

# EPICENTERS OF CLIMATE AND SECURITY: THE NEW GEOSTRATEGIC LANDSCAPE OF THE ANTHROPOCENE

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# FISH, FOOD SECURITY AND FUTURE CONFLICT EPICENTERS

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## INTRODUCTION

Throughout history, fisheries have played a central role in driving economic development and sustaining human livelihoods and health. But their success has also been their Achilles' heel; today fisheries have become ever more contested as nations have increasingly sought both food and economic security in the face of rising demand (population growth) and reduced supply (exhausted stocks, pollution, and species loss). This neo-Malthusian scenario has been somewhat mitigated by the development of an international rules-based approach to fishing governance designed to regulate hauls and access, and provide pathways to avoid confrontation. But this balancing act has now come under increasing pressure from both climatic and non-climatic factors that are driving unprecedented changes to fish numbers, species composition, distribution, range and yield. Climate drivers are presenting new and unprecedented risks to fisheries, including increasing sea temperatures, ocean acidification, sea-level rise and changes to surface and deep water currents. These changes may could become a proximate cause and/or tipping point for resource conflicts as countries and companies pursue dwindling fish stocks that — accelerated by climate change — are also moving beyond sovereign Exclusive Economic Zones (EEZ) and traditional fishing grounds. Furthermore, conflict over fisheries in one part of the world can have impacts on regions and economies thousands of miles away, and are now central to understanding the unique security challenges of the Anthropocene.

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## A BRIEF HISTORY OF FISHERIES GOVERNANCE AND CONTEMPORARY DISPUTES

Fisheries have been and continue to be a central part of the human story.<sup>2</sup> Paleo-studies suggest fish have been important to the human diet throughout our evolutionary history,<sup>3</sup> and multiple studies have emphasized their continued importance to food security.<sup>4,5,6,7</sup> Beyond their important place in our evolutionary and civilizational history, fisheries are an essential part of the modern global economy. Annual catches of fish are nearing 100 million tons by an industry that indirectly supports the livelihood of more than 1.5 billion people and supplies 3.1 billion people with 20% of their protein requirements.<sup>8</sup> As global population is expected to reach 9.7 billion by 2050, fisheries will remain a crucial pillar of food security. Annually, the fisheries contribute more than USD\$270 billion to global GDP and, of the 120 million full-time and part-time people employed by the fishing sector, roughly 47% are women and 97% are in developing countries.<sup>9</sup> More than just a mere food source, fisheries have been, and continue to be, fundamental to global economic development and human health.

Viewed this way, it is axiomatic that any substantive variation to fisheries (such as changing availability, reduced yields, loss of access to fishing grounds, increased competition, as well as changing fish ranges, distribution and species loss) has the potential to significantly impact human, national and — in extremis — international security. This has been recognized since at least the 1950s when the exponential growth of the fishing industry — from local near-shore fishing fleets to the rise of industrial-scale flotillas (about 4.6 million fishing vessels in 2014) — necessitated a lattice of international conventions and agreements designed to regulate catch and avoid confrontation through the promotion of a rules-based approach.<sup>10</sup> This idea has been especially significant for the high-seas, where the tyranny of distance and limited sovereign jurisdiction renders entire areas susceptible to illegal, unreported, unregulated (IUU) fishing.<sup>11</sup> Despite all of this, the agency and effectiveness of international fishing laws, norms and institutions have been limited by the voluntary nature of nations acceding to the various agreements and to the complexities and challenges associated with enforcement. The point that almost one-third of world's fish stocks are overfished and that marine populations have declined by almost 50% since 1970 lends urgency to resolving the structural challenges of fishing governance.<sup>12, 13</sup>

