Aquatic Conservation: Marine and Freshwater Ecosystems

WILEY

COMMENT

Inclusion of all *Anguilla* Eel Species in CITES Appendix II Will Support Their Sustainable Management Across the Globe

Florian Martin Stein[1] | Vincent Nijman[2] | Mickey Chung Wai Lau[3] | Willem Dekker[4]

[1]Technische Universität Braunschweig, Braunschweig, Germany | [2]Oxford Brookes University, Oxford, UK | [3]Humboldt-Universität zu Berlin, Berlin, Germany | [4]Sustainable Eel Group, Brussels, Belgium

Correspondence: Vincent Nijman (vnijman@brookes.ac.uk)

Received: 2 September 2025 | **Revised:** 12 September 2025 | **Accepted:** 3 October 2025

Keywords: Anguilla | aquaculture | CITES | conservation | eel | fisheries | wildlife trade

For the 20th Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) between 24 November and 5 December 2025, the European Union (EU) and Honduras have proposed the listing of all species belonging to the genus *Anguilla* (eels) in CITES Appendix II (hereafter named the proposal) (CITES 2025a). The proponents argue that international trade must be regulated to ensure the conservation of these species and to facilitate sustainable trade (CITES 2025a). Here, we discuss the global significance of eel trade and the potential impact of this proposal in relation to the management and protection of eel species. To this end, we present a concise overview of the worldwide trade in eel, discuss the status of the stocks, the effectiveness of stock management policies, the importance of the proposal in this context and the likelihood of successful implementation.

1 | Global Distribution and Exploitation of *Anguilla* Eel Species

Anguilla eel species are naturally distributed in temperate, subtropical and tropical zones around the globe (Tesch and Thorpe 2003). Eel stocks suffer from fishing and unintended human impacts such as habitat loss, migration barriers and pollution. The magnitude of the nonfishing human impacts is not well-known (ICES 2020) but appears to be at least in the same order of magnitude as the impact of fishing (Dekker 2016). Sustainable management can therefore only be ensured by managing both the fisheries and the nonfishing impacts (Stuart et al. 2024).

Many eel species are exploited for commercial consumption, and eel aquaculture is centred mainly in Asia (Crook and Nakamura 2013). In 2023, mainland China produced 87% of the global production of eel (FAO 2025a). However, the seed supply for this aquaculture is taken from wild stocks, and the seed fisheries outnumber the direct capture fisheries completely. These seed fisheries exploit different eel species in all climate zones, predominantly from the temperate northern hemisphere (American, Japanese and European eels: we use the nomenclature of Tsukamoto et al. 2020). In 2010, the EU banned the export of European eel. Subsequently, the then-still-legal supply of glass eel was replaced by other *Anguilla* species from other continents or illegal supplies (Nijman 2015; Stein et al. 2024). In 2022, the main supply was American eel from Haiti, and from then on, most glass eel is reported to originate from several Caribbean countries (Shiraishi and Kaifu 2024; Statistics Canada 2025). In processing and trade, the different species of *Anguilla* effectively constitute mutual substitutes, and—given that they are almost perfect look-alikes, which cannot be distinguished in the field (e.g., Silfvergrip 2009)—the species identity can only be determined by means of DNA sampling (e.g., Stein et al. 2021; Choo et al. 2025). While in 2007, in the proposals for the listing of the European eel, the country of origin was still seen as a proxy for the species identity (CITES 2007), the broadening of the worldwide markets that resulted from the export ban for European eel from the European Union, as well as the mere increase in the demand for glass eel to seed the growing markets, now has blocked the use of simple proxies completely. The world market for young eels of the genus *Anguilla* constitutes a single, large and complex global trade.

In 2024, approximately 12,000 t of chilled and frozen eel meat and over 20,000 t of live eels have been exported, predominantly by China (Japanese, American and tropical eels), and lesser shares by the United States (American eel) and tropical Asian and African countries (Bicolor and Indo-Pacific eel) (Figure 1; United Nations 2025). Imports in that year comprised 6400 t of chilled and frozen eel and 14,000 t of live eel, mainly to China and the European countries (chilled and frozen), respectively, Japan and Korea (live eel of mixed species) (Figure 1; United Nations 2025). In terms of the number of fish, most of the global trade in live eels consists of glass eels, juveniles of American, Japanese, Bicolor, Indo-Pacific and Mozambique eels, as well as European eel (Crook and Nakamura 2013).

