

# Ascension Island Habitat Action Plan

## ANCHIALINE POOLS



Photo: Shallow Marine Surveys Group

### SUMMARY

**IUCN habitat classification:** 13.4 Coastal Brackish/Saline Lagoons/Marine Lakes

**Description:** Anchialine pools are landlocked, saline bodies of water with a permanent, subterranean connection to the ocean but no surface contact. This limited connectivity often promotes the evolution of unique faunal and floral assemblages with high levels of endemism. On Ascension Island, anchialine pool habitats are best known for the two species of endemic shrimp that they harbour (*Typhlatya rogersi* and *Procaris ascensionis*). However, they are also home to a unique assemblage of endemic amphipods, anemones and limpets, along with large single-celled algae (*Valonia ventricosa*) and an unusual free-living form of the coral *Favia gravida*.

**Threats:** Climate change constitutes the only potentially significant threat to the unique anchialine pool community on Ascension Island, but its effects are difficult to predict at present. Human disturbance is a secondary threat.

**Citation:** Ascension Island Government (2015) Anchialine pool habitat action plan. In: *The Ascension Island Biodiversity Action Plan*. Ascension Island Government Conservation Department, Georgetown, Ascension Island





2. Distribution	
<b>Total extent:</b>	Approx. 280 m <sup>2</sup>
<p>Anchialine pools are common in neotropical coastal areas where porous, fractured substrates such as lava and karst (emerged coral shores) provide good hydrologic connectivity between ground water and the ocean [1]. Based on current knowledge, Ascension Island’s anchialine habitat is limited to two small clusters of shallow, interconnected pools, caves and passages situated in a rough, deeply fissured lava flow inland of Shelly Beach in the south western corner of the Island. The westernmost cluster, known as the ‘marl pool’ series, consists of 3-4 pools, the largest of which measures approximately 6 m in major diameter. A second, larger cluster known as the ‘coral pool’ series lies 125 m to the south east and is comprised of around 10 pools ranging in size from 7m diameter to less than a metre.</p>	<p><b>Figure 1.</b> Distribution of anchialine pool habitat on Ascension Island.</p>

4. Habitat characteristics	
Physical	
<p>Ascension’s anchialine pools consist of shallow, water filled crevices in fissured, basaltic lava approximately 50–100 m inland of Shelly Beach, a stretch of pebbles and coarse shelly material on the exposed, southern coast of the Island. The pools are separated from the ocean by a ridge of shell and coral fragments rising approximately 4–6 m above sea level. [2]. Very little is known about the nature of the subterranean marine passages that connect them to the sea, although they are clearly under tidal influence. Water can be observed flowing through subterranean openings during periods of tidal change and the most landward pools are completely dry at low tide [2]. Water chemistry and temperature are also broadly comparable with sea water (25 – 29 C, 35 – 40 ‰ salinity) suggesting frequent mixing [2,3]. Two types of pool can be distinguished based on the dominant substrate: ‘marl pools’ have a bottom of deep, soft, sedimentary material with a flocculent surface layer that readily goes into suspension if disturbed, whereas ‘coral pools’ have predominantly rocky substrates and are often lined with fragments of the coral <i>Favia gravida</i>. Water depth in the surface pools ranges from approximately 1 metre in the most seaward of the coral pool series to just a few centimetres in the more landward marl pools.</p>	
Biological	
<p>Ascension Island’s anchialine pool habitats harbour a unique invertebrate assemblage, with some variation in community composition between marl pools and coral pools. Two species of endemic caridean shrimp (<i>Typhlatya rogersi</i> and <i>Procaris ascensionis</i>) and three endemic amphipods (<i>Melita</i> spp., <i>Maera</i> spp. and <i>Elasmopus</i> spp.) are found either exclusively or predominantly in this anchialine system [2,4]. <i>Typhlatya</i> occurs in both marl pools and coral pools whereas the larger <i>Procaris</i> is found only in coral pools and the subterranean cavities that connect to them. The evolutionary origin of these species is somewhat enigmatic since their closest relatives are found in anchialine habitats in Bermuda and the Caribbean [5–7], separated by more than 7000 km of open ocean. Besides <i>Typhlatya</i>, other members of the marl pool community include sphaeromatid isopods, the gastropod <i>Nodilittorina melearis</i>, a large burrowing anemone, burrowing worms, copepods, and a tanaid [2]. Characteristic members of the coral pool community include the large single-celled bubble algae <i>Valonia ventricosa</i>, limpets (<i>Fissurella nubecula</i> and <i>Diadora gibberula</i>), polychaete worms (<i>Eurythoe</i> sp.) and an apparently unique, free-living form of the amphiatlantic reef coral <i>Favia gravida</i> [2,8–10]. The latter is normally reef-attached but survives as loose coral fragments in Ascension’s anchialine pools [9,10]. Brittlestars, sipunculids, nemertines, shelled amoeba and diatoms have also been recorded in coral pools [3]. The only vertebrates regularly recorded from anchialine habitats are young moray eels, specifically spotted morays (<i>Gymnothorax moringa</i>) [3] and chain morays (<i>Echidna catenata</i>), which presumably enter through narrow submarine passages and become stranded.</p>	



**3. Status**

The extent of anchialine pool habitat has presumably remained constant in recent times and there are no immediate threats to their unique biota. However, very little information exists with which to assess changes in habitat condition or in the status of key species and food webs. Some preliminary data on the abundance of the endemic shrimps *Typhlatya rogersi* and *Procaris ascensionis* was collected during the 1980s [3] which may serve as a baseline for assessing long-term trends in habitat quality, although methods would need to be carefully developed as numerous factors including tidal state, weather and microhabitat preferences can influence observed densities [3].

