The Norfolk Island Proposal

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Abstract
This paper proposes a novel ecological intervention: *Ethical Marine Offal Dumping* (EMOD) as a low-cost, high-impact method of restoring apex predator presence in marine ecosystems. Using Norfolk Island as a case study, where tiger sharks are significantly larger and more abundant than regional norms, the paper explores the unintended yet beneficial ecological consequences of routine livestock offal dumping. Drawing on ecological literature, trophic cascade theory, and biomaterialist ontology, the paper theorizes a tripart anthropogenic model whereby human-generated nutrient loads sustain mesofauna, attract seabirds, and ultimately feed tiger sharks. Formal modeling supports the claim that tiger shark presence is a second-order function of human waste dumping via indirect trophic relay. Rewilding apex marine megafauna through captivity remains cost-prohibitive and ecologically risky, particularly for sharks, whose transport and training are fraught with difficulty. In contrast, EMOD enables natural apex regeneration at virtually no cost. The paper concludes with a philosophical reframing of waste: not as pollution, but as potential—biomass repayment for ecological debt in the post-Anthropocenic age.

Introduction

Norfolk is a tiny island with big sharks.

Norfolk Island, located roughly 970 miles off the coast of Australia, enjoys one of the largest densities of tiger sharks in the entire world. Even more strikingly, these tiger sharks are not of an average size; tiger sharks around Norfolk Island average ~0.6 m longer than their non-Norfolk counterparts (Matley et al., 2025). Using academic standard shark mass estimation methodologies (see Appendix A) from Braccini et al. (2006), a length differential of 0.6 m might be estimated to produce a size differential of **over 70%** (~430 kg in the 3.4-m shark vs ~740 kg in the 4-m shark).

Sharks of increased size are capable of (1) going for longer without food (2) bearing more pups and (3) exerting stronger apex pressure upon marine ecosystems. In addition, the presence of the Norfolk Ridge provides a diverse marine ecosystem with varying habitats for marine flora and fauna of myriad kinds. Tiger sharks, then, exert apex pressure upon this flourishing marine ecosystem, stabilizing it across time.

The Stakes: Manmade Ecological Catastrophe

Human predation of keystone megafauna has done untold ecological damage. Boivin et al. (2016) document human disruption of ecosystems via unchecked predation of keystone megafauna throughout the Pleistocene and how such predation fundamentally changed Pleistocene ecosystems into their contemporary Holocene counterparts, almost always with the result of decreased bioproductivity. In the Neogene, we can point to the work of Svenning et al. (2024) and Johnson (2009) documenting how removal of keystone megafauna has resulted in large-scale changes in vegetation-guild structuring, fire regimes, and nutrient cycling, and the disastrous effects that result.

The elimination of apex carnivore guilds, in particular, seems to be something of a human specialty in the Neogene, producing disastrous effects via trophic cascade. This pattern includes the damage caused by removing sharks from marine ecosystems, whose full ecological role is only recently being properly understood. Sandin et al. (2022) demonstrate that removal of sharks from marine ecosystems results in accelerated reef degradation, already a threat due to climate change. One causal mechanism may be mesopredator proliferation in the absence of apex pressure, but the literature has yet to reach a conclusion.

Speculative Solution: Apex Rewilding

Still, there remains a glimmer of hope. Upon the reintroduction of but a few dozen wolves to Yellowstone Park, the collective Yellowstone ecology enjoyed wondrous ecological renewal (Ripple and Beschta, 2004). The effects bear positive fruit even today, as Painter et al. (2025) have shown regarding aspen recovery. While Yellowstone's wolves were sourced from Canada, rewilding of keystone megafauna from captivity is a common ecological tactic utilized by nations around the world, particularly the Chinese with their efforts rewilding the giant panda (Yang et al., 2018).

Sourcing apex carnivores from the wild carries immense ecological risk. Apex carnivores are essential keystones in their ecosystems, and their removal risks unanticipated trophic cascade effects. As Ripple and Beschta (2004) argue, "predation risk alone can structure entire ecosystems" (p. 758), highlighting the profound influence of apex carnivores even beyond their physical presence. Prey populations behaviorally change alongside perceived predation risk, which can be massively ecologically influential. To give just one example, deer move between grazing zones with greater velocity given predation risk, giving individual zones more time to recover from herd grazing events.

