A group of approximately ten penguins is walking across a large, flat, white ice floe. The ice floe is partially submerged in dark, calm water. In the background, a long, low, dark landmass or island stretches across the horizon under a cloudy, overcast sky. The overall scene is a stark, cold, and desolate Antarctic landscape.

# The East Antarctic Marine Park

## Maintaining Australia's Legacy

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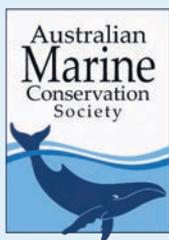
All photos: ©John Weller (excluding images featured on Foreword page)

Front and back cover: The proposed East Antarctic Marine Park will protect foraging grounds and important food sources for Adélie penguins, one of two penguin species that breed on the Antarctic continent. Photo: © John Weller

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*"The spotlight is now on Australia – it must lead the nations of the world in the Antarctic Treaty's next key step: the creation of the East Antarctic Marine Park."*

## Foreword

When Douglas Mawson signed up as physicist on Ernest Shackleton's 1907–09 Antarctic expedition, it was the beginning of Australia's long engagement with the icy continent. Mawson followed it with an expedition of his own (the Australasian Antarctic Expedition of 1911–13), while expedition photographer, Melbourneian Frank Hurley, was present to record the demise of Sir Ernest Shackleton's doomed ship *Endurance* on his 1914–17 Imperial Trans Antarctic Expedition.

The epic adventures of Shackleton and Mawson served as inspiration for two of my own expeditions, to re-trace them. Today, however, I use my expeditions more as a means to promote awareness of climate change.

When retracing Shackleton's journey 100 years on, my crossing of the Sub-Antarctic Island of South Georgia involved traversing two glaciers, compared to his three. The third glacier had been claimed by climate change and was an icy lake we waded across. 85% of South Georgia's glaciers are in danger of suffering the same fate.

So often, the arrival of explorers negatively impacts indigenous peoples and wildlife, and certainly Antarctica's environment suffered with the historic plundering by sealers and whalers. But the legacy of Antarctic exploration has also been incredibly positive in terms of what it has taught us – a learnt sense of shared responsibility for our planet, a vast body of scientific research and, since 1959, a precedent-setting Antarctic agreement that perhaps paves the way for peaceful, collaborative management of other global commons like our atmosphere and oceans.

Antarctica is, by any measure, an extraordinary place. It is the Earth's highest, driest, windiest and coldest continent. My expedition to cross it in 1999 was brutal

and uncompromising, the extreme cold causing frostbite, my metal fillings to contract and drop out, and a 20% loss in my body weight.

But Antarctica is also a place of remarkable beauty and a frontier of ecological importance and extremes. It is a continent of icefields, glaciers, mountain ranges, canyons and two active volcanoes. Lapping its shores is the Southern Ocean, with ferocious winds, huge waves, ever-changing sea ice and the world's largest ocean current. Its fauna, including penguins, seals, whales, albatrosses, krill and toothfish, are perfectly adapted to what, for humans, are desperately inhospitable conditions.

This ocean also has a powerful influence on global climate, absorbing much of the emitted carbon dioxide and warmth, but its temperature, acidity and freshness are now increasing due to climate change.

