

I call to the Commission's attention serious problems in the glass eel fishery in Canada that have spilled over into the United States and will likely increase in the coming years unless the ASMFC and its government partners take steps to address them.

Sadly, over the past five years, Canada has become a hub for the illegal, unregulated and unreported trafficking of baby eels. The situation is described in the alarming report of Shiraishi and Kaifu published earlier this year entitled, *Early Warning of an Upsurge in International Trade in the American Eel*. That article concludes that imports to Hong Kong from Canada included 100 tons, 43 tons 12.7 tons and .2 tons from Dominican Republic, over 150 tons!

As an active industry participant and having spoken to numerous knowledgeable parties in government, science and industry, I can assure this Board that those numbers are grossly exaggerated. Still, they reflect a terrible reality. Specifically, while it is clear that illegal glass eel trade originating from North America is growing, the data indicate that *criminal organizations involved in glass eel smuggling are creating false records and engaging in fraudulent tactics to hide and mislabel a vast number of lookalike eel species that Hong Kong and Chinese importers are bringing in from around the world.*

A primary use of false documents is to change the apparent origin of glass eels illegally harvested in Europe to Haiti or Canada to make them appear legal. (Export of glass eels harvested in the EU (*Anguilla Anguilla*) is strictly illegal.) Also, creating a false record of large volumes of North American eels (*Anguilla Rostrata*) enables criminal elements to increase the value of cheap eels from places like Indonesia, Africa and the Phillipines by making them appear as if they are *Rostrata*, a much more valuable commodity.

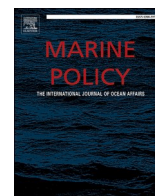
Mismanagement and lax enforcement of the fishery in Canada at a time when Indigenous groups in Canada claim they are not subject to the country's fishing rules and have the right to self-regulate, is at the crux of the problem. However, it is clear that criminals have established strong networks in the U.S. that play an important role. These networks stretch from Florida to New England. They involve Haitian gangs that have overrun that country, powerful Chinese companies that presumably act with the tacit approval of the central government, as well as fishermen from South Carolina, Maine, Canada and elsewhere.

In some cases, they transit glass eels from Maine, which has a strong enforceability system, directly to Toronto. Canada's lack of a traceability system enables these eels to disappear in a regulatory no-man's land, ripe for mislabeling, mixing and hidden export routes.

The combined lawful harvest of glass eels in 2022 from the U.S. and Canada was under 15 tons. The numbers presented by Shiraishi and Kaifu demonstrate that almost ten times that amount of glass eels may be landing in Hong Kong that are either illegal or falsely labeled.

In the short term, this problem has a destructive impact on the value of the commodity in the U.S. and a loss of revenues and economic benefits to honest fishermen. In the long term, the problem gives our Chinese adversaries complete dominance of an industry that remains in its infancy here in North America, but represents billions of dollar's worth of advantage in trade competition. The potential harm to the species and public trust in law enforcement and government regulation are the biggest threats posed by this situation.

Solutions to this problem are beyond the scope of my comments today but in coming months, I will be sharing information and ideas with this Board, the Law Enforcement Committee and other state and federal officials on how to combat the problem. From its past actions, I am confident that the ASMFC will provide helpful leadership to address a grave situation, but only if Commissioners from all the states recognize the urgency.



Early warning of an upsurge in international trade in the American Eel

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ABSTRACT

According to Customs import data from East Asian countries and territories, imports of *Anguilla* live eel fry (recruiting juvenile eels also called glass eels or elver) from the Americas increased from 2 t in 2004 to 157 t in 2022, indicating unprecedented demand for the American Eel *A. rostrata* in the region. In particular, Hong Kong, an important trade hub for live eel fry destined for farming operations in East Asia, reportedly imported 100.6 t, 43.4 t, 12.7 t and 0.2 t of live eel fry from Haiti, Canada, the US, and the Dominican Republic respectively in 2022. Hong Kong's import data also suggested that almost all live eel fry originating in Haiti were traded via Canada or the US. The high demand for *A. rostrata* live eel fry has resulted in IUU fishing, illegal trade and social conflicts in some range States. Although regulations to manage fisheries, trade and/or aquaculture are implemented in both *A. rostrata* range States and East Asian countries/territories, it is vital to examine whether they are sufficient in the context of increased demand and illegal fishing/trade. Monitoring and management targeting the *Anguilla* genus are also essential as the boom in exploitation and export may occur for other *Anguilla* spp. due to shortages of live eel fry currently used for farming or improvement of aquaculture techniques.