The rise of an international, rules-based fishing order has, on occasion, been sorely tested in more direct ways. Between 1952 and 1976, the so-called 'Cod Wars' saw Britain and Iceland repeatedly square off over disputed access to fishing grounds in the North Atlantic. Characterized by major public demonstrations, ramming of ships at sea, and the deployment of opposing naval forces, the conflict climaxed when Iceland threatened to leave NATO, thereby exposing Europe to Soviet submarines operating across the Greenland-Iceland-UK (GUK) gap.<sup>14</sup>

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Similar disputes have also occurred between France and Brazil (the so-called ‘Lobster Wars’ in the early 1960s);<sup>15</sup> in 1993 between France and Britain (the ‘Cherbourg Incident’);<sup>16</sup> and in 1996 between Canada and Spain over fishing rights on the Grand Banks of Newfoundland (the ‘Turbot War’).<sup>17</sup> The Mediterranean has also repeatedly been a region of intense disputes exacerbated by over-exploitation of fisheries for the past 50 years and disputes over maritime boundaries.<sup>18</sup> The region has lost 41% of its marine mammals and 34% of its total fish population<sup>19</sup> Morocco and the European Union (EU) have, since the 1970s, had several major disputes over fishing ground access and claims of over-fishing. Likewise for Spain and the UK, while the ongoing dispute between Turkey and Greece in the Aegean Sea originated, in part, over fishing rights.<sup>20</sup>

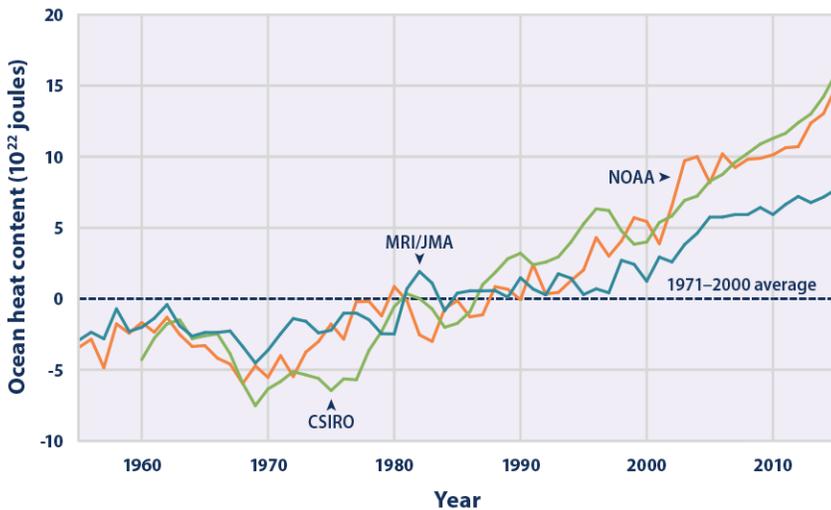
More recently, Vietnam and China have repeatedly clashed over fishing rights in the South China Sea, including a 2005 incident where Chinese patrol boats opened fire on Vietnamese fishing trawlers, killing nine crewmen, reminiscent of a 1988 incident in which 64 Vietnamese were killed.<sup>21</sup> With multiple overlapping and competing territorial claims and large populations dependent on fisheries and other resources, violent incidents and military brinkmanship between multiple nations in the South China Sea remain persistent and unresolved.<sup>22</sup>

Despite the seriousness of these disputes and associated structural challenges, one mitigating factor (variability aside) has been the constancy of the climate. But this dependability — a bedrock of fisheries and human livelihood for millennia — can no longer be relied upon.

