Criterion B: Distribution and Abundance

Sub-criterion Bi: Small and Resident Populations

A small distinct population of Weddell Seals exists at White Island. The presence of this small isolated population led to the designation of White Island as an ASPA (Testa and Scotton, 1999). The Weddell seal colony appears unable to relocate to another area because of its distance from the open ocean of McMurdo Sound, and as such it is highly vulnerable to any human impacts that might occur in the vicinity. The colony is not thought to have been present in the early 1900s, as there is no mention of seals by naturalists who visited White Island many times during Scott’s 1902, 1903 and 1910 expeditions. An ice breakout occurred in the region between 1947 and 1956, and the first two seals were observed near the
north-eastern end of the island in 1958 (R. Garrott, pers. comm). Year-round studies have detected no evidence of immigration or emigration of seals from the population, which appears to have grown to around 25 to 30 animals from a population of around 11 in the 1960s. The seals do not have the breathing capacity needed to dive the 20km required to reach the open ocean, and there is only one record of a seal from the colony making the journey over the ice shelf surface.

Sub-criterion Bii: Aggregations

Arnoux’s beaked whales, killer whales and Antarctic minke whales are seasonally abundant in the Ross Sea, taking advantage of the highly productive waters and associated prey that becomes available as the ice breaks up (Kasamatsu, et al. 1993, Ponganis, et al. 1995, Hobson and Martin 1996, Murase, et al. 2013). The Ross Sea continental slope is a hotspot for Arnoux’s beaked whales that are regularly seen in the area between McMurdo Sound and Terra Nova Bay where they may be summer residents (Smith et al. 2007). Antarctic minke whales occur in large numbers feeding throughout the Ross Sea (Ballard, et al. 2012) and have been estimated to consist of some 14,000 individuals in this region (Ainley, 1985). Among cetaceans, killer whales are seasonally prevalent in the Ross Sea (Lauriano et al., 2011). The dwarf killer whale form (C type) is found in McMurdo Sound (Pitman et al., 2007, 2018). Here, two population clusters have been identified: ‘regulars’ with strong inter- and intra-annual site fidelity and an average annual abundance of 73 individuals and a larger population estimated at 397 individuals, which were less frequently encountered. In McMurdo Sound type C killer whales have been recently assessed after 14 years of study (Pitman et al., 2018). A high degree of individual turnover in the area has been described. Nevertheless, in the sound two main population clusters have been discovered: regulars with strong inter and intra annual site fidelity and irregulars with nomadic lifestyle, which can travel along the coastal area spotting feeding areas (Pitman et al., 2018). Inter-annual site fidelity
has been observed with 73 individuals that are regularly seen while 397 were irregularly observed in the area (Pitman et al., 2018). Less regular data are available from the TNB area, where type C and B1 killer whales were studied in the austral summers 2003-4 and 2014-15; C type individuals were re-sighted between the two periods in the same location along the ice shelf (Lauriano and Panigada, 2015).

High site fidelity of Weddell seals population is based on two colonies occurring in Terra Nova Bay that have persisted for long periods of time in the same area. Weddell are concentrated during the summer on coastal fast ice. The unique and outstanding ecological and scientific value of the region has consistently attracted international scientific interest and led to the establishment of the Ross Sea Region Marine Protected Area (MPA) by the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) in October 2016. The extensive continental shelf, combined with considerable shore-fast and pack ice habitat, creates ideal habitat for Weddell seals. Weddell seals inhabit cracks in the fast ice formed along the shoreline, ice tongues and islands resulting from tidal fluctuations (Hückstädt 2018b). They favour cracks that are far away from open water, close to the shoreline. The abundance of this habitat has enabled what appears to be the highest density and thus population of Weddell seals anywhere in Antarctica (M. Le Rue pers comm). Recent tracking revealed that Weddell seals (Goetz 2015) move throughout the western reaches of the Ross Sea throughout the year; the movement patterns of the other seal species are not as well documented but they are considered to be resident (Meade, Ciaglia et al. 2015, Krause, et al. 2016).

Leopard seals remain near the coastal zone when the ice is offshore, but move with the ice when it is closer to land (Meade et al. 2015). They are most commonly observed near penguin colonies during the spring and summer months (Krause, et al., 2016; Pinkerton et al., 2010). Crabeater and Ross seals are associated with the pack ice (Southwell, et al. 2012,
Bengtson and Stewart 2018). While Ross seals are known to occur in the Ross Sea, their abundance, distribution and general biology are poorly known (Arcalis-Planas, et al. 2015, Hückstädt 2018a). Given their abundance and their broad diet (krill, fish to seals and penguins) the four species of seals represent a significant energy transfer within the Ross Sea food web (Pinkerton et al. 2010).