With this view in mind, captive rewilding remains, at least theoretically, the less ecologically risky option. The downside of this method is that animals may not be "wild ready" and thereby fail to establish breeding populations upon reintroduction into their ancestral habitats. Still, successes involving African lions (Hunter et al., 2007) and Amur tigers (Goodrich et al., 2010) prove that it can be done.

However, shark rewilding is an entirely different beast than carnivoran rewilding. For one thing, human society is far better at training carnivorans than selachimorphs due to either ancestral knowledge on our part or superior carnivoran trainability in general. For another, human beings are terrestrial animals, and our aquatics technologies are functional but prohibitively expensive for shark rewilding en masse. The transportation of sharks, alone, is a notoriously difficult and expensive affair fraught with risk. Mortality rates during transit for large pelagic sharks like tiger sharks can reach as high as 70–90%, depending on stress and transport conditions (IUCN Shark Specialist Group, 2010), and shark transport costs between five and six figures per animal. This all without factoring in the immense cost and mortality risk associated with raising these wild beasts from puphood into seasoned hunters ready to start healing broken ecosystems.

It seems impossible. Unless. . .we lean into preexisting nutrient cycling architected by the greatest ecosystems engineer of all time: *Homo sapiens*. But first, some background.

Tripart Anthropogenic Model

Despite Norfolk Island's dense population of tiger sharks, only one unprovoked shark incident has ever been documented: an 1892 non-fatal arm laceration to a fisherman (Florida-Beaches-Info.com, 2023). Nevertheless, Matley et al. (2025) document a high tiger net shark density along the island, just not in the zones in which people like to swim. Tiger sharks display a strong spatial preference for the Western side of Norfolk Island, accompanying historic and contemporary cow offal dumping off a literal seaside cliff into the deep blue sea.

Offal dumping redistributes nutrients to marine ecosystems. The effect is not often direct to the sharks, but resultant from seabird attraction to the offal, particularly wedgetail shearwaters. At Norfolk Island, tiger sharks derive over half (52%) of their energy intake from seabirds floating on the water at dusk in vast numbers (Matley et al., 2025).

