as DATA DEFICIENT under criterion E.

Overall Category & Criteria

VULNERABLE

Confidence in assessment

Medium: Assessments of the extent of reduction in quantity and quality have been based on limited data as this has not been available for all the Macaronesian islands. If the pattern seen on those islands where data are available is repeated elsewhere, it is likely that this habitat type is in more serious condition and therefore Endangered rather than Vulnerable.

Assessors/Contributors



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