**4. Threats\***

<b>11.2 Climate change &amp; severe weather: temperature extremes</b>	<b>Impact:</b>	<b>UNKNOWN</b>
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Being relatively shallow, landlocked bodies of water, anchialine pools are potentially susceptible to temperature extremes and temperature-induced increases in evaporation and salinity which may threaten their unique ecosystem. However, there is currently very limited information on the environmental characteristics of the pools or the physiological tolerances of key species with which to predict responses. It is possible that anchialine communities are already subject to significant diurnal variation in temperature and salinity linked to tidal and evaporation effects and may therefore be pre-adapted to coping with environmental change. For example, the genera *Typhlatya* and *Procaris* both have wide habitat preferences, including freshwater, brackish and marine species [11,12], that may be suggestive of an inherent physiology or plasticity that allows survival in water of various salinities. The coral *Favia gravida* also appears to be more tolerant to thermal stress than many other coral species [13,14]. However, other anchialine species may not possess the same resilience. Further research is needed to assess the magnitude of the threat posed by climatic warming.

<b>11.5 Climate change &amp; severe weather: storms &amp; flooding</b>	<b>Impact:</b>	<b>LOW</b>
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Anchialine habitats are defined by the lack of a regular surface connection to the ocean and are therefore potentially vulnerable to sea level rise and coastal flooding caused by climate change. Globally, sea levels are predicted to rise by 0.26 to 0.98 m by the year 2100 [15], although some studies suggest this may be an underestimate [16]. A rise of this magnitude is probably insufficient to result in regular tidal inundation of Ascension’s anchialine pools. However, periodic flooding during heavy swells may become increasingly likely, particularly if there is any erosion of the Shelly Beach ridge. Anchialine systems can survive occasional storm overspill from the sea, but not as a permanent or seasonal feature of their hydrography [1], so sea level rise and increased storminess pose a potential threat to the integrity of their unique ecosystem.

<b>8.1.2 Invasive non-native/alien species/diseases: named species</b>	<b>Impact:</b>	<b>NEGLIGIBLE</b>
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Several highly invasive species of drought and salt tolerant shrub, including *Prosopis juliflora* and *Nicotiana glauca*, have colonised much of Ascension’s low-lying, semi-desert habitats and are increasingly expanding their range into the south-western portion of the Island. Invasion fronts are still some distance from Shelly Beach, but if allowed to colonise the area surrounding the pools they could fundamentally alter the character of this site through leaf litter deposition, shading and altering of ground water hydrology. Interestingly, mangrove seedlings are reported to have been deliberately introduced to the pools sometime between 1972 and 1976 but were subsequently destroyed by visiting naturalists [17].

<b>6.1 Human intrusions &amp; disturbance: recreational activities</b>	<b>Impact:</b>	<b>LOW</b>
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The Shelly Beach pools are a well-known attraction on Ascension Island and are often visited by tourists and locals completing the “Letterbox Walk” from Mars Bay. While this creates awareness raising opportunities there is also the potential for disturbance of these sensitive habitats if visitors behave irresponsibly, for example by entering the pools or discarding litter or other substances. No such events have yet been reported and the risk remains low.

\*Threats are classified and scored according to the [IUCN-CMP Unified Classification of Direct Threats](#) [18]



## 5. Relevant policies & legislation

Ascension's entire anchialine pool habitat is contained within the Mars Bay Nature Reserve designated under the [National Protected Areas Order 2014](#). The [National Protected Areas Regulations 2014](#) specifically prohibit the removal of any animal or plant from the pools and prohibit anyone to enter into the pools without license.

## 6. Management notes

Climate change constitutes the only significant long-term threat to Ascension Island's unique anchialine pool habitats, but the magnitude of the threat and the likely outcomes are difficult to predict at present. Further research into the physical characteristics of the anchialine system and the physiological tolerances of the species that inhabit it would significantly improve threat assessments. Indeed, the high biodiversity value of this habitat combined with its small area, low species diversity and simplistic food web may make it a useful microcosm for monitoring and predicting the impacts of climate change on marine ecosystems.

Preventing the continuing spread of invasive weeds into the area surrounding the Shelly Beach pools is a priority, both to preserve the character of the pools themselves and to protect the nesting habitat of the sooty tern which breeds in the vicinity. This should be possible through the creation of managed exclusion zones for woody invasives in the Mars Bay Nature Reserve, providing that systems are put in place to ensure continuity of action (see Mexican Thorn Species Action Plan).



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## Ascension Island BAP: Anchialine Pools

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