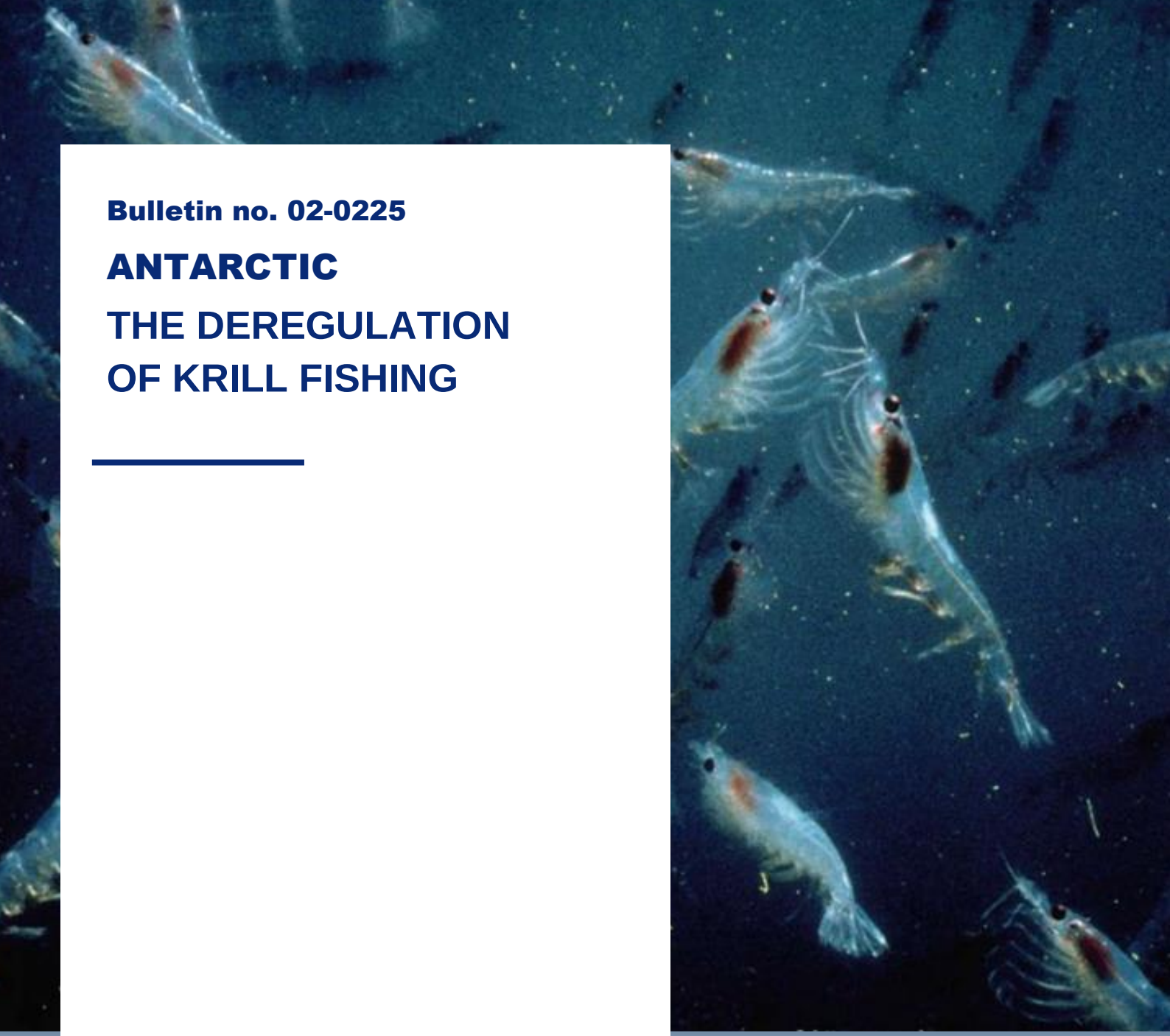

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ANTARCTIC
THE DEREGULATION OF KRILL FISHING

FEBRUARY 2025

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The abandonment of the preventative measure to avoid over-concentration of krill catches

An alarming setback in ecosystem-based management of krill fishing noted at the 43rd annual meeting of the Commission for the Conservation of Antarctic Marine Living Resources.

The Antarctic krill *Euphausia superba*, a small pelagic crustacean that whales in particular feed on, is a major component of the Southern Ocean food web. With an estimated biomass of between 300 and 500 million tons, this source of marine protein could ultimately make a significant contribution to global food security. Rich in fatty acids reputed to be beneficial to health and a staple food for fish farming, krill is increasingly fished and the krill industry is set to develop considerably over the coming decades. This growing demand is sparking a wave of interest, with some companies (Norway's *Aker Qrill*, China's *Liaoyu* Group) and the government of the Russian Federation announcing the construction of new factory ships.