In our view, the global dimension of eel production processes and trade flows—between the spatially separated fishing grounds, trade hubs, aquaculture facilities and consumer markets—necessitates appropriate trade management, even in a single-stock context. While sustainable management of fisheries and nonfishing impacts can be arranged by the authorities in a distribution area, the worldwide trade and the global demand for eel and eel products necessitate a broader approach. Without listing the whole genus *Anguilla* in CITES Appendix II, sustainable management of a (national) stock will nevertheless require full control of and restraints on the worldwide trade from/to the area concerned.

2 | Uncertain Stock Status of *Anguilla* Eel Species

The status of the different eel species and stocks is generally not well-known (e.g., Stuart et al. 2024; Kaifu et al. 2019; Jacoby et al. 2015). Eels are distributed over fragmented fresh waters and coastal habitats (Dekker 2000a), and stocks are impacted by many human activities (including fisheries, pollution, habitat loss and migration barriers). Available data by far do not cover the whole populations and all impacts, and stock assessments are generally rather exploratory and sketchy (Dekker 2000b) as well as often based on far-reaching assumptions and uncertain extrapolations (e.g., Tanaka 2025; Shanmughan et al. 2022; Jellyman 2022). Management of the stocks, as well as the current proposal, is essentially based on time trends in (incomplete) indices of stock abundance. As far as indicative time trends are available, these almost invariably show a long-term decline in fishing yield, a major loss of accessible habitats, a severe decline in recruitment, a high fishing intensity and widespread intense nonfishing human impacts. Nevertheless, a significant proportion of the current discourse centres on the precise status of the stocks and the question of whether that already fulfils the CITES listing criteria or not.

Without discussing the merits of the individual species assessments in detail, we note that none of the *Anguilla* species is beyond question, and that the pressure on glass eel supplies worldwide constitutes a major threat to them all, if not currently, then potentially.

3 | Opposition to the Proposal

As outlined in the summary of responses contained in Annex II of the proposal, six range states have expressed opposition: China, Indonesia, Japan, New Zealand, the Philippines and the Republic of Korea (CITES 2025a). Those included the main eel aquaculture production and some of the major consumption countries. The summary table did not reveal much depth

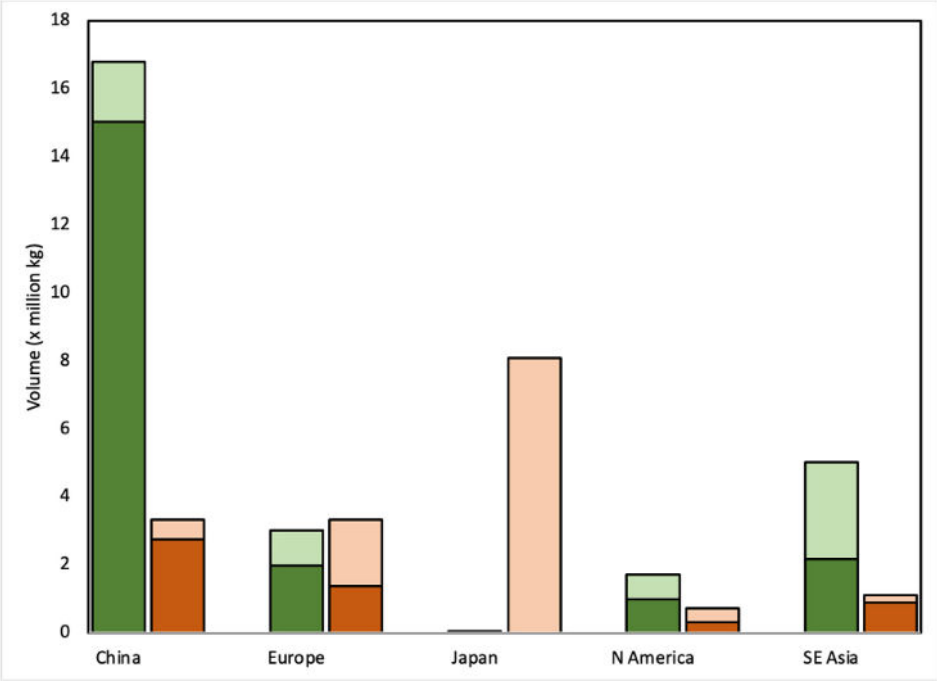

FIGURE 1 | Global eel trade in 2024. Exports in green and imports in red (live eels in dark, chilled and frozen products in pale colours). China includes mainland China, Hong Kong and Macau; Europe includes EU27 plus non-EU European countries; N America includes United States and Canada, SE Asia includes ten South East Asian countries. *Source:* UN Comtrade database (United Nations 2025).

