

Implementation of the CITES Appendix II listing of
European Eel *Anguilla anguilla*

Louisa Musing, Hiromi Shiraishi, Vicki Crook, Matthew Gollock,
Emma Levy and Katalin Kecse-Nagy.

Delivered by the Zoological Society of London



Table of Contents

Executive Summary	4
1. Introduction.....	8
2. Methods.....	12
3. Reporting issues under CITES.....	17
3.1 Discrepancies between importer and exporter reported data	17
3.2 Discrepancies in reporting source code.....	18
3.3 Discrepancies in reporting term	18
4. CITES Trade data analysis.....	20
4.1 Trade data analysis.....	20
5. Customs data analysis.....	31
5.1 Customs trade data analysis	31
5.2 Concluding remarks on Customs trade data	46
6. Implementation issues.....	48
6.1 Non-Detriment Findings.....	48
6.2 Pre-Convention/pre-ban specimens.....	53
6.3 Traceability along the eel supply chain	57
6.4 Transhipments of American eels	60
6.5 Overlapping jurisdictions	61
6.6 Regional and international collaboration	61
7. Illegal trade and enforcement	65
7.1 Mis-declaration of <i>A. anguilla</i>	65
7.2 Smuggling	66
7.3 Enforcement challenges.....	68
8. Effectiveness of the CITES Appendix II listing.....	71
9. Summary of conclusions	74
References	7Error! Bookmark not defined.

Acknowledgments

This report was made possible with financial support from the CITES Secretariat.

The authors would like to thank Karen Gaynor in the CITES Secretariat for support during the drafting of the report. We thank from TRAFFIC, Joyce Wu for supporting the study and Stephanie Pendry, Thomasina Oldfield and Richard Thomas for reviewing elements of the draft report. Camilla Beevor and Aaron Foy at ZSL are thanked for their legal and operational support, and Kristen Steele for translation of documents.

Parties are thanked for completing the questionnaires that informed this report and for reviewing a draft to ensure it is as accurate and up to date as possible. We also thank the individuals who responded to specific requests for information and clarification.

Author affiliations

Matthew Gollock and Emma Levy, Zoological Society of London, Regent's Park, London, NW1 4RY, United Kingdom.

Louisa Musing, Hiromi Shiraishi and Katalin Kecse-Nagy, TRAFFIC, The David Attenborough Building, Pembroke Street, Cambridge CB2 3QZ, United Kingdom.

Vicki Crook – Independent consultant.

Executive Summary

The European eel *Anguilla anguilla* is one of 16 species in the family Anguillidae. It exhibits a complex life cycle and is believed to form a single stock across its range. Continental life-stages are harvested either for consumption or as seed for farms, which are predominantly found in East Asia. However, exploitation is just one of a range of threats impacting *A. anguilla* and there has been growing concern in relation to the status of the stock for decades. In 2007, the European Union (EU) adopted Council Regulation (EC) No 1100/2007 to ensure protection and sustainable use of the species. In the same year, the species was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (CITES 2007b). The listing came into force on 13th March 2009 as did the equivalent Annex B listing of the European Union (EU) Wildlife Trade Regulations. In December 2010, the EU's Scientific Review Group (SRG) concluded that it was not possible to perform a Non-Detriment Finding (NDF) for the export of *A. anguilla* at the time, and subsequently a zero-import/export policy was set for the EU, which still remains in place.

At the 17th meeting of the Conference of the Parties to CITES, four Decisions (17.186-17.189), relating to anguillid eels were adopted. Decision 17.186, states:

the Secretariat shall, subject to external funding:

a) contract independent consultants to undertake a study compiling information on challenges and lessons learnt with regards to implementation of the Appendix II listing of European Eel (Anguilla anguilla) and its effectiveness. This includes in particular the making of non-detriment findings, enforcement and identification challenges, as well as illegal trade.

The CITES Secretariat contracted the Zoological Society of London (ZSL) to prepare the aforementioned report and ZSL in turn contracted TRAFFIC and a consultant with expertise in eel trade issues to deliver elements of the report. A questionnaire was developed by the team to facilitate the gathering of relevant information from Parties. The CITES Secretariat made the questionnaire available to Parties as an Annex to Notification to the Parties No. 2018/018. 28 responses to this Notification were received, including 25 Parties, 17 of which were range States, and a number of individuals were contacted directly within the Parties when clarification was needed. In parallel to this a review of relevant scientific and grey literature was conducted, and trade data were analysed. In addition to this, authors attended a workshop in London 18th-20th April to present a draft version of the report, collate feedback and develop recommendations in light of discussions. A report from this workshop will be submitted to the Animals Committee.

CITES Reporting Issues

Several reporting issues have been identified through the analysis of *A. anguilla* trade data. These include discrepancies between exporter and importer reported data, temporal discrepancies and errors in use of codes, terms and units. Some of these could possibly be explained by the time lag between listing and implementation, and the multiple cut-off dates that were introduced to help try to deal with the complexities of eel trade. A significant issue was around the use of the terms 'fingerling' (FIG) or 'live' LIV for glass eels which is the most lucrative *A. anguilla* commodity in trade. Arguably, FIG is the most appropriate term, and allows the distinction between juvenile and larger

specimens, but to date the term FIG has rarely been used by Parties, which has made identifying glass eel trade challenging. Similarly, depending on the commodity and associated term, trade is reported in weight (kg) or pieces – sometimes interchangeably – making analysis and comparison challenging. These issues were discussed at length at the London Workshop and there was strong agreement that using FIG for reporting trade in glass eels and harmonising reporting units would be helpful.