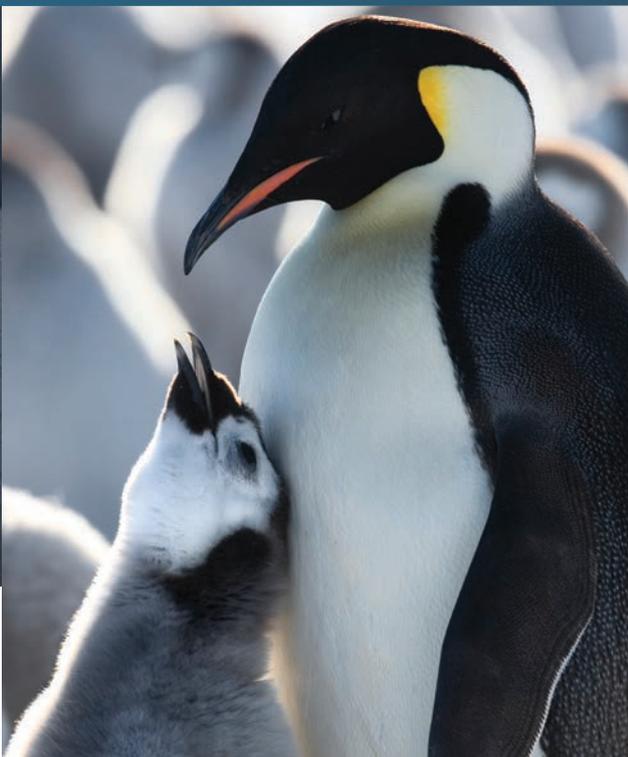
Over the years there have been commitments to protect the Southern Ocean. Two marine parks now protect parts of the Antarctic – the South Orkney Islands and the Ross Sea – but their creation is only the first step in establishing the Antarctic marine park coverage that is urgently needed. The next marine park to be considered lies in the East Antarctic.

With January 2020 marking the 200th anniversary of Antarctica's first sighting, the creation of a ring of marine park protection right around the Antarctic continent is long overdue. The spotlight is now on Australia working with the nations of the world to lead the next key step: the creation of the East Antarctic Marine Park.

**Tim Jarvis AM**  
*Adventurer and Environmental Scientist*

# Executive Summary

Australia is close to achieving a major conservation win for the Southern Ocean. More than 90% of the members of the international commission in charge of fishing and conservation in Antarctic waters support the creation of a big new marine park for the East Antarctic.



The proposed East Antarctic Marine Park, almost a million square kilometres, would protect important foraging areas and essential food sources for emperor penguins (inset) as well as seals, whales and other seabirds. Photos: ©John Weller

The Antarctic is managed by many nations. But Australia has been consistently one of the most influential – with a long history of leading moves to keep the Antarctic wilderness safe from exploitation. To achieve the proposed marine park would maintain Australia's strong positive legacy in Antarctica – as explorers, scientists, treaty-makers and environmental managers.

The 1911–14 Australasian Antarctic Expedition, led by geologist Douglas Mawson, was an exploration epic and greatly advanced scientific knowledge of Antarctica. It inspired ongoing scientific endeavours that led to Australia being a key architect and one of the 12 original signatories to the seminal 1959 Antarctic Treaty. Then, in a mighty diplomatic feat 30 years ago, Australia and France persuaded the other

treaty nations to reverse plans to allow mining in the Antarctic, and to instead declare a ban on mining. Antarctica was then designated as a 'natural reserve, devoted to peace and science'.

Australia was also influential in negotiating a groundbreaking convention in 1982 to protect Antarctic marine life – not just oversee its exploitation. In 2002, the Antarctic nations made a very significant decision – they committed to creating a network of marine parks. So far, two have been established. The next marine park proposal to be considered will be Australia's proposal for the East Antarctic Marine Park. A great deal hinges on this decision – currently less than 5% of the Southern Ocean is protected.

Change has been relentless since sealers sailed into the Southern Ocean two centuries ago. First seals, then whales, then fish, were rampantly hunted, some species to the brink of extinction. Thanks to the global agreements on environmental management of Antarctica, exploitation is now much better controlled.



But industrial-scale fishing in the Southern Ocean is expanding and, as fisheries elsewhere decline, the pressure to exploit its resources, whether legally or illegally, will grow. Also looming are the consequences of climate change. The ocean is warming, acidifying and freshening; ice shelves are collapsing.

The key challenge for Antarctic Treaty nations is to eliminate as many threats as possible to give species the best chance of resisting or adapting to inevitable changes. For this, marine parks are essential. They protect vulnerable habitats and species and boost their resilience to climate change.

The proposed East Antarctic Marine Park would protect three large areas encompassing close to a massive 1 million km<sup>2</sup> of ocean. Each area harbours unique ecosystems and features, and contains important foraging grounds for penguins, seals, whales and flying seabirds. It includes scientific reference areas essential for achieving sustainable fisheries, understanding climate change and determining conservation priorities.