Antarctic krill *Euphausia superba*. *Krill swarms can be as dense as 20,000 individuals per cubic metre, making them particularly easy for hunting (whales) or fishing. Credit: HuiledeKrill.com*

‘ The Antarctic krill industry is set to grow considerably over the coming decades under the pressure from the booming fish farming sector ‘

Norway and China are the two main players in Antarctic krill fishery. Against this economic backdrop, the precautionary approach to managing the *Euphausia superba*[1] krill fishery is being hotly debated at international level. As a direct result of these tensions, at its last annual meeting in October 2024, the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) was forced to abandon a key measure in krill conservation setting regionally differentiated fishing trigger levels to avoid over-concentration of catches in a given area. This is an alarming step backwards for conservation in the Southern Ocean.

Since the beginning of intensive exploitation of animal resources in Antarctica at the end of the 18th century, uncontrolled hunting and fishing have led to the collapse of many seal and whale species, the Kerguelen hake and, more recently, some populations of Patagonian toothfish. The potentially devastating effects of massive and relatively rapid harvesting have left entire populations of higher trophic level species bled dry (Fig. 1). The easing of economic pressure linked to a decline in commercial attractiveness, particularly on oil from whales, seals and even penguins, combined with the emergence of a 'conservationist' consciousness, has led to the introduction of regulations on exploitation activities in the Southern Ocean, in particular the Convention for the Conservation of Antarctic Marine Living Resources (or 'CAMLR' Convention) which have enabled overexploited populations to thrive once again. This Convention, which came into force in 1982, was established in 1980 following negotiations between the Consultative Parties to the Antarctic Treaty, which recognised that unregulated fishing for krill could have harmful effects both on krill resources and on dependent (predator) and associated (prey) species and populations.

The CAMLR Convention has established a Commission that brings together both the 27 member Contracting Parties[2] of the Commission, which participate in the decision-making processes and the budget, and the Contracting Parties that are not members of the Commission but undertake to respect the terms of the Convention. A Member State must have research or fishing activities relating to the living resources covered by the Convention. Among the Members is the European Union (EU) as a regional economic integration organisation, given its exclusive Community competence in fisheries. The EU

[1]There is another species of krill in the Southern Ocean Seas, *Euphausia crystallorophias*, which is less exposed to fishing pressure for the moment due to its coastal distribution.

[2] South Africa, Germany, Argentina, Australia, Belgium, Brazil, Chile, People's Republic of China (China), Republic of Korea (Korea), Ecuador, Spain, United States of America, France, India, Italy, Japan, Namibia, Norway, New Zealand, Kingdom of the Netherlands (Netherlands), Poland, United Kingdom of Great Britain and Northern Ireland (United Kingdom), Russian Federation (Russia), Sweden, Ukraine, European Union (EU) and Uruguay.

therefore sits alongside Member States of the European Union that are members of the CCAMLR, such as France and Germany, and this dual representation requires close coordination. In particular, France sits on the CCAMLR for the representation of its non-EU territories, the Kerguelen and Crozet islands, which are included in the area of application of the CAMLR Convention and form part of the 'Terres australes et antarctiques françaises' (TAAF), which enjoy the status of Overseas Countries and Territories (OCT). Under the terms of a 'Chairman Statement' supplementing its accession to the Convention, France enjoys a special status that gives it the right to apply the CCAMLR conservation measures in these areas on a voluntary basis.

