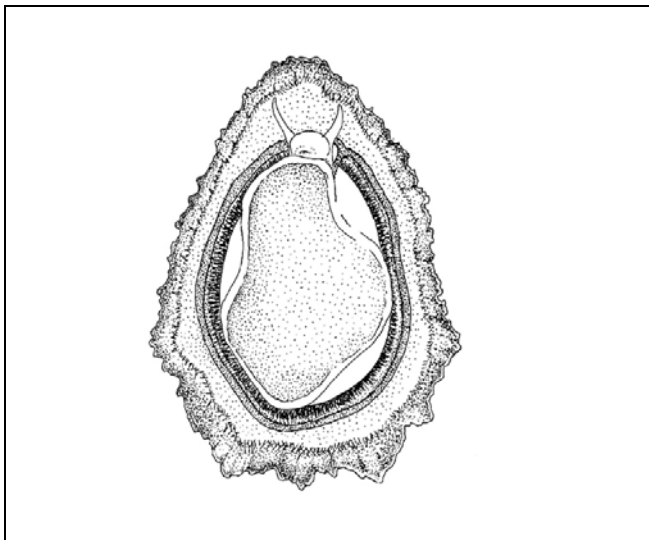


## Nomination

*Patella aspera*  
(*Patella ulyssiponensis aspera*)  
Azorean limpet



*Patella ulyssiponensis aspera* was nominated for the OSPAR list as a Macronesian subspecies of *P.ulyssiponensis*. There has been some uncertainty about the systematics of Azorean limpets and the most recent work suggests that there are two distinct species - *P.aspera* which is endemic to Macaronesia, and *P.ulyssiponensis* which occurs on continental Europe (e.g. Hawkins *et al.*, 2000). The species nomination has therefore been amended to *P.aspera*. The local name for this species is “lapa brava”.

## Geographical extent

OSPAR Region; V

Biogeographic zone: 5

Region & Biogeographic zones specified for decline and/or threat: II/11

*P.aspera* (formally described as *P.ulyssiponensis aspera*) is believed to be endemic to the Macronesian islands. Its distribution in the OSPAR Maritime Area is limited to the islands of the Azores where it occurs on rocky substrates in the intertidal, and in the shallow sublittoral. (e.g. Christiaens, 1973; Titselaar, 1998).

## Application of the Texel-Faial criteria

*P.aspera* was nominated for inclusion on the OSPAR list with particular reference to its decline, keystone status and sensitivity with information also present on threat.

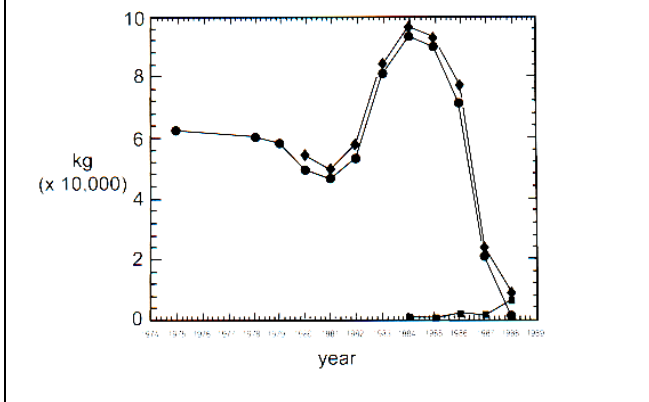
## Decline

*P.aspera* is one of two species of limpet collected for human consumption in the Azores. Moderate harvests, mainly for self consumption, are believed to have taken place since the islands were colonised in the 15<sup>th</sup> century. A combination of easier access to sublittoral populations, improved refrigeration, increased commercial value and a hypothetical “limpet disease” led to a decline of stocks mainly in the Central group of islands (Faial, Pico, Terceira, São Jorge and Graciosa) in the mid to late 1980’s and a collapse of the fishery by 1988 (e.g. Martins *et al.*, 1987; Santos *et al.* 1995; Ferraz *et al.*, 2001; Hawkins *et al.*, 2000) (Figure A). Effects have also been observed in the size distribution with more large individuals in professionally harvested landings than in unexploited stocks (Martins *et al.*, 1987). Various fisheries management measures were introduced and since then populations appear to have recovered and are stable with regard to their biomass in the Central and Western Groups while those in the Eastern group of island (Santa. Maria and São Miguel) have not recovered from over-exploitation and seem to be dangerously low (Ferraz & Menezes, 1998 & 1999; Ferraz & Santos, 2000; Ferraz *et al.*, 2001).

## Keystone species

Limpets are known to have an important influence on the structure and function of rocky shore communities. They are dominant grazers that have a major influence on the community composition of rocky shores and can be considered keystone species (e.g. Raffaelli & Hawkins, 1996). Once removed, conditions may also change to a state that makes recolonisation less likely. In areas where uncontrolled human exploitation has taken place, for example, algal turfs tend to dominate the rock surfaces, which deprives the limpets of a lithothamnia covered nursery ground which can be easily grazed. There are only two species of patellid limpets found on the Azores therefore changes in the population status of *P.aspera* could have far reaching implications for rocky shore ecology of the islands.

