Analysis of the current status of the Antarctic Specially Protected Area No. 144, Chile Bay (Discovery Bay), Greenwich Island

English version provided by the author

This document is presented in support of the Working Paper 050 “Status of Antarctic Specially Protected Area No. 144, Chile Bay (Discovery Bay), Greenwich Island”

**Analysis of the current status of the Antarctic Specially Protected Area No. 144, Chile Bay (Discovery Bay), Greenwich Island**

***Summary***

The analysis carried out for ASPA No. 144, Chile Bay (Discovery Bay), Greenwich Island, is presented, based on the “Checklist to assist in the inspection of Antarctic Specially Protected Areas and Antarctic Specially Managed Areas” (Resolution 4 (2008)), the “Guidelines for implementation of the Framework for Protected Areas” (Article 3, Annex V, Environmental Protocol) and “Guidelines for de-designation of ASPAs” (Appendix 3, Final Report CEP XXIII (2021)). Chile suggests the de-designation of the area as ASPA.

***Introduction***

In order to establish the relevance of maintaining the protection of the Antarctic Specially Protected Area No. 144, Chile Bay (Discovery Bay), Greenwich island, South Shetland Islands, the management plan, the activities developed in the area and the available scientific literature were reviewed.

Following the details and the results of the analyses developed are presented.

***Assessment of the Zone***

In 1987, Chile proposed that two small areas of benthic habitat in Chile Bay be considered a Site of Special Scientific Interest, which was favorably received. The site was designated SSSI 26 in Rec. XIV-5 (1987), was re-designated as ASPA 144 in Decision 1 (2002). In principle, December 31, 1997 was established as the expiration date of the designation, however, the management plan was extended until 2005 (Measure 2 (2000)) and finally, until December 31, 2010 under of Measure 4 (2005).

The reasons for its designation were based on the continuous benthic research that Chile had been conducting since 1967, which provided a baseline for long-term research, and its usefulness as a control area, related to the study of the reestablishment of the benthic fauna in Puerto Foster, Deception Island, after the volcanic eruption of December 1967.

The protected areas are two polygons, with an approximate surface area of 0.66 km2, with benthic assemblages with a high diversity of species and biomass. Benthic habitat A, at depths between 50 and 100 meters, is generated by the coordinates 62º 28.9'S 59º 41.2'W and 62º 29.3'S 59º 41.7'W, and benthic habitat B, at depths between 100 and 200 meters, is formed by the polygon 62º 28.3'S 59º 40.3'W and 62º28.7'S 59º 40.8'W.

The bottom of both subsites consists of coarse to fine silt that allows the establishment of benthic communities. The lithological and mineralogical composition of the sediments indicates their origin from the outcrops and littoral deposits that surround Chile Bay (Discovery Bay), that is, porphyritic andesite, aphanitic andesite, diorite, andesitic volcanic breccias and tuffs, among others. The composition of the coarse sandy fraction is similar to that of pebbles. The finer sandy fraction is composed of feldspar, quartz, pyroxene, biotite, epidote, and organic matter. This material is transported to the coastline mainly by glaciers, solifluction and mudflows from the island (Valenzuela and Varela, 1972).

Chile Bay (Discovery Bay) has a transverse submarine barrier separating subsites A and B of the Area and dividing the bay into an inner and an outer part, respectively. Sediments in the inner bay are protected from the action of waves and currents, thereby preserving the grain size distribution, sorting and shape pf the contained material (Valenzuela and Varela, 1972).

Chile Bay (Discovery Bay) is considered a highly productive system during the austral summer, with very well oxygenated waters and concentrations of inorganic micronutrients consistent with their productivity, exhibiting seasonal changes in bacterioplankton communities (Valencia, 1998; Alcamán-Arias et al. 2018; Fuentes et al. 2019). The vertical temperature distribution is clearly stratified, with values above 0.46 ºC and up to 1.70 ºC. Salinity also presents stratification, showing values between 32.5 and 34.2‰. Although the mixture of the water column is very dynamic due to the strong winds that hit this coastal area, the glacial melt in Chile Bay (Discovery Bay) seems sufficient to establish a slight stratification in the first five meters of the water column (Arcos y Salamanca, 1980; Alcamán-Arias et al. 2021).

The area has the typical structure of areas with a stable environment, with a high specific diversity, high homogeneity and low dominance. Both benthic habitats (subsites) have high diversity of species and biomass, with about 150 species identified (Clarke, 1995). Bottom topography and sediment features influence the structure of communities and distribution pattern (Arnaud, 1998).

The benthic fauna in the subsites is dominated by polychaetes, which represents about 60% of the total number of individuals, with the presence of at least 13 families, of which Capitellidae was the most abundant, followed by Spionidae. Nematodes are in second order of numerical importance, representing approximately 32% of individuals. Amphipods, gastropods, cumaceans and bivalves together represent about 7% of the community (Calderón and Jaramillo, 1998).