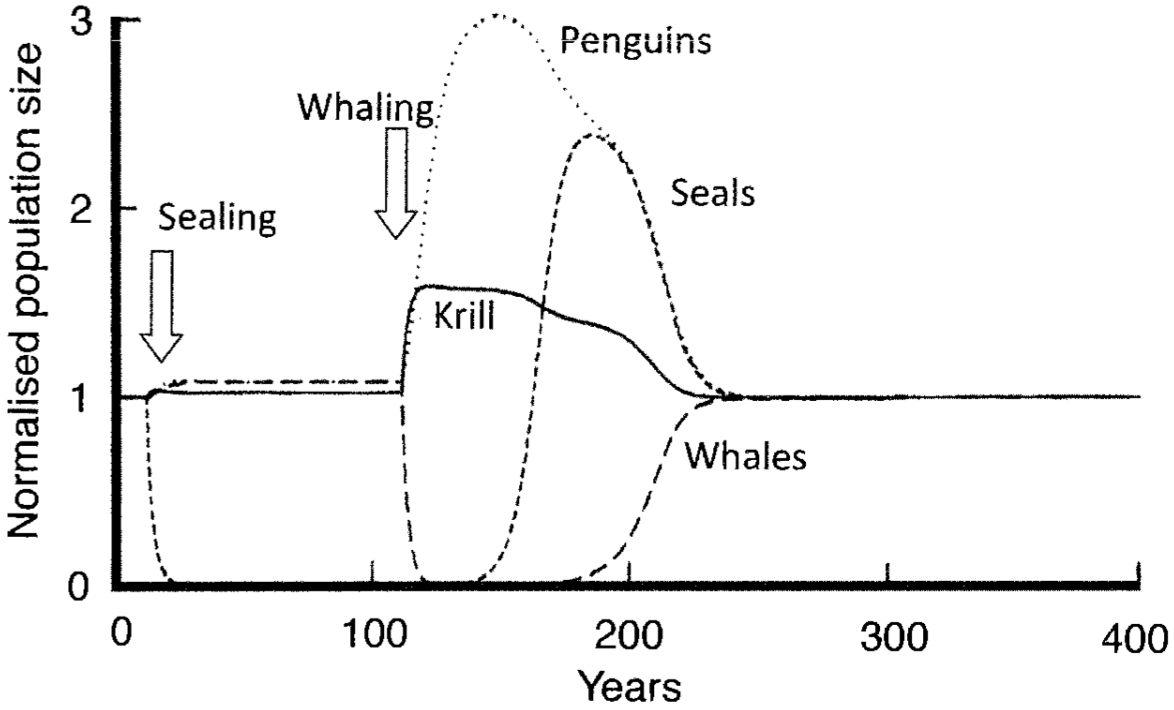

Fig. 1: Simulation model of the population dynamics of seals, whales, penguins and krill to understand the effects of seal and whale exploitation on other ecosystem compartments (Murphy, E.J., 1995). During the period of seal exploitation (years 25 to 125 of the simulation), the other ecosystem compartments were little affected. However, as soon as whale exploitation began (year 125), the quantity of krill increased by almost 50%, with an increase in other predators (penguins, seals). The speed at which populations return to their initial equilibrium depends very much on the speed at which they recover, which in turn depends on the intensity of exploitation and the growth rate of the species. Intensive exploitation of krill, which began with the emergence of innovative technologies and economic opportunities (in the 200s of the simulation), has had no effect on the other compartments of the ecosystem. *Source: Trathan P.N. & Reid K, 2009.*

The CAMLR Convention is conceived as an agreement for the conservation of the marine ecosystem as a whole. Article I of the Convention specifies that living marine resources, the '*populations of finfish, molluscs, crustaceans and all other species of living organisms, including birds*' (Art. I, para 2), are not limited solely to targeted and traded species, the

Antarctic marine ecosystem being defined as '*the complex of relationships of Antarctic marine living resources with each other and with their physical environment*' (Art. I, para 3). This means considering not only the target species, but also the species that depend on them, as well as the relationships of these species with all the others and with their environment. The Convention is therefore a legal framework for the conservation of biodiversity in the Southern Ocean that aims to implement management measures based on a scientific ecosystem-based approach. Its decisions are based on the recommendations of a Scientific Committee mandated to mobilise the 'best available scientific information'.

The CAMLR Convention was not intended to exclude fishing in its area of application. Article II, paragraph 2, states that '*for the purposes of this Convention, the term "conservation" includes the rational use*' of marine resources. According to the Food and Agriculture Organization of the United Nations (FAO), the CAMLR Convention is a conservation agreement, with certain powers of a regional fisheries management organisation (RFMO). This dual approach, which is a source of ambivalence, is clearly stated in the report of the 21st annual meeting of CCAMLR: '*The Commission agreed that its role as a conservation organisation with responsibility for managing fisheries in the Southern Ocean gives it the attributes of an RFMO*' (CCAMLR-XXI, Para. 15.2). The Convention takes care to specify the principles for determining what is likely to constitute a 'rational use' of the living marine resources in the Southern Ocean:

> *'(a) prevention of decrease in the the size of any harvested population to levels below (...) a level close to that might ensures the greatest net annual increment ;*
> *(b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources (...) ;*
> *(c) prevention of changes or minimisation of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades (...)' (Art. II, para. 3)*.

The Commission's decisions must be translated into conservation measures that are legally binding on the signatories. Decisions are taken by consensus, which ensures that each Member is given equal weight, but also makes it easier for Members to block conservation measures if they regard CCAMLR as a mere RFMO.

The CAMLR Convention applies to an immense geographical area of around 33 million square kilometres (Fig. 2), comprising waters under international jurisdiction and exclusive economic zones (EEZs) around the sub-Antarctic islands: South Georgia (UK), Bouvet Island (Norway), Prince Edward Islands (South Africa), Crozet and Kerguelen

Islands (France), and Heard and McDonald Islands (Australia). The geographical scope of CAMLR Convention is broader than that of the 1959 Antarctic Treaty, since it includes the areas south of the 60th parallel as well as the areas between this parallel and the 'Antarctic Convergence' or 'Antarctic Polar Front', the boundary between the cold waters of Antarctica and the warmer waters of the sub-Antarctic regions.