Trade Analysis

Analysis of CITES trade data from 2009 to 2016 highlighted discrepancies between exporter and importer data, as described above, with 2014 and 2015 showing significant disparities in the total quantity of live *A. anguilla* reported. Across this time period it was also clear that these discrepancies, both for weight and specimens, resulted in a poor understanding of which range States were exporting, though Morocco, Tunisia and Norway appeared consistently. This seemed to be less of an issue when examining import countries – South Korea, Denmark, Hong Kong SAR and China being consistent – though quantities were often vastly different between exporter and importer data. For re-export data, these issues seemed to be less significant, though discrepancies seem to be more prevalent in data reported by number of specimens. China was by far the primary re-exporter, primarily to Japan, with these eels originating from France.

With regard to trade in meat and bodies from 2009-2016, there were also significant discrepancies between CITES exporter and importer data, with the total quantity reported being 20 times greater from the latter. Again, discrepancies meant that understanding which Parties were trading was challenging, but Tunisia and China appeared consistently as export countries – the latter most likely as a re-exporter. This was confirmed on examination of re-export data, where China, Japan and Denmark were identified as key re-exporters. Japan was identified as being the major importer of Chinese re-exports, with the source countries for these primarily being France, Spain and Morocco.

Analysis of Customs data indicated that trade in live eels (*Anguilla* spp.) from the EU declined considerably after the trade ban in 2010. Exports of both live and processed eels from non-EU countries fluctuated, with a decline occurring in the first few years after the CITES listing came into force, followed by an increase in 2013, and in 2014, reached levels double that of prior to the listing. Prior to the EU ban, live eel exports, primarily from Morocco, Norway and Tunisia, were destined for the EU. After the ban, Morocco and Tunisia exported to East Asia – China, Hong Kong SAR, Japan and South Korea depending on the life. 'Trade' within the EU continued post-ban, however, quantities generally declined and with reported price for glass eels variable. Imports of all *Anguilla* commodities (live, fresh, frozen, smoked and prepared) into the EU from non-EU countries and territories declined post-listing to ~1000 t in 2011 and has remained at this level since.

Implementation Issues

Since December 2010, the EU SRG have not been able to make a NDF for *A. anguilla* primarily due to its concerning status. Outside of the EU, Norway banned fishing in 2010, apart from a small scientific fishery, but indicated work had started on making an NDF in 2018 – this was shared at the London Workshop for discussion. Outside of Europe, NDFs have been made by Algeria, Morocco, Tunisia and Turkey. Information provided by these range States, either through Notification responses or via the

CITES Review of Significant Trade process indicated that export of glass eels was not permitted at the time of writing, and for some, this has not been permitted for a number of years; this does not appear to align, however, with trade reported by Customs.

As stated previously, there were a number of cut-off dates set by the European Commission relating to trade in pre- and post-Convention eel specimens which proved challenging for national CITES management and enforcement authorities to implement. This was exacerbated by the fact that trade was still occurring from range States outside of the EU.

EU Council Regulation (EC) No 1100/2007 sets out a clear framework as to the EU's obligations concerning traceability of *A. anguilla* trade but at the time of writing, a harmonised system is not in place. In addition to the challenge of monitoring a species whose range is beyond EU borders, issues around accurate record keeping, reporting and documentation along the eel supply chain from catch to sale have further hampered traceability, raising concerns around the legality of a proportion of the *A. anguilla* being harvested and traded. Differences between national and sub-national regulations within EU Member States led to further complexities. Improving national, regional and international co-operation appears to be core to addressing the challenges relating to traceability, with a lack of information sharing and differing national priorities being raised as key factors.

Illegal trade and enforcement

In the years following the CITES listing and associated EU trade ban, the black-market trade in *A. anguilla* to meet demand in East Asia, particularly in glass eels, increased significantly. This was due to the restricted availability of *Anguilla* specimens for farming caused by declines in stocks, and establishment of export quotas and trade bans. Evidence of mis-declaration of specimens as pre/post-Convention and other *Anguilla* species in order to illegally trade *A. anguilla* has been reported by enforcement authorities across the EU. Further, the dynamics of smuggling operations to evade controls has become more organised and sophisticated in recent years. An increasing number of seizures have occurred since the EU ban and the establishment of Operation LAKE by EUROPOL has proved a successful collaboration between EU range State law enforcement and Management Authorities. However, there remains reluctance by enforcement officers to intercept live glass eels due to the high value of the commodity and the limited period that they can be kept alive during transportation. Further, identifying glass eels to the species level requires molecular technology – at least in cases where a seizure is to be used in a prosecution. Finally, in cases where seizures occur, there are concerns in relation to finding facilities to ensure they are kept alive and can be repatriated.