Bivalve molluscs of the species *Cyclocardia astartoides*, *Thracia meridionalis*, *Limopsis liliei*, *Nacella concinna*, *Neobuccinum eatoni* and *Yoldia eighthsi* have been identified (Cruz, 1990).

The distribution of polychaete species on the soft bottoms of Chile Bay (Discovery Bay) indicates a predominance, in the shallower parts, of those that feed in suspension, particularly Cirratulidae, *Tharyx* sp. and Spionidae, and in the deeper parts, of those that feed on sediments, especially Maldanidae (Arntz et al. 1994).

In subsite A, the bivalves *Yoldia eightsii* and *Eudorella gracilor* predominated as characteristic fauna. Subsite B is located in the outer part of the bay and is dominated by *Maldane sarci* *antarctica* polychaetes, especially below 100 m depth, on large cylindrical colonial sea squirts of the species *Holozoa cylindrica*. Other characteristic species are *Genaxinus bongranii*, *Cyamonactra denticulum*, *Typhlotanais greenwichensis* and *Pycogonida* spp. (Gallardo et al. 1988).

Marine mammals have also been identified feeding in Chile Bay, especially Weddell seals, *Leptonychotes weddellii*, which frequent the area to breed, feed and rest. Antarctic fur seals, *Arctocephalus gazella*, are regular visitors during the summer, when they can be seen resting on the beach next to the bay. Some cetaceans, such as killer whales, *Orcinus orca*, and minke whales, *Balaenoptera acutorostrata*, can also be sighted in the bay.

Since the 1990s, Chile has not carried out benthic research in the protected area. In that decade, the researches focussed on inter and subtidal fauna associated to the coastline and present in the water column, above 50 m depth. These activities were carried out systematically until 2003, when the Antarctic station "Capitán Arturo Prat" was closed. Since 2008, upon reopening the station and the Chilean operations in Chile Bay (Discovery Bay), the scientific research that Chile develops in the area has been oriented on the pelagic marine environment regarding the study of fish larvae (La Mesa et al; 2017; Landaeta et al., 2017) and microbial ecology associated with bacterioplankton (Alacamán-Arias et al. 2018, 2021; Alcamán-Arias et al, 2022 a and b; Cifuentes-Anticevic et al. 2021), none of them has required work in the protected area.

Ecuador has developed both benthic and pelagic marine research activities in the area of Chile Bay (Discovery Bay) and Guayaquil Bay (Cruz, 1990; Calderón and Jaramillo, 1998; Ortega, 1998), but without carrying out specific investigations within the protected area. From studies we can infer that the level of benthic biodiversity is similar to the protected zone, predominating polychaetes (59.39%) and nematodes (31.88%) (Calderon and Jaramillo, 1998). Regarding macrozooplankton, Ortega, 1998, reported that the most representative group were isopods, constituting 76% of the samples analyzed, followed by salps, particularly of the genus *Salpa* and the species *Salpa fusiformis*.

Chile Bay (Discovery Bay), on the other hand, is not an usual place for tourist visits; the boats that arrive to the area correspond mainly to those of the National Antarctic Programs that support the activities of the stations located in the vicinity of the area, although sometimes it is possible that those boats visiting Barrientos Island (Aitcho Islands) or Yankee Bay also visit Chile Bay (Discovery Bay). The Area is not considered to develop activities by the fishing vessels operating in subarea 48.1 of the Convention for the Conservation of Antarctic Marine Living Resources, CCAMLR.

The Area information was reviewed and analysed based on the “Checklist to assist in the inspection of Antarctic Specially Protected Areas and Antarctic Specially Managed Areas”, as well as on the “Guidelines for implementation of the Framework for Protected Areas” set forth in Article 3, Annex V of the Environmental Protocol, and the Guidelines for de-designation of ASPAs, analyses that are presented below:

**1. Analysis according to the Checklist to assist in the inspection of Antarctic Specially Protected Areas and Antarctic Specially Managed Areas**

*Assessment of Area Management Plan*

1. Are the values for which the Area was designated still relevant?

Quantitative and qualitative benthic research to provide a baseline has ended in the 1990s and its special interest as a control area for the reestablishment of the benthic fauna, according to the research carried out, is no longer valid.

The environmental instability in Port Foster has allowed the equal and parallel development of a large number of species, regularly finding changes in the dominant specific composition, which have maintained low diversity-homogeneity values and high dominance values, conforming the structure of this type of environment, altered by volcanic influence (Retamal, 1981; Arnaud et al. 1998), while Chile Bay (Discovery Bay) maintains a typical structure of stable environment zones, with high specific diversity, high homogeneity and low dominance (Retamal, 1981).

According to studies carried out by Arnaud et al. (1998), the macrobenthic fauna in Port Foster differs significantly from those found in other Antarctic sites with soft bottoms, as a consequence of the volcanic activity of Deception Island, which is moderated by its bottom type. While most Antarctic bottoms are characterized by substrate heterogeneity (due to material falling from icebergs), the sediment distribution in Port Foster shows the characteristics of a closed bay, with grain size decreasing with depth.