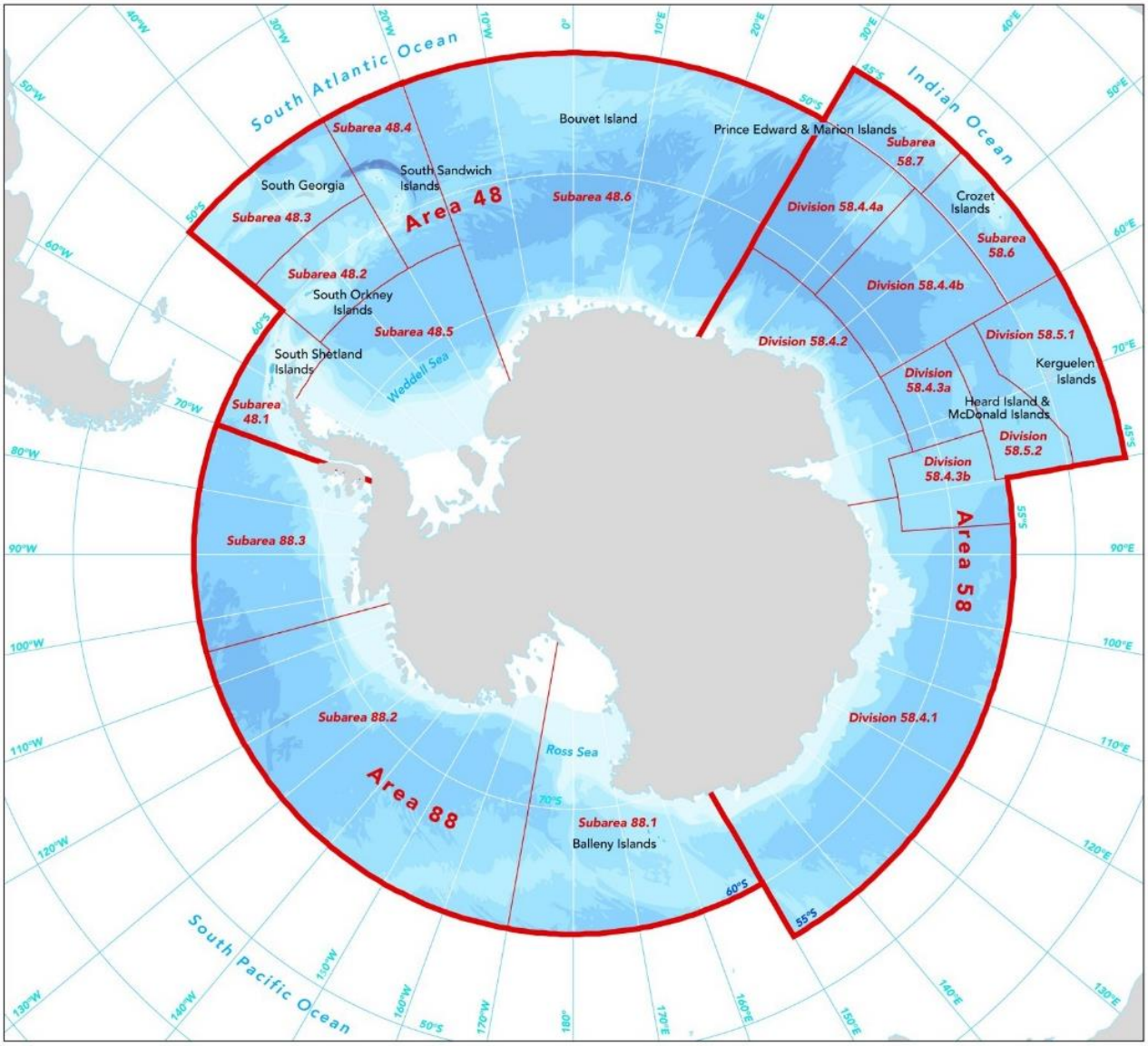

Fig. 2: Area of application of the CAMLR Convention. The thick red lines indicate the boundary of the CAMLR Convention area; the thinner red lines delimit the zones, sub-zones and statistical divisions of the Food and Agriculture Organization (FAO). *Source :* http://gis.ccamlr.org

When the CCAMLR began its work in 1982, annual catches of krill in the Convention area reached 500,000 tons, with ecosystem consequences that were unknown at the time. Exploratory krill fishing had begun in the early 1960s, when it was thought that the Southern Ocean was home to a surplus of krill, a direct consequence of the drastic reduction in whale populations linked to over-exploitation (Fig. 1). After a peak in

exploitation in 1982, catches fell sharply until 1983-84 due to a lack of commercial outlets and problems with krill processing. New krill processing methods have since been developed to make krill fit for consumption and these new processes, together with the increase in demand for animal meal for aquaculture, have stimulated a recovery in catches, which have continued to rise to the present day (Fig. 3).