Effectiveness of the listing

At the EU level, the CITES listing of European eels combined with EU Council Regulation (EC) No 1100/2007 have led to the adoption of management and conservation measures specifically designed to stimulate the recovery of species, in particular the escapement of adult eels and ultimately the recruitment of glass eels. These measures have led to a reduction of legal fishing effort and catches of eels. Other measures, notably to improve the river continuity to allow eels to migrate, have also been put in place. The CITES listing has set a clear framework to protect the species, in relation to unsustainable and illegal exploitation and trade, and has raised the profile of said trade internationally.

At the national level, there have been efforts to improve traceability, new laws developed and collaborative efforts to combat illegal trade. Conversely, there are concerns that the listing, and associated EU ban, has shifted trade to non-EU *A. anguilla* range States and/or other species, and resulted in an increase in illegal trade.

In view of the specificities of the life cycle of eels – for example, the average generation length has been estimated as 15 years – it will take time before measurable progress can be identified as a result of the CITES listing and other management and conservation measures. More fundamentally, it is essential that metrics to measure progress in relation to the listing are identified. Lessons could usefully be learned from analysis of other listings and their effectiveness, such as a recent example relating to sharks. As the CITES listing, Council Regulation (EC) No 1100/2007 and the EU import/export ban all came in to effect within a period of three years, it will be useful to determine whether one, some or all of them have resulted in the observed changes.

Conclusions

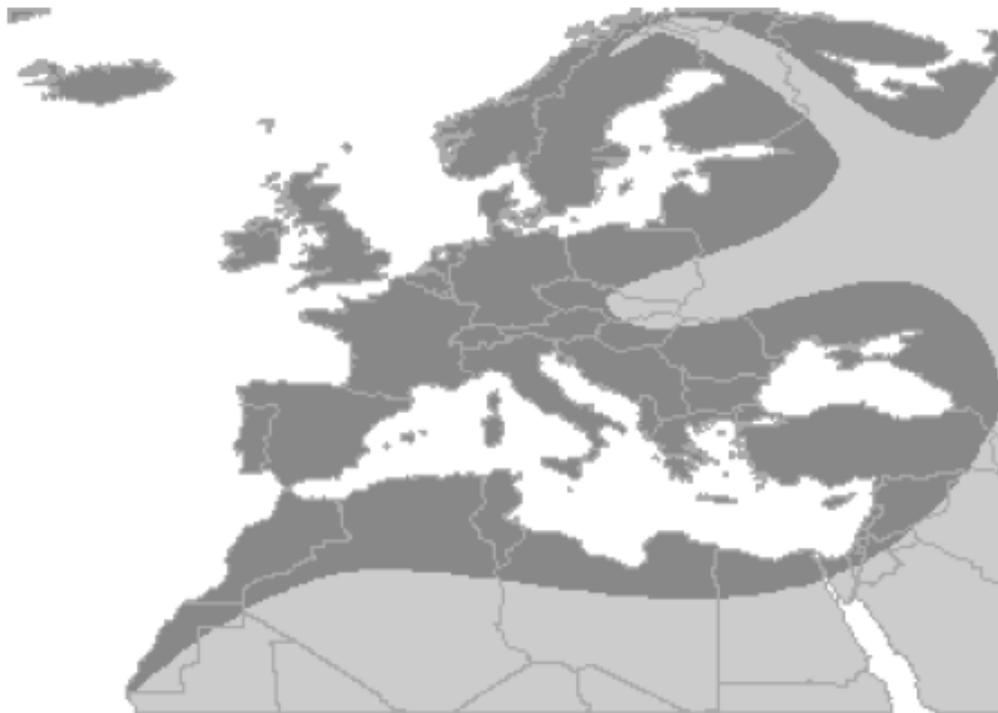
The study, responses to CITES Notification 018/2018 and the London Workshop highlighted that regardless of progress, several of the issues outlined above require further action to ensure the listing of *A. anguilla* is effectively implemented and any trade in the species is legal, traceable and sustainable. Suggestions for CITES Parties include:

- Accurate and consistent reporting of both exports and imports is required, and the use of ‘Fingerling’ rather than ‘Live’ for reporting trade in glass eels/juveniles would be of value.
- Using Customs data to cross-reference CITES trade data, provides a more detailed analysis of trade to identify discrepancies and/or possible illegal activity.
- The development of a stock-wide NDF and/or the harmonisation of making national NDFs for this species could be useful.
- The development of national/intra-EU strategies by EU Member States could help to combat illegal fishing and regulate trade.
- Information on North African *A. anguilla* range State management measures and fishing regulations would be of use, especially to other range States and trading partners;
- Improved information sharing among different competent authorities at the national and regional (EU) levels would be valuable.
- The sharing of enforcement (Customs and seizure) information from Trading Parties with *A. anguilla* range States on a regular basis could help with combatting illegal trade.
- The development of a harmonised traceability system for *A. anguilla* could help to ensure trade is legal and sustainable.
- In order to address identification issues concerning *Anguilla* species in trade, the consideration of potential challenges and benefits of available techniques and mechanisms would be useful.

