EUROPEAN GLASS EELS

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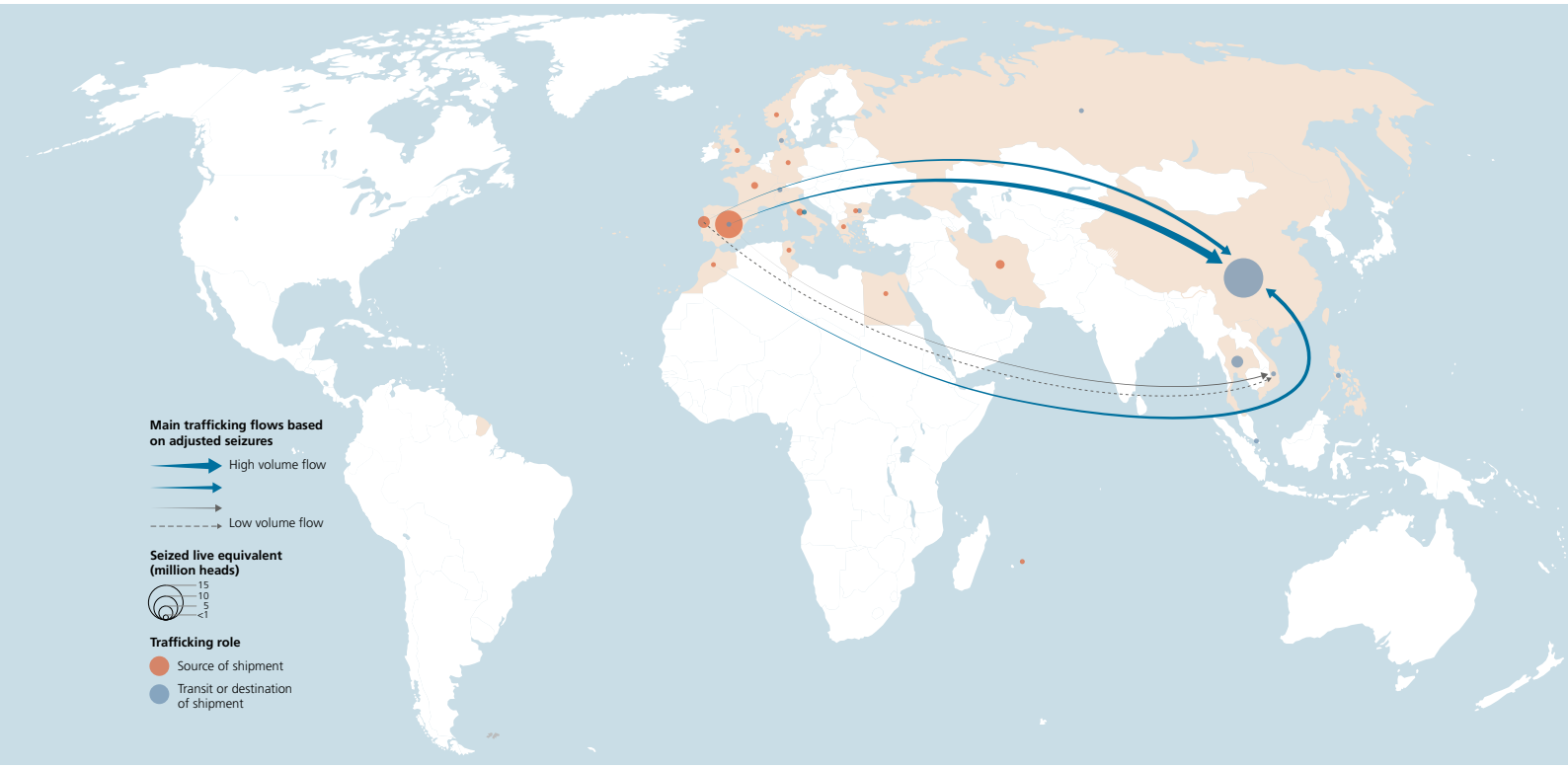
Map 1 Trafficking flow map - European glass eels (2007-2018)



Source: UNODC World WISE Database

The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. The year 2018 is based on partial data. A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Malvinas).

On 28 October 2019, French customs officers at Charles de Gaulle Airport arrested two people on their way to Kunming, China, because they had 300,000 live glass eels[1] in their luggage. Contained in water-filled plastic bags kept cool by frozen water bottles, this contraband weighed 91 kilograms and was worth over 100,000 euros. What these "fish mules" were doing was illegal because, following a significant decline in the wild population, European eel (*Anguilla anguilla*) was listed in Appendix II of CITES in 2009, and the European Union (EU) placed a ban on the import and export of these eels in 2010. This seizure represents just one small portion of a large-scale illicit flow involving many tons of live, critically endangered European eels smuggled from Europe to Asia every year.

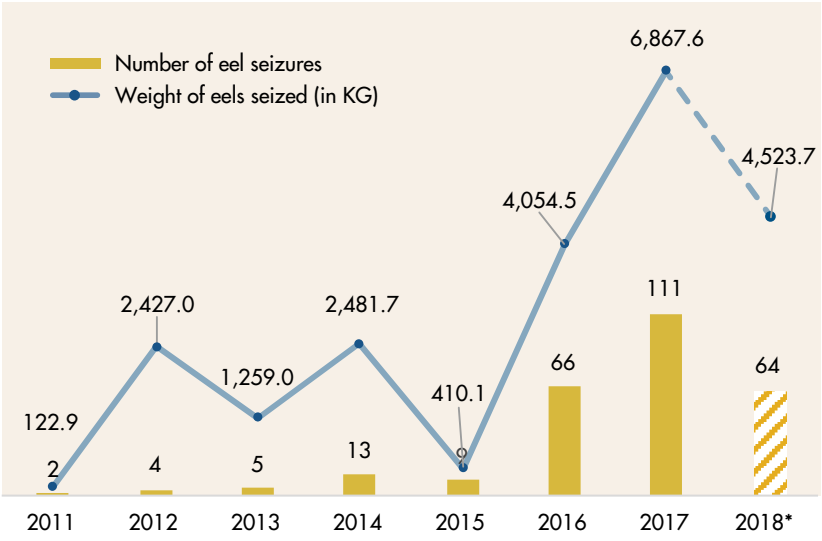
The first *World Wildlife Crime Report* focused on a different market: illegal sturgeon caviar. The illicit caviar market, however, appears to be in decline. In the 1990s and early 2000s, seizures of hundreds of kilograms were made. While a few large seizures continue to be made,[2] the volumes seized have plummeted in recent years. For example, in 2001, over six metric tons of caviar were seized, which is more than all the caviar seized between 2003 and 2017. While poaching continues in both the Caspian and Black Sea regions, it appears that the value of the illicit market has declined over the last two decades.

The first World Wildlife Crime Report concluded that the decline of caviar trafficking was attributable to two things: the growth of farmed caviar as a viable alternative and the decline in wild Caspian sturgeon populations. While poaching of sturgeon continues to pose a threat to the remaining wild population, most of this contraband appears to be consumed in source country markets, as very little is seized internationally. As a result, this report focuses on a different marine species, European glass eels, where the alternative of captive breeding is not available.

Freshwater eels are one of the most widespread marine genera and are part of the national cuisine in countries around the world. European eels, like most sturgeons, are diadromous, which means they spend part of their life cycle in saltwater and part in freshwater. While sturgeons spend most of their lives in saltwater and return to the freshwater to breed, eels do it the other way around, spending most of their lives in rivers and streams and returning to sea to mate. Scientists believe that both European and American eel *(Anguilla rostrata)* breed in the Sargasso Sea, a calm area of the North Atlantic bordered by ocean currents and home to a characteristic seaweed.[3] While this breeding has never been witnessed, captured larvae grow increasingly larger radiating from the Sargasso Sea toward the US and European coastlines.[4]

After riding the Gulf Stream to the European and North African estuaries over the course of a year or longer, the arriving larvae have matured to the glass eel stage, reaching between six and eight centimetres in length. These juveniles, referred to as "glass eels" due to their transparent appearance, are needed for aquaculture because adult European eels have never been successfully bred in captivity. This means that, unlike sturgeon caviar, demand for wild caught eels cannot be replaced by captive breeding. And since populations of Japanese eel *(Anguilla japonica)*, American eel and European eel are in steep decline, some of the multi-billion-dollar[5] eel industry appears to have become reliant on poaching.

