Management Plan

For Antarctic Specially Protected Area No. 161
TERRA NOVA BAY, ROSS SEA

Introduction

The ASPA of Terra Nova Bay is a coastal marine area encompassing 29.4 km^2 between Adélie Cove and Tethys Bay, Terra Nova Bay, immediately to the south of the Italian Mario Zucchelli Station (MZS). Terra Nova Bay was originally designated as Antarctic Specially Protected Area through Measure 2 (2003) after a proposal of Italy. CCAMLR considered and approved its designation during CCAMLR XXVI, Hobart 2007. The Management Plan has been revised in 2008, through measure 14 (2008), in 2013 through measure 15 (2013) and in 2019 through measure 7 (2019).

The primary reason for the designation of Terra Nova Bay as an Antarctic Specially Protected Area (ASPA) is its particular interest for ongoing and future research. Long term studies conducted in the last 30 years by Italian and international scientists have revealed a complex array of species assemblages, characterized by unique symbiotic interactions. In this Area, several VME species are also present, above all the Antarctic scallop *Adamussium colbecki* and pterobranchs, and new species continue to be described.

The high ecological and scientific values derived from the diverse range of species and assemblages, together with the vulnerability of the Area to disturbance by scientific oversampling, alien introductions, and direct human impacts arising from increasing activities at the nearby permanent scientific stations are such that the Area requires long-term special protection.

ASPA 161 is listed within the Environmental Domain S and T (Morgan F. *et al*. 2014. Environmental Domains of Antarctica Version 2.0, Final Report) and protects adjacent Important Bird Area 177 Adélie Cove. As a marine area, it is not part of Antarctic Conservation Biogeographic Regions (Resolution 6, 2012).

1. Description of Values to be Protected

This coastal marine area is an important area for well-established and long-term scientific investigations that allowed, up to now, collection of an extensive amount of scientific data. During the last 5 years, substantial scientific research carried out in the ASPA led to significant advances in the knowledge of this area, as demonstrated by the great number of publications produced (see References and relevant supporting bibliography).), many of which contributed to refine the lists of species present in the area and their nomenclature, especially thanks to the use of molecular techniques (barcoding and metabarcoding). The site typically remains ice-free in summer, which is rare for coastal areas in the Ross Sea region, making it an ideal and accessible site for research into the near-shore benthic communities of the region. Extensive marine ecological research has been carried out at Terra Nova Bay since 1986/87, contributing substantially to our understanding of the marine communities in this area, and of the effect of katabatic winds on the physical, chemical and biological processes occurring in the water column (Povero *et al*., 2001).

High diversity at both species and community levels makes this Area of high ecological and scientific value. Studies have revealed a complex array of species assemblages, often co-existing in mosaics (Sarà *et al*., 1992; 2002; Gambi *et al*., 1997; Cantone *et al*., 2000; Ghiglione *et al*., 2013) and characterized by unique symbiotic interactions (Schiaparelli *et al*., 2011; 2015; Regoli *et al*., 2004). There exist assemblages with high species richness and complex functioning, such as the sponge and anthozoan communities, alongside loosely structured, low diversity assemblages. In this area several VME species also occur, above all the Antarctic scallop Adamussium colbecki (Schiaparelli and Linse, 2006) and pterobranchs (Schiaparelli *et al*., 2004), and new species continue to be described (see section 6). A population of Adélie penguins (Pygoscelis adeliae) is present nearby the Area.

The collected scientific data over the years, allowed the site to serve as reference for the determination of impacts arising from human activities (Berkman and Nigro, 1992; Focardi *et al*., 1993; Minganti *et al*., 1995; Bruni *et al*., 1997; Nonnis Marzano *et al*., 2000, Lo Giudice *et al*., 2013), the understanding of inter-annual variability in species dynamics (Cecchetto *et al*., 2021) and the assessment of predictive models of species occurrences (Peel *et al*., 2019; Grillo *et al*., 2022)

2. Aims and Objectives

- avoid degradation of, or substantial risk to, the values of the Area by preventing unnecessary human disturbance to the Area;
- allow scientific research on the ecosystem, in particular on the marine species assemblages and long-term monitoring, while ensuring protection from oversampling or other possible human impacts;
- allow other scientific research and support activities provided they are for compelling reasons which cannot be served elsewhere and that will not compromise the values for which the Area is protected;
- prevent or minimise the possibility of introduction of non-native species (e.g. alien plants, animals and microbes) into the Area;
- allow visits for management purposes in support of the aims of the Management Plan.