1. Introduction

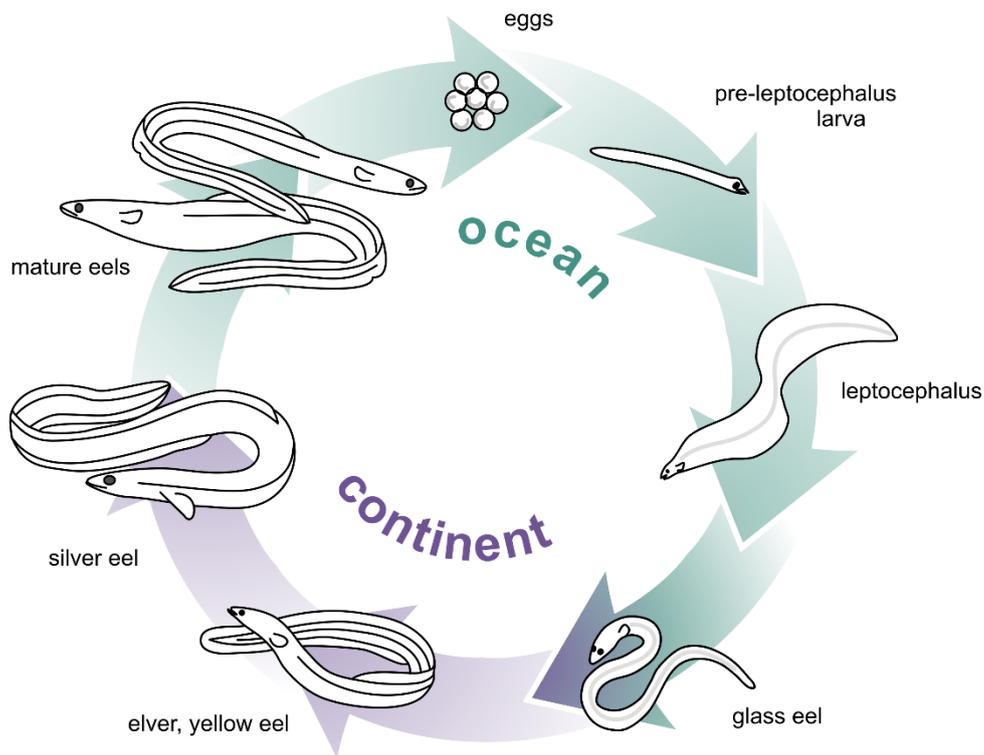
The European eel *Anguilla anguilla*, one of the 16 species in the family Anguillidae (Jacoby *et al.* 2015), is a panmictic species (considered to be made up of one population only) believed to spawn in the Sargasso Sea in the Atlantic Ocean (Schmidt, 1922; Tesch, 2003). Its continental non-breeding range includes most of Europe, Mediterranean Asia and parts of the North African coast (Jacoby and Gollock, 2014) (Figure 1). The species exhibits facultative catadromy, is semelparous and has a complex life cycle which can be divided into seven distinct life stages (Henkel, *et al.* 2012; Jacoby and Gollock, 2014; Tesch, 2003) (Figure 2).

Figure 1. Range of *Anguilla anguilla*. Source: Moriarty and Dekker, 1997.



- eggs, presumably hatching in the Sargasso Sea, then form into cylindrical larvae before developing into leaf-shaped leptocephalus larvae. These are then carried inland from marine spawning regions on currents;
- “glass eels” (juveniles - approximately five to eight centimetres and 1/3 gram in weight) reaching the continental shelf and estuaries;
- “elvers” (pigmented juveniles) reaching continental habitats / “yellow eels” (over 10cm) living in continental habitats;
- “silver eels” (migratory and maturing) those leaving continental habitats/estuaries to migrate to the spawning grounds; and
- “mature eels” – maturing occurs during or after migration to the spawning grounds.

Figure 2. A schematic diagram of the life cycle of anguillid eels. Source: Henkel *et al.* 2012.



All continental life stages of *A. anguilla* are commercially harvested, traded and used directly for human consumption (Crook and Nakamura, 2013). Wild juvenile glass eels are also caught and then used as “seed” in farming/aquaculture operations, as closed-cycle captive breeding is not yet commercially viable (Butts *et al.*, 2016; Shiraishi and Crook, 2015). While farming operations exist within Europe, they predominantly occur in East Asia, particularly in China¹, followed by Taiwan Province of China, Japan and the Republic of Korea, with Hong Kong Special Administrative Region (SAR) as an important trade hub for glass eels destined for farming operations in the region (Crook and Nakamura, 2013; Crook, 2014; Shiraishi and Crook, 2015). Prior to the 1990s, eel farming and trade predominantly relied upon species of local provenance, such as the *Anguilla japonica*, the Japanese eel, in East Asia and *A. anguilla* in Europe (Ringuet *et al.* 2002). However, as recruitment of *A. japonica* into continental waters rapidly declined (Dekker, *et al.* 2003; Dekker and Casselman, 2014), East Asian farms, predominantly in China, looked for alternative sources, in particular *A. anguilla* (Ringuet, *et al.* 2002; Shiraishi and Crook, 2015; Stein *et al.* 2016).