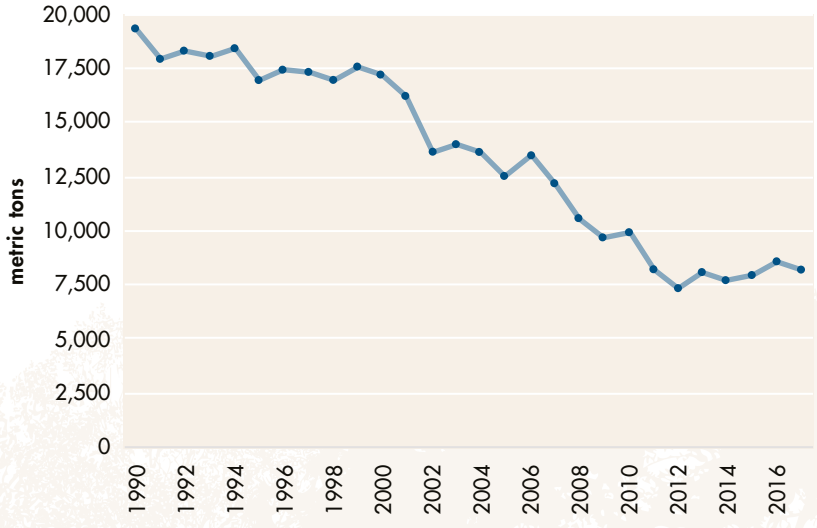
Fig. 1 Weight equivalent of European eels seized and number of European eel seizures (live, fingerlings), 2011-2018*



Source: UNODC World WISE Database

* Data for 2018 should not be considered as complete and are therefore not directly comparable with those from previous years.

Fig. 2 European eel produced (aquaculture and capture fisheries) in Europe, 1990-2017



Source: FAO

The legal global eel market

Eel products are legally produced and consumed in countries around the world. This legal market is relevant to a discussion of eel trafficking, because it is largely fed by aquaculture producers who may receive some of their glass eel stock from illegal sources. Unlike contraband like street drugs, there is no back-alley black market for eel meat products. Rather, similar to some other wildlife products, legitimate products can be tainted by illegitimate sources of supply. The following section describes the parameters and trends of this legal market and the role European glass eels have played in it.

Adult eels may be caught from rivers for consumption, but most eels consumed today come from aquaculture. In 2017, FAO statistics show over 96 per cent of the global eel supply was from aquaculture.[6] As explained later in this chapter, some of these farming operations make use of illegally taken glass eels.

There are many species of freshwater eel (of the genus *Anguilla*), but it appears that just four provide most of the glass eels for eel aquaculture:[7]

- *Anguilla japonica* (Japanese eel),[8]
- *Anguilla rostrata* (American eel),[9]
- *Anguilla bicolor* (shortfin eel),[10] and
- *Anguilla anguilla* (European eel).

According to the IUCN, shortfin eels are classified as "Near Threatened", with an uncertain population trend.[11] Both Japanese and American eels are "Endangered", European eels are "Critically Endangered", and all three species have a declining population trend.[12] However, only European eel is CITES-listed (Appendix II as of 2009) and, in 2010, the European Union banned all European eel imports and exports. While sourcing and trading of other eel species could be contrary to national fisheries laws, only European eel are subject to international controls, and so they are the focus of this chapter.

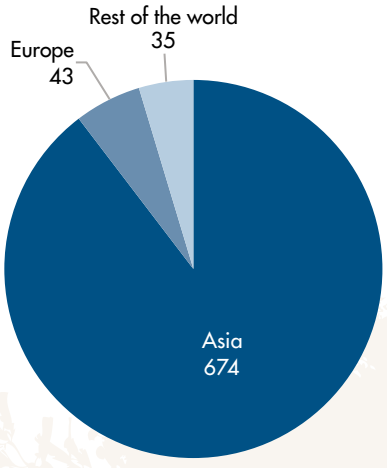
Only the import and export of European eel is banned in the European Union.[13] Production of eel in the EU for European consumption continues, although at greatly reduced levels compared to 30 years ago (Figure 2). For more than 50 years, stock abundance and fishing yield of European eels have declined by about 5% annually, to less than 10% of their historical levels today.[14] In the 1980s, official glass eel catch figures for Europe exceeded 3,000 MT per year, but between 2010 and 2016, the official catch was less than 60 MT.[15] This decline is due to a number of factors, not just overexploitation,[16] but the species has been deemed too vulnerable for international commercial trade from the European Union. National trade data show that France, Spain, Portugal and the United Kingdom hosted the primary fisheries for glass eels in the past, and a different group of countries (particularly the Netherlands, Denmark and Germany) grew the glass eels to maturity and processed the meat. Today, the Portuguese fishery is strongly restricted, so most of the legal glass eel catch in Europe comes from the other three countries:

- In Spain, the situation is complicated by the fact that the coastal areas have autonomous status, so the fishery is regulated locally with no national quota, and recreational fishing of glass eels for personal consumption is allowed in some areas.[17]
- In France, a national quota is set (just under 65 MT for 2017-2018), which is the sum of local quotas and includes glass eels set aside for restocking.[18]
- In the United Kingdom, there is no national quota, but fishing is limited to the use of hand nets by a small number of fishers (about 300) operating during a constrained season in a limited geographic area.[19]

The volumes legally fished for Europe appear to be less than those illegally exported for aquaculture. Global seizures alone can represent more than 10 per cent of the French national quota, and have trended upward since 2011, the year after the eel export ban was put in place (Figure 1). Based on World WISE data, Spain, France and Portugal appear to be the source of most of glass eels seized today. Seizure data also show the destination of these glass eels is also the region with the highest legal production: Asia. In 2017, 96 per cent of global aquaculture eel production took place in Asia.[20]

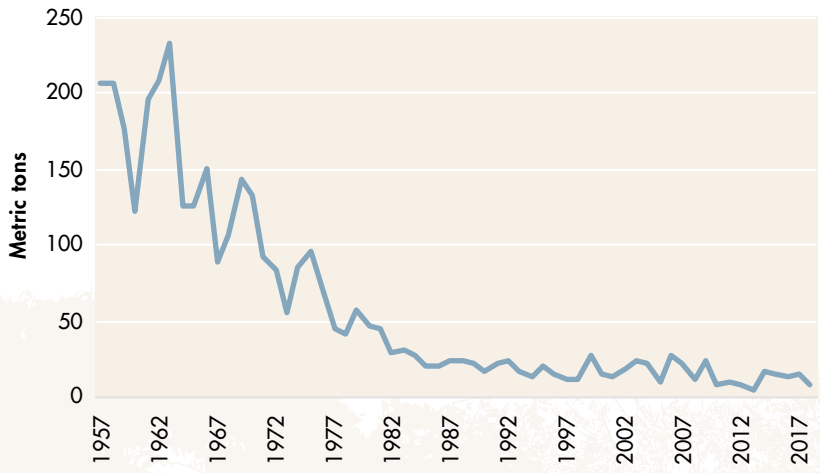
Traditionally, Asian eel production was based on Japanese eel, but declines in catches have forced the industry to import glass eels of other

Fig. 3 Live eel imports in 2018 (US$ millions)



Source: UN Comtrade

Fig. 4 Juvenile eels (Anguilla japonica) legally caught in Japan (metric tons), 1957-2017



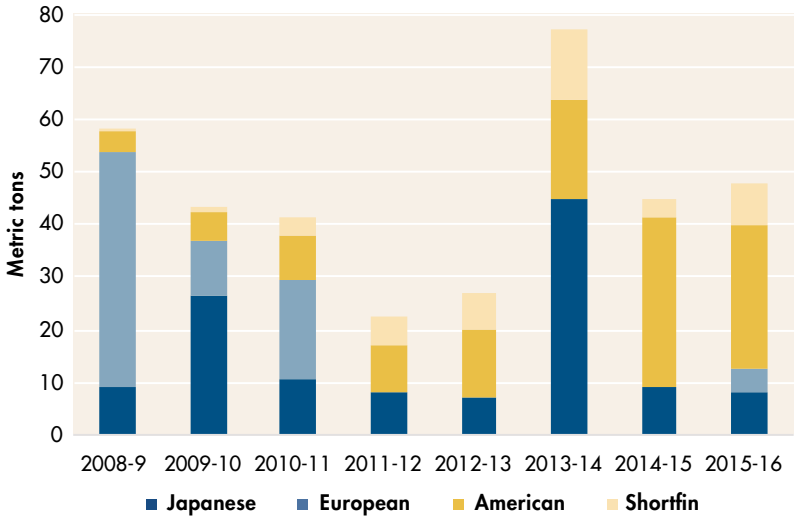
Source: Japan Fisheries Agency

species. Based on UN Comtrade data, 89 per cent of the world's live eel imports (including glass eels) were made by Asian countries in 2018, particularly Japan, the Republic of Korea and China (Figure 3). Japan was the leading importer, importing virtually all its live eels from China.