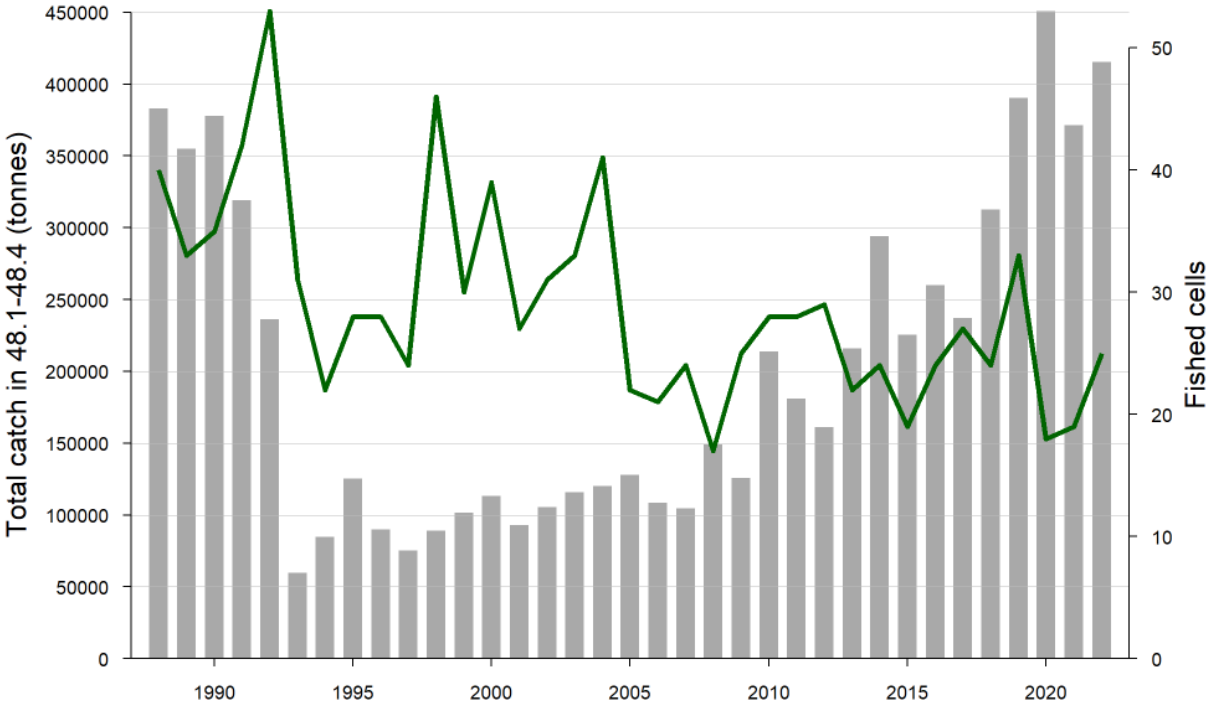

Fig. 3: The extent of fishing zones (green, right-hand y-axis) **between 1988 and 2002 tended to decrease at the same time as the volumes fished increased** (grey, left-hand y-axis). During the 1980s, krill fishing was dominated by the USSR, with annual catch levels in the Convention area generally in excess of 200,000 tons, concentrated in East Antarctic waters and the South Atlantic. After the demise of the USSR, catches fell and, from 1992-93 to 2003-04, were mainly taken by Japanese vessels. Japanese catches then began to fall, but global catches began to rise with the arrival of new players: South Korea, Norway, Ukraine, China and Chile. Over the last decade (2013-2023), Norwegian companies accounted for 63.6% of total catches, and Chinese companies for 17.1%. *Source: Zhao, X., Collins, M., Watters, G.M., Ziegler, P., and CCAMLR Secretariat 2023 (WG-EMM-2023/03).*

Since the 2000s, most krill fishing has taken place in the South Atlantic (Area 48, Fig. 4), with fishing over the last ten years concentrated in the Bransfield Strait region off the Antarctic Peninsula (sub-area 48.1), to the north-west of the Coronation Island, the largest island in South Orkney (sub-area 48.2), and to the north of South Georgia (sub-area 48.3) (Fig. 4).

CCAMLR's desire to implement ecosystem-based management of the krill fishery is based on a still relatively incomplete knowledge of the biology and particular position of krill in southern ecosystems. Management of krill fishery requires an assessment of the state of

the biomass. The use of the 'catch per unit effort' (CPUE) parameter, i.e. the quantity of krill caught per unit of volume fished, to assess krill abundance has proved unusable because of biases due to the gregarious nature of krill, which form huge swarms. CCAMLR quickly agreed that a 'feedback management' approach was needed to prevent overexploitation of the resource and to avoid potential effects on krill predators. This approach would involve the continuous adjustment of management measures in response to newly collected information. In the meantime, it would be necessary to set annual catch limits on a precautionary basis.

Box 1: Antarctic krill at risk under climate change. Antarctic krill feeds on phytoplankton and, in the early stages of its existence, in winter, on the layer of algae that develops under the sea ice. This characteristic makes it particularly vulnerable to climate change, which is likely to lead to a reduction in this essential habitat, the sea ice. Krill could therefore become less abundant and move to more ice-covered areas. With the increase in anthropogenic carbon dioxide in the atmosphere, the ocean is also becoming more acidic, which could reduce the reproductive success of krill. *Credit: Senscritique.com*

CCAMLR introduced this precautionary approach to its estimates of krill catch limits in statistical area 48 in the early 1990s. Precautionary catch limits (PCLs) are calculated by multiplying the estimated biomass before exploitation by an estimate of the precautionary catch rate. This rate is set according to specific conservation criteria defining the level of krill spawning biomass to be maintained, taking into account recruitment (injection of new individuals by birth, maturation or immigration) and the needs of predators.