The result is a three-part anthropogenic ecological model: offal fills the role of producer, mesofauna and shearwaters fill the role of primary consumer, and tiger sharks fill the role of apex predator. Diagramatically:

```
[Human Offal Dumping (H)]
          ↓
 [↑ Nutrient Load / Detritus]
          ↓
 [Baitfish & Mesofauna (B)] ←→ [Shearwaters (S)]
          ↓                ↓
      [Tiger Sharks (T)] ←←←←←←←
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(see Appendix B for a formal mathematical model depicting this relationship)

In essence, marine offal dumping produces an influx of biological nutrients to jump-start ecological productivity through increased carrion access to scavengers and mesofauna. The ecosystem is provided with raw biomass supporting increased numbers of marine fauna, including tiger sharks as apex predators *and* opportunistic scavengers. The result is a net positive effect on the local ecosystem, including supporting large numbers of thriving keystone megafauna with zero recorded harm to human beings in the past 100 years. And this is to say nothing of the potential ecological benefits of seabird guano in Norfolk's marine ecosystem, a study which this paper recommends for future scholarship.

Furthermore, the trophic relay of marine offal dumping functions even if offal remains unconsumed by seabirds and mesofauna. Offal can decay on the sea floor, enriching pelagic detritivores and providing the ecosystem with calcium necessary to grow mollusk shells[1].

Mass influx of artiodactyl carrion is actually by no means new to marine ecosystems; the literature terms them *whale falls* (Smith & Baco, 2003). Therefore, this paper proposes that future studies be conducted upon seafloor surrounding Norfolk Island to observe the effects of bovine offal dumping and how analogous these effects might be to whale falls proper.

The Proposal: EMOD

Apex marine megafauna are thus far prohibitively expensive to rewild from captivity at scale. However, Norfolk Island offers an essential paradigm demonstrating how to naturally enhance marine apex presence within an ecosystem, and the method is essentially costless: **ethical marine offal dumping** (EMOD).

EMOD is a solution with two key benefits: (1) increased biomass to nurture marine ecosystems and (2) a cheap and ethical means of disposing of unwanted livestock scraps. Traditional offal disposal is relatively cheap, but presents risk of disease and captures viable biomass outside biological communities capable of metabolizing it into productive forms. Oceanic ecosystems have an increased presence of consumer roles rather than producer roles relative to terrestrial ones, meaning that animal flesh can be metabolized faster in the sea than on land ceteris paribus.

Key EMOD zones should be established at strategic locations, optimized for proximity to human settlements to reduce offal transit costs alongside ecological viability, but strategically placed to avoid human-apex interactions. Norfolk's own EMOD zone, a seaside cliff far from viable beachfront, was genius. Ecological viability for EMOD zones can be determined by looking at the health of preexisting marine ecosystems and geographic factors encouraging biodiversity, such as sea mounts.

Oceanic current behavior must be taken into account, alongside the presence of preexisting apexes, even in small numbers, capable of exerting pressure upon the ecosystem. EMOD without apexes might end up causing mesopredator proliferation, and the mesopredators may then return to their original ecosystems to wreak havoc. The fortunate news is that large pelagic sharks have extremely keen olfactory abilities and naturally swim for miles at a time in search of food. And this is nothing to say of orcas, those demigods of the deep.

In turn, stable marine apex predator populations will be established in key EMOD sites. However, intra-guild[2] competitive pressure will eventually force individual animals to leave behind EMOD zones for new territories. In other words, EMOD is a means of "generating" apex marine megafauna at scale with virtually zero human cost, economic or social.

The long-term strategic move is to coordinate EMOD zones in advance such that megafaunal blooms co-occur to produce a stable meta-ecosystem in which apex megafauna

[1] Treude et al. (2009) might be useful reading here

[2] I say guild rather than species in the event of multiple apexes profiting from EMOD in the same zone.

circulate *around and between* EMOD zones, thereby exerting apex pressure on local ecosystems in proportion to the latter's biodiversity. In essence, we're making a giant meta-ecological ring using EMOD zones as fence posts, thereby fertilizing the interior with increased bioproductivity.

Response to Recent Changes in Australian Waste Dumping Laws

Laws preventing marine pollution are noble. For decades, *Homo sapiens* has treated arguably the most sacred contiguous entity on planet Earth as an aquatic trash can. If that weren't enough, the effects of macroplastic and petroleum spills on marine fauna have been catastrophic, and science is only just beginning to study the effects microplastics could be having on our oceans.