FIGURE A. Collapse of the Sao Miguel limpet fishery (diamonds all islands; circles São Miguel, Squares other islands. Decline in landings (from Santos *et al.*, 1990)



### Sensitivity

*P.aspera* is thought to be a protandrous hermaphrodite. In heavily exploited populations the average size decreases and therefore the number of the large sized females is affected. This may lead to increased likelihood of recruitment failure due to lowered reproductive output. Genetically, it would also reduce the effective populations size considerably (Santos *et al.* 1995; Hawkins *et al.*, 2000). *P.aspera* is susceptible to “recruitment overfishing” due to distortion of the sex ratios by removal of the larger females, and to heavy exploitation which destroys the well-grazed lithothamnia dominated habitat needed for continual recruitment.

### Threat

The main threat to *P.aspera* is overexploitation for the fishery. When harvesting was banned in the central group of islands in 1985 this increased exploitation in other islands, mainly in São Miguel and Santa Maria, and stocks in these islands have still to recover. The total ban on limpet collection in 1989 probably allowed the stocks to avoid catastrophic over-exploitation. Since then progressively tighter fisheries regulations have been introduced but limpet populations are still very much reduced in many of the islands (Hawkins *et al.*, 2000). Recent studies have shown that illegal harvesting in the Formigas islets, which had healthy stocks some years ago, has reduce the population to nearly zero (Cardigos *et al.* 2002). It can be concluded that there has been and continues to be a threat to this species across most of its range within the OSPAR Area.

## Relevant additional considerations

### Sufficiency of data

There are nearly 20 years of data on landings from limpet fisheries in the Azores but no records and statistical data prior to the 1980s. Since then, landings have been recorded from all the islands. The data show a substantial increase in landings in 1997 and 1998 which appears to be connected with the policy of the Regional Directorate of Fisheries to only issued licences to harvesters who declared catches in the previous year. Catch per unit effort data have been calculated using the information from individual “limpet capture diaries”. Fisheries independent data on the status of the limpet population have also been collected (e.g. Martins *et al.*, 1987; Ferraz *et al.*, 1999) which enables a more direct assessment of the stock to be made. Taken together, there appears to be a sound information base on which to determine the status of *P.aspera* in the Azores.

### Changes in relation to natural variability

Natural fluctuations occur in the limpet population. One of the causes is known to be prolonged storms and heavy seas that can lead to boulder damage on rocky shores.

During the severe decline of limpet populations in the early 1980's there was a suggestion that a “limpet disease” was partly responsible. The nature, extent and cause of this remains a mystery as it was virtually over before an investigation could be started although possible culprits include red tides or unusual warm temperature or disease (Martins *et al.*, 1987). However it seemed to occur primarily on the southern coasts, which are the more populated areas, with calmer seas, and thus also more accessible for harvesters. The only clear facts are that there was a huge increase on limpet's landings at the fish auction posts between 1982 to 1986, followed by a dramatic decline. Fisheries independent data and data comparing the size structure of natural populations with catches by professional harvesters give an indication of “natural” changes in *P.aspera* but are only available for recent years.

### Expert judgement

Local knowledge and unquantified observations pointed to a dramatic decline in the population of *P.aspera* on most of the islands of the Azores in the 1980s. This is supported by a good data set showing changes in the landings of *P.aspera* from

1978 and verified by surveys (e.g. on the southern coasts of Pico and São Jorge in 1983) which provided fisheries independent data. Consideration of the case on the basis of expert judgement was therefore unnecessary.

#### ICES evaluation

The ICES review of this nomination raised the question of whether the decline of the subspecies is rather local given that *P. ulyssiponensis* is abundant in the Cantabrian Sea (northern Spain). Recent research has however proposed that there are two distinct species (*P. aspera* an endemic species which occurs in Macronesia and *P. ulyssiponensis*, which occurs on the continent of northern Europe) (Hawkins *et al.*, 2000). The status of the mainland population therefore becomes less relevant to the overall status of the species found in the Azores.

#### Threat and link to human activities

*Cross-reference to checklist of human activities in OSPAR MPA Guidelines*

*Relevant human activity:* Fishing, hunting, harvesting. *Category of effect of human activity:* Biological – removal of target species

The increase in landings, subsequent crash of the fishery, and recovery (in some areas) following temporary closure and licensing arrangements for the harvest of limpets, suggests that there is a strong link between the threat to *P. aspera* populations and the collection of limpets in the Azores. Records showing that the sex ratios of the population were seriously distorted after the dramatic decline in landings are another indication that over-exploitation was a major factor in their decline as females are the larger individuals and therefore more valuable to the harvesters (Martins *et al.*, 1987). Independent research to evaluate the effects of new regulations based on reserve areas versus fisheries areas, have shown that after the open season the mean individual size and the proportion of females is higher on the populations of the reserve areas in spite of poor enforcement of regulations.

#### Management considerations

A number of management measures have been introduced to the limpet fishery since its dramatic collapse in the late 1980's. These include closed seasons, closed areas, size limits, licensing of fishermen and endeavours to get better management information. This combination of measures is planned to continue for the foreseeable future although the details may change depending

on the status of the population. Complete closure of the fishery has been instituted in the past and remains an option if required to stabilise, aid recovery and/or prevent decline in the stocks.

#### Further information

*Nominated by:*

Joint submission from Iceland, Portugal, UK

*Contact person:*

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