



LETTERS

The nets used by Brazil's fishing trawlers can harm the marine ecosystem.

Edited by Jennifer Sills

Prevent bottom trawling in southern Brazil

Bottom trawling, a method of fishing in which nets are dragged across the ocean floor, leads to the death of an estimated 4.2 million tons per year of non-target species worldwide (1), decreases revenue by disrupting the growth of juvenile fishes (2, 3), threatens ocean ecosystems worldwide (4), and increases aqueous CO₂ emissions by disturbing the seafloor (5). The coastal shallow waters of the Rio Grande do Sul state in southern Brazil, an ecological hotspot for megafauna and fish feeding, spawning, and nursing, have deteriorated due to extensive fishing. To protect and reconstruct their former fishery productivity, scientific evidence should be valued over the industry's immediate interests, and bottom trawling should not be allowed in this ecosystem.

Extreme overfishing (6, 7) and the chronic inefficiency of federal fisheries management pushed local fishers in Rio Grande do Sul to lead the push for the 2018 approval of the Sustainable Fisheries State Policy Act (Rio Grande do Sul State Law 15,223/2018), which banned all motor-powered bottom trawling up to 12 miles from the state's 570 km of marine coast. Decades of scientific evidence indicated that the ban would have sustainable

ecosystem benefits and ensure continued revenues for small-scale and industrial fisheries (6–8). For the same reasons, trawling bans have been established in other countries (9). However, the law was questioned in Brazil's Federal Supreme Court in 2019 after the neighboring state Santa Catarina's industrial fishing sector claimed economic losses. The dean minister maintained the law (10), but in December 2020, his successor suspended it (11).

Efficient and effective fisheries management is essential to the food security of the more than one million people along the 8000-km Brazilian coastline for whom fishing is a way of life and primary source of income (12). The new minister's decision led to uncertainty about the state's right to legislate on this issue, which could be an enormous setback in ecological and fisheries restoration. We urge the Supreme Court to formally recognize rights of states in Brazil to legislate in their coastal waters. Only then will local and other coastal fisheries be able to choose a sustainable path forward.

Luís Gustavo Cardoso^{1*}, Manuel Haimovici¹, Patrícia Raggi Abdallah², Eduardo Resende Secchi¹, Paul Gerhard Kinas³

¹Instituto de Oceanografia, Universidade Federal do Rio Grande, Rio Grande, RS, Brazil. ²Instituto de Economia, Universidade Federal do Rio Grande, Rio Grande, RS, Brazil. ³Instituto de Matemática, Estatística e Física, Universidade Federal do Rio Grande, Rio Grande, RS, Brazil.

*Corresponding author.
Email: cardosol15@gmail.com

REFERENCES AND NOTES

- M. A. P. Roda *et al.*, "A third assessment of global marine fisheries discards," Food and Agriculture Organization of the United Nations (FAO Fisheries and Aquaculture Technical Paper, 633, 2019).
- A. Jensen, R. Reider, W. Kovalak, *N. Am. J. Fish. Manag.* **8**, 191 (1988).
- U. R. Sumaila, *Game Theory and Fisheries* (Routledge, London, 2013).
- J. G. Hiddink *et al.*, *Proc. Natl. Acad. Sci.* **114**, 8301 (2017).
- E. Sala *et al.*, *Nature* 10.1038/s41586-021-03371-z (2021).
- M. Haimovici, L. G. Cardoso, *Mar. Biol. Res.* **13**, 135 (2017).
- L. G. Cardoso, M. Haimovici, P. R. Abdallah, L. F. C. Dumont, "Efeitos para o setor pesqueiro do deslocamento do arrasto de fundo para além da 12 milhas náuticas na costa do Rio Grande do Sul" (Tech. Rep. 1, BRA-0142-2017, Universidade Federal do Rio Grande, 2018); https://demersais.furg.br/images/Cardoso_et_al_2018_Efeitos_para_o_setor_pesqueiro_do_deslocamento_do_arrasto_de_fundo_para_alm_da_12_milhas_noticias_na_costa_do_Rio_Grande_do_Sul.pdf [in Portuguese].
- Instituto Chico Mendes de Conservação da Biodiversidade/Ministério do Meio Ambiente, "Livro Vermelho da Fauna Brasileira Ameaçada de Extinção," VI – Peixes (ed. 1, Brasília, 2018) [in Portuguese].
- T. L. Loh, Z. Jaafar, *Aquatic Conserv. Mar. Freshw. Ecosyst.* **25**, 581 (2015).
- C. Mello, "Medida cautelar na ação direta de inconstitucionalidade 6.218 Rio Grande do Sul" (2019); www.stf.jus.br/arquivo/cms/noticiaNoticiaStf/anexo/ADI6218cautelar.pdf [in Portuguese].
- N. Marques, "Ag.Reg. na medida cautelar na ação direta de inconstitucionalidade 6.218 Rio Grande do Sul" (2020); www.conjur.com.br/dl/nunes-marques-autoriza-pesca-arrasto.pdf [in Portuguese].
- J. Dias Neto, "O uso da biodiversidade aquática no Brasil: uma avaliação com foco na pesca" (Instituto Brasileiro do Meio Ambiente, Brasília, BR, 2015) [in Portuguese].