Giving hope that the necessary consensus can be achieved, was a decision in 2016 by the commission to create the 1.5 million km<sup>2</sup> Ross Sea Marine Park in the Antarctic – the world's largest marine park. Tantalisingly, Australia and its co-proponents could achieve the same for East Antarctic waters.

The establishment of the East Antarctic Marine Park led by Australia would be a major achievement for a small nation with a powerful voice in international forums and would be something for Australians to celebrate. Coming 60 years after the Antarctic Treaty and 30 years after the protocol banning mining, it would maintain our well-deserved legacy achieved over more than a century of Australian leadership in Antarctica.



It will take a long time for some whale species in the Southern Ocean to recover from rampant hunting during the 20th century. Antarctic blue whale populations remain at only about 1% of their former abundance, having dropped from more than 250,000 to fewer than 400 in 1972.<sup>25</sup> Photo: ©John Weller

## A place of peace and science

Down to 90 below freezing, 300 km/h gales, 4.7 km-thick ice, but barely any snow or rain – Antarctica is a fierce land. Few lifeforms can endure the coldest, windiest, iciest and driest of continents: mainly lichens, algae, fungi, bryophytes and small invertebrates; as well as just two flowering plants and the scene-stealing seals, penguins and flying seabirds.<sup>1</sup>

**But slide off the ice into the sapphire waters of the Southern Ocean, and it is a very different story. Life here in Earth's coldest ocean is prolific and diverse. More than 8000 species have been recorded so far, probably half or more unique to these waters.<sup>2,3</sup>**

Manyfold more are yet to be discovered. With over 90% of the Southern Ocean 1–7 km deep, most remains unexplored.<sup>2</sup>

The mosaic of habitats created by seamounts, ridges and canyons, shelves and slopes, sea ice and ice

shelves, ocean fronts and gyres, upwellings and polynyas has spawned remarkable riches in polar-adapted families.<sup>4,5</sup>

Southern Ocean species are often slow-growing, long-living and big.<sup>5</sup> The blue whale, weighing up to 170 tonnes, is the largest animal ever to have lived on Earth, while some 2-metre-high glass sponges may be thousands of years old and the world's oldest animals.<sup>6,7</sup>

Southern Ocean species often have ingenious adaptations for freezing waters. As Gondwana broke up, isolating Antarctica, abrupt cooling wiped out most fish, creating enormous opportunities for one bottom-living species blessed with an antifreeze glycoprotein. Freed of competition, this notothenioid fish radiated spectacularly into more than 120 species, a group now making up more than 90% of the fish biomass (the amount of living tissue) on the continental shelf.<sup>8,9</sup> The biggest of them is the Antarctic toothfish, growing to 2 metres and living 50 years.<sup>10</sup> Another is the Antarctic silverfish, the most abundant open-sea fish in Antarctic waters and an important food source for seals, whales, and other fish.<sup>11</sup>

*“To help species cope with inevitable change, the challenge for Southern Ocean managers is to eliminate as many stressors as possible. For this, marine parks are essential.”*

Another ecologically critical species is Antarctic krill, a crustacean of 'delicate and feathery beauty'.<sup>12</sup> They number in the hundreds of trillions and have the largest biomass of any wild species on Earth.<sup>12,13</sup> The future of many other animals – whales, seals and penguins – depends on maintaining healthy krill populations.