Due to its complex life history *A. anguilla* is exposed to a range of potential threats including habitat loss and modification, migration barriers, pollution, parasitism and fluctuating oceanic conditions, as well as exploitation, all of which have resulted in a significant depletion of stock across the species’ range (Jacoby, *et al.* 2015) – the species is listed as ‘Critically Endangered’ on the IUCN Red List of Threatened Species (Jacoby and Gollock, 2014). According to the International Council for the Exploration of the Sea (ICES) ‘Advice on fishing opportunities, catch and effort of the Northeast Atlantic Ecoregions’ the status of *A. anguilla* stock reached a historical low in most of its distribution area

¹ ‘China’ refers to ‘mainland China’

during the last decade (ICES Advice, 2008) and the status of the stock remains critical (ICES Advice, 2017; ICES Advice, 2016; ICES Advice; 2015).

Concerns were raised from the late 1990s as to the impact that unsustainable exploitation and associated trade was having on the *A. anguilla* population with the ICES recommending that exploitation and other anthropogenic impacts be reduced to the lowest possible level until an international recovery plan be instated (ICES Advice, 2002). Consequently, the European Union (EU) adopted Council Regulation (EC) No 1100/2007² to ensure protection and sustainable use of *A. anguilla*, which *inter alia*, stipulated that EU Member States should develop Eel Management Plans (EMPs) to ensure the recovery of stock across their territories (Official Journal of the European Union, 2007)³. Furthermore, in 2007, the species was listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which came into force on 13 March 2009 (CITES 2007b), and the equivalent Annex (B) of the EU Wildlife Trade Regulations. In December 2010, the EU's Scientific Review Group (SRG) concluded that at the time it was not possible to perform a Non-Detriment Finding (NDF) for the export of *A. anguilla*, and subsequently a zero-import/export policy was set for the EU (EC, 2010; EC, 2014b). On that basis, EU CITES Management Authorities were not able to allow export of *A. anguilla* from the EU and commercial trade in all commodities of *A. anguilla* to and from the EU was banned from 3 December 2010 (EC, 2010; EC, 2014b; EC, 2016; TRAFFIC, 2015). At the time of writing this ban is still in place.

As with any changes in regulation, there have been national, regional and international challenges in relation to effectively implementing these conservation measures across the species' range. These issues have been augmented by the ongoing illegal trade in *A. anguilla*, particularly in glass eels that have become an extremely lucrative commodity, reaching prices of EUR1200 –1500 per kg in East Asia (Anonymous, 2016; Briand, *et al.* 2008; Stein, *et al.* 2016). In recognition that the illicit trade in *A. anguilla* is one of the most serious wildlife crime problems the EU faces (EC, 2016), further efforts in implementation of EU rules and a more strategic approach to enforcement was stipulated in Objective 2.1 of the EU Action Plan Against Wildlife Trafficking⁴.

At the 17th meeting of the Conference of the Parties to CITES, held in Johannesburg, South Africa, 24 September to 5 October 2016, four decisions, 17.186 17.189, relating to anguillid eels were adopted⁵. Decision 17.186, directed to the CITES secretariat, stated the following:

The Secretariat shall, subject to external funding:

*a) contract independent consultants to undertake a study compiling information on challenges and lessons learnt with regards to implementation of the Appendix II listing of European Eel (*Anguilla anguilla*) and its effectiveness. This includes in particular the making of non-detriment findings, enforcement and identification challenges, as well as illegal trade. This study should notably take account of the data compiled and advice issued by the ICES/GFCM/EIFAAC Working Group Eel;*

*b) contract independent consultants to undertake a study on non-CITES listed *Anguilla* species:*

² <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R1100&from=EN>.

³ Unless '...river basins lying within the national territory of a Member State cannot be identified and defined as constituting natural habitats for the European eel...'.

⁴ http://ec.europa.eu/environment/cites/pdf/WAP_EN_WEB.PDF

⁵ <https://cites.org/eng/dec/valid17/81868>

i) documenting trade levels and possible changes in trade patterns following the entry into force of the listing of the European Eel in CITES Appendix II in 2009;

ii) compiling available data and information on the biology, population status, use and trade in each species, as well as identifying gaps in such data and information, based on the latest available data and taking account inter alia of the Red List assessments by the IUCN Anguillid Eel Specialist Group; and

iii) providing recommendations for priority topics for technical workshops based on gaps and challenges identified under i)-ii);

c) make the reports from the studies above available to the 29th meeting of the Animals Committee (AC29) for their consideration; and

d) organize, where appropriate, international technical workshops, inviting cooperation with and participation by the relevant range States, trading countries, the Food and Agriculture Organization of the United Nations (FAO), the IUCN Anguillid Eel Specialist Group, the ICES/GFCM/EIFAAC Working Group Eel, industry and other experts appointed by Parties as appropriate. Such workshops should in particular cover the topics identified by the reports described in subparagraphs a) and b) of this Decision and could focus on challenges specific to the various eel species, such as

i) in relation to European eel, the realization of and guidance available for non-detriment findings, as well as enforcement of the Appendix II listing including identification challenges; and

ii) in relation to the other eel species, to enable a better understanding of the effects of international trade, including trade in their various life stages, and possible measures to ensure sustainable trade in such species ;

e) make any workshop report available to the 30th meeting of the Animals Committee (AC30) for their consideration; and

f) make available to the Standing Committee relevant information on illegal trade in European eels gathered from the study and the workshop report mentioned in paragraphs a) and e).