in their arguments, but media releases (e.g., Kyodo News 2025; Fisheco 2025) revealed that opponents claimed species were not at risk of extinction and highlighted the economic importance of eel aquaculture.

The Food and Agriculture Organization of the United Nations (FAO) regularly assesses CITES proposals concerning commercially exploited aquatic species. The 2025 expert panel's report concluded that the American and the Japanese eel, as well as the other *Anguilla* species, did not meet the CITES listing criteria. For the Japanese eel and other *Anguilla* species, the experts argued that their conclusion is based on the best available scientific and technical data, showing that the mentioned species had medium productivity, large populations above Appendix II thresholds and low extinction risk according to Population Viability Analysis. For the American eel, they noted that available scientific and technical information did not support the conclusion that regulating international trade is necessary to prevent population decline from harvest or other pressures. Additionally, the experts expressed their concerns about the risks of unintended negative consequences and emphasized that the continuation of existing and new targeted conservation actions and region-specific management might be a more effective pathway to sustainable conservation outcomes (FAO 2025b).

In contrast, the CITES secretariat concluded that criteria for the genus *Anguilla* listing are met. However, regarding Japanese and American eel, the secretariat assessed that there is insufficient evidence to determine whether those species meet the criteria for inclusion in Appendix II (CITES 2025b).

4 | Potential Consequences of Changes to *Anguilla* eel Listings

The listing of the European eel in CITES Appendix II, which came into effect in 2007, had unintended consequences. The trade of glass eels from Europe to Asia continued illegally and out of sight for several years in most countries, until Europol was tasked with coordinating anti-eel trafficking enforcement efforts in 2015 (Stein et al. 2024). It is highly recommendable to evaluate the listing and implementation of the listing of the European eel in detail, to improve the potential further listing of any other *Anguilla* species.

If the genus *Anguilla* is listed in Appendix II, every export country aiming to continue trade in *Anguilla* species is required to perform a Non-Detriment-Finding (NDF) assessment (CITES 2016). Only a positive outcome of an NDF assessment ensuring that the trade is not detrimental to the species' survival will enable trade under CITES conditions. Though not all source countries intending to export *Anguilla* eels might have the capacities for a perfect NDF from scratch, the listing can act as a catalyst providing the opportunity to gradually improve.

5 | Conclusion

All documented *Anguilla* stocks around the world have declined due to human impacts, including fishing, water management, land reclamation, hydropower and pollution. Therefore, it is of importance that trade flows are known, controlled and managed for all stocks. Since different *Anguilla* species replace each other in aquaculture and on the market, the individual stocks cannot be managed in isolation, and trade regimes might have to be adjusted to the "weakest" stocks. The greater value of effectively protecting all *Anguilla* species worldwide may well outweigh the potentially marginal value of trade management for single species in their distribution areas.

Given the circumstances and uncertainties outlined above, we believe there is room for greater socio-economic sensitivity toward the major user countries, as well as a need for more proactive consideration of potential knock-on effects that could arise from a listing.

Noting the precarious state of most (if not all) eel species around the world, we recognize and appreciate the opportunity for progress—particularly in enhancing the visibility and traceability of global trade in *Anguilla* eels. At the same time, questions around capacity and resources for effective implementation remain open, and we are concerned that exploitation may increasingly shift to regions with the least ability to manage effectively.

To ensure the best possible outcomes, we recommend that all potential changes and implementation challenges be considered early and thoroughly. We feel that this process has not yet been fully realized. Nonetheless, we remain hopeful that the international CITES community will consider the valuable lessons learned from listing the European eel and apply them constructively in future decision-making for other *Anguilla* species.