Nowhere are eels more important as a food source than in Japan, where *unagi kabayaki* is popular year-round, but traditionally eaten by everyone on the Midsummer Day of the Ox. Fisheries catches of Japanese eels (*Anguilla japonica*) have been steadily declining since the 1960s (Figure 4) due to a variety of factors, including over-exploitation.[21] The species has been classified as "Endangered" on the IUCN Red List since 2014.[22] Parallel to this decline, export of European eels to East Asia began to rise steeply in the 1970s.[23] According to the CITES Trade database, in 2009,[24] Japan imported 96 per cent of the legally traded European eel meat.[25] While Japan dominates imports, China dominates aquaculture production. In 2017, 85 per cent of global eel production by weight occurred in China (Figure 5). The combination of species of the glass eels on which this production is based has varied over time. Until exports from the European Union were banned in 2010, most of the Chinese eel production was based on European eel (78 per cent in 2008-9, see Figure 6). Since then, there have been limited CITES certified exports of live European eel from North Africa, which is within the range of the European eel but outside the EU export restrictions.

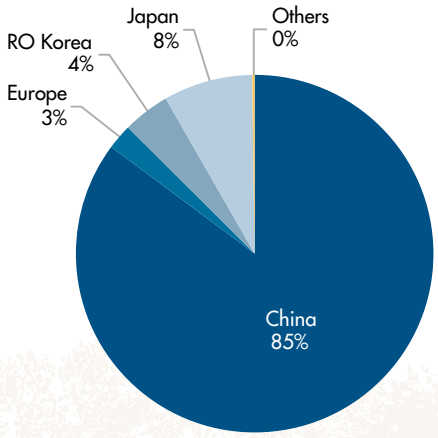
The 2010 EU export restriction triggered a rush for glass eels from other sources. Based on UN Comtrade import data, it appears that demand for Chinese aquaculture was satisfied by imports from Malaysia and the Philippines (presumably shortfin

Fig. 6 Imports of glass eels into legal aquaculture ponds in China (metric tons), 2008-2016



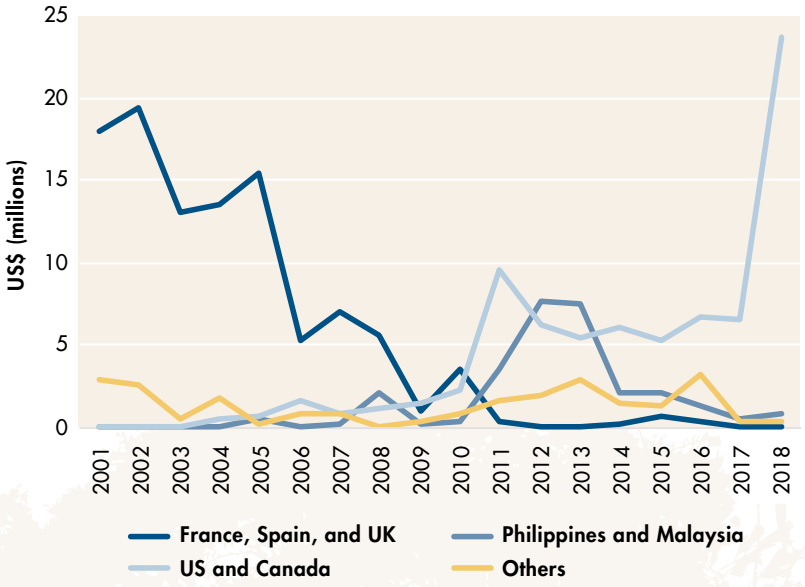
Source: CITES

Fig. 5 Imports of glass eels into legal aquaculture ponds in China (metric tons), 2008-2016



Source: FAO

Fig. 7 Legal imports of live glass eels to China by exporting country (US$ millions), 2001-2018



Source: UN Comtrade

eel) initially, but increasingly from the United States and Canada (presumably American eel) (Figure 7). The shift in demand outside Europe can be seen, for example, in export data on American glass eels. In the state of Maine, the catch quadrupled as prices increased twenty-fold in three years, from just under US$100 per pound[26] in 2009 to just under US$2,000 per pound in 2012. The increase in both price and volume caused a sharp increase in the total market size in 2012 (Figure 8). In 2018, renewed demand for American eel was seen, albeit at lower prices, suggesting a competing source of supply.

Despite population declines and fluctuations in the source of glass eels, global eel production has remained remarkably consistent over the years, driven by rising production in China (Figure 9). Although the 2010 ban on exports from the European Union did cause a slight decline in eel production until 2013, production again increased after that time, reaching a new high in 2016 (Figure 9). Since the total value of recorded glass eel imports (of all species) by China have declined by half since the CITES listing of European eel in 2009 (Figure 10),[27] it remains unclear how production is being maintained. Data on the species input for Chinese aquaculture shows a different pattern in the sourcing after 2009 (Figure 6), with increasing reliance on the endangered American eel. Despite its "Endangered" status, American glass eel can still be legally exported without CITES certification.

Sourcing

Based on World WISE data, it appears that it is in the traditional source countries that much of the illegal glass eel supply originates. According to high ranking wildlife law enforcement officials interviewed in 2018,[28] there are two main sources of European glass eels illegally trafficked internationally:

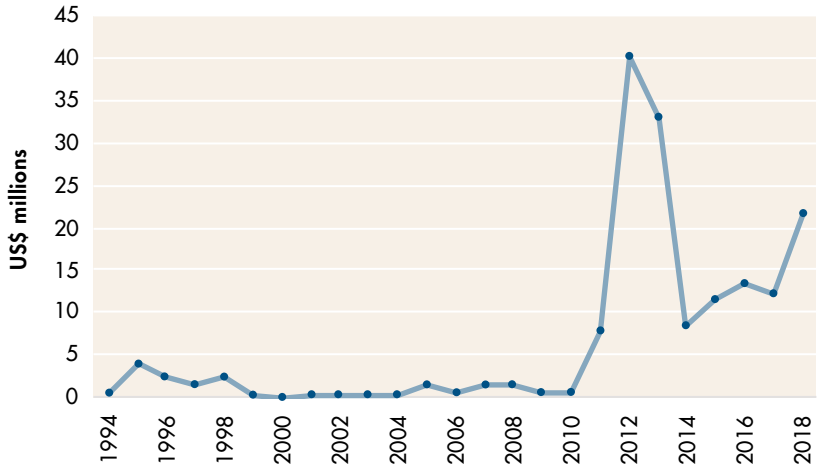
- commercial fishers who catch glass eels for the legal market and knowingly or unknowingly supply illegal exporters (diversion);
- poachers, who fish clandestinely with the intent to supply the illegal market.

Established eel traders have been found to be involved in illegal exports, so any commercial fisherman selling glass eels to a trader could unwittingly be complicit in illegal exports. Commercial traders can also be involved in acquiring glass eels illegally and then further exporting them illegally.

For example, European investigations uncovered a Spanish eel trader who was working with a Greek eel farm to illegally export large (800 kg) shipments of glass eels to China. The eels were illegally taken in Spain, transported in trucks to Barcelona, and then by ferry to Italy and onwards to Greece, where the legal eel farm was located.[29] This ostensibly legal farming operation gave cover to both illegal fishing and illegal export.

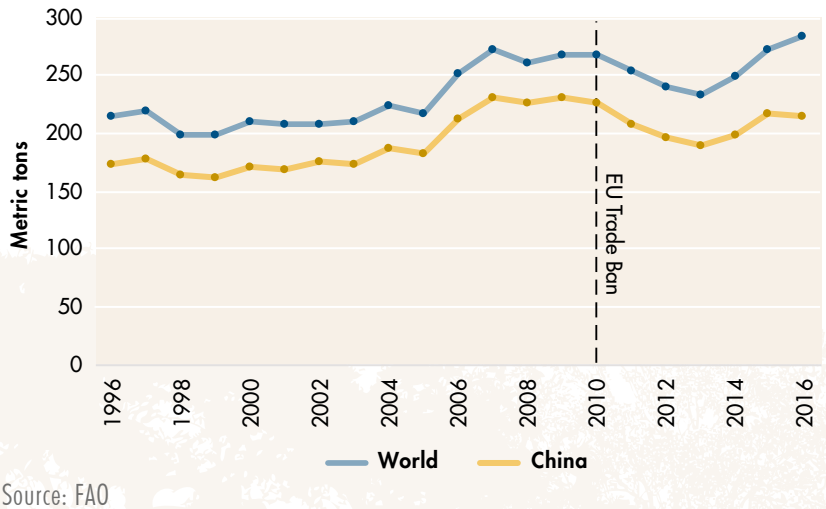
In parallel, there are also networks of poachers who acquire their glass eels clandestinely. Based on their

Fig. 8 Recorded value of the legal American glass eel fishery (*Anguilla rostrata*) in the state of Maine (US$ millions), 1994-2018



Source: Source: State of Maine Department of Marine Resources

Fig. 9 Legal aquaculture eel production in China and the world, 1996-2016 (metric tons)



Source: FAO

knowledge of the timing and location of eel migration, poachers use hand nets, trap nets or small trawling nets to work the estuaries where glass eels transit at night. According to European law enforcement sources, on average, a poacher can gather between 200 grams and one kilogram of glass eels per night, although much larger takes are possible under the right conditions.[30] One kilogram of glass eels represents about 3,000 individual fish,[31] so each poacher can remove between 600 and 3,000 eels for every night of work. The number of poachers is unknown, but they collectively add to glass eel shipments measured in the tens and hundreds of kilograms.