Due to issues with securing funding, the decision has not been able to be implemented in time to submit the reports outlined in paragraphs a) and b) to AC29 or technical workshops, as per paragraph c) and b) iii, respectively. However, it was agreed that the reports should be submitted to AC30. As such, this report fulfils the requirements of paragraph a).

2. Methods

2.1 Review of existing reports and data

In order to gather data that would allow us to assess the implementation of the Appendix II listing of the European eel, in the context of Decision 17.186, existing reports and data, such as CITES and Customs data, were analysed in addition to new information requested from CITES Parties via a Notification and questionnaire. TRAFFIC have provided a number of internal and external documents relating to the European eel to the European Commission (EC) and as such, with the permission of the EC, some of this information was used to draft a proportion of the report. Outside of EU member States, web searches were carried out to gather information in relation to other range States – including in French to obtain information North African countries. Additionally, and where possible, individuals known to be European eel stakeholders were contacted directly.

2.1.1 CITES Trade data analysis

CITES trade data were downloaded on 2 March 2018 from the CITES Trade Database (<https://trade.cites.org/>) – see Section 4. Comparative tabulations, which compare the imports and exports reported by individual CITES Parties, were used. Trade reported by weight in kg was converted to tonnes (t); quantities were converted to the nearest tonne. Exports (direct trade reported by the exporter and importer) and re-exports (indirect trade reported by the exporter and importer) were analysed separately. Re-exports are those defined as having an entry in the “origin” field of the CITES Trade Database.

All records with source code “I”, confiscated or seized specimens (12 records), or purpose codes “M”, for medical purpose (3 records) and “S”, for scientific purpose (17 records), were excluded from the dataset⁶. One record reportedly involving 19 500 “litres” of meat (purpose code “T”, commercial, and source code “O”, Pre-Convention) reported by Japan as imported from China in 2010 also had to be excluded from the analysis as it appears to be a reporting error.

A number of likely anomalies were identified in the dataset, but the records were retained in the dataset for analysis, with the following assumptions:

- In 2014, 30 kg of meat from Morocco to the Republic of Korea was reported with purpose code “Q”, circus or travelling exhibition (exporter data). The reported purpose was assumed to be an error.
- In 2016, Japan reported importing 20 t of meat originating in France, re-exported by China with source code “A”, plants that are artificially propagated. The reported source was assumed to be an error.
- In 2016, there are two trade records for Tunisia both involving the export of “unspecified” specimens under the descriptive terms; one record involved 5 t with purpose code “B”, for breeding in captivity or artificial propagation, the other record 92 t with purpose code “T”; both records with unknown importers. These records were analysed and discussed in the section “Other trade terms”.

⁶ While trade records reported for scientific purposes were excluded from the analysis, it is noted that one trade record reported by Turkey involved the export of 160 kg live eels to an unknown (‘XX’) importer in 2016 indicating scientific purpose.

A number of additional reporting issues have been identified specifically for CITES trade in eels—these are discussed in more detail in section 2 above.

Data for 2016 were likely to be somewhat incomplete; examples of range/traditional trading Parties not having submitted their 2016 annual reports at the time of writing included Algeria and the Republic of Korea (hereafter “South Korea”)⁷.

2.1.2 Customs data analysis

Customs data for *Anguilla* spp. were collated from several different sources to analyse possible *A. anguilla* trade (see Section 5) which may or may not be reflected in the CITES Trade Database. Globally, there are several six-digit Harmonised Systems (HS) Customs codes designated for eel, however these codes do not differentiate between the various life stages or species:

- live eels (*Anguilla* spp.) (HS 030192);
- fresh or chilled eels (*Anguilla* spp.) (HS 030274);
- frozen eels (*Anguilla* spp.) (HS 030326); and
- prepared/preserved eels (HS 160417)⁸.

Some countries/territories have more detailed Customs codes for live eels, which enables users to differentiate between live eel fry (used for farming) and other larger live eels (for consumption) and conduct a more detailed analysis.

The issues of over- and under-reporting must be considered when interpreting Customs data and information. Double counting may occur as *Anguilla* spp. are traded internationally before and after being converted in to different commodities. In addition, look-a-like eel species (non-*Anguilla* spp.) seem to be traded under HS codes for *Anguilla* eels in some countries. Live eel exports from Southeast Asian countries are known to include *Monopterus albus* (swamp eels) (SEAFDEC, 2018, unpublished data; the Philippines’ response to CITES Notification 2018/018), and trade to and from some countries in the Americas reported as *Anguilla* spp. is known to include Hagfish, Conger, Moray and Snake Eel (*Ophichthus remiger*) (United States’ response to CITES Notification 2018/018; Bustamante and Segovia, 2006; UN Comtrade, 2018).