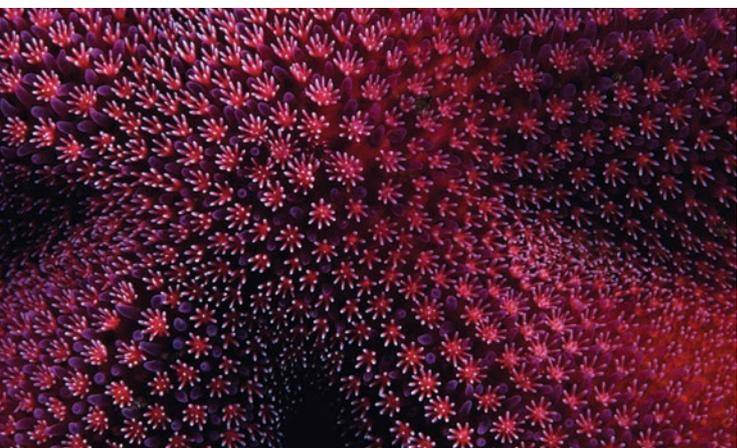
Ever since sealers sailed into the Southern Ocean 200 years ago, it has been subjected to relentless change.<sup>14</sup> First seals, then whales, then fish, were rampantly hunted, some species to the brink of extinction.<sup>15</sup>

International agreements now require Antarctica to be managed for 'peace and science', and exploitation is much better controlled.<sup>2</sup> Australia can claim much credit for this transformation. Some species are recovering well, while others such as the blue whale remain at a small fraction of their former numbers.<sup>15,16</sup>

However, industrial-scale fishing in the Southern Ocean is expanding – focused mainly on krill, toothfishes and mackerel icefish – and, as fisheries elsewhere decline, the pressure to exploit the Southern Ocean, whether legally or illegally, will grow.

Also looming are the consequences of the changing climate. The ocean is warming, acidifying and freshening; ice shelves are thinning and collapsing.<sup>17-19</sup> How wildlife will fare is mostly unknown. In some places, changes are already evident in phytoplankton, Antarctic krill, penguin and seal populations.<sup>20-24</sup>

To help species cope with inevitable change, the challenge for Southern Ocean managers is to eliminate as many stressors as possible. For this, marine parks are essential.



More than 8000 species have so far been recorded in the Southern Ocean, but the total number is likely to be far greater. The species include anemones (top), sea stars (*Odontaster validus*, bottom left), and fishes (*Trematomus bernacchii*, bottom right). Photos: ©John Weller

# Australia's legacy in Antarctica

As explorers, scientists, treaty-makers and environmental managers, Australians have a legacy in Antarctica to be proud of.

In 1911, the Australasian Antarctic Expedition, led by geologist Douglas Mawson, set out to explore for the first time the vast stretch of Antarctic coastline and hinterland south of Australia. The travails of Mawson on a sledging trip during which his two companions died have been described as the 'greatest survival story in the history of exploration'.<sup>26</sup> Much more than this, the expedition greatly advanced geographical, geological and oceanographic knowledge of Antarctica, and inspired ongoing scientific endeavours, much of it conducted at Australia's three research stations on the continent.

Thanks to that scientific commitment, Australia became a key architect and one of 12 original signatories to the 1959 Antarctic Treaty.<sup>27</sup> Another 42 countries have since signed on.<sup>28</sup> The treaty was designed to prevent territorial conflicts by freezing all claims to the continent and to foster peace and science. 'Antarctica shall be used for peaceful purposes only,' says Article 1.

Then, 30 years ago, 'Australia took a brave and influential step in Antarctic diplomacy'.<sup>29</sup> The signatories to the Antarctic Treaty had negotiated another treaty, this one to enable mining in Antarctica. But when it came one year later for ratification, Prime Minister Bob Hawke balked at signing. He later said of this moment, 'Here was the last pristine continent ... I thought, "No bloody way"'.<sup>30</sup> Opposition leader John Howard also opposed mining Antarctica.

In a mighty diplomatic feat, Hawke, with his ally, the French prime minister, eventually persuaded all other signatories to instead ban mining and drilling. The resulting environmental protocol designates Antarctica as a 'natural reserve, devoted to peace and science' and prioritises environmental protection.

One conservation success in the Southern Ocean has been a major drop in the number of seabirds captured by longline fishing, mainly due to increased enforcement and improved fishing techniques. Photo: ©John Weller



Four seal species breed in the East Antarctic region: Weddell (shown here), crabeater, Ross and leopard. Weddell seals are the most southerly breeding mammals in the world. Photo: ©John Weller

Australia was also influential in negotiating the 1982 Convention on the Conservation of Antarctic Marine Living Resources. This created a commission with representatives from 24 countries and the European Union to protect the Southern Ocean's marine life and manage fishing. Its headquarters are in Tasmania. This was the first international agreement to apply an ecosystem approach to marine conservation.