3. Management Activities

The following management activities are to be undertaken to protect the values of the Area:

- A map showing the location of the Area (stating the special restrictions that apply) shall be displayed, and a copy of this Management Plan shall be kept available, at all the scientific stations located within 50 km of the Area. Information illustrating the location and boundaries with clear statements of entry restrictions is displayed on posters at MZS;
- Buoys, or other markers or structures established for scientific or management purposes shall be secured and maintained in good condition, and removed when no longer necessary;
- Any abandoned equipment or material shall be removed to the maximum extent possible, provided that doing so does not adversely impact on the environment and the values of the Area;
- Visits shall be made as necessary to assess whether the Area continues to serve the purposes for which it was designated and whether management and maintenance measures are adequate;
- National Antarctic Programs are encouraged to consult together to prevent oversampling within the Area.

4. Period of Designation

Designated for an indefinite period.

5. Maps and Photographs

- **Map 1:** Terra Nova Bay, Antarctic Specially Protected Area No. 161, bathymetric map.

  Map specifications: Projection: UTM Zone 58S; Spheroid: WGS84. Bathymetric contour interval 50 m. Land contours and coast derived from 1:50,000 Northern Foothills Satellite Image Map (Frezzotti *et. al.* 2001). Bathymetry within ASPA derived from high resolution sidescan sonar data surveyed by Kvitek, 2002. Bathymetry outside of ASPA supplied by Italian Hydrographic Office 2000. Marine data collected under Terra Nova Bay marine protected area Project (PNRA 1999-2001). Inset 1: The location of Terra Nova Bay in Antarctica. Inset 2: Terra Nova Bay location map, showing the region covered by Map 1, stations, and sites of nearby protected areas.

6. Description of the Area

6 (i) Geographical co-ordinates, boundary markers and natural features

General description, borders and coordinates

The Area is situated in Terra Nova Bay, between the Campbell Glacier Tongue and Drygalski Ice Tongue, Victoria Land (Map 1). It is confined to a narrow strip of coastal waters to the south of MZS (Italy), extending approximately 9.4 km in length and generally within 1.5 – 7 km of the shore, comprising an area of 29.4 km2. No marine resource harvesting has been, is currently, or is planned to be conducted within the Area, nor in the immediate surrounding vicinity.

The western boundary of the Area is defined as the mean high water mark along the coastline extending between 74°42′57″S in the north (2.3 km south of MZS) and 74°48′00″S in the south (the southern shore of Adélie Cove), and includes the intertidal zone (Map 1). The northern boundary of the Area is defined as the 74°42′57″S line of latitude, extending from the coast 1.55 km eastward to the 164°10′00″E line of longitude. The boundary position may be recognised near the shore by the presence of a large and distinctive offshore rock in the northernmost cove on the coast south of MZS, which is an unique feature on this stretch of coast. The southern boundary is defined as the 74°48′00″S line of latitude, extending from the coast 3.63 km eastward to the 164°10′00″E line of longitude. The boundary position may be recognized visually as being at the southern shore of the mouth of Adélie Cove, immediately south of a distinctive rocky outcrop at the base of the coastal cliffs. The eastern boundary of the Area is defined as the 164°10′00″E line of longitude extending between 74°42′57″S in the north and 74°48′00″S in the south.