## CLIMATE CHANGE: A NEW FACTOR IN FISHERIES

### NEW PHYSICAL AND CHEMICAL CHARACTERISTICS

Climate change is now widely recognized as a major factor shaping the world’s oceans, posing a threat to global fisheries and the existing international rules-based approach.<sup>23</sup> Central to this is the unprecedented change in the underlying physical characteristics of the world’s oceans. Since the 1980s ocean heat content has increased by  $15 \times 10^{24}$  joules or roughly 270 times the total amount of energy used by all the people on Earth for one year (Figure 1).<sup>24</sup> This is increasing ocean sea-surface temperatures (0.11°C per decade 1971-2010 for the upper 75m) and is a contributing factor to sea-level rise through thermal expansion and its role in melting sea-ice, particularly across the Arctic.<sup>23</sup> Climate change is also causing the world’s oceans to become more acidic, driving changes in salinity levels, altering oxygen and carbon concentrations, and affecting the variability of the planet’s major ocean surface currents and deep-water circulation systems.<sup>24</sup>



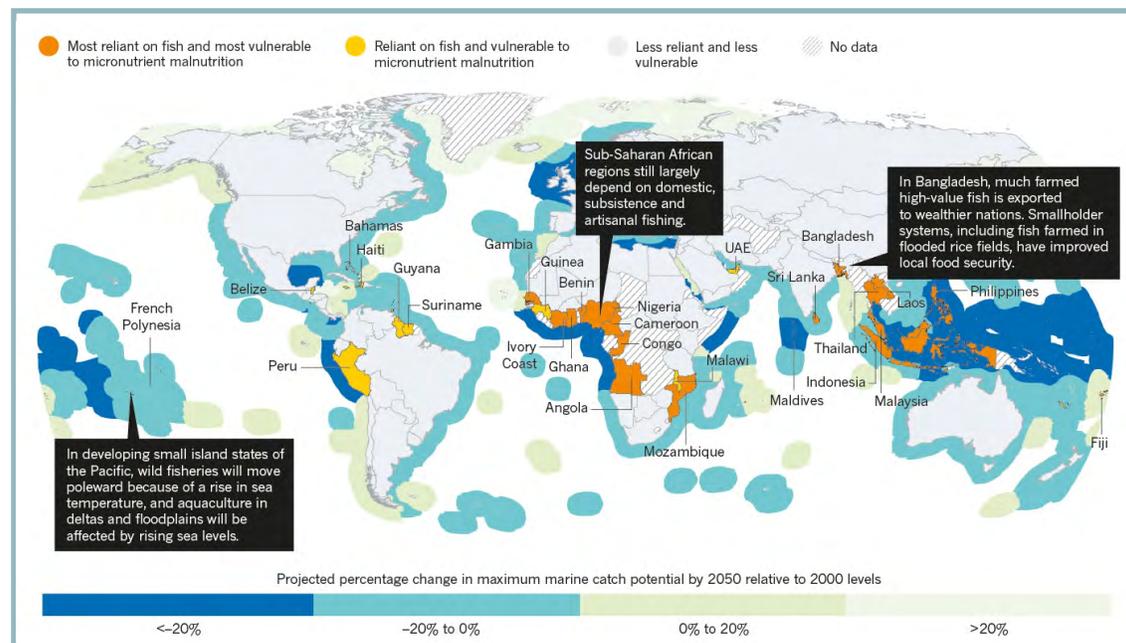
**FIGURE 1: Climate change is driving up global ocean heat content.**

**SOURCE: US EPA.<sup>25</sup>** Such changes are negatively impacting fish physiology, phenology, and behavior, resulting in changes to spatial distribution, productivity, species numbers and composition.<sup>25</sup> Some studies, for instance, estimate that ocean warming and shifts in net primary production could lead to a reduction in total global fish catch by 6%, and as much as 30% in the tropics, by 2050.<sup>26</sup> Others have assessed that ocean warming in association with declining oxygen levels could reduce the body weight of fish by 14-24% globally, with a 20% reduction in fish biomass experienced across the tropics.<sup>27</sup>

Climate change is also particularly damaging to coral reef and mangrove systems;<sup>28</sup> often considered as the engine rooms of marine productivity, wherein they serve as incubators and as oases for larger pelagic fish and marine mammals.<sup>29</sup> The overall changes imposed by climate change on the oceans are crucial from a food security perspective, particularly across developing nations, where fish accounts for some 20% of the daily diet (by weight) for 1.39 billion people, and where creating access to alternative sources of micronutrients often is beyond the capacity of poor local communities, much less weak states.<sup>30</sup> In this challenged ecosystem – where denuded marine ecosystems, already under stress from over-exploitation, IUU, industrial pollution and poor governance, rapidly translate into loss of income, livelihood and in some cases malnutrition of communities that rely on fish as a key source of nutrition,<sup>31</sup> – climate change stands to be a major threat to global food and economic security.