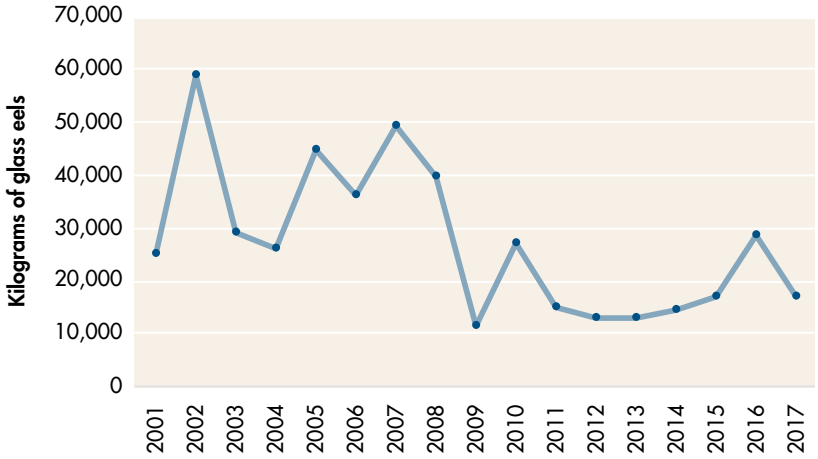
The poachers receive between 180 euro and 400 euro per kilogram from buyers, thus receiving up to 400 euro per night. Some poachers keep tanks in their homes and sell to buyers from their front door. In some instances, buyers travel to the harvest locations and consolidate the output of many poachers, paying cash on the spot.[32]

After the glass eels are collected from the poachers or licensed collectors, they are transported to consolidation facilities, often located near international airports. These facilities generally include a series of aerated tanks in which the glass eels are stored; typically, about 20 kg of glass eels are put into oxygenated water tanks with about 1,000 litres of water. To ensure the highest survival rates, the eels are kept in these conditions no longer than 15 days, so the exports should be closely tied to the harvest season. At these facilities, the local buyers are paid between 400 euros and 900 euros per kilogram by those who traffic the glass eels internationally.[33]

Trafficking

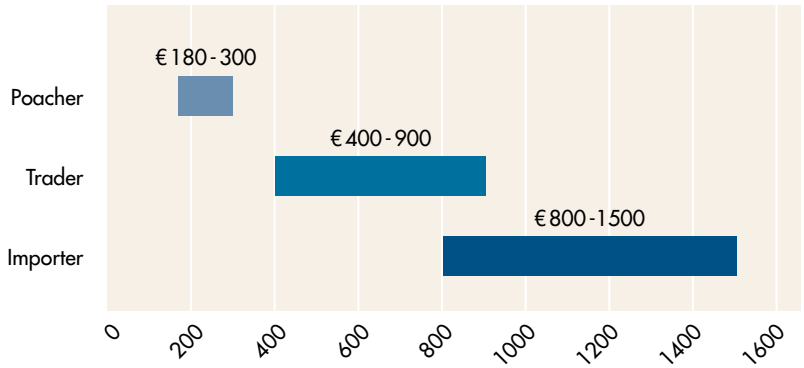
Based on World WISE data and interviews with law enforcement officials, glass eels are smuggled using two main techniques:

Fig. 10 Glass eels (all species) legally imported by China (kilograms), 2001-2017



Source:UN Comtrade

Fig. 11 Price per kilogram for illegal eels paid to poachers, traders and importers in 2018 (Euros)



Source: UNODC

- They are shipped in refrigerated containers via air freight under cover of, or mis-declared as, other seafood products.
- They are smuggled using commercial air couriers in specially prepared luggage.

The two trafficking techniques roughly correspond to the two forms of illegal sourcing (diversion and poaching), although it is entirely possible that eels sourced from poaching could be shipped using cover loads, or that diverted eels could be smuggled by couriers.

To be transported internationally and arrive alive, glass eels must be kept in controlled conditions and released as quickly as possible. Containers suitable for transporting other live seafood can be used in airfreight, so mislabelling (as shrimp, mussels, or octopi, for example) or concealing the eels in these containers containing other forms of live seafood is common practice.

Air couriers make use of luggage containing bags of glass eels in addition to some form of refrigeration, typically frozen bottles of water. This luggage may be shielded with inexpensive insulation material, such as car windshield sun protectors. Raids on consolidation sites have revealed hundreds of identical suitcases used for this purpose. The longer the flight, the fewer glass eels that will survive the trip, so direct flights are likely

to be favoured, unless a secondary staging area is used. In the latter case, European, North African and other Asian countries are used for transit to Asia. Upon arrival, the traffickers are paid between 800 euros and 1,500 euros per kilogram for the contraband. In effect, each buyer in the initial stages of the supply chain doubles or triples their money.

Enforcement activities associated with Europol's Operation Lake (2017-2019) uncovered a new variation in trafficking method, in which glass eels are hidden in Styrofoam ice chests that are packed in checked luggage. European eel was also detected in European consumer markets mislabelled as American eel. In connection with Operation Lake, some 3.8 MT of European glass eels were seized in the 2017-2018 season and 5.8 MT in 2018-2019.[34] Speaking of the 2017-2018 season, Europol estimated that around 100 MT were smuggled from the EU to China.[35]

Seizures of European glass eels have increased from an annual average of less than 1.5 metric tons in the first four years of the European Union ban to an average of just under 5.5 metric tons in the last four years. Considerable resources were applied to interdiction, and this trend is surely affected by these dedicated efforts. Some 80 per cent of these seizures were made by the governments of Spain, France and Portugal, the origins of almost all the eels seized. To put this figure in context, these seizures are equivalent to about 10 per cent of the total supply of glass eels introduced into aquaculture in major producer states.[36]

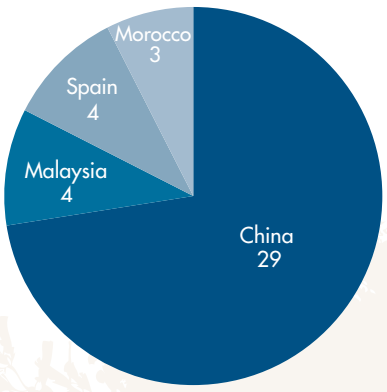
Of those seizures whose destination was known between 2011-2018, more than half were destined for China and 19 per cent for Thailand. Thailand does export hundreds of tons of eels every year, but this is about 1 per cent of what China exports, so some share of these is likely trans-shipped. Those arrested in connection with these seizures represent a mix of European and Asian nationalities (Figure 12). Of intercepted shipments, the most common destination was Hong Kong, China, which is located near the largest eel farms, located in the provinces of Guangdong and Fujian. Genetic testing has proven that European eel are smuggled from Europe to Hong Kong, SAR of China.[37]

Destination markets

On arrival in Asia, it appears the illicitly exported European glass eels are fed into the commercial eel farming industry. According to the Food and Agriculture Organization of the United Nations (FAO), in 2017 some 259,000 metric tons of eel (all species) were produced, of which about 221,000 metric tons were produced by China, accounting for 85 per cent of global production.[38] According to the China Eel Industrial Association, more than half of this is exported, with the rest for domestic consumption. Much of the exports are destined for the Japanese market, but also to the United States and other destinations around the world.