Anguillid eels are found across the globe except in the eastern Pacific, South Atlantic and polar areas. There are currently 19 recognised species/subspecies of the genus *Anguilla*, family Anguillidae. Eels exhibit a catadromous life history; they spawn in offshore oceanic waters, and the hatched larvae then migrate to continental waters where they feed and grow, before they return to spawn [24]. Their complex life history means that *Anguilla* spp. are susceptible to a range of threats. These include changes in oceanic currents and/or climatic conditions, barriers to migration, loss or degradation of freshwater habitat, disease, pollution, and unsustainable exploitation and trade [14]. Stocks of many *Anguilla* spp., most notably those in temperate Northern Hemisphere regions, have exhibited declines in recent decades due to these impacts [8,12,14]. The European Eel *A. anguilla* is currently listed as Critically Endangered on the IUCN Red List of Threatened Species and the Japanese Eel *A. japonica* and American Eel *A. rostrata* are classified as Endangered [15,19,20].

Recruiting juvenile eels (also called glass eels, elver or live eel fry) are the primary focus of exploitation in many countries/territories due to their commercial value. These are caught and then used as 'seed' in farming/aquaculture operations as artificial breeding of *Anguilla* spp. is

not yet commercially viable [21]. Farming operations of *Anguilla* spp. predominantly occur in East Asia (China, Japan, South Korea and Taiwan), with Hong Kong being an important trade hub for live eel fry destined for farming operations in the region [6,23]. The cumulative total farming production of the region accounted for 98% of global *Anguilla* farming production in 2021 [10]. In 2007, *A. anguilla* was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which came into effect in 2009. Since that time, increase in harvest and international trade of other *Anguilla* spp. has been observed as the Americas and Southeast Asia became important live eel fry source regions for East Asian farms in early 2010s [18]. Imports from the Americas into East Asia remain high while Haiti and the Dominican Republic have become key exporters of live eel fry in recent years [4,11].

Customs import data for *Anguilla* live eel fry for the East Asian countries and territories for 2004–2022 were obtained in April 2023¹ to provide an overview of trade dynamics of live eel fry imported into the region. Globally, there is one six-digit Harmonised Systems (HS) Customs code designated for live *Anguilla* spp. (HS030192), however this does not differentiate between the life stages or species. All East Asian

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¹ China Customs statistics online platform: <http://english.customs.gov.cn>; Ministry of Finance, Trade Statistics of Japan: <http://www.customs.go.jp/toukei/info/>; Korea International Trade Association: <http://www.kita.org/>; Taiwan Bureau of Foreign Trade: <https://cuswebo.trade.gov.tw/FSCE010F/FSCE010F/>; Hong Kong Census and Statistics Department: <https://tradeids.censtatd.gov.hk>

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countries/territories have adopted more detailed Customs codes for imports and differentiate between ‘live eel fry (for farming)’ and ‘other live eel’ for consumption purposes from 2004² although the definition of ‘live eel fry’ varies between them. As species-specific Customs data are not available, geographic provenance was used to infer the likely *Anguilla* spp. being traded and supplied to farms. Even though live eel fry can be traded between countries and territories before being (re-) exported to East Asia, particular regions in the import data were assumed to refer to the source of the following *Anguilla* spp. based on the species distribution ranges reported in the IUCN Red List assessments, i. e., Americas (*A. rostrata*), Europe and North Africa (*A. anguilla*), Southeast Asia (*A. bicolor* and other tropical species), and the remainder e.g. Oceania and East/Southern Africa.

According to East Asian Customs data, imports of live eel fry from the Americas (likely to be *A. rostrata*) increased from 2 t in 2004 to 53 t in 2021 and 157 t in 2022 (Fig. 1). Since 2009 when the CITES listing of European eel came into effect, average imports from the Americas up to 2021 was 29.1 ± 14.3 t. Imports in 2022 were 157 t, more than five times the mean. Imports from the Americas accounted for 89% of all live eel fry imports into East Asia in 2022. Hong Kong was the main importer of live eel fry from the other regions in 2022, accounting for 96% of the imports into East Asia; the proportion of imports into Hong Kong increased over the years with some fluctuations, from 25% to 42% in 2005–2007 to 82–96% in 2020–2022. Hong Kong reportedly imported 100.6 t of live eel fry from Haiti, 43.4 t from Canada, 12.7 t from the US, and 0.2 t from the Dominican Republic in 2022 (Fig. 2). The increase in imports from Haiti between 2021 and 2022 was nearly tenfold (10.6 in 2021 to 100.6 t in 2022). Further, in 2022, the majority (more than 95 t) from Haiti was imported in three months, October to December. Hong Kong’s import data, which differentiate imports by origin and consignment, suggests that almost all live eel fry originating in Haiti were traded via Canada or the US (more than 99% in 2022).