However, the trouble with waste dumping isn't in the dumping of waste per se, but in dumping *the wrong kind* of waste. If ecologists know one thing, it's that nature is seldom wasteful. Biological systems can cycle almost all biological waste, it's simply a matter of matching biowaste products with their appropriate trophic meta-guilds such that safe cycling occurs. As this paper suggests, biowaste dumping, in general, should be seen as a net asset to both human and nonhuman communities. It is not a question of ethicality, but a question of strategy; which biowaste to dump where? How can we avoid adverse microbial infections in marine mammal*s*?[1]

This paper advocates for future studies to determine which sorts of human biological waste products are most amenable to enriching particular marine ecosystems, and to thereby coordinate biowaste dumping efforts accordingly. In sum; non-biological waste dumping is what might truly warrant a ban,[2] whereas biowaste dumping requires regulation and oversight.

Currently, global society mixes biowaste with non-biowaste, to the detriment of both the economy and the ecology. Garbage dumps are ever-growing festering wounds on the planet's surface. In addition to providing perfect breeding grounds for disease (Alam & Ahmade 2013), they are lamentable bio-sinks where viable biomaterial is trapped alongside useless dead matter. Scavengers such as opportunistic seabirds, rats, raccoons, and stray dogs play a role in metabolizing the biowaste in traditional garbage dumps, but their foraging behavior is far less efficient than otherwise due to the necessity of sifting through tons of literal trash in order to acquire a meal. Worse still, that meal is generally less nutrient-dense than what the animal might enjoy in the wild; see Coogan (2018) and Martins et al. (2024) for systemic analysis of this problem.

Philosophical Takeaway

In philosophical terms, contemporary thought has largely failed to overcome a category error that I term **human-nonhuman dualism**. Human-nonhuman dualism poses human activity and biospheric activity as ontologically (read: fundamentally) separate. This is an obvious error, and the slightest empirical examination proves it; if humans were truly separate from the biosphere, then we wouldn't be able to affect it. Rather, human beings exist as the **one and only** true apex predator dominating the Earth biosystem, and we are an apex predator improperly stewarding the global ecosystem towards biological collapse akin to a mass extinction event. *Homo sapiens* should be thought of as an ecological keystone species that acts upon ecosystems by withering them of nutrients and productivity through clumsy reduction of biodiversity, especially that of rival keystones.

Thus, the modern conscience, dominated by human-nonhuman dualism, cannot help but regard marine offal dumping as a kind of pollution, when a century of evidence shows it is actually humanity's inadvertent means of returning to the biosphere a portion of that which it took: biomaterial as a means of supporting ecological productivity. Far from pollution, EMOD should be seen as a means of ecological healing.

The brilliance of this method is that it costs humanity nothing; offal must be discarded one way or another. Why not feed it to ecosystems starved of nutrients? In the long run, marine bioactivity will improve, swelling fish stocks and enriching global and local economies alike. EMOD should be seen as a net gain for human economic activity *alongside* biodiversity improvement. Norfolk Island may some day be regarded as the first accidental laboratory of win-win human-nonhuman collaboration.

Finally, this paper proposes a **biomaterialist eco-ontology** for the post-Anthropocenic age. Biomass is fungible, so long as it can be metabolized up and down the trophic chain. Cow carcasses can generate apex predators; in fact, in Africa it happens all the time. Instead of spending millions of dollars artificially producing the perfect conditions to raise and rewild apex megafauna, a simpler solution might be to seed their home ecosystems with key biomass, encouraging natural biological growth with minimal fear of ecological catastrophe.

Addressing Counterarguments

The main viable counterargument to consider is disease. Human livestock is a historic pathogen hotspot, which, if unchecked, could pose an issue to the health of marine ecosystems. However, this is more of a theoretical concern than a pragmatic one, as Norfolk Island's own EMOD zone has not demonstrated any sort of negative ecological effect from pathogen proliferation, and if it has, it has thus far been overshadowed by ecological expansion.

Nevertheless, caution is prudent, especially regarding the biosphere. Before implementing EMOD en masse, scientific studies ought to be undertaken comparing marine and terrestrial microflora-and-fauna to ensure that disease does not run rampant alongside increased marine offal dumping. However, again, Norfolk Island offers a well-documented case of over a century of EMOD with no known negative pathogenic effects on the local ecosystem.

My suspicion is that poultry represents the greatest pathogenic concern due (a) to its fairly close evolutionary relation with seabirds and (b) documented potential to carry bird flu. I imagine that fish, distant cousins of the rest of the chordata, will likely remain pathogenically insulated from livestock microorganisms, but it may be prudent to worry after seabirds and marine mammals.