In 1991, the pre-exploitation biomass for statistical area 48 was estimated at 15.1 million tons, and the precautionary annual catch limit was estimated at 10% of this biomass, or

1.5 million tons. However, CCAMLR recognised the risks to krill-dependent species from over-concentration of fishing in a given area.

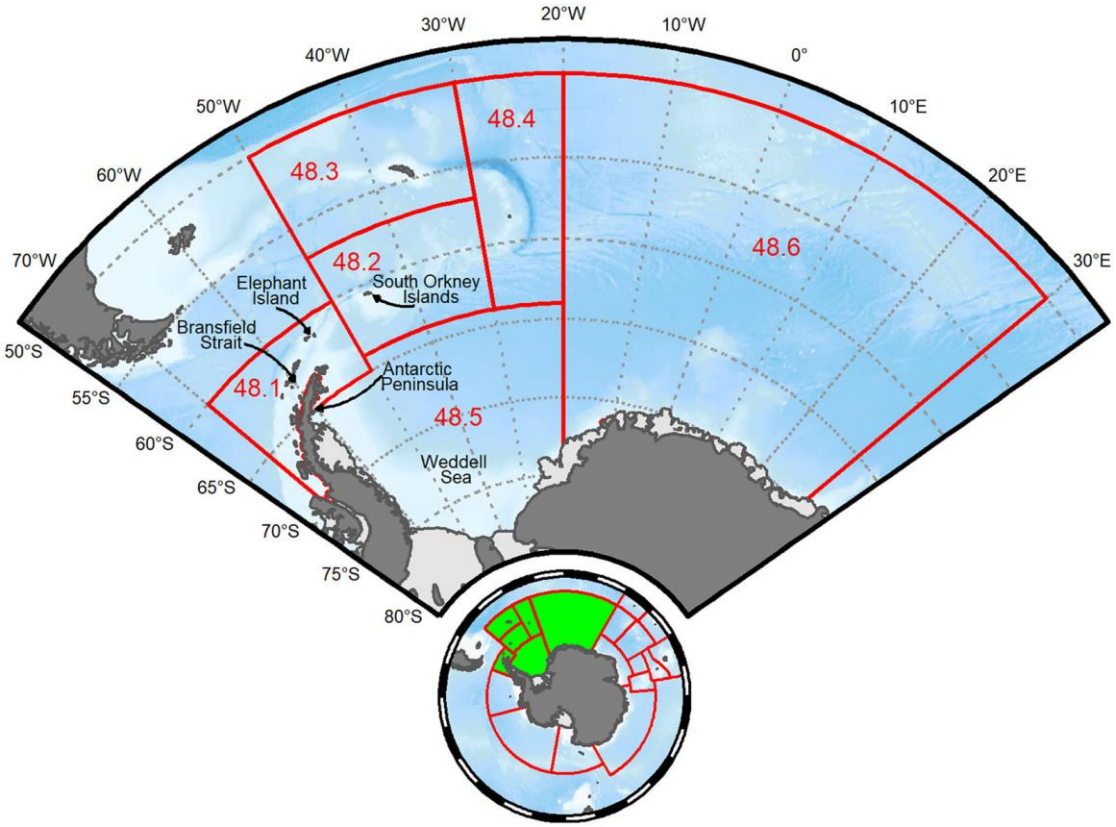

Fig. 4: Map of Area 48 of the CAMLR Convention (in green**) and the sub-areas where most of the krill fishing in the Southern Ocean is concentrated**. Source : *Meyer, B., Atkinson, A., Bernard, K.S. et al. Commun Earth Environ 1, 28, 2020.*

For this reason, in 1991, in parallel with the precautionary catch limit (PCL), the CCAMLR introduced a so-called trigger level of 620,000 tons, which should not be exceeded as long as there is no mechanism for a geographical distribution of catch limits to avoid or minimise cascading and feedback effects within the ecosystem. The value of the trigger level represents the sum of the maximum historical catches calculated over the period 1973-1990, for each sub-area, values which had not led to any measurable effects on the ecosystem up to that date. In 2009, this trigger level was subdivided for each sub-area (155,000 tons for sub-area 48.1, 279,000 tons for each of sub-areas 48.2 and 48.3, and 93,000 tons for sub-area 48.4) and this allocation was included in CCAMLR Conservation Measure 51-07. The sum of these quantities deliberately exceeds 620,000 tons in order to provide some flexibility for fishing in each sub-area. Total catches for Area 48, however, remained capped at 620,000 tons.