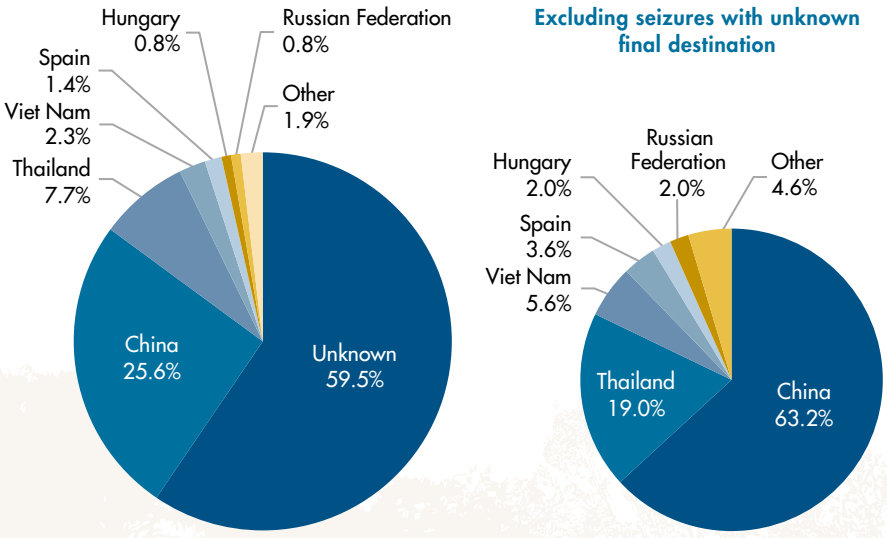
From the 1970s to the 1990s, live eels imported by Japan mainly came from Taiwan, Province of China,[39] but eel production gradually moved to the southern provinces of mainland China, predominantly Guangdong and Fujian, which have been responsible for about 86 per cent of Chinese production in recent years. Before the European glass eel export ban in 2010, Fujian production was focused on European eel.[40] Once imported, despite starting out larger than other

Fig. 12 Number of people arrested for European glass eel trafficking in Spain by nationality, 2016-2018



Source: SEPRONA response to UNODC questionnaire

Fig. 13 Share of total seizure volume by reported shipment destination, 2011-2018*



Source: UNODC World WISE Database

* The year 2018 is based on partial data.

species, it takes between 18 and 36 months to grow European glass eels to marketable size (400 to 500 grams for export, or 600 grams for the domestic market), making them one of the slowest growing species of eels, according to the Chinese Industrial Eel Association.[41]

The Chinese Bureau of Fisheries reported that there were 797 eel aquaculture operators in 2017.[42] In 2013, the United Nations Industrial Development Organization (UNIDO) produced a study focused on an eel processing company (*Firm Y*) from the Guangdong province. The company employed 200 workers and procured live eels from 16 different suppliers to produce 10,000 metric tons of output per year.[43] The sheer volume of production, the number of firms involved, and the complexity of the supply chain makes this industry vulnerable to the introduction of illicit sources of supply. For example, any of the 797 aquaculture operators could unwittingly contract with an overseas glass eel supplier who illegally sources European glass eel.

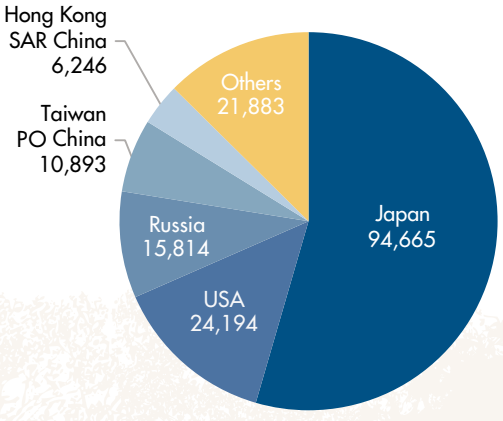
Aside from the seizure record, one way of estimating the amount of illegal eel introduced into legal supply chains is to compare the amounts of glass eels of all species imported and the amounts of adult eels produced. In the case of China, this analysis is complicated by the fact that the country is within the range of Japanese eel and could, in theory, supply most of the aquaculture demand for glass eels from this source. In practice, however, this has not been the case. Rather, as shown in Figure7.6, glass eels from a variety of species are used in Chinese aquaculture, while China exports about half the Japanese glass eel it catches. Between 2008 and 2016, China exported roughly half the Japanese glass eel it caught.[44] As a result, only one-third of aquaculture demand for glass eels between 2008-9 and 2015-16 came from domestic sources, leaving the industry two-thirds dependent on imports.

With this in mind, it is difficult to reconcile reported imports of glass eels with total eel production and exports over time. Of course, glass eels of any species can be utilised, but stark changes between glass eel imports and production (taking into account utilization of domestically caught *Anguilla japonica*) suggest an undocumented source of glass eel supply. This supply need not be of European eel, but the fact that these ascribed imports of glass eels are not recorded raises suspicions about their origins.

Between 1995 and 2000, China's reported production amounts to an average of about 1.5 metric tons of eel for every kilogram of glass eel imported. Between 2001 and 2008, this figure rose to about 4.5 metric tons of eel for every kilogram of glass eel imported. From 2009 (the year of the CITES listing) to 2015, the figure rose to an average of almost 15 metric tons of eel for every kilogram of glass eel imported. Even considering the likelihood that eel growing technology has improved, mortality rates in transit and production will have decreased and that domestic sourcing of glass eels may have increased, this tenfold rise is difficult to explain, whatever the yield of the species introduced.

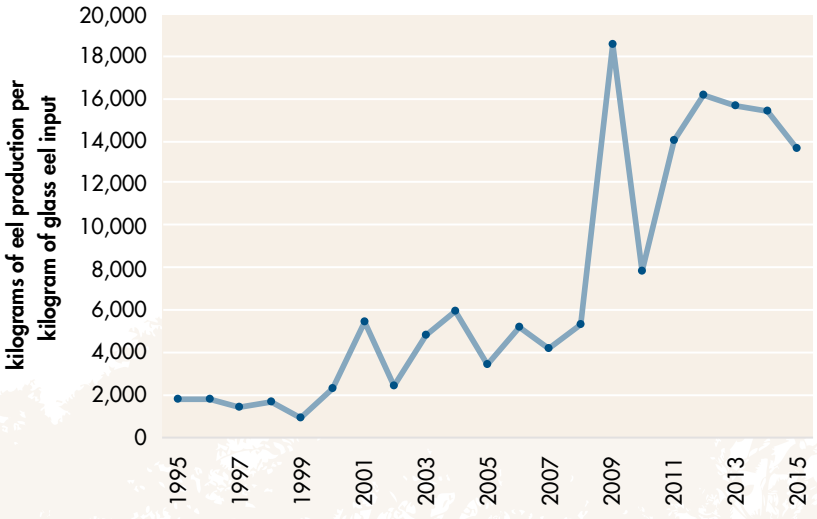
While there are often discrepancies in trade statistics, there are stark differences between the data presented by

Fig. 14 Share of legal exports of prepared or preserved eels (all species), whole or in pieces (excluding minced), from China by destination country or territory, 2014-2018 (metric tons)



Source: ITC Trade Map.

Fig. 15 Kilograms of adult eel produced in China for every kilogram of glass eel imported, 1995-2015



Source: China Customs for imports, FAO for production

CITES, UN Comtrade and Eurostat.[45] Comparison is complicated by the very wide range of codes used to describe eels and eel products in trade: 72 different, partly overlapping, codes were identified in this study. In the absence of evidence of illegal trade, it would be difficult to ascribe significance to the discrepancies, but when taken in context, they appear to be evidence that the industry is affected by some unrecorded supply.

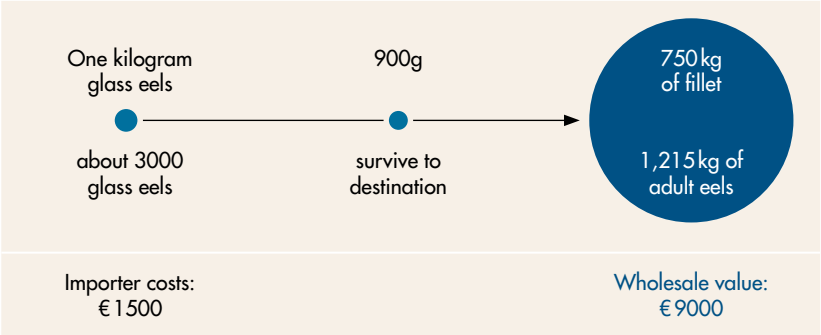
Analysis

Thousands of kilograms of European glass eels have been seized since 2012, representing millions of individual eels. It is unclear what share of the total illegal flow is interdicted, but law enforcement surveillance and intelligence suggest the share is relatively low. For example, one operation seized less than 500 kg of eels from a group that evidence later suggested had exported more than ten times that amount.[46]

The volume and value of this trade is thus difficult to estimate. The 6,000 kg of glass eels seized in 2018 alone would have been worth up to nine million euros to importers. According to law enforcement sources interviewed by UNODC, records seized from a criminal group as evidence suggest that similar volumes are shipped by individual groups annually. Of course, the glass eels are only the front end of the production process. Each kilogram of glass eels, costing 1,500 euros on the black market, can be converted into some 9,000 euros worth of filet on a wholesale level, thus enriching businesses who use trafficked eels in their production process. Wholesalers do not pocket all this money, of course, since the costs of farming must be taken into account, but given the volumes, the profits appear considerable.