Shallow benthic communities within Foster Harbor have recovered following episodes of volcanic eruptions (1967, 1969, and 1970), with a predominance of invertebrates, particularly echinoderms such as ophiuroids, sea stars, and sea urchins (Cranmer et al., 2003; Angulo-Preckler et al., 2017). In addition, an important community of filter feeders and suspensivores (mainly sponges, bryozoans and ascidians) is found on the few hard bottoms described within Port Foster. Likewise, bivalves contribute to the suspensivore communities present in the soft bottoms of Deception Island (Angulo-Preckler et al., 2018).

Upon thorough review of the background information, it is feasible to assert that the values ascribed to the designated area are no longer pertinent. Moreover, the current state of Chile Bay (Discovery Bay), does not demonstrate the existence of other essential values that would justify the preservation of the subsites as Antarctic Specially Protected Areas.

2. Are the values of the Area being protected effectively?

There are no antecedents that indicate that the values of Bahía Chile (Discovery Bay) are being threatened. On the other hand, this community described is similar to that found in other places in Antarctica such as Bahía Arturo (Anvers Island) and Bahía Almirantazgo (King George Island) (Gallardo et al. 1988; Sicinski et al. 2012). The activities carried out in the area are considered to be of low level and intensity, so it is estimated that its values will continue to be effectively protected with the general application of the Environmental Protocol.

3. Are the management aims and objectives appropriate?

The objective of the management plan was to prevent any disturbance to the habitats and benthic communities present in the sub-sites, thereby safeguarding the objects of study of the long-term research program. However, as the program has already reached its conclusion, it is considered that the original protection goals and objectives are no longer necessary.

4. Is the period of designation appropriate?

The original designation period expired on December 31, 1997, that was extended by virtue of Measure 2 (2000) and Measure 4 (2005), until December 31, 2010, being sufficient to develop and successfully conclude the research program, as well as other scientific initiatives that were developed in the area.

5. Do maps and photographs show the boundary of the Area clearly and the key features it contains?

There are no maps or photographs that clearly show the limits of the area, which have been defined as polygons formed by pairs of geographic coordinates.

6. Are the boundaries easy to locate?

The protected area is located in the benthic zone of the marine environment, below 50 meters depth, without the presence of specific indications of it, so the location of the limits can only be done with instrumentation. Locating the limits of the area is difficult.

7. Are maps and photographs easy to use and up to date?

The current maps are not easy to use because they are not self-explanatory and have limitations. The last update of the maps was done in 1998 and was included in the proposed revised management plan for the area, which has not been formalized through a measure.

8. What are the geographical coordinates of the Area? Are they correct (clearly state how this was checked in the field)?

The geographical coordinates of the area are determined by the polygons established between points 62º 28.9'S, 59º 41.2'W and 62º 29.3'S, 59º 41.7'W, for the benthic habitat A, and 62º 28.3'S , 59º 40.3'W and 62º28.7'S, 59º 40.8'W, for the benthic habitat B. The revision is based on the cartography of the Hydrographic and Oceanographic Service of the Chilean Navy, SHOA, scale 1: 20,000, SAD-69 datum, 1998.

*Management activities*

9. Are appropriate management activities being undertaken to protect the values of the Area?

In general, the management plan originally proposed has been complied with, in order to limit the activities to be developed within the protected area. In addition, the two countries that mainly carry out activities in the area, in the vicinity of the protected area, develop environmental monitoring programs.

10. Is any monitoring of the Area being undertaken?

Since the 1990s, activities have not been carried out specifically monitoring the protected area.

11. What measures are in place to ensure that the aims and objectives of the Management Plan are being met? Do they need to be revised?

In spite of not currently carrying out scientific activities in the protected area, compliance with the originally indicated measures is maintained, no artefacts have settled in the bottom or elements are discharged into the marine environment. Wastes of human origin generated in the surrounding stations, at 1.5 and 3.5 km from the ASPA, are discharged into the marine environment only after being treated. Chile develops an environmental monitoring program since 2009 in the area to determine the impact of human presence in the area and minimize them. It is not considered necessary to review the measures for compliance with the purposes and objectives of the management plan.

**2. Analysis according to the Guidelines for implementation of the Framework for Protected Areas set forth in Article 3, Annex V of the Environmental Protocol**