The East Asian Customs data suggests imports of *A. rostrata* live eel fry increased enormously in 2022, indicating the unprecedented demand for live eel fry in the region. It is noted that the East Asian Customs data indicated imports of *A. anguilla* whose international trade is regulated by CITES were scarce in recent years, however, input of *A. anguilla* for farming in East Asia may not be that low as ongoing illegal trade in *A. anguilla* has been identified through a number of seizures. While the scale of illegal trade in *A. anguilla* to East Asia is unknown, EUROPOL [9] estimated that up to 100 t of live eel fry were smuggled from the EU to China in the 2017–2018 fishing season. The annual input of *A. japonica*, the native species to East Asia, for farming has been also reported to be less than 100 t since the 2011–2012 fishing season [2]. Considering the reported imports of 157 t of live eel fry from the Americas in 2022, it is reasonable to conclude that currently *A. rostrata* is arguably the most extensively exploited *Anguilla* species in the world.

The strong demand for *A. rostrata* live eel fry used for farming in East Asia is reflected in the price of live eel fry. In China, the price of *A. rostrata* glass eels (USD0.90 per piece) in 2019 exceeded that of *A. anguilla* glass eels (USD0.57 per piece), the most widely-used non-native *Anguilla* species for farming in the past, whereas *A. japonica*, the native species to East Asia, cost USD3.14 per piece [25]. The size of live eel fry from the Caribbean is smaller than those from North America, and the price is also reported to be lower. The disadvantages of live eel fry from the Caribbean include longer farming period due to its size, high percentage of injured fry, diseases and higher mortality rates [16]. Still, the price increased in the Caribbean as well - in the Dominican Republic, the price went up from DOP30–50 (USD 0.5–0.9) per gramme prior to 2017 to DOP200–250 (USD3.6–4.5) per gramme in the 2019–2020 fishing season [7]. The high demand for *A. rostrata* live eel fry and its inflated price have resulted in illegal, unreported and

unregulated (IUU) fishing, illegal trade and social disputes in some range States. Seizures and arrests are reported in Canada, as well as conflicts about fishing quota between fishers and indigenous people [26]. Marcano [17] noted a portion of live eel fry caught in the Dominican Republic enters the black market through Haiti where it fetches a better price while more recent information suggests the Dominican Republic is used for smuggling of live eel fry from Haiti with several seizures reported in the last fishing season [7]. Reported East Asian imports of live eel fry from Haiti (>100 t in 2022) were well above 6.4 t of the export quota for glass eels allocated to exporters in the country [22], indicating a large amount are potentially illegally exported from Haiti and/or other countries.

To date, mechanism to monitor the volume and species of live eel fry used for farming is limited, apart from the nonbinding ‘‘Joint Statement’’ relating to ‘‘International Cooperation for Conservation and Management of Japanese Eel Stock and Other Relevant Eel Species’’ developed in 2014 by China, Japan, South Korea and Taiwan with a focus on exploitation, aquaculture input of juveniles, and trade [1]. The input limits for *A. japonica* and other *Anguilla* spp. are set at an annual meeting, but remained unchanged up to the 2023–2024 fishing season; for example, they agreed in 2023 that *A. japonica* glass eel input for 2023–2024 should be no more than 80% of that in 2013–2014 and for other *Anguilla* species ‘‘to take every possible measure not to increase the amount of initial input of seeds of eel species other than Japanese eels from the level stated in the 2014 Joint Statement’’ [2]. Inputs for other *Anguilla* spp. were 39.9 t in total in the 2013–2014 fishing season (China 32 t, Japan 3.5 t, South Korea 2.9 t, Taiwan 1.5 t) [2,3]. Although the input limit and total imports of live eel fry into East Asia are not fully comparable because of the difference in the reporting period i.e. fishing season vs calendar year, and there are possible reporting errors in the Customs data, the imports of live eel fry in 2022 do seem to have substantially exceeded the input of the total volume for 2013–2014. The reasons behind this gap might include trade in large-sized live eel fry and/or high mortality of live eel fry during the long transport period. Evaluation of the accuracy of the input reports and the mortality of live eel fry during transport are required to better understand the levels of import. Co-operation between range States, transit and import countries/territories would be also essential to better understand the scale of exploitation and trade and how to address any IUU activity.