In 2010, following the international campaign 'CCAMLR-2000 Krill Synoptic Survey of Area 48' organised during the austral summer of 1999-2000, a new estimate of the available

biomass of krill (60.3 million tons) and a new catch limit (5.61 million tons) - representing a significant increase on previous estimates - were proposed and adopted by the CCAMLR Scientific Committee at its 29th annual meeting. However, as the Commission's concerns about the ecosystem consequences of this fishery were not allayed, the value of the trigger level and its distribution by sub-area remained unchanged and, in 2019, the CCAMLR adopted a strategy to minimise the ecosystem risks associated with the geographical concentration of catches, particularly at small spatial scales during predator reproduction.

Recent CCAMLR work has focused on sub-area 48.1 (Fig. 4), which is the richest in data and therefore likely to produce robust results. This has led to the establishment of new small-scale precautionary catch limits for 7 different fisheries management units set up for the purpose (Fig. 5), totalling 668,101 tons, well above the 155,000 tons allocated to sub-area 48.1 since 1991. Another important innovation: to take account of the krill requirements of dependent species, CCAMLR has developed a new tool, Spatial Overlap Analysis, which produces an index of the spatial and seasonal overlap rate in the distribution of krill and its predators, leading to the setting of precautionnary catch limits LCPs) taking account of the krill requirements of predators.

‘ An important step in the ecosystem-based management of Antarctic krill fishery resulted in the taking into account the needs of dependent species ‘

In parallel with the development of this new approach to managing the krill fishery, since 2005, CCAMLR has been constructing a representative system of Marine Protected Areas (MPAs) capable of ensuring better conservation of a representative proportion of Antarctic marine ecosystems. Among the proposals for the creation of MPAs that are still being debated, the one that would cover the Antarctic Peninsula area, Domain 1 MPA (D1MPA), with its 455,957 km^2, is of direct interest to the management of krill fishing. Some of the objectives of this MPA are explicitly linked to the protection of krill, including areas important for their life cycle and the assessment of the potential effects of krill fisheries on dependent predators.

In July 2024, CCAMLR organised a Harmonisation Symposium with the aim of aligning the conservation approach with fisheries management. During the discussions, differing interpretations of the concept of harmonisation emerged. Most delegations saw harmonisation as the establishment of an indissoluble link between MPAs and fisheries

management through the revision of certain conservation measures, in particular Conservation Measure 51-07. Other delegations, on the other hand, understood harmonisation as bringing together two disjoint elements that were not intended to be linked.