*Assessing Values to be Protected*

Checklist of the values

|  |  |  |
| --- | --- | --- |
| **Value** | **Description** | **Answer** |
| **Environmental values** | does the area contain physical, chemical or biological features e.g., glaciers, fresh water lakes, melt pools, rock outcrops, plant life or animal life that are particularly unique or representative components of the Antarctic environment? | Yes, it contains fauna representative of the Antarctic environment, characterized by a community of marine invertebrates composed mainly of polychaetes and nematodes. |
| **Scientific values** | does the area contain physical, chemical or biological features of special interest to scientific researchers where the principles and methods of science would be applicable? | Yes, it contains features that may be of interest for the development of scientific research, but without a high degree of endemism. |
| **Historic values** | does the area contain features or objects that represent, connate or recall events, experiences, achievements, places or records that are important, significant or unusual in the course of human events and activity in Antarctica? | No, It does not contain. |
| **Aesthetic values** | does the area contain features or attributes e.g., beauty, pleasantness, inspirational qualities, scenic attraction and appeal that contribute to people’s appreciation and sense or perception of an area? | No, It does not contain. |
| **Wilderness values** | does the area contain characteristics e.g., remoteness, few or no people, an absence of human-made objects, traces, sounds and smells, untravelled or infrequently visited terrain that are particularly unique or representative components of the Antarctic environment? | No, It does not contain. |
| **Combination** | does the area contain any combination of the above values? | Yes, the area combines environmental and scientific values, which are not particularly unique or of special interest to science as they are also represented or described for other areas of Antarctica. |
| **Ongoing or planned**  **scientific activities** | does the area include ongoing or planned scientific projects or activities? | No, the long-term research program in the area has ended. There are no ongoing or planned activities in ASPA No. 144. |

*Assessment of Potential Protection and Use Category*

Checklist for identifying and clarifying the type of area to be protected (protection category) as well as the use or reasons (use category)

|  |  |  |
| --- | --- | --- |
| **Protection Categories** | **Description** | **Answer** |
| **Ecosystems** | would the area be protected for its ecosystems? I.e. dynamic complexes of plant, animal and micro-organism communities and their non-living environment interacting as an ecological unit. | No, since they are not unique and this zone was raised as a control zone for Port Foster. |
| **Habitats** | would the area be protected for its habitats? I.e. the places or types of site where an organism or population naturally occurs. | No, these silt-clay benthic habitats are similar to other areas of the South Shetland Islands. |
| **Species assemblages** | would the area be protected for its species assemblages? I.e. important or unusual groupings or populations of one or more species of fauna or flora (usual type of area protection of species in Antarctica). | No, although it presents important sets of benthic species, they are not unique to the area and they are similar to other benthic areas. |
| **Species (taxa)** | would the area be protected for its species? I.e. special groups of organisms which resemble each other and sometimes are linked to a common habitat to a greater degree than members of other groups, and which commonly form reproductively isolated groups that will not normally breed with members of another group. | No, there are groups of organisms also present in other habitats without a high degree of endemism. |
| **Geological,**  **glaciological or**  **geomorphological**  **Features** | would the area be protected for its geological, glaciological or geomorphological features? I.e. distinctive or special characteristics of the history, structure or components of the Earth’s crust, rocks, fossils and cryosphere or a result of present or past processes beneath or at the Earth’s surface in Antarctica. | No |
| **Landscapes** | would the area be protected for its landscape? I.e. expanses of coastal or inland scenery, usually at a scale where they contain a mosaic of inter-related ecosystems, and characterised by particular patterns of geometry, heterogeneity, patch dynamics and biophysical processes. | No |
| **Aesthetic** | would the area be protected for its aesthetic features? I.e. attributes concerned with beauty, appreciation, perception and inspiration. | No |
| **Wilderness** | would the area be protected for its wilderness features? I.e. attributes concerned with remoteness and a relative absence of both people and indications of past and present human presence or activity. | No |
| **Historic** | would the area be protected for its historic features? I.e. things which represent or recall events, experiences, places, achievements or records that are important, significant or unusual in the course of human events and activity in Antarctica. | No |
| **Intrinsic** | would the area be protected for its intrinsic features? (The real or inherent nature of a thing is worth protecting in its own right i.e. without requiring use). | No, since this type of benthic community has also been described in other places. |

|  |  |  |
| --- | --- | --- |
| **Use Categories** | **Description** | **Answer** |
| **Scientific research** | would the area be protected for scientific research? | Yes, to develop benthic studies, under 50 m of depth. |
| **Conservation** | would the area be protected for its conservation purposes?  (Conservation embraces both protection and judicious use, management of biodiversity, intrinsic value and importance in maintaining the life sustaining systems of the biosphere: distinguished from “sustainable use” and “sustainable management”. | No |

*Quality Criteria*

|  |  |
| --- | --- |
| **Representativeness** | |
| Is the potential area **representative** of other comparable parts of Antarctica? | Yes |
| Does it contain ecosystems, species, habitats, physical, historic, aesthetic and wilderness or other values or features represented elsewhere? | Yes, it contains species and habitats present in other sites in the Antarctic Peninsula region. |
| What contribution would the area make to an Antarctic Protected Area system with a full range of outstanding natural environmental, biological, geographic and geological values of the Antarctic region? | The literature recognizes that Chile Bay (Discovery Bay) has high values of benthic fauna diversity. However, it would have lower densities and biomass than other sites within the South Shetland Islands themselves. In addition, it has a species composition similar to that recorded in other sites of the South Shetland Islands. |
| In relation to Antarctica as a whole, what proportion of the values or types of protected area identified in Articles 3(1) and 3(2) are represented in the site being investigated?  *E.g. an area containing representative examples of marine & terrestrial ecosystems & assemblages of species of seabird may be higher quality than one containing a single colony of a common species.* | There is a low proportion of values, mainly presenting the combination of natural (or environmental) and scientific values. |
| **Diversity** | |
| What diversity of species, habitats or other values or features does the area contain?  *For example an area might be of higher quality if it contained a greater diversity of biological and/or geological features than a nearby area.* | In the protected area, it is possible to find groups of polychaetes. |