10.1126/science.abh0279

Assess before changing Brazil's shipping policy

In September 2020, the Brazilian Infrastructure Ministry announced a plan to incentivize additional ship traffic by increasing transport rights for ships, creating new routes between ports, and reducing the cost of transporting containers (1). Although more ships may help the local economy and streamline cargo transport, the Ministry has not evaluated the potential ecological impacts of increasing cargo ship traffic among ports by an estimated 40% by 2022 (1). Ship traffic is associated with greenhouse gases (2), oil spills (3), and noise pollution (4). Policies likely to increase ship traffic should not be implemented before an independent environmental assessment has been conducted.

The current ship traffic has already led to loss of livelihoods for Brazil's people and degradation of its ecosystems. Residents of the Brazilian coast, particularly fishers, are still recovering from the 2019 oil spill (5, 6). Underwater noise pollution by cargo ship traffic disrupts the behavior and populations of marine animals (7, 8), increasing the risks to endangered species (9, 10). Ships are also potential vectors for invasive organisms, such as bay barnacle or zebra mussels, which are transported in hull fouling or ballast water and threaten native species (11, 12). The Brazilian government has not made public any information about how it will inspect ships or protect the marine ecosystems from these perturbations as the new plan takes effect.

Considering the risks, the new initiative should be put on hold until the government can evaluate the potential for damages and propose a plan to prevent them. To move forward with the ship traffic program responsibly, the government will have to allocate more funding to research, create action plans for endangered species, expand biomonitoring programs (13, 14), and encourage cargo transportation that uses cleaner energy sources. If these measures are not addressed, the Brazilian government will jeopardize ecosystems with immeasurable value.

Lucas Rodriguez Forti^{1*}, Marcos R. Rossi-Santos^{2,3}, José Anchieta C. C. Nunes¹

¹Universidade Federal da Bahia, 40170-115 Salvador, Bahia, Brazil. ²Universidade Federal do Recôncavo da Bahia, Cruz das Almas, BA 44380-000, Brazil. ³Centre for Marine Science and Technology, Curtin University, Bentley, WA 6102, Australia.

*Corresponding author. Email: lucas.forti@ufba.br

REFERENCES AND NOTES

1. Governo Federal, Ministério da Infraestrutura, "Br do Mar" (2020); www.gov.br/infraestrutura/pt-br/brdomar [in Portuguese].
2. T. R. Walker *et al.*, *World Seas* **3**, 505 (2019).
3. M. Girin, E. Mamaca, *Pollutions Chimiques Accidentelles du Transport Maritime* (Editions Quæ, Versailles, 2010).
4. B. S. Halpern *et al.*, *Sci. Rep.* **9**, 11609 (2019).
5. H. Escobar *Science*, **366**, 672 (2019).
6. S. F. Câmara *et al.*, *Ocean Coast. Manag.* **202**, 105506 (2021).
7. R. A. Dunlop, *Soc. Open Sci.* **6**, 6190967 (2019).
8. C. Duarte *et al.*, *Science* **371**, eaba4658 (2021).
9. D. T. L. Martins *et al.*, *Mar. Biol. Assoc. U.K.* **98**, 215 (2018).
10. C. Erbe *et al.*, *Front. Mar. Sci.* **6**, 606 (2019).
11. E. Lakshmi *et al.*, *Ocean Coast. Manag.* **199**, 105296 (2021).
12. International Maritime Organization, "Common Hull Fouling Invasive Species" (2019); www.imo.org/en/OurWork/Environment/Pages/Common-Hull-Fouling-Invasive-Species.aspx.
13. Programa Ambiental, "Paisagem Acústica" (2021); www.comunicabaciadesantos.com.br/programa-ambiental/projeto-de-monitoramento-da-paisagem-acustica-submarina-pmpas.html [in Portuguese].
14. Programa Ambiental, "Cetáceos" (2021); www.comunicabaciadesantos.com.br/programa-ambiental/projeto-de-monitoramento-de-cetaceos-pmc.html [in Portuguese].