Ethics Statement

The authors have nothing to report.

Conflicts of Interest

WD declares that, as chairman of the ICES/EIFAC eel working group 1987-2006, he pioneered the campaign to create awareness of the need for protection for the eel (European and others), and has led the development of scientific advice that gave rise to the EU Eel Regulation and the CITES listing. VN declares that during the time the European eel became listed on CITES appendix II he was a member of the Dutch CITES Scientific Authority. No other conflicts of interests need to be declared.

Data Availability Statement

The data that support the findings of this study are openly available in United Nations (2025), UN Comtrade Database at https://comtradeplus.un.org/.

References

Choo, J. S., G. Rabbani, E. X. Lim, and B. J. Wainwright. 2025. "A Shift in the Trade? An Investigation of the Eel Trade Reveals a Likely Species Switch." *Conservation Science and Practice* 7, no. 4: e70013. https://doi.org/10.1111/csp2.70013.

CITES. 2007. "Proposal 18: Amendment of Appendices I and II." Fourteenth Meeting of the Conference of the Parties, the Hague, Netherlands. https://cites.org/sites/default/files/eng/cop/14/prop/E14-P18.pdf.

CITES. 2016. "Resolution Conf. 9.24 (Rev. CoP17): Criteria for amendment of Appendices I and II." Seventeenth Meeting of the Conference of the Parties, Johannesburg, South Africa. https://cites.org/sites/default/files/documents/COP/19/resolution/E-Res-09-24-R17.pdf.

CITES. 2025a. "Proposal to Include *Anguilla japonica* and *Anguilla rostrata* in CITES Appendix II, in Accordance With Article II, Paragraph 2 (a) of the Convention and Criterion B of Annex 2a, and to Include All Non-CITES Species of the Genus *Anguilla* in CITES Appendix II in Accordance With Article II, Paragraph 2 (b) of the Convention and Satisfying Criterion A of Annex 2b of Resolution Conf. 9.24 (Rev. CoP17) for Reasons of Similarity to *A. anguilla*, or to One of the Proposed Species (*Anguilla japonica* and *Anguilla rostrata*) in Live/Processed Form." CoP20 Pro. 35. https://cites.org/sites/default/files/documents/COP/20/prop/E-CoP20-Prop-35.pdf.

CITES. 2025b. "Notification to the Parties no. 2025/102." Convention on International Trade in Endangered Species of Wild Fauna and Flora. https://cites.org/sites/default/files/notifications/E-Notif-2025-102.pdf.

Crook, V., and M. Nakamura. 2013. "Glass Eels: Assessing the Supply Chain and Market Impacts of CITES Listings on *Anguilla* Species." *TRAFFIC Bulletin* 25, no. 1: 24–30.

Dekker, W. 2000a. "The Fractal Geometry of the European Eel Stock." *ICES Journal of Marine Science* 57, no. 1: 109–121. https://doi.org/10.1006/jmsc.1999.0562.

Dekker, W. 2000b. "A Procrustean Assessment of the European Eel Stock." *ICES Journal of Marine Science* 57, no. 4: 938–947. https://doi.org/10.1006/jmsc.2000.0581.

Dekker, W. 2016. "Management of the Eel Is Slipping Through Our Hands! Distribute Control and Orchestrate National Protection." *ICES Journal of Marine Science* 73, no. 10: 2442–2452. https://doi.org/10.1093/icesjms/fsw094.

FAO. 2025a. "FishStat: Global Aquaculture Production 1950–2023." In: FishStatJ. Licence: CC-BY-4.0. www.fao.org/fishery/en/statistics/software/fishstatj.

FAO. 2025b. "Report of the Eighth FAO Expert Advisory Panel for the Assessment of Proposals to Amend Appendices I and II of CITES Concerning Commercially-Exploited Aquatic Species—Bangkok, 7–11 July 2025 and Rome, 21–25 July 2025." FAO Fisheries and Aquaculture Report, No. 1482. Rome. https://doi.org/10.4060/cd6542en.

Fisheco. 2025. "EU의 뱀장어 국제거래협약 등재 움직임과 대응 방향 – 한국수산경제." http://www.fisheco.com/news/articleView.html?idxno=90287.