Geology

The coastline of Terra Nova Bay is characterised predominantly by rocky cliffs, with large boulders forming occasional 'beaches' (Simeoni *et al*., 1989). In the sheltered areas, the soft bottom begins at a depth of 20–30 m. The tidal range is 1.5–2 m and pack ice approximately 2–2.5 m thick covers the sea surface for 9–10 months of the year (Stocchino and Lusetti, 1988; 1990). Data available for the summer period suggest that ocean currents in the Area are likely to be slow and to flow generally in a north-south direction. Along the coastline of the Area there are two main coves; the larger Adélie Cove in the south and a smaller cove around 3 km to its north. The sea floor substrate of the smaller consists of pebbles of various sizes, while Adélie Cove is characterised by fine-grained, muddy sediments. The seafloor within the Area is primarily granitic rock, with softer substrates composed of coarse sands or gravels.

Marine benthic communities (0-500 m)

Several new taxa have been described from Terra Nova Bay in the framework of PNRA expeditions. A list of species is reported here below, where type species of new genera are marked with an asterisk (*) and type localities falling within the ASPA boundaries are reported with two asterisks (**). Most taxa having type localities in Terra Nova Bay or Tethys Bay have also been confirmed to occur within the ASPA boundaries.

Species	Phylum	Type locality	Reference
Craspedostauros ineffabilis Trentin, Moschin, Lopes, Custódio & Moro 2022	Heterokontophyta	Terra Nova Bay	Trentin *et al*., 2022
Craspedostauros zucchellii Trentin, Moschin, Lopes, Custódio & Moro 2022	Heterokontophyta	Terra Nova Bay	Trentin *et al*., 2022
Tethysphytum antarcticum Sciuto, Moschin & Moro, 2021 (*)	Rhodophyta	Tethys Bay	Sciuto *et al*., 2021
Thalassolithon adeliense Trentin, Moschin & Moro 2023 (*)	Rhodophyta	**Adelie Cove (**)**	Trentin *et al*., 2023
Vellaria zucchellii Sabbatini, Pawlowski, Gooday & Bowser, 2004	Foraminifera	Tethys Bay	Sabbatini *et al*., (1999)
Megapogon schiaparellii Alvizu, Xavier & Rapp, 2019	Porifera	Tethys Bay	Alvizu *et al*., 2019
Microxina sarai Calcinai & Pansini, 2000	Porifera	**Adelie Cove (**)**	Calcinai & Pansini, 2000
Iophon terranovae Calcinai & Pansini, 2000	Porifera	**Faraglione (**)**	Calcinai & Pansini, 2000
Ectyodoryx minuta Calcinai & Pansini, 2000	Porifera	Terra Nova Bay	Calcinai & Pansini, 2000
Microxina lanceolata Calcinai & Pansini, 2000	Porifera	Terra Nova Bay	Calcinai & Pansini, 2000
Crella (*Crella*) *aurantiaca* Bertolino, Calcinai & Pansini, 2009	Porifera	**Adelie Cove (**)**	Bertolino*et al*., 2009
Mycale (*Aegogropila*) *denticulata* Bertolino, Calcinai & Pansini, 2009	Porifera	Terra Nova Bay	Bertolino *et al*., 2009
Amphicteis teresae Schiaparelli & Jirkov, 2016	Annelida	Terra Nova Bay	Schiaparelli & Jirkov, 2016
Amage giacomobovei Schiaparelli & Jirkov, 2021	Annelida	Terra Nova Bay	Schiaparelli & Jirkov, 2021
Lepidepecreella debroyeri Schiaparelli, Chiara, Kilgallen, Scinto & Lörz, 2015	Arthropoda	Terra Nova Bay	Schiaparelli *et al*., 2015
Alcyonidium kuklinskii Schwaha, Cometti, Saadi, Cecchetto & Schiaparelli, 2023	Bryozoa	Tethys Bay	Schwaha *et al*., 2023