**FIGURE 1: Changes in marine catch as a result of climate change and other factors is projected to be acutely felt across the equatorial belt and in developing countries.**

**SOURCE: Nature.<sup>32</sup>**



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## NEW EXTREMES

Climate change is also driving more extreme events, laying waste not only to marine habitats but also to the critical infrastructure (vessels and ports) required to support fisheries' livelihoods. Related to this is the prospect of larger and more intense *El Nino* and *La Nina* that are harbingers of more extreme droughts, cyclones, floods, wildfires and downpours across the planet.<sup>33</sup> This is also the case in the marine environment, as evinced by the 1972/73, 1982/83 and 1997/98 *El Nino* that witnessed decreased catch, surging fish prices, and adverse economic consequences.<sup>34</sup>

In particular, extreme *El Nino* and *La Nina* events have the ability to significantly disrupt marine nutrient supplies (such as phytoplankton and zooplankton) that are critical to virtually all higher forms of marine life.<sup>35,36</sup> While disruptions to nutrient supply related to the Peruvian Current are well known under *El Nino* conditions, a recent study found that nutrient production in the South China Sea also was suppressed under extreme *La Nina* conditions,<sup>37</sup> which due to climate change, could potentially increase in frequency.<sup>44</sup> Ultimately, less nutrients means smaller and fewer fish. As history has shown, this usually leads to one of two outcomes: increased competition and tensions over existing fishing grounds, or a move by foreign fleets to exploit new locations.

On the latter point, a recent report highlighted how Chinese Distant Water Fishing (DWF) companies have pushed into West African waters, exploiting the lax maritime enforcement and costing West African economies \$2 billion a year.<sup>38</sup> In the case of Senegal, fish prices have soared as scarcity has increased due to the presence of destructive Chinese bottom trawlers that sap 40,000 tons of fish a year from their waters. Already gripped by climate-related drought, the decline of the Senegalese fishing sector has led to economic and food security concerns that have been cited as one factor in driving their youth to make the hazardous journey to Europe and adding to existing migrant tensions and instability across the continent.<sup>39</sup>

## FISH SECURITY EPICENTERS

Three global “fish security epicenters” have emerged where climate change has the potential to significantly impact regional and global security: the South China Sea (SCS), the Arctic,<sup>41</sup> and the African great-lakes.<sup>42</sup>



FIGURE 2: With local waters exhausted, China has deployed its Distant Water Fleet (DWF) into other areas around the globe, reducing fish stocks and impacting food and economic security for littoral nations.

SOURCE: Greenpeace.<sup>40</sup>

### THE SOUTH CHINA SEA

The SCS is an area fraught with security dilemmas. While energy resources are often cited as a factor,<sup>43</sup> fisheries plays a major — if not defining — role.<sup>44</sup> An overview captures the high-stakes: the area is home to more than 3,360 marine species, generates 12% of the world’s catch, worth \$21.8 billion, employs almost 4 million people and feeds hundreds-of-millions more. 55% of the world’s fishing fleet operates in an area that possesses an increasingly dwindling resource base that has seen a 70% to 95% depletion since the 1950s.<sup>45</sup> Moreover, competition among nations has been manifest for decades, and fishing fleets are widely regarded as proxies for staking maritime claims. Arguably, China is the most advanced and uses its 200,000-strong fishing fleet as a “maritime militia,” operating with impunity as an irregular naval force, claiming islands, ferrying goods and materials to assist the PLA in port and military-base construction, and collecting maritime intelligence inside the so-called nine-dashed line.<sup>46</sup> However, while many point to aggressive Chinese tactics, other littoral nations have been equally bold. Indonesia, Vietnam, Malaysia and the Philippines have all blown up or threatened to blow up vessels that enter “their” waters and regularly use their navies to intercept and destroy foreign fishing vessels.<sup>47, 48</sup>