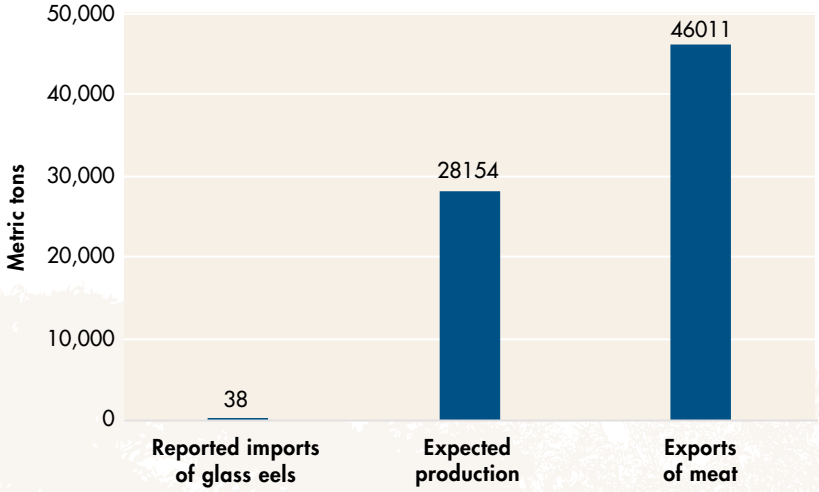
At this point in time, every European glass eel imported for the purposes of farming requires a CITES certificate to export, as should every adult European eel exported after being grown out. Interviews with aquaculture specialists indicate that one kilogram of European glass eels yields 750 kilograms of filet. If so, it should be possible to reconcile glass eel imports with eel meat exports. Even taking into account the gap between introduction and harvest, it is unclear how such large exports of European eel meat would be possible given the low quantities of reported European glass eel imports (Figure 17). This suggests that glass eels were imported without CITES certification. In 2017, eel meat exports were commensurable with expected production, but this would only be possible if all European eel meat were exported and none retained for the domestic market. Additional, though incomplete, data reported to the CITES Animals Committee suggest that only 4.5 MT of European glass eels may have been introduced into Chinese cultivation ponds between 2011 and 2017.[47] Teamed with the seizure data, which indicate the majority of intercepted shipments were destined for China, these trade data provide evidence of a sizable illegal flow.

Fig. 16 Transformation of European glass eels to eel filet



Source: UNODC

Fig. 17 Comparison of European glass eel imports, expected production, and legal European eel meat exports reported by China (metric tons), 2009-2017 aggregated



Source: CITES Trade Database

Box 1. Sea Cucumbers

Sea cucumbers have important functions within marine ecosystems; they are considered the 'ocean's vacuum cleaners'[48] and important for the overall health of the ocean.[49] They are harvested primarily as a food,[50] and are considered a delicacy in their processed form, known as *bêche-de-mer, trepang* or *hai-som*.[51] Sea cucumbers' emergence as a luxury food item in the 1980s has since expanded into a highly lucrative market,[52] with demand for hundreds of thousands of metric tons (MT) annually.

To meet this demand, capture fisheries[53] have grown, and aquaculture has also expanded exponentially, surpassing capture production in 2003. Global capture fisheries increased from 4,300 MT in 1950 to 53,000 MT in 2017; aquaculture production rose from virtually zero in 2002 to 222,000 MT in 2017 (Figure 1), with an estimated value of US$1.4 billion.[54]

Sea cucumber capture fisheries are important for the livelihoods of coastal communities across a wide range of countries, and, in some regions, is the most economically important fishery.[56] Ten countries accounted for 87 per cent of global capture production in 2018: Canada, Iceland, Indonesia, Japan, Mexico, Nicaragua, Republic of Korea, the Russian Federation, Sri Lanka and the United States of America.[57] In contrast, aquaculture is dominated by one country: global aquaculture production from 2008 to 2017 was estimated to be 1.6 million MT, with China accounting for 99 per cent of this production.[58]

While there are approximately 1,500 species of sea cucumbers, only 42[59] were identified in the first half of the 2000s as being under population stress due to demand for international trade.[60] While price varies considerably by species,[61] they can reach US$1,800 per kilogram.[62] The value and demand for sea cucumbers appear to be increasing in recent years.[63]

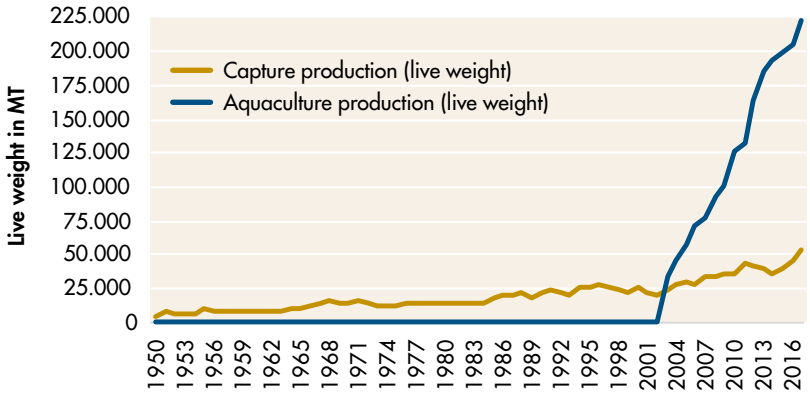
In 2002, the Parties to CITES started to consider whether a listing on any of the CITES Appendices would be appropriate for some of the most harvested wild species.[64] In 2003, Ecuador decided to list one species, the Brown sea cucumber (*Isostichopus fuscus)* on Appendix III,[65] and at the 18th meeting of the Conference of the Parties to CITES in 2019, three species of sea cucumbers (*Holothuria fuscogilva, Holothuria nobilis and Holothuria whitmaei*) were listed in Appendix II.[66]

Similar to other capture fisheries, illegal fishing for sea cucumbers[67] is a known threat, either perpetrated by source country nationals or by foreign vessels.[68] Local fishermen are offered high prices and pressured to poach by international buyers, which often leaves fishermen in a 'loan-to-debt' cycle, where buyers will provide cash advances for harvesting but then buy fishermen's catch at low prices, requiring them to pay back part of the advance or overfish to compensate for low prices.[69]

Data on illicit trade is quite limited. World WISE has data for CITES-listed species (*Isostichopus fuscus)*, and a few seizures for non-CITES listed species. For the period between 2008 to 2017, World WISE contains seizures accounting for approximately 139 tons (wet weight, 365,000 live equivalents) of Brown sea cucumbers (*Isostichopus fuscus*).[70] The majority of sea cucumber seizures in World WISE appear to be coming from Mexico with almost a third (29 per cent) headed for the United States, where the seizures were made.

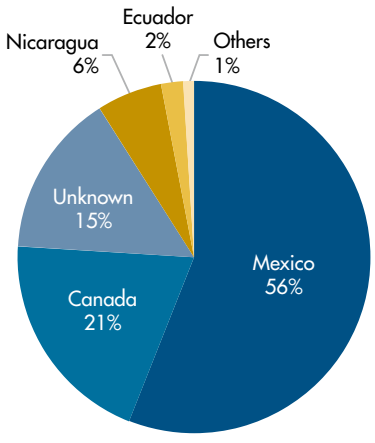
Although transnational organized crime involvement in illegal fishing is hard to quantify, strong anecdotal evidence suggests that sophisticated trafficking networks target totoaba fish, abalone, and sea cucumbers, among other marine species.[71] In a notable case in the United States, in March 2018, an Arizona firm and two of its executives pled guilty to illegal trafficking in US$17 million worth of sea cucumber from Mexico from 2010-2012. They were further charged with conspiracy to illegally export sea cucumber to Asia by means of documents containing false information, importation contrary to the law and false labelling. They were sentenced to pay over US$1.2 million in fines, forfeiture and restitution.[72]

Fig. 18 Global production of sea cucumbers, live weight (MT) from 1950 to 2017



Source: Data obtained from FAO FishStatJ. Data presented in live weight; no conversions applied.[55]

Fig. 19 Reported country of origin of sea cucumber seizures (by estimated mass in kilograms), 2008 - 2017



Source: UNODC World WISE Database

Endnotes

1 A juvenile eel is approximately six to eight centimeters in length and with a transparent appearance. See https://www.scmp.com/news/world/europe/article/3035646/chinese-man-and-woman-caught-france-smuggling-60kg-live-baby-eels

2 Based on World WISE data. There are frequent small seizures of non-compliant caviar in Europe, as well as seizures of "caviar" face creams without CITES documentation. Some larger-scale international trafficking does continue, however, but not from the Caspian. For example, in 2017, the United States made two large seizures (71 and 30 kg) of kaluga caviar shipped from China. In addition, there have been some very large seizures of sturgeon meat, including 14 metric tons seized in Genoa harbour on its way to Georgia in 2016.