The sudden increase in exploitation of the American Eel *A. rostrata*, may lead to negative consequences without prompt intervention. The extent and scale of *A. rostrata* glass eel harvest and export from the Caribbean are still relatively unknown as fisheries and/or trade data are not fully available. This is partially because most of glass eels harvested in the region are traded via Canada and the USA, but some are declared as of Canadian/US origin, not as re-exports from the Caribbean when imported into East Asia [4,11]. In addition, information on catch and trade regulations to ensure long-term sustainability in the Caribbean is lacking [4]. While ICES [13] reported annual harvest of *A. rostrata* glass eels and elvers across its range increased to > 17 t after 2010, it seems to have far exceeded this quantity in the last few years. Although fisheries regulations are implemented in some *A. rostrata* range States, it is vital that they all examine whether the present fisheries and trade regulations are sufficient in the context of increased demand and IUU activity. The Dominican Republic announced its intent to list *A. rostrata* in CITES Appendix III at the 74th CITES Standing Committee meeting in 2022 [5]. It would help to understand the trade flow of the species although no further information was available about the listing at the time of writing. In terms of harvest and international trade in live eel fry, *A. rostrata* may reach a similar situation as *A. anguilla* when a significant amount of live eel fry was traded in the late 1990 s or early 2000 s for farming in East Asia, which led to the CITES listing of the species in 2007.

The boom in exploitation and export may also occur for other *Anguilla* spp. when the availability of live eel fry of Northern hemisphere species becomes low, or aquaculture techniques for other species is improved. As already recommended by the previous studies (e.g., [11]),

² The year when the codes were designated varies depending on the countries/territories.

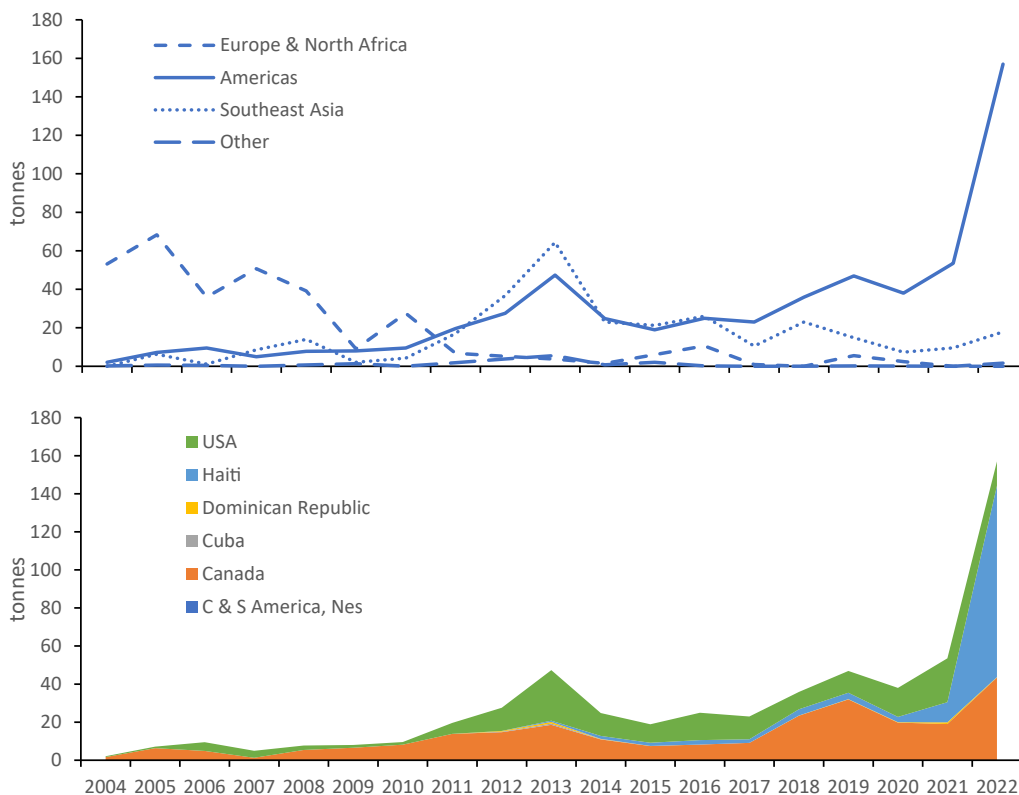


Fig. 1. (Top) Imports of live eel fry into East Asia from the other regions based on East Asian Customs data, 2004–2022. (Bottom) Imports of live eel fry into East Asia from the Americas based on East Asian Customs data, 2004–2022. Europe and North Africa (likely to be *A. anguilla*); Americas (likely to be *A. rostrata*); Southeast Asia (likely to be *A. bicolor* and other tropical *Anguilla* spp.); Other (other regions).