**Criterion C: Key Life Cycle Activities**

**Sub-criterion Ci: Reproductive Areas**

There are numerous breeding aggregations of Weddell seals along the Victoria Land Coast that are associated with the coastal tidal cracks in the shore-fast ice. Another significant breeding aggregation is associated with Cape Colbeck in the eastern Ross Sea (Davis et al., 2008). The breeding colony at White Island is composed of some 84 Weddell seals that were known to have existed between 1990 and 2000 (Testa and Scotton 1999, Gelatt, et al. 2009). Between 2003 and 2007, 11 females have been sighted at White Island, but only six of these individuals have produced pups. Between two and four live pups were recorded in 1963-1968, 1981, and 1991. Annual censuses since 1991 recorded between four and ten pups from 1991 to 2000, but lower numbers (between two and four pups each year) from 2000 to 2007. Pup mortality is high, possibly due to inbreeding and pup production is low in comparison to the population in Erebus Bay.

**Sub-criterion Cii: Feeding Areas**

The area is an important summer feeding habitat for the three whale species and is a year-round feeding habitat for the four seal species. Minke whales feed on krill, while killer whales feed on penguins, crabeater and Weddell seals, as well as Antarctic toothfish (*Dissostichus mawsonii*). The B1 type killer whales prey primarily on ice seals and occur commonly along to the ice shelf in austral summer to take advantage of
both the seals and the Adelie and emperor penguin colonies (Cape Washington, Edmonson point, Adelie Cove, Inexpressive Island) in the Ross Sea coastal area. Extensive movements from McMurdo Sound and Terra Nova Bay by B1 type killer whales have been described for this killer whale ecotype (Andrews et al., 2008; Lauriano et al., 2007). Satellite studies conducted in both McMurdo Sound and TNB show areas along the western Ross Sea coastline where C killer whales have been engaged in feeding activities and long-distance travel beyond the coast, outside the polar front (Pitman et al, in prep.; Lauriano & Panigada, 2015; Eisert et al., 2015). This killer whale type feeds only on fish. B1 ecotype is a mammal eating form, which preys primarily on ice seals and occur commonly along to the ice shelf in austral summer to take advantage of both the seal and Adelie penguin colonies in the area (Andrews et al., 2008; Lauriano et al., 2007a,b). The most important component in their diet is the Antarctic toothfish, which is by far the largest species of fish in Antarctic waters. Moreover, other species have been considered in type C killer whales’ diet and these all belong to the Nototheniodae, a suborder that includes pelagic and semi pelagic species which dominate the fish fauna at > 90% levels of abundance and biomass in the Ross Sea and in the cIMMA. The Antarctic silverfish (*Pleurogramma antarcticum*) is one of the most abundant fish in the suborder and a prey of the toothfish; a nursery area has been described in the Terra Nova Bay where type C killer whales feed regularly along the ice shelf (Lauriano & Panigada, 2015). Satellite tracking studies conducted in both Mcmurdo Sound and Terra Nova Bay show that type C killer whales engage in feeding activities (Area Restricted Search – ARS and diving activities) in both Terra Nova Bay and Lady Newnes Bay, and they travel long distances away from the coast, outside the polar front (Lauriano & Panigada, 2015; Eisert et al., 2015).

Antarctic minke whales feed in large numbers in the whole Ross Sea area (Ainley et al., 1985; Ballard et al., 2012; Ainley et al (1985). They are commonly seen foraging in the leads that develop in the fast/pack ice
(Friedlaender et al. 2014) as far south as Cape Armitage. The Arnoux’s beaked whales are regularly seen, and presumably feed, in the area between McMurdo Sound and Terra Nova Bay (Lauriano et al., 2011) where the species has been considered as resident in summer (Smith et al., 2007). Leopard seals prey on Adélie penguins (Pygoscelis adeliae), crabeater seals, and Emperor penguins (Aptenodytes forsteri). Leopard seals remain near the coastal zone when the ice is offshore, but move with the ice when it is closer to land (Meade, et al. 2015). They are most commonly observed near penguin colonies during the spring and summer months (Krause et al., 2016; Pinkerton et al., 2010). Recent tracking revealed that Weddell seals (Goetz 2015) move throughout the western reaches of the Ross Sea throughout the year; the movement patterns of the other seal species are not as well documented but they are considered to be resident (Meade, et al., 2015, Krause et al., 2016).

**Sub-criterion Ciii: Migration Routes**

Migration routes for C Type killer whale along the Ross Sea coast were described in 2015 (Lauriano and Panigada, 2015; Eisert et al., 2015). Movements with high persistence and low turning angle along with shallow diving activities, occurred alongside the coastal area between the tagging location (TNB) and outside the polar front; this transiting behaviour show a migratory pattern beyond the polar front towards New Zealand sub-tropical waters (Lauriano and Panigada, 2015; Eisert et al., 2015).

**Criterion D: Special Attributes**

**Sub-criterion Di: Distinctiveness**

This is the southernmost range extension for the whale and seals species and as such represents the southernmost natural habitat for any mammal (besides humans). The breeding colony at White Island is composed of some 84 Weddell seals that were known to have existed between 1990
and 2000. This is an isolated breeding aggregation that was likely founded by a small group of individuals (three females and two males) that accessed the island during a brief break in the surrounding sea ice in the mid-1950s) and is genetically isolated (Testa and Scotton 1999, Gelatt, et al. 2009).