|  |  |
| --- | --- |
| **Distinctiveness** | |
| Is the potential area **distinctive** from other areas? How different is it from other areas? | It does not present unique/distinctive characteristics. |
| Does it contain species, habitats or other values or features not duplicated elsewhere? Are they **unique**, **rare**, uncommon or common? | Yes, they are common. |
| Are there naturally uncommon taxa present, including “*sparse*” taxa which occur within typically small and widely scattered natural populations, “*range restricted*” taxa whose distribution is naturally confined to specific substrates (e.g a specific rock type), habitats (e.g. geothermally-heated soils) or geographic areas (e.g. nunataks), “vagrant” taxa which may appear for short periods without establishing long-term breeding populations, and “*seasonal*” taxa which migrate into the polar regions during summer? | No |
| Are there naturally uncommon abiotic features present that have been formed or preserved through an unusual or infrequent set of geological, geomorphological or glaciological processes?  *For example an area containing the only example of a terrestrial ecosystem or a unique fossil locality might be of higher quality than one that contained a common terrestrial ecosystem or type of fossil.* | No |
| **Ecological importance** | |
| How **important**/critical is the area ecologically or numerically for key species, ecosystems or as a type locality? | The area is representative of the Antarctic ecosystem, but it is not relevant in ecological terms, according to species presence or the type of site. |
| Do the number of individuals or groups occurring at the area include a high proportion of the global population? *For example, if 90% of the global population were present, this would represent a key population and a very important ecological site*. | No |
| What contribution does the area make to maintenance of essential ecological processes or life-support systems or habitats? | There is no clear contribution. |
| Does the area have any inherent vulnerability due to local endemism, rarity of species, biological vulnerability or for other reasons? | No. However, the bay faces glaciers on Greenwich Island. |
| **Degree of interference** | |
| To what extent has the area been subject to human **interference**? | It has been subjected to a low degree of human interference: A station operates throughout the year, with a staff that does not exceed 12 people and other during the summer period. Staffs at both stations do not exceed 80 people in summer season. According to IAATO statistics, a total of 2,214 people visited the area in the period 2000-2017. |
| Does the area lack signs of human activities (e.g. tracks, litters)? | Because it is a deep marine zone, there are no visible signs of human activity. |
| Is there minimal loss or addition of species, natural processes and abiotic material? | According to the available scientific information, there are no changes in species, natural processes or abiotic material in the zone. |

|  |  |
| --- | --- |
| What is the degree of visitation and alteration of the adjacent landscape?  *E.g. an area that has not experienced local human-induced change and is protected from it because of isolation may have higher quality wilderness values and might be more valuable as an undisturbed reference area than a less natural area.* | In spite of finding two stations in the vicinity of the area, it is considered that the degree of visits is low, as well as the alteration of the landscape. |
| **Scientific and monitoring uses** | |
| What is the potential for the pursuit of science including gaining of knowledge by study and analysis? | As in the rest of Antarctica, it is considered high. |
| What is the potential of the area to be used as a reference area (e.g. for environmental monitoring)? | Medium, with characteristics similar to other areas in the South Shetland Islands. |

*Human activities and impacts*

* Are human activities regularly, infrequently or almost never carried out in the area?

The “Arturo Prat” Station (Chile) since 2008 develops regular activities in the area. The “Pedro Vicente Maldonado” Station (Ecuador) executes activities during the austral summer. In the winter months, the bay freezes, so there is no access to the protected area. In the protected area, as such, activities are not currently carried out.

* Are biological or abiotic components or processes of the area vulnerable to any existing or likely future human activities in the area itself or nearby?

Based on the available scientific information, and recognizing that human activities have been carried out in the area since 1947, it is considered that the biological and abiotic components of the area are not threatened by existing or future human activities. As in the rest of the Antarctic marine environment, the main threats are those caused by shipping accidents, including the sinking of ships and the spillage of fuel stored in them.

* Could these activities directly, indirectly or in a cumulative way result in impacts on the values for which this area has been identified or modify them in any way?

Since 1947 and during more than 25 years in which the area has had special protection, human activities have been developing. Today, in addition, there is greater concern in the bases in terms of environmental protection, so it is considered that human activities should not directly, indirectly or cumulatively affect the values of the area.

* How likely, frequent and intensive might the impacts be and over what temporal and spatial scales?

The area is visited regularly by vessels that support the activities of the National Antarctic Programs. However, the anchorages of these ships are located near the stations and far from the protected area.