It is in this overall context that climate change has emerged as an SCS threat-multiplier, layering existing problems with new dilemmas that serve as a further catalyst for conflict. This can occur in several ways. First, climate change has the potential to cause SCS fish stocks to migrate away from the region, potentially causing fleets to pursue stocks into more northern (Taiwan Strait, East China Sea, or Sea of Japan), southern (Indonesian archipelago) or eastern waters (Philippine Sea). In such a tight operating space, with hundreds of thousands of fishing vessels, unresolved territorial claims and depleted fish stocks, even the slightest migrations present risk. Second, climate change has the potential to reduce SCS marine productivity through coral

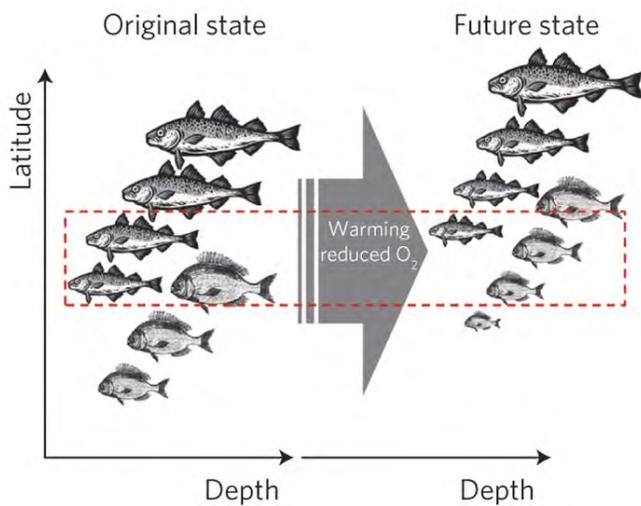
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bleaching, habitat destruction and changes in nutrient production. In the absence of alternatives, particularly for those nations lacking distant water fleets, reduction to fisheries productivity exposes millions to food and economic insecurity.

## THE ARCTIC

More than any other region on the planet, the Arctic is being transformed by climate change. The narrative, by now, is an unhappily familiar one: the region is warming twice as fast as the global average and summer sea-ice has been declining more than 10% per decade since 1979<sup>49</sup> such that it is "likely" to be ice-free by summer 2050, <sup>24</sup> with some estimates as early as 2030.<sup>50</sup> The loss of ice has produced a negative feedback loop, in which an increasing amount of the sun's energy is being absorbed rather than reflected. No longer the global refrigerant, increased temperatures have triggered widespread tundra-melt, hastening the release of stored methane, which acts as an accelerant to climate change. In lock-step with these changes has been increased interest by nations to exploit the Arctic's increasing accessibility and accompanying socioeconomic opportunities. Foremost, they seek shorter shipping routes that connect the global commodity markets of Europe with Asia-America and offer the opportunity to exploit untapped natural resource deposits, fishing, tourism opportunities and scientific expeditions.<sup>51</sup> As countries position themselves, national military forces are being marshaled as a means to secure these opportunities. Military force projection into the region and future expansion plans by the militaries of Russia, the US, Canada, Norway and others have fed perceptions that the Arctic is being unnecessarily "securitized," with the possibility that it may lead to grave misunderstandings. The possibility of the Arctic as a future theater of conflict has not been dismissed.