3 General facts on eel biology and reproduction can be found in Tesch, F.-W., The Eel (Fifth Edition), Oxford: Wiley, 2003.

4 Ibid.

5 According to Food and Agriculture Organization of the United Nations (FAO), Fisheries Global Information System (FIGIS), global river eel aquaculture was worth US$2,042,180,000 in 2017. The retail trade is necessarily worth significantly more (FIGIS is available at: http://www.fao.org/fishery/figis/en).

6 FAO FIGIS (ibid.). That is, about 260,000 metric tons out of about 270, 000 metric tons globally.

7 This is based on data of the species introduced into aquaculture in the largest eel producer countries, as shared in the Tenth Meeting of the Informal Consultation on International Cooperation for Conservation and Management of Japanese Eel Stock and Other Relevant Eel Species (CITES AC29 Inf. 13). FAO does gather species-specific eel production data but it does not appear to be accurate in light of the data presented at this meeting, as it suggests the vast bulk of eel production since 1970 was based on Japanese eel. It does suggest, however, that a wider range of eels have been used in production, including the use of speckled longfin eel (*Anguilla reinhardtii*) in Oceania. This species, however, accounted for less than two-tenths of one per cent of Oceania eel production between 1952 and 2017.

8 According to the International Union for Conservation of Nature (IUCN), Japanese eel is only found in China (including Taiwan Province of China), Japan, the Philippines and the Republic of Korea. See Jacoby, D. & Gollock, M., *Anguilla japonica,* The IUCN Red List of Threatened Species 2014: e.T166184A1117791, 2014 (available at: http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T166184A1117791.en).

9 According to the IUCN, American eel is found throughout Central America and the Caribbean, as well as in the Bolivarian Republic of Venezuela, Canada, Colombia, Greenland and the United States. See Jacoby, D., Casselman, J., DeLucia, M. and Gollock, M., *Anguilla rostrata* (amended version of 2014 assessment). The IUCN Red List of Threatened Species 2017: e.T191108A121739077, 2017 (available at: http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T191108A121739077.en).

10 According to the IUCN, shortfin eel is found in Australia, Bangladesh, Federated States of Micronesia, India, Indonesia (Sulawesi, Lesser Sunda Island, Java), Kenya, Madagascar, Maldives, Mozambique, Myanmar, Northern Mariana Islands, Oman, Papua New Guinea, Philippines, Somalia, South Africa, Sri Lanka, United Republic of Tanzania, Viet Nam and Yemen (Socotra). See Jacoby, D., Harrison, I.J. and Gollock, M., *Anguilla bicolor. The IUCN Red List of Threatened Species* 2014: e.T166894A67015710, 2014 (available at: http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T166894A67015710.en).

11 Possibly due to its very wide range – see the reference above.

12 See references above.

13 European eel is also produced in North Africa, but at a lower rate than in Europe. For example, in 2017, just over 1000 MT of European eel was produced in Africa, compare to over 8000 MT in Europe.

14 Dekker, W., 'The history of commercial fisheries for European eel commenced only a century ago.' *Fisheries Management and Ecology*, Vol. 26, pp. 6-19, 2019; International Council for the Exploration of the Sea (ICES), *Report of the Joint EIFACC/ ICES /GFCM Working Group on Eel*, 3 - 10 October 2017, ICES CM 2017/ACOM:15.

15 International Council for the Exploration of the Sea (ICES), *Report of the Joint EIFACC/ ICES /GFCM Working Group on Eel*, 3 - 10 October 2017, ICES CM 2017/ACOM:15, pp. 32-33.

16 Contributing factors may include changing oceanic conditions, migration barriers, predation, pollution, disease and parasites. See Miller, M. J., Feunteun, E. and Tsukamoto, K., 'Did a "perfect storm" of oceanic changes and continental anthropogenic impacts cause northern hemisphere anguillid recruitment reductions?', *ICES Journal of Marine Science: Journal du Conseil*, Vol. 73, No. 1, pp. 43-56, 2016.

17 Based on responses to a UNODC questionnaire administered to law enforcement officials in 2018.

18 This total is more than twice that needed for restocking and eel aquaculture on a European level (estimated at 30 metric tons).

19 Based on responses to a UNODC questionnaire administered to law enforcement officials in 2018.

20 FAO FIGIS, op.cit. That is, about 260,000 metric tons out of about 270,000 (?) metric tons globally.

21 According to the IUCN, "Threats to this species include overfishing, loss of habitat and changes to oceanic conditions among other threats" Jacoby, D. and Gollock, M., *Anguilla japonica*. The IUCN Red List of Threatened Species 2014: e.T166184A1117791, 2014 (available at: http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T166184A1117791.en).

22 Ibid.

23 Briand, C., Bonhommeau, S., Beaulaton, L. and Castelnaud, G., *An appraisal of historical glass eel fisheries and markets: landings, trade routes and future prospect for management*, The Institute of Fisheries Management Annual Conference 2007, conference paper, 2008, p. 21.

24 The CITES Appendix II listing took effect on 13 March 2009 and the European Union import and export ban went into effect in December 2010.

25 7.4 million kilograms of 7.7 million kilograms in trade based on importer reporting, all exported from China.

26 1 pound is 454 grams. In the United States, only Maine and South Carolina have legal glass eel fisheries, and South Carolina's data are confidential.

27 According to import data, in the eight years between 2001 and 2008, China reported importing 310 metric tons of live eel fry, and in the eight years between 2009 and 2016, it reported importing only 141 metric tons.

28 During 2018, law enforcement officials were contacted in a variety of forums, including CITES meetings and closed operational sessions. Questionnaires were also completed by key national enforcement agencies, including those of France and Spain. The information that follows is based on their investigations from around from 2012 to date, which involved seizure of multiple tons of glass eel annually and over 100 arrests. See Methodological Annex for details.

29 Ibid.

30 Ibid.

31 The China Eel Industrial Association reports that there were between 2,200 and 3,800 European glass eels per kilogram, making them the largest glass eel species imported. In contrast, there are between 5,500 and 6,000 Japanese eels per kilogram, and around 5,000 American eels per kilogram.

32 Based on responses to a UNODC questionnaire administered to law enforcement officials in the affected European countries in 2018. These observations are based on police operations.

33 Ibid.

34 EU Trade Enforcement Meeting, Brussels, 16 October 2019.

35 https://www.europol.europa.eu/newsroom/news/glass-eel-traffickers-earned-more-eur-37-million-illegal-exports-to-asia

36 CITES Twenty-ninth meeting of the Animals Committee, *Joint press release on the occasion of the tenth meeting of the informal consultation on international cooperation for conservation and management of Japanese eel stock and other relevant eel species*, AC29 Inf. 13, 2017.

37 Stein, F.M., Wong, J.C.Y., Sheng, V. Law, C., Schröder, B. and Baker, D., 'First genetic evidence of illegal trade in endangered European eel (*Anguilla anguilla*) from Europe to Asia. *Conservation Genetics Resources* Vol 8, pp. 533–537 (2016).

38 The FAO statistics have been questioned by some analysts, but they correspond directly to figures cited in the official China Fishery Statistical Yearbooks.

39 United Nations Industrial Development Organization (UNIDO), 'Case Study: Chinese Eel Exports', *Meeting Standards, Winning Markets: Regional Trade Standards Compliance Report, East Asia 2013,* Ch. 4, pp. 49-61, November 2013.

40 Ibid.

41 In contrast, the China Eel Industrial Association reports Japanese eels only require 12 to 24 months to grow to marketable size, and American eels between 15 and 30 months

42 CITES Twenty-ninth meeting of the Animals Committee, *Joint press release on the occasion of the tenth meeting of the informal consultation on international cooperation for conservation and management of Japanese eel stock and other relevant eel species*, AC29 Inf. 13, 2017. In e-mail communication, the China Eel Industrial Association estimates that there were between 900 and 1,000 eel farms in China in mid-2018. The Japanese Ministry of Health, Labour and Welfare lists 93 Chinese eel farms registered for the export of live eels to Japan and 278 farms authorized to supply 49 food processing companies. See *List of 278 Chinese eel farms*. Available at: https://www.mhlw.go.jp/file/06-Seisakujouhou-11130500-Shokuhinanzenbu/0000080001.pdf and *List of the registration farm of live eel exportation*. Available at: https://www.mhlw.go.jp/file/06-Seisakujouhou-11130500-Shokuhinanzenbu/0000079999.pdf

43 United Nations Industrial Development Organization (UNIDO), 'Case Study: Chinese Eel Exports', *Meeting Standards, Winning Markets: Regional Trade Standards Compliance Report, East Asia 2013,* Ch. 4, pp. 49-61, November 2013.