ICES. 2020. "Joint EIFAAC/ICES/GFCM Working Group on Eels (WGEEL)." *ICES Scientific Reports* 2, no. 85: 223. https://doi.org/10.17895/ices.pub.5982.

Jacoby, D. M., J. M. Casselman, V. Crook, et al. 2015. "Synergistic Patterns of Threat and the Challenges Facing Global Anguillid Eel Conservation." *Global Ecology and Conservation* 4: 321–333. https://doi.org/10.1016/j.gecco.2015.07.009.

Jellyman, D. J. 2022. "An Enigma: How Can Freshwater Eels (*Anguilla* Spp.) Be Such a Successful Genus yet Be Universally Threatened?" *Reviews in Fish Biology and Fisheries* 32, no. 2: 701–718. https://doi.org/10.1007/s11160-021-09658-8.

Kaifu, K., F. Stein, W. Dekker, et al. 2019. "Global Exploitation of Freshwater Eels (Genus *Anguilla*): Fisheries, Stock Status and Illegal Trade." In *Eels Biology, Monitoring, Management, Culture and Exploitation: Proceedings of the First International Eel Science Symposium*, edited by A. Don and P. Coulson, 504. GB: CABI.

Kyodo News. 2025. "EU proposes global eel trade curbs despite Japan's opposition." https://english.kyodonews.net/articles/-/56329.

Nijman, V. 2015. "CITES-Listings, EU Eel Trade Bans and the Increase of Export of Tropical Eels Out of Indonesia." *Marine Policy* 58: 36–41.

Shanmughan, A., N. Dahanukar, A. Harrison, A. C. Pinder, K. Ranjeet, and R. Raghavan. 2022. "Demographics and Exploitation of Two Near Threatened Freshwater Eels, *Anguilla bengalensis* and *Anguilla bicolor*, in Small-Scale Subsistence Fisheries and Implications for Conservation." *Aquatic Conservation: Marine and Freshwater Ecosystems* 32, no. 2: 269–281. https://doi.org/10.1002/aqc.3765.

Shiraishi, H., and K. Kaifu. 2024. "Early Warning of an Upsurge in International Trade in the American Eel." *Marine Policy* 159: 105938. https://doi.org/10.1016/j.marpol.2023.105938.

Silfvergrip, A. 2009. *CITES Identification Guide to the Freshwater Eels (Anguillidae): With Focus on the European Eel Anguilla anguilla*. Naturvårdsverket.

Statistics Canada. 2025. "Trade Data Online." https://ised-isde.canada.ca/site/trade-data-online/en.

Stein, F. M., J. Frankowski, V. Nijman, C. Absil, I. Kranendonk, and W. Dekker. 2021. "Chinese Eel Products in EU Markets Imply the Effectiveness of Trade Regulations but Expose Fraudulent Labelling." *Marine Policy* 132: 104651. https://doi.org/10.1016/j.marpol.2021.104651.

Stein, F. M., A. Troneci, J. Jesus, and J. A. Alfaro Moreno. 2024. "Europe's Biggest Wildlife Crime: Eight Years of Coordinated Actions Against Eel Trafficking." *Trends in Organized Crime* 27: 496–502. https://doi.org/10.1007/s12117-024-09540-6.

Stuart, R. E., J. D. Stockwell, and J. E. Marsden. 2024. "Anguillids: Widely Studied yet Poorly Understood—A Literature Review of the Current State of *Anguilla* Eel Research." *Reviews in Fish Biology and Fisheries* 34: 1637–1664. https://doi.org/10.1007/s11160-024-09892-w.

Tanaka, E. 2025. "Updated Stock Assessment of Japanese Eels Using Japanese Abundance Indices." *Fisheries Science*. https://doi.org/10.1007/s12562-025-01912-3.

Tesch, F. W., and J. E. Thorpe. 2003. *The Eel*. Vol. 15. Blackwell Science.

Tsukamoto, K., M. Kuroki, and S. Watanabe. 2020. "Common Names for All Species and Subspecies of the Genus *Anguilla*." *Environmental Biology of Fishes* 103, no. 8: 985–991. https://doi.org/10.1007/s10641-020-00988-3.

United Nations. 2025. "UN Comtrade Database." Retrieved from https://comtradeplus.un.org/.