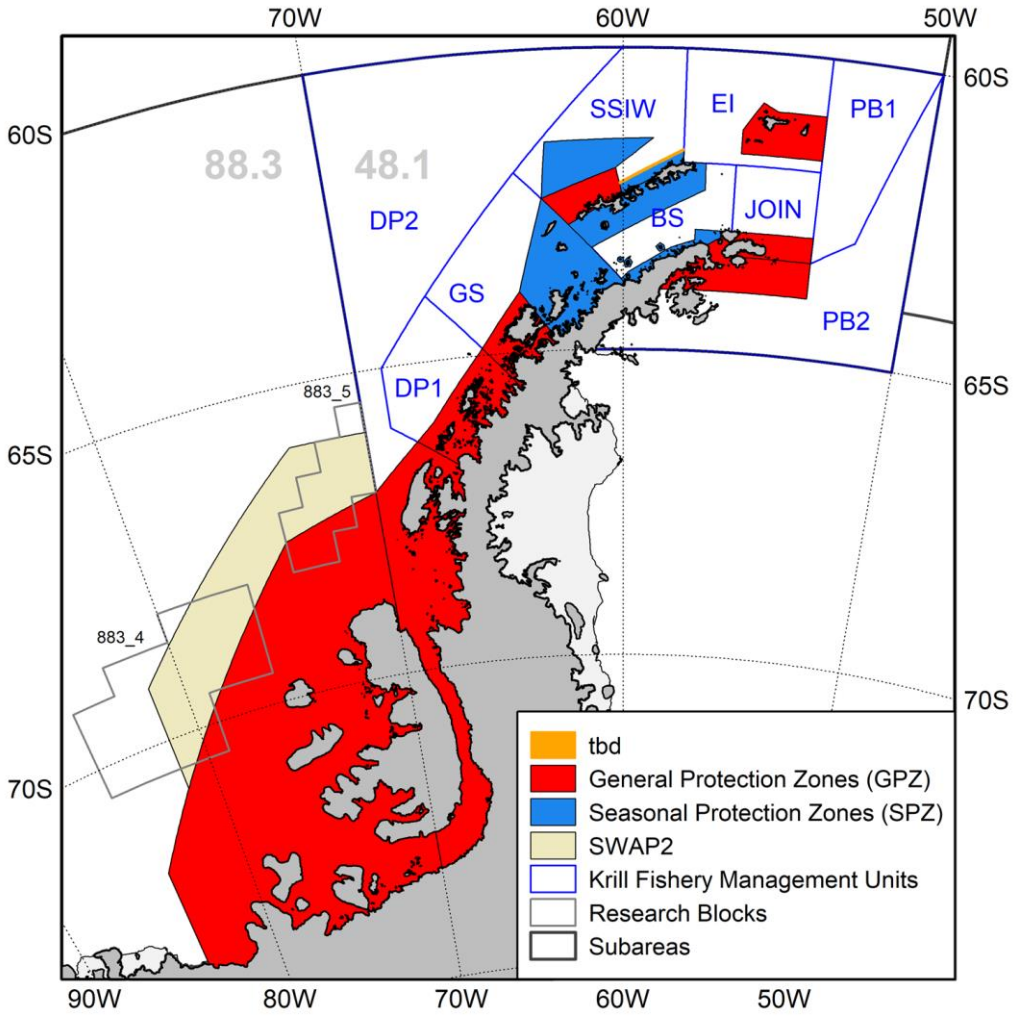

Fig. 5: Geographical distribution of krill fishery management units and seasonal or general protection zones of the proposed Domain 1 Marine Protected Area (D1MPA): seasonal protection zones known as 'SPZs', closed to fishing for part of the year; general protection zones of the proposed Domain 1 Marine Protected Area (D1MPA) known as 'GPZs', closed all year round; and a GPZ known as 'SWAP2' located to the south-west of the Antarctic Peninsula, less restrictive than the other GPZs. The names of the krill fishery management units are as follows: Elephant Island ('EI'), Joinville ('JOIN'), Bransfield Strait, ('BS'), South Shetland Islands West ('SSIW'), Gerlache Strait ('GS'), Drake Passage ('DP'), Powell Basin ('PB'). *Source : CCAMLR-43/20, Rapport du symposium d'harmonisation 2024*

During the 43rd annual meeting of the CCAMLR, held in Hobart (Australia) in October 2024, these differences of views led to a twofold stalemate, that of Domain 1 Marine Protected Area (D1MPA) and that of the new management of krill fishing, to the extent that Conservation Measure 51-07, which expired in 2021, was not extended. The 2024-

2025 krill fishing season is therefore taking place entirely legally, with no constraints on the spatial distribution of catches. The trigger level of 620,000 tons set out in another conservation measure (CM 51-01) has remained unchanged, and voluntary exclusion zones set up by the *Association of Responsible Krill Harvesting companies*[3] (ARK) will no doubt help to curb the potentially harmful effects of this fishery on southern ecosystems.

Beyond the dual approach of the CAMLR Convention, between conservation and management, this disastrous result also betrays a questioning of the value of scientific diagnosis, 'the keystone of the ecosystem approach to the conservation and management of Antarctic marine living resources'[4], within the Commission. While most Members of the Commission insist on the marked effects of global change (reduction in sea ice, drop in salinity in certain regions of the ocean, warming of surface waters, acidification of the oceans, etc.) to justify setting up a system of MPAs, other Members insist on the absence of a threat of anthropogenic origin, the inadequacy of the scientific data available and the absence of a clear legal framework, to postpone the adoption of these MPAs. According to the latter, the expired Conservation Measure 51-07 no longer had any legal or scientific justification, since the trigger level of 620,000 tons limiting total catches remained well below the new precautionary catch limit of 5.61 million tons.

Multilateral negotiations within the Commission are not immune to the tensions and dissensions of world geopolitics, and as a matter fo fact, during the 43rd meeting of the CCAMLR, several preliminary statements by heads of delegations condemned Russia's armed aggression in Ukraine[5].

The value and place of the 'best available scientific information' in the Commission's decision-making process is being openly or covertly contested, and the whole edifice on which the Commission is based is being undermined.

Conservation biology is a science that requires us to take into account the uncertainties[6] associated with the natural variability of the environment, climate change, population movements and lack of knowledge. Waiting indefinitely for « sufficient data » to be available before taking action, as some CCAMLR Members maintain, is not compatible

[3] ARK brings together ten krill fishing companies based in 4 Member States of CCAMLR (Chile, China, South Korea and Norway), which together account for almost 90% of krill catches in CAMLR Convention waters.
[4] Resolution 31/XXVIII (2009) – 'Best avalilable scientific information'.
[5] Report of the 43rd CCAMLR meeting.
[6] This is a 'stochastic uncertainty' linked to the intrinsic and chaotic variability of phenomena, and not an 'epistemic uncertainty' linked to imperfect knowledge of phenomena and their approximate representation in models.

with the nature of conservation biology, which is a 'crisis discipline'[7] whose compass is the precautionary approach[8].

Marc ÉLEAUME,
for Polar Watch.

[7] Soulé, M.E., 1985.

[8] The precautionary approach is based on the observation that there is a lack of scientific information that precludes the production of a well-founded prognosis. It is not an arbitrary decision or a timid position, and can only be invoked in cases where a potential risk is supported by reasons or knowledge relating to the dynamics of the phenomenon concerned, in which the missing information is likely to favour an undesirable development of the said phenomenon. It is therefore a rational approach and cannot be reduced to blind prudence. Against a narrowly positivist vision of science, the precautionary approach manifests a reflexive dimension of science that continually reflects on itself, thereby producing critical knowledge about its knowledge.

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