In the supralittoral zone, only cyanobacteria and diatoms colonise the hard substrates, while the intertidal zone (1.5–2.0 m wide) has, in the most sheltered areas, a high coverage of the green alga Urospora penicilliformis and Prasiola crispa (Cormaci *et al*., 1992b). Below the tidal zone, down to 2–3 m depth, the community is very poor, due to the persistent presence and scouring action of pack ice, and is mainly composed of epilithic diatoms and the amphipod Paramoera walkeri. Immediately deeper, rocks can be fully colonised by the red alga Iridaea cordata (Cormaci *et al*., 1996), frequently found with Plocamium cartilagineum, to a depth of 12 m (Gambi *et al*., 1994; 2000a). At this level, large sessile animals such as Alcyonium antarcticum and Urticinopsis antarctica can be occasionally observed, while frequent are the asteroid Odontaster validus and the echinoid Sterechinus neumayeri. Phyllophora antarctica is another red alga forming expanded mats from 12 to 25 m depth, often heavily colonised by sessile organisms, mainly hydroids (Cerrano *et al*., 2000c, Puce *et al*., 2002), serpulids and bryozoans (Celleporella antarctica and Harpecia spinosissima). The upper algal belts represent shelter and a food source for diversified and abundant communities of mobile fauna. Numerous invertebrates, such as the polychaete Harmothoe brevipalpa, the gastropod mollusc Laevilittorina antarctica, the crustacean amphipod Paramoera walkeri and the tanaid Nototanais dimorphus feed on these algal species and can be very abundant. On rocky bottoms in deeper layers, the thalloid macroalgal community is absent and only a calcareous crustose coralline alga previously determined as Clathromorphum lemoineanumund and later erroneously assigned to Phymatolithon foecundum by Alongi *et al*. (2002). Recent molecular studies have questioned the correctness of previous determination and issued new taxa, such as the new genus Tethysphytum and the species Tethysphytum antarcticum (Hapalidiales, Rhodophyta) (Sciuto *et al*., 2021). From the same group of algae, also the new genus Thalassolithon and the new species Thalassolithon adeliense (Trentin *et al*., 2023) have been described from Adelie Cove.

The soft bottoms from 20–40 m depth are coarse sands and gravels, where the community is characterised by the bivalve mollusc Laternula elliptica and the polychaete Aglaophamus ornatus (Nephtiidae). The bivalve Yoldia eightsi is abundant in fine-sand sediments especially in Adelie Cove. From this depth range several new other taxa have been recently described, such as the new genus Tethysphytum and the species Tethysphytum antarcticum of non-geniculate coralline algae (Hapalidiales, Rhodophyta) (Sciuto *et al*., 2021) and, the same group, the new genus Thalassolithon and the new species Thalassolithon adeliense (Trentin *et al*., 2023), the new,such as the Antarctic diatoms Craspedostauros ineffabilis and Craspedostauros zucchellii (Trentin *et al*., 2022), the new bryozoan Alcyonidium kuklinskii (Schwaha *et al*., 2023) and the calcareous sponge Megapogon schiaparellii (Alvizu *et al*., 2019).

Between 30–70 m, the substrate becomes finer and is completely colonised by the bivalve Adamussium colbecki, the shells of which are colonised by a micro-community comprising mainly forams, bryozoans (Aimulosia antarctica, Arachnopusia decipiens, Ellisina antarctica, Micropora brevissima) and the spirorbid Paralaeospira levinsenii (Albertelli *et al*., 1998; Ansell *et al*., 1998; Chiantore *et al*., 1998; 2000; 2001; 2002; Vacchi *et al*., 2000a; Cerrano *et al*., 2001a; 2001b). In this region, large predators such as the gastropod Neobuccinum eatoni and the nemertean Parborlasia corrugatus are frequent. The echinoid Sterechinus neumayeri and the starfish Odontaster validus are still very frequent at all depths on both hard and mobile substrates (Chiantore *et al*., 2002; Cerrano *et al*., 2000b). Several unique biotic associations have been described at these depths, e.g. between sponges and other invertebrates (Schiaparelli *et al*., 2000; 2003; 2007; 2010; 2011; 2015). Sponge also represent a key taxon, which has been widely investigated in terms of symbionts (Regoli *et al*., 2004) and associated microbes (Lo Giudice *et al*., 2019). In recent years also species new to science have been described, including the parasitic amphipod Lepidepecreella debroyeri (Schiaparelli *et al*., 2015). Other data have been produced about VME species, such as Cephalodiscus densus (Schiaparelli *et al*., 2004) and Adamussium colbecki (Schiaparelli and Linse, 2006). About the latter species, new analyses of data collected in 2006-2007, thanks to the presence of a mooring within the ASPA boundaries (Mooring "L" under the Italian mooring code system), showed that this species recruits during summer months in coincidence with an increase of the seawater temperature and a seasonal shift in the water currents and intensity (Schiaparelli and Aliani, 2019).