* When disturbance occurs, what is the time taken to return to pre-disturbance or equilibrium levels?

To date, no disturbance caused by human impacts has been reported in the area.

*Natural processes*

* Are natural processes (e.g. atmospheric, climatic, marine, biological or glacial processes) likely to modify the area or its values?

Yes, as with any other area in Antarctica of similar conditions of presence of glaciers in the vicinity.

*Natural variability and viability*

* What are the short and long term variations (e.g. seasonal changes) in populations of biota present in the area?

According to the available information, in general the populations are stable. However, if a greater glacial contribution to the bay occurs (increased melting process), it is possible that the abiotic conditions undergo modifications, and may even alter the biological composition of the area. This situation could also occur in other sites of the South Shetland Islands with similar conditions.

* Is the likely variation due to natural processes likely to be smaller, similar to or larger than impacts of human activities in the area?

The glacial contribution and climate modifications are the main natural processes that could affect the area and, depending on the level that could be reached in the future, its impact would be greater than that of human activities.

* Are there any medium- or long-term indications that natural trends could result in significantly different characteristics of the area which could affect its future viability, require a reassessment of protected status or necessitate changes in management?

In the entire region of the Antarctic Peninsula there is currently an increase in air and sea surface temperature, so those areas with similar conditions to Chile Bay (Discovery Bay) could face the same future impacts, with similar effects.

* To what extent does natural buffering protect the area from outside influences?

To date, scientific research indicates that, despite the changes registered in the region, the area remains stable. In addition, the geographical location of the area, the English Strait with the Aitcho Islands in the far north, limits the transit of ships in the area.

*Non-Antarctic threats*

* Would protection of the area be compromised by processes originating or driven from outside the Antarctic such as global change, ozone depletion or long-range transport of contaminants such as long-lived chemical pollutants and introduction of non-native species?

Like the rest of the Antarctic Peninsula region, the increase in air and sea temperatures could affect the values of the area in some way, directly or indirectly, as well as those of the other islands in the region.

*Urgency*

* Do human activities pose imminent environmental risks?

No, because in general in the area there is a low number of activities (presence of two stations and few ship visits each season).

*Scientific uncertainty*

* How well known are the natural values and other characteristics of the area and potential impacts of human activities on them?

Scientific researches are regularly carried out in the area, which allows a good understanding of its characteristics as well as the potential human impacts. However, it is acknowledged that there exists a scarcity of research pertaining to depths below 50 meters in the region.

* Could these uncertainties mask significant threats to the area and its values?

So far, uncertainties are not recognized.

*Boundaries*

* Are the proposed boundaries consistent with management objectives? (E.g. do they protect foraging areas of birds in an important breeding area and/or do they enclose other ecosystem components required for continuity of species identified?).

The originally proposed limits were intended to facilitate a comparison with Port Foster in Deception Island. Additionally, the two selected zones were characterized by distinct depths and environmental conditions, while still aiming to achieve comparable representativeness.

* Can boundaries be easily defined for management purposes and identified by visitors? (E.g. can fixed natural boundaries such as mountain peaks, ridgelines, shorelines, or water depth be used?).

There is an absence of demarcation of surface boundaries. In the marine zone, two subsites located below a depth of 50 meters are taken into consideration.

* Can management objectives be met regardless of the future use of areas adjacent to the protected area boundary, including conflicts between different values or management objectives, and acceptability to others?

Yes. Indeed, the area was designated as protected in 1987, at a time when activities were already underway in the vicinity, particularly in Prat Station. Later, another station (Maldonado) was built in the area, and tourist activities have also been established. Despite this, the area experiences a relatively low volume of maritime visits, and human activities are conducted trying to minimize potential impacts on the marine environment.

*What are the existing scientific or other uses of the area?*

* Are there conflicting values (e.g. between environmental and scientific values in Article 3(1)) or between protection and use categories, or management objectives.

The area presents scientific values (terrestrial, marine, microbiological and environmental studies) and environmental ones. The activities are carried out without presenting conflicts between those values.

*Size*

* Is the area large enough to maximise the chance of management objectives being achieved?

The protected area covers 0.66 km2 and is located at a depth ranging between 50 and 200 meters. Chile Bay (Discovery Bay) has a surface area of approximately 25 km2, stretching from the intertidal line to a depth of 200 meters. In order to fulfill the original management objective and facilitate comparison with Foster Port in Deception Island, the area boasts sufficient size. Nevertheless, it is important to note that the ecosystems in the two regions ere different.

* Is it large enough to contain all or most of the key elements identified, in their natural relationships, so that it will be self-perpetuating?

No, but it is representative.

* What is the minimum size needed to achieve management objectives?

The proposed size allows the achievement of the management objectives.

* Is the area small enough to minimise conflicts between different values or management objectives?

Yes, the proposed size allows reducing the conflicts between the different values of the area.

* Is the area large enough to accommodate future changes (e.g. due to climate change?)