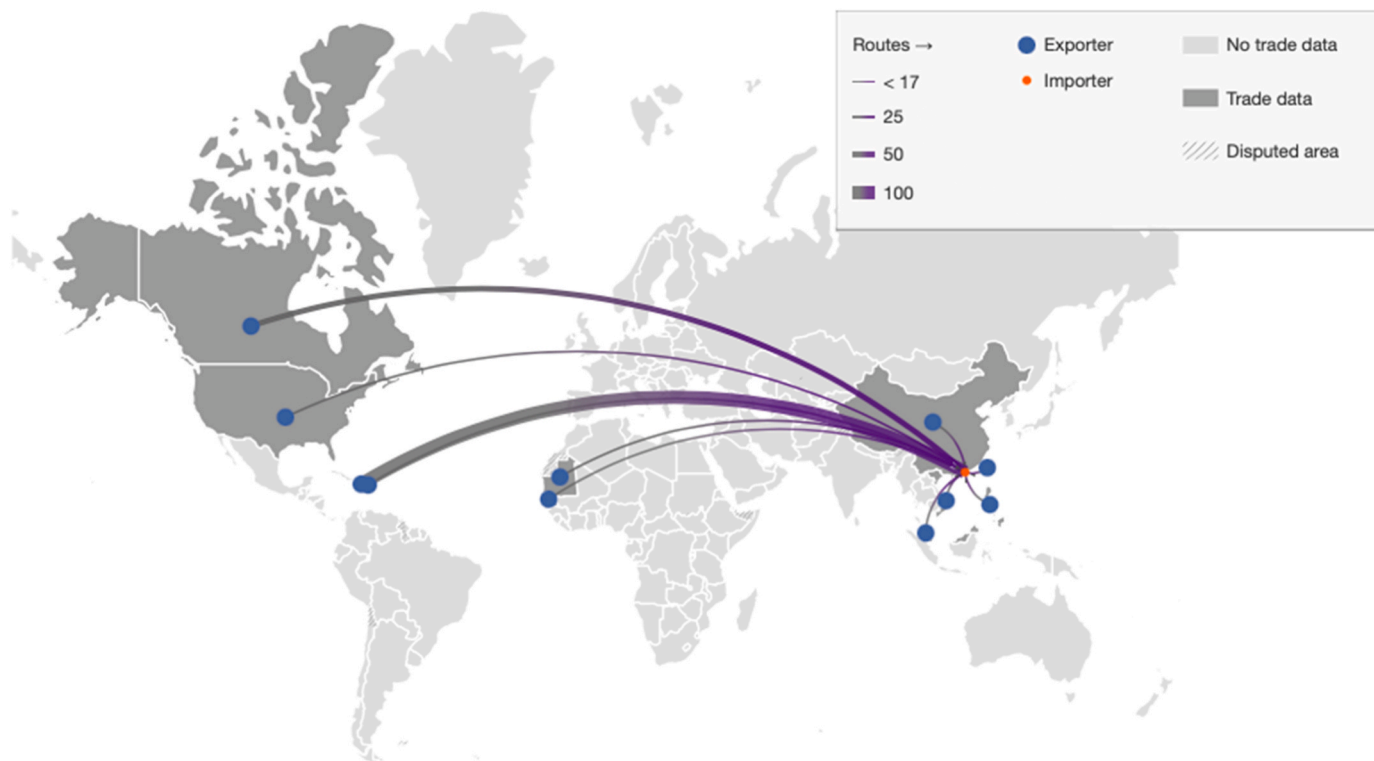


Fig. 2. Live eel fry imports into Hong Kong in 2022 by exporter. According to its Customs data, Hong Kong imported 100.6 t of live eel fry from Haiti, 43.4 t from Canada, 12.7 t from the US, and 0.2 t from the Dominican Republic in 2022. Hong Kong is an important trade hub for live eel fry destined for farming operations in East Asia; imports into Hong Kong accounted for 96% of all imports of live eel fry into East Asia in 2022.

monitoring and management targeting the whole *Anguilla* genus are essential to achieve sustainable use and conservation of *Anguilla* spp.

CRedit authorship contribution statement

Hiromi Shiraishi: Conceptualization, Data analysis, Methodology, Writing - original draft. **Kenzo Kaifu:** Funding acquisition, Writing - review & editing.

Data Availability

We have shared the supplementary data. Other data will be available on request.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.marpol.2023.105938](https://doi.org/10.1016/j.marpol.2023.105938).

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