Below 70–75 m down to 120–130 m depth, heterogeneous substrates allow hard- and soft-bottom communities to coexist. On the sparse rocky outcrops the encrusting algae disappear and the benthic communities are dominated by the sessile zoobenthos. This diversified filter feeding assemblage is mainly characterised by sponges and anthozoans, while in soft sediments detritus-feeder polychaetes and bivalves dominate. Among sponges, which can reach very high biomass, Axociella nidificata, Calyx arcuarius, Gellius rudis, Phorbas glaberrima, Tedania charcoti, are very abundant (Sarà *et al*., 1992; 2002; Gaino *et al*., 1994; Cattaneo-Vietti *et al*., 1996; 2000c; Bavestrello *et al*., 2000; Cerrano *et al*., 2000a). Numerous invertebrates constitute an important component of this assemblage which develops down to 120-140 m depth. These include crustacean peracarids, pycnogonids, mollusc opisthobranchs (Austrodoris kerguelenensis, Tritoniella belli) (Cattaneo-Vietti, 1991; Gavagnin *et al*., 1995) and bivalves, ophiuroids and holothuroids, bryozoans, and a variety of endobionts. The conspicuous sponge spicule mats found at these depths underline the important role of sponges in this area, besides the one played by diatoms, in determining the sediment texture and silica content. A peculiar community, dominated by polychaetes and by the bivalve Limatula hodgsoni, can be associated with these mats.

Below 130 m the hard substrates become very sparse and are mainly colonised by the polychaete Serpula narconensis (Schiaparelli *et al*., 2000) and several bryozoans (Arachnopusia decipiens, Ellisina antarctica, Flustra angusta, F. vulgaris and Isoschizoporella similis). The dominant muddy bottoms are instead characterised by tubicolous polychaetes (Gambi *et al*., 2000b), mainly Spiophanes. Much deeper, at about 150-200 m depth, brachiopods and various species of bivalves characterise the environment on small gravels as well as on the soft bottom (Cattaneo-Vietti *et al*., 2000b). The great heterogeneity of these substrates contributes to the creation of communities with considerable species richness, diversity and biomass. New polychaete species have also been described in 2021at ~ 500m of depth, i.e. the ampharetidAmphicteis teresae (Schiaparelli and Jirkov, 2016) and Amage giacomobovei (Schiaparelli & Jirkov, 2021).

Bird, fish and mammals

An Adélie penguin (Pygoscelis adeliae) colony is situated nearby the Area at Adélie Cove, with a 2013 population of 13,408 breeding pairs (Humphries *et al*., 2017) (Map 1). About 30 Skua (Stercorarius maccormicki) pairs breed close to the penguins.

The faunal assemblage of the Area includes notothenioid fishes, represented especially by species of the Trematomus group, including T. bernacchi, T. pennelli, T. hansoni and T. loennbergii. These exert an important role in benthic food webs as consumers of many invertebrate species, mainly crustaceans and polychaetes (Vacchi *et al*., 1991; 1992; 1994a; 1994b; 1995; 1997; 2000b; La Mesa *et al*., 1996; 1997; 2000; Guglielmo *et al*., 1998). The platelet ice occurring at Terra Nova Bay in early spring has been shown to house an important nursery for the Antarctic silverfish, Pleuragramma antarcticum, a key organism in the ecology of Antarctic food webs (La Mesa *et al*., 2004; Vacchi *et al*., 2004). The distribution of Pleuragramma eggs has been studied in detail only at three Terra Nova Bay sampling locations (i.e. Gerlache Inlet, Silverfish Bay and Cape Washington) (Guidetti *et al*., 2015) where it was showing a certain degree of patchiness in eggs and larvae distribution (significantly changing at a spatial scale of kilometres and showing a not homogeneous distribution under the solid ice). No specific studies to quantify Pleuragramma eggs have been performed within the ASPA 161 boundaries, but it is know that abundant platelet ice is also occurring here in this area where additional nurseries of this fish species could reasonably be found. The platelet ice environment has also strong prooxidant characteristics at the beginning of austral spring, and the marked responsiveness of antioxidant defences represents a fundamental strategy for P. antarcticum (Regoli *et al*., 2005b).