COMPETING INTERESTS

L.R.F. received a fellowship from the Coordination for the Improvement of Higher Education Personnel (CAPES Finance Code 001).

10.1126/science.abh3608

Northeast Brazil's imperiled Cerrado

Brazil's Cerrado region, a tropical savanna ecosystem globally recognized for its rich and endemic biodiversity (1) and its importance in water regulation (2), faces escalating threats to its environmental services due to deforestation (3). The state of Maranhão, with an area of 33 million hectares, contains both Cerrado (65%) and Amazon (35%) biomes (4). In the state's Amazonian region, predatory deforestation has led to poverty and violence against traditional and Indigenous peoples (4). Maranhão, which is currently deliberating zoning policies, must ensure that the mistakes made in the Amazon are not repeated in the Cerrado.

Millions of hectares of native vegetation are legally available for agricultural conversion in the Cerrado region of Maranhão (5), including lands susceptible to desertification (6). The large-scale replacement of native vegetation by a single crop results in expropriation and violence against traditional communities (7). Large-scale agriculture also changes the water cycle (2), erodes (8) and extinguishes (9) biodiversity, and

contaminates soil and water with agrochemicals (10).

The Maranhão state government is carrying out technical studies to define zones for management and territorial planning (locally known as ZEE-Cerrado). The zoning decisions will determine which lands will be designated for conservation and which will be used for agriculture expansion. The process is expected to conclude in November with the proposal of a bill (11). In March 2020 (12), the Maranhão state parliament passed a similar zoning law for its Amazon region (4) through a process that excluded most external discussion and therefore failed to prioritize forest protection and restoration. Maranhão should make sure that both the scientific community and civil society (i.e., nongovernmental organizations, community and social action groups, and other not-for-profit associations) are integrally involved throughout the development of the Cerrado zoning law to avoid environmental setbacks and enable sustainable development in the region.

Celso H. L. Silva Junior^{1,2,3*}, Swanni T. Alvarado³, Danielle Celentano^{3,4}, Guillaume X. Rousseau³, Luis M. Hernández³, Tiago M. Ferraz³, Fabrício B. Silva⁵, Maycon H. F. de Melo⁵, Taissa C. S. Rodrigues⁶, Josué C. Viegas^{7,3}, Ulisses D. V. Souza^{8,9}, Andre L. S. Santos¹⁰, Denilson Bezerra¹¹

¹Tropical Ecosystems and Environmental Sciences Laboratory, São José dos Campos, SP, Brazil. ²Instituto Nacional de Pesquisas Espaciais, São José dos Campos, SP, Brazil.

³Universidade Estadual do Maranhão, São Luís, MA, Brazil. ⁴Conservação Internacional, Brasília, DF, Brazil. ⁵Universidade Ceuma, São Luís, MA, Brazil. ⁶Universidade Estadual da Região Tocantina do Maranhão, Imperatriz, MA, Brazil.

⁷Universidade de Coimbra, Coimbra, Portugal. ⁸Colégio Universitário da Universidade Federal do Maranhão, São Luís, MA, Brazil. ⁹Universidade de São Paulo, São Paulo, SP, Brazil. ¹⁰Instituto Federal do Maranhão, São Luís, MA, Brazil. ¹¹Universidade Federal do Maranhão, São Luís, MA, Brazil.

*Corresponding author. Email: celsohlsj@gmail.com

REFERENCES AND NOTES

1. N. Myers, R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca, J. Kent, *Nature* **403**, 853 (2000).
2. S. A. Spera, G. L. Galford, M. T. Coe, M. N. Macedo, J. F. Mustard, *Glob. Chang. Biol.* **22**, 3405 (2016).
3. Instituto Nacional de Pesquisas Espaciais, Portal TerraBrasilis (2020); <http://terrabrasilis.dpi.inpe.br>.
4. C. H. L. Silva Junior *et al.*, *Land Use Pol.* **97**, 104806 (2020).
5. Ministério do Meio Ambiente, *Plano Nacional de Recuperação da Vegetação Nativa* (2017); www.gov.br/mma/pt-br/assuntos/servico-sambientais/ecossistemas-1/conservacao-1/politica-nacional-de-recuperacao-da-vegetacao-nativa/planaveg_plano_nacional_recuperacao_vegetacao_nativa.pdf [in Portuguese].
6. R. M. S. P. Vieira *et al.*, *Solid Earth* **6**, 347 (2015).
7. F. T. Pitta, G. C. Vega, *Impacts of Agribusiness Expansion in the Matopiba Region: Communities and the Environment* (ActionAid, Rio de Janeiro, 2017); <https://actionaid.org.br/wp-content/>

Where Science Gets Social.