The proposed size allows including and considering possible future changes.

*Possible management tools*

* Are there management tools available that could be used to help achieve management objectives and minimise conflicts? (E.g. would zoning be useful to facilitate recognition, protection and management including partitioning between objectives such as protection of vulnerable species in core breeding areas, provision of reference areas and capacity for human activity in suitable fringe areas?).

There are no other tools available, beyond the methodology of benthic studies, to facilitate the recognition, protection, and management of the area, given its depth.

* Can management programmes be formulated to attain management objectives? (E.g. signage or boundary markers, survey and research, monitoring, any specific information needed for reporting).

Due to the location of the Zone (more than 50 m depth) it is not practical to establish signs that demarcate it on the surface.

*Time period/duration*

* Can the area be protected for a time period that allows full achievement of management objectives?

The area was originally protected for a period of 10 years, which was later extended. As of today, the site has been under protection for over 25 years, and it is considered that the proposed objectives were achieved during the initial years of protection while comparative studies with Foster Port were being conducted.

* Are there some seasonal periods when parts of the area or species in it are not vulnerable to human activity?

In general, due to the location of the Zone (marine environment at more than 50 m depth), the values are not vulnerable to human activity.

*Accessibility/logistics*

* Is the area sufficiently accessible for management operations?

Access to the area is easy. However, since the two sub-areas of the protected Zone are under 50 and 100 m depth, appropriate equipment is required to perform benthic studies in the area.

* Might the logistics needed negatively impact on management objectives and are there alternative management options?

Eventually, the ships that support the activities of the stations could have a negative impact. However, the anchorage sites are located far from the Zone.

* Would inaccessibility help achieve management objectives by deterring potentially impacting activity?

The depth in which the Zone is located hinders the development of activities in it.

*Ability to protect more than one value and meet different management objectives (i.e. complementarity)*

* Is there more than one value or objective in Article 3 (1) & 3(2) that can be protected in the area?

The area has given protection to more than one value (habitats, species and intrinsic values of the site, in addition to scientific research).

* Would the site add value to the Antarctic protected area system, in quality as well as quantity?

The Zone contributes to the Antarctic protected area system as a marine zone, but its contribution is not considered significant, as the values found within the zone are also present in other areas of the region.

* Is there an appropriate balance between the costs and benefits of protecting the area, and appropriate equity in the distribution of it and adjacent protected and unprotected areas?

Based on the available scientific information, there are other sites within the region that can be considered more significant from both biological and environmental perspectives than the protected area in Chile Bay (Discovery Bay). Additionally, given the depth of the Zone, appropriate vessels are required to study benthic species, which incurs a cost for the Antarctic Program wishing to undertake such activities.

In the South Shetland Islands region, there are 12 Antarctic Specially Protected Areas (ASPAs), and in the Antarctic Peninsula region, there are five marine areas.

***Conclusions***

The protected area of Bahía Chile (Discovery Bay) was initially proposed as a specific study control area for Port Foster. However, the available literature suggests that the sites have different population structures and environmental conditions, which renders them incomparable.

Currently, scientific research in the area focuses on the study of marine microorganisms, invertebrates, and macroalgae. None of these studies have required work within the protected Zone, but rather in the coastal, intertidal, and subtidal areas associated with the coastline, or in the water column at a depth no greater than 50 m.

The Zona has been subjected to a low degree of human interference: A station operates throughout the year, with a staff that does not exceed 12 people and other during the summer period. Staffs at both stations do not exceed 80 people in summer season. According to IAATO statistics, 2,214 people visited the area in the period 2000-2017 (17 years). In the last report presented by IAATO to the XLIII ATCM (2021) the Area is not included in the list of the 20 most visited places in the Antarctic Peninsula region.

Due to the low level of activities in the area, it is considered that the values for which the Zone was originally designated are not threatened.

Therefore, it is suggested to review the protection of the Zone as an Antarctic Specially Protected Area.

***Bibliographic review***

**Published articles**

Arcos R., D. & M.A. Salamanca O. 1980. Observaciones hidrográficas en bahía Foster y bahía Chile (islas Shetland del Sur), enero 1978. Bolm. Inst. Oceanogr., S. Paulo, 29 (2): 51-55.

Arnaud, P.M., C.M. López, I. Olaso, F. Ramil, A.A. Ramos-Esplá & A. Ramos. 1998. Semi-quantitative study of macrobenthic fauna in the region of the South Shetland Islands and the Antarctic Peninsula. Polar Biol. 19: 160-166.

Calderón, T. & S. Jaramillo. 1998. Estudio de la macrofauna bentónica en Bahía Chile y Ensenada Guayaquil (Isla Greenwich, Antártica). Acta Antártica Ecuatoriana 4 (1): 87-100.

Clarke, A. 1996. The distribution of Antarctic marine benthic communities. In: R.M. Ross, E.E. Hofmann and L.B. Quetin (Eds.), Foundations for Ecological Research West of the Antarctic Peninsula. Antarctic Research Series, 70: 219-230.