An aerial survey on cetacean species, conducted in the coastal area surrounding the Italian Station Mario Zucchelli, showed the presence of Killer Whale Orcinus orca (L.), types B and C and Minke Whale (Balaenoptera bonaerensis Burmeister). (Lauriano *et al*., 2007a; 2007b.). Leopard seals (Hydrurga leptonix) were sighted several times at the end of the slope that penguins climb to reach the colony in the area represented in Map 1.

Environmental characterization

Studies on industrial pollutants in biomarkers allowed monitoring of the impact of human activities on the Antarctic biota in Terra Nova Bay area (Focardi *et al*., 1995; Regoli *et al*., 1998; Jimenez *et al*., 1999; Regoli *et al*., 2005a; Benedetti *et al*., 2005, 2007; Canapa *et al*., 2007; Di Bello *et al*., 2007, Corsolini, 2009).

In Terra Nova Bay, organisms are exposed to a naturally elevated bioavailability of cadmium causing tissue concentrations generally 10-50 folds higher than those typical of temperate species (Mauri *et al*., 1990; Nigro *et al*., 1992, 1997; Canapa *et al*., 2007, Caruso *et al*., 2018). Elevated level of cadmium at Terra Nova Bay modulates bioaccumulation and metabolism of polycyclic aromatic hydrocarbons and of organochlorine xenobiotics in local marine organisms (Regoli *et al*., 2005a; Benedetti *et al*., 2007; Canapa *et al*., 2007). Recent analyses (Signa *et al*. 2019) reported increased concentrations of Pb and Hg (Pb: Grotti *et al*., 2008; Ianni *et al*., 2010; Hg: Bargagli *et al*., 1998; Negri *et al*., 2006), and phytoplankton reached trace elements levels from 2-fold (Hg) to 4-fold (Cd) and even 10-fold (Pb) higher than those previously recorded (Bargagli *et al*., 1996, 1998; Dalla Riva *et al*., 2004). In contrast, Hg concentration measured in feathers of Adelie penguins (Pygoscelies adelie) and Skua (Catharacta maccormlcki) in 2013 (Signa *et al*. 2019) did not differ from those measured in 1989-1991 (Bargagli *et al*. 1998).

A systematic publication of faunal check-lists for the Terra Nova Bay area has been started by the Italian National Antarctic Museum (MNA, https://steu.shinyapps.io/MNA-generale/) in 2013, with the final target to provide to GBIF distributional information for all taxa occurring in the area. Data are available for: Mollusca (Ghiglione *et al*., 2013), Tanaidacea (Piazza *et al*., 2014), Ophiuroidea (Cecchetto *et al*., 2017), Porifera (Ghiglione *et al*., 2018), Asteroidea (Moreau *et al*., 2018; Guzzi *et al*., 2022), Bryozoa (Cecchetto *et al*., 2019), Rotifera (Garlaschè *et al*., 2020), planktonic Copepoda (Bonello *et al*., 2020), planktonic, benthic and sympagic copepods (Grillo *et al*., 2024), Gnathostomulida (Sterrer *et al*., 2022), polynoid polychaetes (Cowart et asl., 2022), fishes (La Mesa *et al*., 2022), echinoids and crinoids (Guzzi *et al*., 2023).).

Long-term monitoring activities using non-destructive sampling techniques such as ROV, benthic cameras and ROV surveys have also been carried out in the Terra Nova Bay in recent years, further defining the set of organisms occurring in the area (Canese *et al*., 2015; Piazza *et al*., 2018; 2019; 2020; Castellan *et al*., 2021; La Mesa *et al*., 2022; Marini *et al*., 2022a; 2022b).