In 2009, the commission committed to creating a network of marine protected areas. So far, just two marine parks have been established, protecting less than 5% of the Southern Ocean.

In 2012, in partnership with France and the European Union, Australia proposed a large marine park in East Antarctic waters. Consensus is required, so every member nation of the commission needs to be persuaded. This is very close to being achieved with a major push by the Antarctic nations to get it done.

**To achieve the East Antarctic Marine Park would be to maintain Australia's strong legacy in Antarctic protection and be a fitting tribute to our long-standing Antarctic connection.**

It would also be in Australia's national interest – reinforcing our long standing support for the Antarctic Treaty System.<sup>27</sup>

It's also what is needed to help Southern Ocean wildlife survive the relentless changes ahead.



# The role of marine parks in Antarctic waters

Marine parks are accepted globally as essential for healthy ocean ecosystems.<sup>31</sup>

Historically, their main purpose was to protect vulnerable habitats and species from harmful human activities such as fishing and mining. Study after study has shown that highly protected marine parks boost the number, diversity and size of fish and other species, and that this benefits fisheries by spilling over into unprotected areas.<sup>32,33</sup> A 2019 review found that one hectare of a 'no-take' reserve produces, on average, at least five times as much fish as an equivalent unprotected hectare.<sup>34</sup>

More recently, large marine parks have been recognised as important for boosting the resilience of species to climate change, which operates over far larger scales than other threats.<sup>35,36</sup> Biological communities in a more natural condition tend to be more resilient.

Removing as many other stresses as possible gives marine life the best chance of resisting or adapting to changes and recovering from extreme events.<sup>35</sup>

For penguins this means protecting their foraging grounds and food sources such as krill, which are vulnerable to fishing and climate change impacts.<sup>37</sup> For keystone species like krill and Antarctic silverfish, it's important to protect nursery areas and productive habitats.

Another function of marine parks is as natural laboratories for learning about ecological processes and long-term changes. The Southern Ocean is among the world's most rapidly changing regions, and it is difficult to predict how species and ecosystems will respond, particularly to multiple interacting changes such as fishing, warming, changing ice cover and acidity.<sup>18,38</sup>

All these benefits of marine parks and more were recognised by the members of the Southern Ocean commission in 2011 when they adopted a framework aimed at protecting representative examples of biodiversity and habitats, ecosystem processes, scientific reference areas, vulnerable habitats, features with critical functions, and areas to maintain resilience.<sup>39</sup>

The marine park proposed for East Antarctica can achieve many of those goals.



*"Marine parks are accepted globally as essential for healthy ocean ecosystems."*



Marine parks are essential for minimising threats to species likely to be affected by the inevitable consequences of climate change such as reduced sea ice. The production of sea ice is vital to the survival of krill, a major food for whales, seabirds and seals, including Weddell (main photo) and crabeater seals (inset photo). Photos: ©John Weller

This is the part of Antarctica that in its Gondwanan past was attached to Australia and India. Most lies within the East Antarctic. It features two major basins separated by one of the largest plateaus in the Southern Ocean.<sup>40</sup> There are seamounts and canyons with distinctive deep-water species and a continental shelf dissected by depressions and canyons.<sup>41</sup> It is an important area for the production of Antarctic bottom water (the coldest water in the ocean, which strongly influences ocean currents).<sup>42</sup>

There are more variable food webs here than in many other regions. Krill are dominant in some ecosystems but copepods and lanternfish in others.<sup>43</sup> And where there are prey, there are predators – these waters are important for penguins, whales, seals and flying seabirds.<sup>44</sup> East Antarctica supports more than 500,000 breeding pairs of Adélie penguins and 50,000 pairs of emperor penguins (based on counts up to the 1980s), with breeding colonies up to 100 km or more from the open sea.<sup>45,46</sup> Minke, humpback, blue and fin whales inhabit these waters as well as crabeater, Weddell, Ross and leopard seals.<sup>47,48</sup>