AAAS.ORG/COMMUNITY



AAAS' Member Community is a one-stop destination for scientists and STEM enthusiasts alike. It's "Where Science Gets Social": a community where facts matter, ideas are big and there's always a reason to come hang out, share, discuss and explore.

Member
COMMUNITY
AAAS

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

- files_mf/1520602943ACTIONID_MATOPIBA_ENG_WEB.pdf.
8. C. A. Klink, R. B. Machado, *Conserv. Biol.* **19**, 707 (2005).
 9. T. Newbold *et al.*, *Science* **353**, 288 (2016).
 10. L. M. Bombardi, *Geografia do Uso de Agrotóxicos no Brasil e Conexões com a União Europeia* (FFLCH-USP, São Paulo, 2017); <http://conexaoagua.mpf.mp.br/arquivos/agrototoxicos/05-larissa-bombardi-atlas-agrotxico-2017.pdf> [in Portuguese].
 11. Governo do Maranhão, "ZEE dos Biomas Cerrado e Costeiro maranhense será finalizado em novembro de 2021" (2020); www.ma.gov.br/agenciade-noticias/?p=291618 [in Portuguese].
 12. J. Barros, "Aprovado projeto que institui o Zoneamento Ecológico-Econômico do Maranhão" (2020); www.al.ma.leg.br/noticias/39800 [in Portuguese].

10.1126/science.abg0556

TECHNICAL COMMENT ABSTRACTS

Comment on "Tumor-initiating cells establish an IL-33–TGF- β niche signaling loop to promote cancer progression"

Jasper B. J. Kamphuis, William P. M. Worrall, Julien Stackowicz, Aurélie Mougél, Emilie Mauré, Eva Conde, Pierre Bruhns, Laurent Guilleminault, Nicolas Gaudenzio, Jimmiao Chen, Rebecca Gentek, Laurent L. Reber

Taniguchi *et al.* (Research Articles, 17 July 2020, p. 269) claim that the cytokine interleukin-33 induces accumulation of tumor-associated macrophages expressing the immunoglobulin E receptor Fc ϵ RI. Although these findings hold great therapeutic promise, we provide evidence that the anti-Fc ϵ RI antibody used in this study is not specific for Fc ϵ RI on macrophages, which raises concerns about the validity of some of the conclusions.

Full text: [dx.doi.org/10.1126/science.abf2022](https://doi.org/10.1126/science.abf2022)

Response to Comment on "Tumor-initiating cells establish an IL-33–TGF- β niche signaling loop to promote cancer progression"

Sachiko Taniguchi, Ajit Elhance, Avery Van Duzer, Sushil Kumar, Justin Leitenberger, Naoki Oshimori, Kamphuis *et al.* argue that macrophages accumulated in the proximity of tumor-initiating cells do not express the high-affinity immunoglobulin E receptor Fc ϵ RI α . Although we cannot exclude the possibility of nonspecific binding of anti-Fc ϵ RI α antibody (clone MAR-1), we provide evidence that macrophages in squamous cell carcinomas express Fc ϵ RI α and that IL-33 induces Fc ϵ RI α expression in bone marrow cell–derived macrophages.

Full text: [dx.doi.org/10.1126/science.abf3316](https://doi.org/10.1126/science.abf3316)

ERRATA

Erratum for the Report "PML Regulates Apoptosis at Endoplasmic Reticulum by Modulating Calcium Release" by C. Giorgi *et al.*, *Science* **371**, eabi4740 (2021). Published online 26 March 2021; 10.1126/science.abi4740

Assess before changing Brazil's shipping policy

Lucas Rodríguez Forti, Marcos R. Rossi-Santos and José Anchieta C. C. Nunes

Science **372** (6538), 139.

DOI: 10.1126/science.abh3608

ARTICLE TOOLS

<http://science.sciencemag.org/content/372/6538/139.1>

REFERENCES

This article cites 9 articles, 2 of which you can access for free
<http://science.sciencemag.org/content/372/6538/139.1#BIBL>

PERMISSIONS

<http://www.sciencemag.org/help/reprints-and-permissions>

Use of this article is subject to the [Terms of Service](#)

Science (print ISSN 0036-8075; online ISSN 1095-9203) is published by the American Association for the Advancement of Science, 1200 New York Avenue NW, Washington, DC 20005. The title *Science* is a registered trademark of AAAS.

Copyright © 2021 The Authors, some rights reserved; exclusive licensee American Association for the Advancement of Science. No claim to original U.S. Government Works