Ongoing studies on food web structure will enable quantification of trophic interactions between species and potential community vulnerability to biodiversity loss and changes in sea-ice dynamics (Calizza *et al*., 2018, Signa *et al*., 2019; Rossi *et al*., 2019).

Human Activities

The Area is close to the Italian Station Mario Zucchelli (74°41'39"S,164°06'55"E) that can accommodate approximately 90 people, has facilities for helicopter operations and a jetty for the docking of small boats. Fuel used at the station is Jet-A1. The station is equipped with a waste water treatment plant. Treated water is discharged into the sea adjacent to the station 2.3 km from the northern boundary of the Area. A support ship regularly visits Mario Zucchelli Station during the summer, and there are occasional visits by tourist ships. These usually stop offshore several kilometers to the north of the Area.

Other nearby stations are Gondwana (74°38'0.7"S, 164°13'19" E; Germany), a summer station with capacity for approximately 25 personnel, Jang Bogo station (74°37'15"S ,164°11'57"E; Republic of Korea) year round station with a complement of 60 personnel during summer and 17 during winter, the new Qinling station (74°56'0.4"S, 163°42'55"E; China) at Inexpressible Island, a year-round station with a complement of up to 30 in winter and 80 summer personnel.

A gravel runway has been built at Boulder Clay site, Terra Nova Bay (74°44'45"S, 164°01'17"E, 205 m a.s.l.). The end of the runway is about 1.8 km from the penguin colony of Adelie Cove. An Environmental Impact Monitoring Plan has been developed to evaluate changes in the ecosystem during construction and operation of the runway (Draft CEE – MZS gravel runway ATCM39).

6 (ii) Access to the Area

Access into the Area is generally by ship. Access into the Area may be made by air or over sea ice when conditions allow. Access routes within the Area have not been defined.

6 (iii) Location of structures within and adjacent to the Area

There are no permanent structures within the Area. The nearest structure is the atmospheric monitoring facility (locally referred to as 'Campo Icaro') 650 m north of the northern boundary of the Area, while Mario Zucchelli Station (74°41'42"S, 164°07'23"E) is situated on a small peninsula on the coast adjacent to Tethys Bay, a further 1.65 km to the north. A gravel runway is located at Boulder Clay site, Terra Nova Bay (74°44'45"S, 164°01'17"E, 205 m a.s.l.). The end of the runway is about 1.8 km from the penguin colony of Adelie Cove. The Italian Marine Observatory in the Ross Sea (MORSea) maintains a mooring within the Area (74°45'25"S, 163°42'55"E).

6 (iv) Location of other protected areas in the vicinity

ASPA No. 178 Inexpressible Island and Seaview Bay is situated about 17 km to the south; ASPA No. 175 the high altitude geothermal sites on Mount Melbourne, is a terrestrial site situated 45 km to the NE.

6 (v) Special zones within the Area

There are no special zones within the Area.

7. Terms and conditions for entry permits

7 (i) General permit conditions

Entry into the Area is prohibited except in accordance with a permit issued by the appropriate national authority. Conditions for issuing a permit are that:

- it is issued for scientific purposes, or for educational purposes which cannot be served elsewhere;
- it is issued for essential management purposes consistent with plan objectives such as inspection, maintenance or review;
- the actions permitted will not jeopardise the values of the Area;
- any management activities are in support of the objectives of the Management Plan;
- the actions permitted are in accordance with the Management Plan;
- the permit, or a copy, shall be carried by the holder within the Area;
- permits shall be issued for a stated period.

7 (ii) Access to and movement within the Area

Access into the Area shall be by sea, land, over sea ice or by air. There are no specific restrictions on routes of access to and movement within the Area, although movements should be kept to the minimum necessary consistent with the objectives of any permitted activities and every reasonable effort should be made to minimise disturbance. Anchoring is prohibited within the Area. There are no overflight restrictions within the Area and aircraft may land by permit when sea ice conditions allow, taking into consideration the penguin colony situated at Adelie Cove and following the Guidelines for Operations of Aircraft near Concentration of Birds in Antarctica (Resolution 2, 2004), to limit disturbance.