Fisheries form a part of this increasingly fraught climate-security scenario. Marine ecosystems, like their surface counterparts, have also warmed twice as fast as the global average, prompting a pole-wards shift of migratory fish out of the north-Pacific and Barents Sea at an "invasion intensity" rate five-times the global average.<sup>52</sup> The arrival of "generalist" fish is causing a retraction and deterioration of existing Arctic species that may ultimately lead to disruption, even the destruction and extinction, of local ecosystems and fish varieties. Of particular interest is the movement of commercially popular species such as cod and haddock, as well as projections that fish size may actually increase (figure 3), which could make the region increasingly attractive to non-arctic fishing fleets. In this instance, the unwelcomed and increased presence of foreign fishing fleets moving into an area of unresolved maritime disputes poses additional challenges for the region.



**FIGURE 3. Projected changes in expected biological responses of fish communities in terms of distribution and body size.**

SOURCE: Nature.<sup>53</sup>

### THE GREAT LAKES

While much focus is on the impact of climate change on the world's oceans, climate change is also impacting inland lakes, rivers and estuaries, which represent a new dimension to fish and food security. Nowhere is this more prevalent than in the African Great Lakes region. Located in the East African rift valley region, the African Great Lakes are a vast collection of lakes<sup>54</sup> that possess 25% of the planet's freshwater supply, 10% of its fish species, and a source of food and economic security to some 107 million people. This affects almost a dozen countries, including some of the most crisis-stricken in the Democratic Republic of Congo, Burundi, Rwanda, Uganda, Kenya, Tanzania, Zambia, Mozambique and Ethiopia.<sup>55</sup>

The importance of the lakes to livelihoods and national economies cannot be underestimated. To take one example, Lake Tanganyika yields up to 200,000 tons of fish per annum and supplies about 60% of the region's protein consumption.<sup>56</sup> Nonetheless, it is a region in the balance, wracked as it is by poverty, terrorism, corruption, poor governance, unemployment, population growth, resource scarcity and violent conflict. Climate change presents as an additional threat multiplier that exacerbates these challenges. While the effects of climate change on precipitation patterns, desertification, temperatures, drought and extreme events are well documented across Africa, it will also be detrimental to fisheries through declining fish and mollusk species, reduced mixing and upwelling events leading to suppressed nutrient supply, and impacts on fish habitats through increased temperatures, decreased dissolved oxygen levels and increased toxicity.<sup>57</sup>

Negative impacts on the Great Lake fisheries will have significant consequences for regional food and economic security, particularly given the litany of existing problems, but also because of the high reliance of the population on fish as a fundamental source of nutrition, employment and livelihoods, income and government revenues through fisheries agreements and taxes.<sup>58</sup> A decline in fisheries risks malnutrition, unemployment and reduced incomes, which serves to increase societal stress and state fragility.

Such conditions are ripe for exploitation by either entrenched elites or, as has occurred further north around Lake Chad, by terrorist groups and insurgents. Lake Chad has been severely stressed by climate change; over the past 50 years it has lost 90% of its surface with the prospect that it could disappear within 20 years. As the region's economic and cultural anchor point, which sustains some 30 million people, such an event not only would have devastating security consequences, especially in Africa, but also would drive desperate migrants across the Mediterranean to Europe. In part, these issues are already playing out in the form of Boko Haram, the terrorist group that preys on poor and underemployed youth, which has already claimed some 20,000 lives.<sup>59</sup>

## CONCLUSION

Fisheries are central to human existence. Climate change has the potential to act as a major disrupter to fish stocks, distribution and composition. While conflict over fish has been a constant feature of international relations, climate change is poised to introduce large-scale changes unmatched in recorded history. The ability of governance frameworks and institutions to manage these changes remains, at best, a fragile and uncertain bet. Preventing conflict over fisheries and maintaining food security from fish protein will require better understanding and preparation for the confluence of risks. The current international rules in place to regulate fishing do not do enough to accommodate a changing climate. Food and fishery security and the possibility of these conflicts scaling up to higher order security risks, suggests that this issue be prioritized.

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