2.1.2.1 UN Comtrade

Global *Anguilla* export and import data of live, fresh, frozen and prepared/preserved eel for 2007-2016 were downloaded in February 2018 from the UN Comtrade Database (<http://comtrade.un.org/>). UN Comtrade data were more detailed (providing data of individual trading partners) and up to date than FAO Fisheries Commodities and Trade data (<http://www.fao.org/fishery/statistics/global-commodities-production/en>) and were therefore selected for further analysis (totals from these two sources being comparable). UN Comtrade was used as the source for export data for non-EU A.

⁷ Source: https://www.cites.org/sites/default/files/annual_reports.pdf

⁸ HS Nomenclature 2017 edition: <http://www.wcoomd.org/en/topics/nomenclature/instrument-and-tools/hs-nomenclature-2017-edition/hs-nomenclature-2017-edition.aspx>

anguilla range States (see Eurostat for EU range States). UN Comtrade data do not differentiate life stages of eels. Taiwan data are reported under “Other Asia nes” in UN Comtrade⁹.

2.1.2.2 Eurostat

In order to obtain eel trade data of EU Member States, import and export data for live, fresh, frozen, smoked and prepared/preserved *Anguilla* eels were downloaded from Eurostat (<http://ec.europa.eu/eurostat/web/main/home>) in February 2018. The EU has adopted three more detailed Customs codes for live eels since the Combined Nomenclature (CN) was revised in 2012 (see Table 3). Exports and imports recorded in Eurostat include trade between the EU Member States (intra-EU trade) and with non-EU countries/territories (extra-EU trade). Within the EU, intra-EU exports and imports are referred to as dispatches and arrivals respectively. Intra-EU trade data are collected from intra-EU traders if their trade exceeds a certain threshold established by each Member State – the current thresholds cover more than 92% of dispatches and 87% of arrivals (EC, 2014a). However, intra-EU trade may be underestimated if a large number of small quantities below the specified thresholds were traded.

2.1.2.3 East Asia Customs data

Customs import and export data for live, fresh, frozen and prepared/preserved *Anguilla* eel for East Asian countries/territories for 2007–2016 were obtained through the following sources:

- China Customs Information Centre (data requested via China Cuslink Co. Ltd.);
- Hong Kong Trade Development Council (http://bso.hktdc.com/bso/jsp/bso_home.jsp);
- Ministry of Finance, Trade Statistics of Japan (<http://www.customs.go.jp/toukei/info/>);
- South Korea International Trade Association (<http://www.kita.org/>); and
- Taiwan Bureau of Foreign Trade (<http://cus93.trade.gov.tw/ENGLISH/FSCE/>).

All East Asian countries/territories have adopted more detailed eel Customs codes in comparison to the global HS codes, differentiating between “live eel fry” for farming and “other live eel” for consumption purposes (except for Japan’s live eel export Customs code); however the definition of “live eel fry” varies between them. For example, in Japan, “live eel fry” refers to glass eel and elvers less than 13 g per specimen, however in South Korea, the term includes young eels up to 50 g per specimen (Table 8). Furthermore, South Korea differentiates between two different sizes of eel fry (by weight) and Taiwan differentiates between three sizes (by pieces per kg).

It is noted again that it is estimated to take about two years on average before *A. anguilla* larvae/juvenile eels arrive at the continental shelf (Jacoby and Gollock, 2014) whereas the “Guidelines for the preparation and submission of CITES annual reports” define “fingerling” as “juvenile fish of one or two years of age for the aquarium trade, hatcheries or for release operations”. *A. anguilla* weigh approximately 0.3g each when arriving to continental waters (Shiraishi and Crook, 2015).

⁹ <https://unstats.un.org/unsd/tradekb/Knowledgebase/50104/Taiwan-Province-of-China-Trade-data?Keywords=Taiwan> Accessed 6 March 2018.

For this report, unless otherwise specified, the following terms apply:

- “live eel fry” refers to juvenile/young eels (irrespective of the size, including glass eels and elvers) used for farming; and
- “other live eel” refers to larger sized eels used for consumption (including large elvers, yellow and silver eels).

Table 1: Customs codes and descriptions of live *Anguilla* eels in Europe and East Asia