Overflight and landings within the Area by Remotely Piloted Aircraft Systems (RPAS) are prohibited except in accordance with a permit issued by an appropriate national authority. RPAS use within the Area should follow the Environmental Guidelines for Operation of Remotely Piloted Aircraft Systems (RPAS) in Antarctica (Resolution 4 (2018).

7 (iii) Activities that may be conducted within the Area

Activities that may be conducted in the Area should not jeopardise the values of the Area and include:

- Scientific research that cannot be served elsewhere;
- Sampling, which should be the minimum required to reach the scientific goals. Selective and less-invasive sampling methods should always be considered to reduce disturbance of the rich bottom communities;
- Essential management activities, including monitoring and inspection;
- Operational activities in support of scientific research or management of the Area;
- Activities for educational and outreach purposes.

7 (iv) Installation, modification or removal of structures

Structures or scientific equipment shall not be installed within the Area except as specified in a permit. All markers, structures or scientific equipment installed in the Area shall be clearly identified by country, name of the principal investigator and year of installation. All such items should be made of materials that pose minimal risk of contamination of the Area. Removal of specific equipment for which the permit has expired is mandatory.

7 (v) Location of field camps

None within the Area.

7 (vi) Restrictions on materials and organisms which can be brought into the Area

- No living animals, plant material, pathogens or microorganisms shall be deliberately introduced into the Area.
- Poultry products, including food products containing uncooked dried eggs, shall not be introduced into the Area.
- No herbicides or pesticides shall be introduced into the Area.
- Chemicals, including radio-nuclides or stable isotopes, which may be introduced for the scientific or management purposes specified in the permit, shall be used in the minimum quantities necessary to achieve the purpose of the activity for which the permit was granted.
- All materials introduced in the Area shall be stored and handled so that risk of their accidental release into the environment is minimized and removed at the end of the period allowed in the permit.
- Visitors shall take special precautions against marine pollution and ensure that sampling equipment or markers brought into the Area are clean. Vessels that are found to show fuel leakage, or a significant risk of such leakage, are prohibited from entering the Area.

7 (vii) Taking or harmful interference with native flora or fauna

Taking or harmful interference with native flora or fauna is prohibited, except by permit issued in accordance with Annex II to the Protocol on Environmental Protection to the Antarctic Treaty. Careful environmental evaluation is needed concerning trawling, dragging, grabbing, dredging, or deployment of nets because of the sensitivity of the rich bottom communities to disturbance. More selective and less-invasive sampling methods should always be considered;

Where taking of or harmful interference with animals is involved, the SCAR Code of Conduct for the Use of Animals for Scientific Purposes in Antarctica (ATCM XXXIV-CEP XIV, 2011) should be used as a minimum standard.

7 (viii) Collection or removal of materials not brought into the Area by the permit holder

Any anthropogenic material found should be notified to the appropriate national authority.

Material may be collected or removed from the Area only in accordance with a permit. In this case removal of material should not create an impact greater than leaving the material in situ.

7 (ix) Disposal of waste

All wastes, including all human wastes, shall be removed from the Area.

7 (x) Measures that may be necessary to continue to meet the aims of the Management Plan

Permits may be granted to enter the Area to

- carry out monitoring and site inspection activities, which may involve the collection of limited samples for analysis or review, or for protective measures;
- Install markers on specific sites of long-term monitoring.

7 (xi) Requirements for reports

The holder of each permit issued should report to the appropriate national competent authority about the activity undertaken in the Area.

Such reports should include, as appropriate, the information identified in Appendix 2- ASPA visit report form of the Guide to the Preparation of Management plans for ASPAs (Resolution 2, 2011). Parties should, wherever possible, exchange with the Party that proposed the Management Plan, information on reports received to assist managing the Area.

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Map 1 Terra Nova Bay ASPA N° 161, Victoria Land, Ross Sea.