Cruz, M. Estudio del bentos marino antártico en bahía Chile o Discovery, isla Greenwich (islas Shetland del Sur), Antártida. 1990. Acta Antártica Ecuatoriana, PROANTEC, Ecuador, 2 (1): 33-45.

Gallardo, V.A. 1987. Benthic macroinfauna of Antarctic sub-littoral soft bottoms. In: El-Sayed, S.Z. and A.P. Tomo (Eds.), Antarctic Aquatic Biology. Proceedings of the Regional Symposium on Recent Advances in Antarctic Aquatic Biology with Special Reference to the Antarctic Peninsula Region, Bariloche, Argentina, 6-10 June, 1983. BIOMASS Scientific Series Nº 7: 73-86.

Gallardo, V.A. & J. Castillo. 1970. Quantitative observations on the benthic macrofauna of Port Foster (Deception Island) and the Chile Bay (Greenwich Island). In: Holdgate, M.W. (Ed.), Antarctic Ecology (Proceedings of 2nd SCAR Symposium on Antarctic Biology, Washington, USA, 29 July - 3 August 1968), Volumen 1, 242-243.

Gallardo, V.A., S.A. Medrano & F.D. Carrasco. 1988. Taxonomic composition of the sublittoral soft-bottom polychaeta of Chile Bay (Greenwich Island, South Shetland Islands, Antarctica). Ser. Cient. INACH 37: 49-67.

Gallardo, V.A., J.G. Castillo, M.A. Retamal, J. Hermosilla & R. Trucco. 1975. Benthic community studies in the South Shetland Islands. Antarctic Journal of the United States 10 (4): 135.

Gallardo, V.A., J.G. Castillo, M.A. Retamal, A. Yáñez, H.I. Moyano & J.G. Hermosilla. 1977. Quantitative studies on the soft-bottom macrobentic animal communities of shallow Antarctic Bays. In: Llano, G.A. (Ed.), Proceedings of the Third SCAR Symposium on Antarctic Biology. Adaptations within Antarctic Ecosystems. Part II: The structure and function of Antarctic marine benthic ecosystems, 361-387.

IAATO. 2021. A Five-Year Overview and 2020–21 Season Report on IAATO Operator Use of Antarctic Peninsula Landing Sites and ATCM Visitor Site Guidelines. Information Paper IP 111 presented in the XLIII Antarctic Treaty Consultative Meeting. 14 pp.

Moyano G., H.I. 1972. Investigación bentónica durante la XXV Comisión Antártica Chilena. Boletín del Difusión del INACH Nº 7: 17-18.

Ortega, D. 1998. Distribución y composición del macrozooplancton en Bahía Chile y Ensenada Guayaquil, Isla Greenwich – verano austral 1998. Acta Antartica Ecuatoriana 4 (1): 115-122.

Retamal, M.A. 1981. Consecuencia en la biota bentónica de las erupciones volcánicas en la isla Decepción y su comparación con bahía Chile, Antártica. Bol. Antárt. Chileno 1 (2): 15-17.

Sicinski, J., K. Pabis, K. Jazdzewski, A. Konopacka & M. Błazewicz-Paszkowycz. 2012. Macrozoobenthos of two Antarctic glacial coves: a comparison with non-disturbed bottom areas. Polar Biol. 35:355–367.

Valencia, M. 1998. Estudio de las características físicas y químicas de las aguas de Bahía Chile para el verano austral, período 1995-1998. Acta Antártica Ecuatoriana 4 (1): 151-162.

Valenzuela, E. & J. Varela. 1972. Sedimentology and submarine deposits from Bahía Chile (Discovery Bay), Greenwich Island, South Shetland Island. In: Adie, R. J. (Ed.), Antarctic geology and geophysics: Symposium on Antarctic Geology and Solid Earth Science / International Union of Geological Sciences. Oslo, Norway, 6-15 August, 1970, pp 75-81.

**Un-published reports**

Gallardo, V.A., J.G. Castillo, M.A. Retamal, A. Yánez, H.I. Moyano & J.G. Hermosilla. 1974. Quantitative studies on the oft-bottom macrobenthic animal communities of shallow Antarctic bays. Informe al Instituto Antártico Chileno. 70 pp.

Larraín, E. 1981. Consecuencia en la biota bentónica de las erupciones volcánicas en Isla Decepción (62º 57’S, 60º 38’W) y su comparación con Bahía Chile (62º 29’S, 59º 04’W), Antártica. Memoria para optar al Título de Biólogo Marino. Departamento de Oceanología, Facultad de Ciencias Biológicas y de Recursos Naturales, Universidad de Concepción. 150 pp.

**Databases**

IAATO. Tourism Statistics, 2000-2001 / 2016-2017. Number of visits per site per vessel – Peninsula Sites. <https://iaato.org/tourism-statistics>.

SCAR Mar-BIN. RAMS taxon details and Distribution maps.<http://www.scarmarbin.be/index.php>.