### Penguins and climate change

Sea ice is very sensitive to global warming. With warming of two degrees above pre-industrial temperatures, the two penguins dependent on sea ice, Adélie and emperors, could lose more than half their existing breeding colonies.<sup>49</sup> Chinstrap (shown here) and Adélie penguin populations in the West Antarctic Peninsula and Scotia Sea have already declined, probably due to fewer krill, their main prey, in years of reduced sea ice.<sup>22</sup> Krill density in this region has declined by as much as 80% since the mid-1970s.





The East Antarctic Marine Park would protect crucial foraging habitats for Adélie (shown here) and emperor penguins. Their dependence on sea ice and krill makes them highly vulnerable to climate change and overfishing. Photo: ©John Weller

## The opportunity for an East Antarctic marine park

In October this year, representatives from 24 countries and the European Union (all members of Antarctica's marine life commission) will gather in Hobart to discuss further protections for the Southern Ocean. It's been some years now since the 2012 deadline they set themselves to create a comprehensive network of marine parks. So far, less than 5% of the Southern Ocean has been protected.

On the table are three proposals, including that for the East Antarctic Marine Park. Sponsored by Australia, France and the European Union, this park would protect three large blocks encompassing close to 1 million km<sup>2</sup> of ocean from the East Antarctic coastline to beyond the continental shelf.

Each block would protect unique ecosystems and features, including sites where Antarctic bottom water is formed (this is the coldest water in the ocean and strongly influences ocean currents). They are rich in seafloor life and important foraging areas for Adélie and emperor penguins, the two penguins dependent

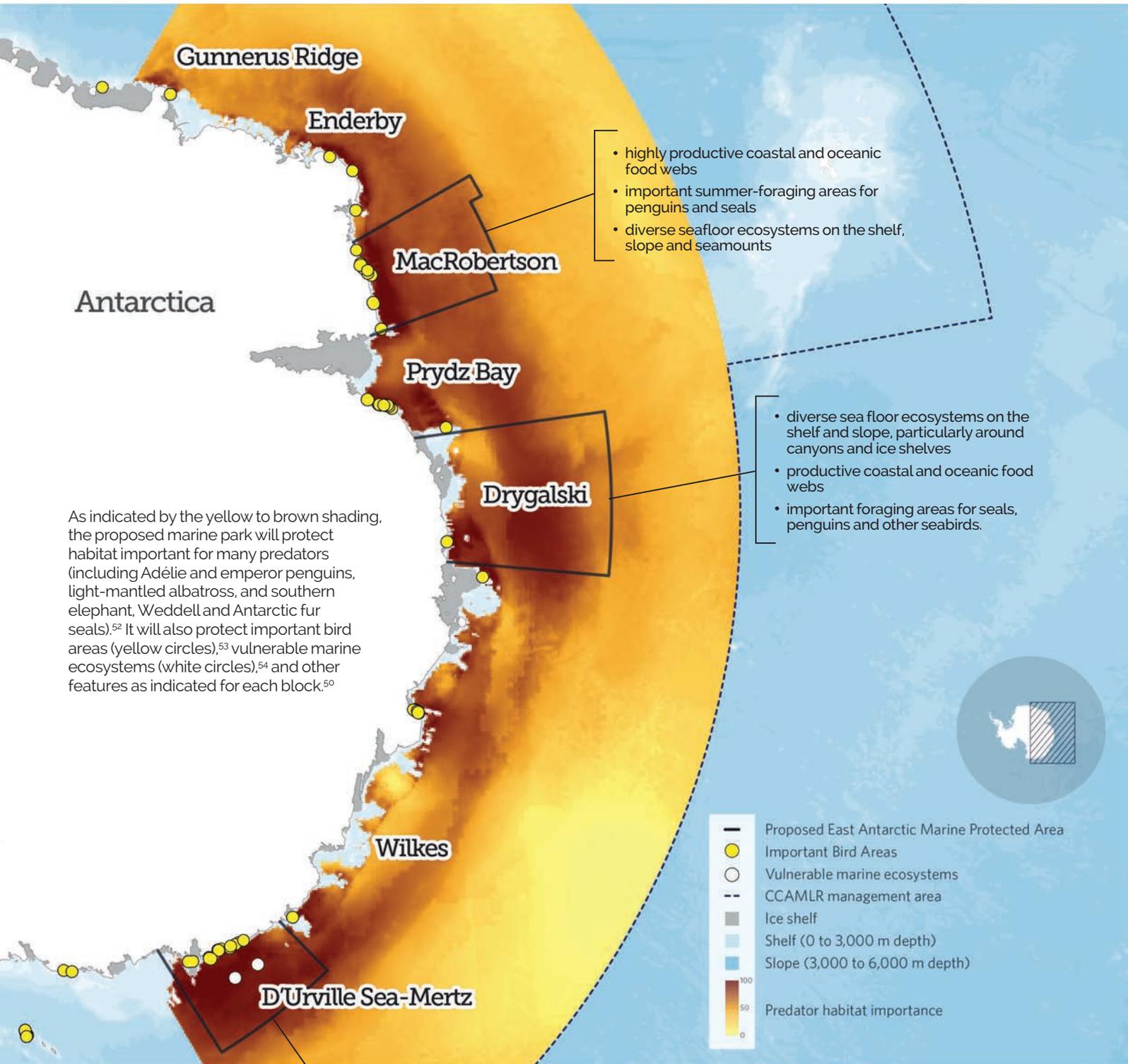
on sea-ice. Their size has been determined by the foraging requirements of penguins, seals, and flying seabirds during the critical summer breeding period.<sup>50</sup>