One also ought to consider the potential for eutrophication due to overabundance of seabird guano, but the solution is simple; roll out EMOD in extremely careful phases via a program of Alpha-testing, and if a zone demonstrates guano eutrophication, flag it as unfit for the method. Continuous monitoring of EMOD zones for guano eutrophication (GE) is therefore essential, though I suspect GE will not be an issue. Apex marine megafauna love to chow down on seabirds.

Further concerns might be that marine ecosystems change their behavior alongside systemic EMOD. My response is simply that this counterargument puts the cart before the horse. So long as EMOD remains consistent–and with the world's love of beef and pork, I suspect it will–marine behavioral changes will not negatively affect the health of marine ecosystems. Norfolk Island has shown that strategic EMOD in one of the closest zones possible to human habitation (literally right off an ocean cliff) fails to encourage, at minimum, tiger sharks from seeking human presence itself as a source of food. Again, the known number of tiger shark attacks in Norfolk within the last century is zero.

Communities near EMOD zones ought to develop social norms strongly discouraging residents from feeding marine fauna, but even here, the problem is minimal. Social norms against feeding wild animals is simply good bioethical practice independent of EMOD, and another solution might be to simply strategically position EMOD zones away from terrestrial communities. One EMOD zone is better than none, and two zones are better than one; accordingly, we ought not make the perfect the enemy of the good.

Finally, what if people dump inorganic or unsuitable biowaste alongside offal? This issue is also simple to solve. A handful of EMOD quality control professionals can inspect biomass for impurities. At scale, this is likely still cheaper than traditional dumping methods.

Conclusion: EMOD as Repayment of Ecological Debt

The expansion of livestock production has wrought untold ecological damage to the biosphere. At a minimum, it threatens to devastate the Amazon. Livestock production is simply the mass extraction of biomaterial for human consumption using animals as intermediaries, and nothing more. However, humanity stands at a crossroads. We can begin to heal the ecosystems that we threaten to destroy, and all it takes is knowing where and when to throw out our biological garbage.

For centuries, human waste has poisoned the biosphere. However, this is not because it possesses some ontological curse, but because of our poor strategic judgment regarding the optimal locations and timeframes in which to dispose of our biowaste. Without bioengineering intervention, it will likely take microorganisms centuries, if not millennia, to evolve to decompose plastic, but cow scraps can be metabolized tomorrow. Why not give it a shot?

Appendix A: Braccini Tiger Shark Mass Estimation Formula

$$Weight\ (in\ kg) = (6.317\ x\ 10^{-6}) * Length\ (\ in\ cm)^{3.096}$$

Appendix B: Formal Mathematical Model of Norfolk Tiger Shark Ecology

Definition of Terms

Let:

- **H** = Human input (offal dumping rate)
- **B** = Biomass of scavenging mesofauna (e.g. baitfish, invertebrates)
- **S** = Shearwater population (primarily *Ardenna pacifica*)
- **T** = Tiger shark biomass and/or site fidelity index

Functional Relationships

A. Offal Nutrient Subsidy

- B = f1(H)
    - Mesofaunal biomass is a **positive function of offal input**, assuming enrichment increases organic detritus availability.

B. Shearwater Aggregation

- S = f2(B, H)
    - Seabird populations increase as a function of bait availability **and/or** direct scavenging of offal if accessible. They may also benefit from nutrient-enriched breeding grounds.
    - Feedbacks may also be seasonal: S(t) where t = months.

C. Shark Aggregation and Size

- T = f3(H, S)
    - Tiger sharks are attracted both by **direct offal scavenging** and **abundant seabird prey**.
    - Shark mass and/or density grows with consistent subsidy access:
        - $\frac{dT}{dt} = \alpha H + \beta S - \delta T$
        - Where α (alpha) and β (beta) are consumption coefficients, and δ(delta)-T is loss due to natural mortality/dispersal.

System-Level Equation (Simplified)

Let:

- $T \propto (\alpha H + \beta f2\ (f1(H)))$

This model suggests that tiger shark population growth and fidelity are a second-order function of human offal dumping, with both direct and indirect (via seabirds) pathways.

Endnotes

1. To give one paradigmatic example, cat waste via surface runoff has wrought havoc upon marine ecosystems, as has been documented by Miller et al. (2002) and Gajadhar et al. (2004) regarding epidemics caused by *Toxoplasma gondii* (TG) on marine mammals. Ahmadpour et al. (2022) offer a systemic meta-analysis of TG infection in marine mammals, and Song et al. (2025) provide a promising framework to understand the effects of trace cat fecal waste infecting the marine ecosystem via surface runoff. Perhaps these studies indicate that domestic cat waste is simply unfit for biodumping. In which case, quality control specialists or sociocultural protocols ought to be recruited to differentiate cat waste from other sorts of biowaste.
2. This remains a speculative claim, not an absolute one. For all we know, microbes in some undiscovered corner of the planet are chowing down on plastic. Plastic is a hydrocarbon, so theoretically, it should be biometabolizable. The question is, how?

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