44 According to the data attached to CITES AC29 Inf. 13 (CITES Twenty-ninth meeting of the Animals Committee, *Joint press release on the occasion of the tenth meeting of the informal consultation on international cooperation for conservation and management of Japanese eel stock and other relevant eel species, 2017)*, between 2008-09 and 2015-16, China caught 253 metric tons of Japanese glass eel and introduced only 123.5 metric tons of Japanese glass eel. Between 2008 and 2016, China exported 108.5 metric tons of Japanese glass eel.

45 CITES AC30 Doc 18.1, Annex 1, *Implementation of the CITES Appendix II listing of European Eel Anguilla* (available at: https://cites.org/sites/default/files/eng/com/ac/30/E-AC30-18-01-A1.pdf). CITES has recently revised the guidance regarding reporting of eel trade and illegal trade. See *Guidelines for the preparation and submission of CITES annual reports* (December 2019), Ch. 6a) 'Description of specimens and units of quantity', pp. 7-11 (available at: https://cites.org/sites/default/files/notif/E-Notif-2019-072-A1.pdf) and *Guidelines for the preparation and submission of the CITES annual illegal trade report* (https://cites.org/sites/default/files/notif/E-Notif-2019-072-A2.pdf).

46 Based on responses to a UNODC questionnaire administered to law enforcement officials in 2018.

47 CITES Twenty-ninth meeting of the Animals Committee, *Joint press release on the occasion of the tenth meeting of the informal consultation on international cooperation for conservation and management of Japanese eel stock and other relevant eel species*, AC29 Inf. 13, 2017.

48 Purcell et al. (2016) Ecological Roles of Exploited Sea Cucumbers. Retrieved from https://www.researchgate.net/publication/311234596_Ecological_Roles_of_Exploited_Sea_Cucumbers

49 National Geographic, 30 August 2018. https://www.nationalgeographic.com.au/animals/watch-sea-cucumbers-are-the-oceans-vacuum-cleaners.aspx

50 To a lesser extent, they are also used for traditional medicines, as well as cosmetic, pharmaceutical, aquaria, and biomedical research purposes. See CITES. (2002b). Trade in sea cucumbers in the families *Holothuriidae* and *Stichopodidae*. Twelfth meeting of the Conference of the Parties Santiago (Chile), 3-15 November 2002. CoP12. Doc. 45 Annex; CITES. (2007a). Biological and trade status of sea cucumbers in the families *Holothuriidae* and *Stichopodidae*. Report by Verónica Toral-Granda, Charles Darwin Foundation. Fourteenth meeting of the Conference of the Parties. The Hague (Netherlands), 3-15 June 2007. CoP14 Doc. 62 Annex 1; CITES. (2019a). Consideration of proposals for amendment of appendices I and II. Eighteenth meeting of the Conference of the Parties Geneva (Switzerland), 17-28 August 2019. CoP18 Prop. 45 (Rev. 1); Conand, C. (2006). Harvest and trade: Utilization of sea cucumbers; sea cucumbers fisheries trade; current international trade, illegal, unreported and unregulated trade; bycatch, socio-economic characteristics of the trade in sea cucumbers. In: Bruckner A (editor) The Proceedings of the CoP18 Prop. 45 (Rev. 1) – p. 20 Technical workshop on the conservation of sea cucumbers in the families *Holothuridae* and *Stichopodidae*. NOAA Technical Memorandum NMFS-OPR 44, Silver Spring, 239 pp; Toral-Granda, V., Lovatelli, A., Vasconcellos, M. (eds). (2008). Sea cucumbers. A global review of fisheries and trade. *FAO Fisheries and Aquaculture Technical Paper.* No. 516. Rome, FAO. 317p.

51 Conand, 2006; CITES, 2002b; 2019a; Toral-Granda et al., 2008; Purcell, S.W. (2010). Managing sea cucumber fisheries with an ecosystem approach. Edited/compiled by Lovatelli, A.; M. Vasconcellos and Y. Yimin. (2010). FAO Fisheries and Aquaculture Technical Paper. No. 520. Rome, FAO. 157p.

52 CITES, 2002b; 2019a.

53 Capture fisheries refer to harvesting of naturally occurring living resources (wild fish catches), which can be in marine or freshwater environments. Aquaculture is the farming of aquatic organisms.

54 Based on live weight for sea cucumber and Japanese sea cucumbers. FAO. (2019a). Fishery and Aquaculture Statistics. Global aquaculture production 1950-2017 (FishstatJ). In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 2019. www.fao.org/fishery/statistics/software/fishstatj/en.

55 FAO presented sea cucumber and Japanese sea cucumbers data in live weight. FAO, 2019a; 2019b; Data obtained from FAO FishStatJ, collected since 1950, were presented in live weight, while in previous years FAO data was presented in dried weight. This made it difficult to compare with prior studies on sea cucumbers which used also used FAO data, but where the unit of measurement was different.

56 Conand, 2006; Toral-Granda et al., 2008.

57 FAO, 2019b.

58 FAO, 2019a.

59 Belonging to the families *Stichopodidae, Holothuriidae* and some in *Cucumariidae* (Purcell, 2010; CITES, 2007a).

60 CITES, 2007a.

61 Conand, 2006.

62 M. Fabinyi, K. Barclay & H. Eriksson (2017). Chinese trader perceptions on sourcing and consumption of endangered seafood. Frontiers in Marine Science, 181: 1-12; Purcell, S.W., Williamson, D.H., and Ngaluafe, P. (2018). Chinese market prices of beche-de-mer- Implications for fisheries and aquaculture. *Marine Policy*. 91: 58-65.

63 Purcell et al., 2018.

64 At CoP12, the US submitted a background document on sea cucumbers, specifically on the families *Holothuridae* and *Stichopodidae* to highlight exploitation and trade concerns and consider a CITES listing. While a proposal was not put forward, decisions were taken at CoP12 to evaluate these unlisted species, since they were subject to significant international trade, and determine whether they would qualify and benefit from a CITES listing (CITES Decisions 12.60 and 12.61 refers to a technical workshop and preparation of a discussion document on the biological and trade status of the species). At CoP13, CITES Decision 13.48 and 13.49 were adopted (to review the proceedings of the workshop, extend the deadline for the preparation of the discussion document, and to assist in raising funds for the development of the discussion paper). CITES, 2002b; CITES, 2007a; CITES. (2002a). CITES Decisions. Decisions of the Conference of the Parties to CITES in effect after the 12th meeting. Retrieved from: https://cites.org/sites/default/files/eng/dec/valid13/E12-Dec.pdf; CITES. (2007b). Interpretation and implementation of the Convention. Species trade and conservation issues Sea cucumbers. Fourteenth meeting of the Conference of the Parties. The Hague (Netherlands), 3-15 June 2007. CoP14 Doc. 62. CITES. (2004). CITES Decisions. Decisions of the Conference of the Parties to CITES in effect after the 13th meeting. Retrieved from: https://cites.org/sites/default/files/eng/dec/valid13/E13-Dec.pdf.

65 UNEP. (2019). The Species+ Website. Nairobi, Kenya. Compiled by UNEP-WCMC, Cambridge, UK. Available at: www.speciesplus.net. [Accessed 21/08/2019].

66 This listing took effect on 28 Aug 2020. CITES, 2019b. Summary record of the twelfth session for Committee I. CoP18 Com I. Rec. 12. Eighteenth meeting of the Conference of the Parties Geneva (Switzerland), 17-28 August 2019.

67 As defined by CITES, "illegal Holothurian fisheries are characterized by: 1) poaching and exports by nationals in remote areas, marine protected areas, the use of illicit

devices, the existence of different regulations between regions of a country and 2) poaching and exporting by foreigners in the majority of cases by temporary bandits 'poach and go', Chinese entrepreneurs, in remote areas, countries with low regulations, poor countries." (CITES CoP18 Prop45, p. 12). This is however not necessary fitting with the FAO definition so I would suggest to be more general.

68 CITES, 2007a; CITES, 2019a.

69 Ibid.

70 Based on live sea cucumbers and bodies. WorldWISE recorded 99,839 kg (converted to wet weight) or a total of 272,543 live equivalents of *Isostichopus fuscus* from 2008 to 2017. An additional 100,226 sea cucumbers with no description were also reported, so it is impossible to determine if they were fresh/frozen or dried, but they would be equivalent to approximately 38,703kg (wet weight).

71 Bergenas, J. (2016). Fish crime: What do the numbers say? Retrieved from: https://www.stimson.org/2016/fish-crime-what-do-numbers-say/.

72 https://www.justice.gov/usao-sdca/pr/illegal-sea-cucumber-trade-nets-more-12-million-dollars-fines-forfeiture-and