They include large scientific reference areas for measuring natural variability and long-term changes – essential for achieving sustainable fisheries, understanding climate change impacts and determining conservation priorities.

**Negotiations over the past few years have succeeded in gaining the support of more than 90% of member nations for the East Antarctic Marine Park.**

Giving hope that consensus can be achieved was a decision in 2016 by all member nations to create the 1.5 million km<sup>2</sup> Ross Sea Marine Park, the world's largest.<sup>51</sup> Australia and its co-sponsors could achieve the same for the East Antarctic ocean.

# Values of the proposed East Antarctic Marine Park



- highly productive coastal and oceanic food webs
- important summer-foraging areas for penguins and seals
- diverse seafloor ecosystems on the shelf, slope and seamounts

- diverse sea floor ecosystems on the shelf and slope, particularly around canyons and ice shelves
- productive coastal and oceanic food webs
- important foraging areas for seals, penguins and other seabirds.

- Antarctic bottom water formation, which drives global ocean circulation and traps greenhouse gases, an important area for understanding climate change
- unique habitats due to bottom water formation
- diverse seafloor habitats on the shelf and slope, particularly around canyons, ice shelves and the Mertz Polynya
- coastal and oceanic food webs, and foraging areas for mammals and birds
- a nursery area for Antarctic silverfish
- vulnerable marine ecosystems



Australia must build on its legacy of strong global leadership to protect one of the world's last great wildernesses and its unique wildlife. Photo: ©John Weller

## Conclusion and recommendations

The proposed East Antarctic Marine Park has outstanding values. Its establishment, led by Australia, would be a major achievement for a small nation with a powerful voice in international forums and something for Australians to celebrate.

**Coming 60 years after the Antarctic Treaty and 30 years after the Antarctic environmental protocol, it would maintain the legacy achieved over more than a century of Australian leadership in Antarctic conservation.**

It would serve as a powerful exemplar about what can be achieved through international cooperation.

The required consensus is close to being achieved. Smart diplomacy achieved an agreement for the creation of the ground-breaking Ross Sea Marine Park in 2016. The opportunity to take the next key step in securing the Antarctic's future is now before the nations of the world that have pledged to conserve it. This is an important moment in Australia's Antarctic legacy and the future of one of the last remaining wild areas of the planet.

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