	Customs	Commodity
European Union	0301.92.10	Live eels " <i>Anguilla</i> spp." of a length of < 12 cm
	0301.92.30	Live eels " <i>Anguilla</i> spp." of a length of => 12 cm but <20 cm
	0301.92.90	Live eels " <i>Anguilla</i> spp." of a length of => 20 cm
China¹⁰	0301.92.10.10	Live eel fry of marbled eel (<i>Anguilla marmorata</i>)
	0301.92.10.20	Live eel fry of European eel (<i>Anguilla anguilla</i>)
	0301.92.10.90	Live eel fry, other <i>Anguilla</i> spp.
	0301.92.90.10	Live eels, other than fry (<i>Anguilla marmorata</i>)
	0301.92.90.20	Live eels, other than fry (<i>Anguilla anguilla</i>)
	0301.92.90.90	Live eels, other than fry (other <i>Anguilla</i> spp.)
Japan	0301.92.10.0	Live eel fry " <i>Anguilla</i> spp." (only used for imports)
	0301.92.20.0	Live eels, other than fry (<i>Anguilla</i> spp.) (only used for imports)
	0301.92.00.0	Live eel (<i>Anguilla</i> spp.) (only used for exports)
South Korea	0301.92.10.00	Glass eel (≤ 0.3 g per unit, for aquaculture)
	0301.92.20.00	Young eel (> 0.3 g and ≤ 50 g per unit, for aquaculture)
	0301.92.90.00	Live eels, other than fry (<i>Anguilla</i> spp.)
Hong Kong SAR	0301.92.10	Live eel fry " <i>Anguilla</i> spp."
	0301.92.90	Live eels, other than fry (<i>Anguilla</i> spp.)
Taiwan	0301.92.10.10-	Eels, <i>Anguilla japonica</i> , live
	0301.92.10.20-	Eels, <i>Anguilla marmorata</i> , live
	0301.92.10.90-	Other eels (<i>Anguilla</i> spp.), live
	0301.92.20.10-	Glass eel ($\Rightarrow 5000$ pcs per kg)
	0301.92.20.20-	Eel fry ($\Rightarrow 500$ and < 5000 pcs per kg)
	0301.92.20.30-	Young eel (elver) (> 10 and < 500 pcs per kg)

Source: Eurostat; Editorial Department of the Customs Import and Export Tariff of China (2016); Hong Kong Census and Statistics Department; Ministry of Finance, Trade Statistics of Japan; Korea International Trade Association; Taiwan Bureau of Foreign Trade. Note: China uses 10-digit codes for Tariff purposes, but only 8-digit data (non-species-specific) are available for analysis.

2.2 Notification 2018/018 and questionnaire

In order to gather additional information from the CITES Parties, and other stakeholders, specifically focused on implementation and enforcement of the *A. anguilla* CITES listing and the biology,

¹⁰ Only 8-digit Customs code data are made available to the public (China Customs Information Center and China Cuslink Company, Ltd., *in litt.* to TRAFFIC, March 2018)

population status, use and trade of other *Anguilla* species, a questionnaire was developed by the authors (Annex A). The questionnaire was made available through Notification to the Parties 2018/018, published by the Secretariat on 01/02/2018; some range States were also contacted directly. This was also sent to the chair of the CITES Animal Committee Inter-Sessional Working Group on anguillid eels established at AC29 to encourage input.

Responses were submitted by the following Parties: Australia, China, Croatia, Denmark, European Union, France, Germany, Greece, Indonesia, Ireland, Italy, Japan, Latvia, Malaysia, Netherlands, Norway, Poland, Slovakia, Spain, Switzerland, Tunisia, Turkey, United Kingdom, United States of America, and the Virgin Islands. A short response was also received from Sweden via email.

Responses were also received from other stakeholders: Comité National des Pêches Maritimes et des Elevages Marins (CNPMEM), du Comité National de la Pêche Professionnelle eu Eau Douce (CONAPPED) et de l'Union du Mareyage Français (UMF) (joint submission) and the Sustainable Eel Group (SEG).

2.3 Workshop

The CITES international technical workshop on Eels (*Anguilla* spp.), 18th to 20th April 2018, London, UK – London Workshop from here-on - was held during the period that this study was being drafted in order to directly deal with issues raised in Decision 17.186 and provide recommendations. There was representation by three of the study authors and while a stand-alone report will be submitted to Animals Committee, we will include information collected during discussions, where relevant.

3. Reporting issues under CITES

Accurate and reliable reporting of trade data facilitates the analysis, and thereby the understanding of trade patterns and levels, and thus can inform various decisions to regulate international trade, including the making of NDFs (Vincent, *et al.* 2013). However, if reporting of trade is of poor quality, with omissions and errors which remain in the dataset without clarification, the reliability of trade data analyses can be undermined.

Following the CITES listing of any species, detailed trade data should be reported by CITES Parties, including information on source and country/territory of origin. However, in the case of the *A. anguilla*, which was listed in 2007 but only came into force in 2009, there was a considerable time lag before significant data were available in the CITES trade database (Crook 2010b). Furthermore, several reporting issues have been identified over the years through the analysis of trade data of eels (TRAFFIC, 2015; TRAFFIC, 2017a). Some of the issues identified are more general, while others are more taxon specific and include:

- discrepancies between the exporter and importer reported data;
- reporting cycle based on calendar year vs. glass eel fishing seasons crossing years;
- reported source (wild, captive-bred, ranches etc.);
- reported term (live versus fingerlings for glass eels); and
- reported unit (weight (kg) as preferred unit for reporting fingerlings and the question of inclusion of water as “transport intermediary” in the reported weight).

CITES trade data reported by the importer and exporter should in principle be identical. However, in practice these often differ. Reasons for discrepancies include:

- the reporting being based on the CITES documents issued rather than the documents actually used;
- different units being used to describe the same transaction (e.g. reports in weight or in number of specimens); and
- specimens that are exported at the end of one year are received by the importer only at the beginning of the subsequent year.

In Section 4, CITES trade data for *A. anguilla* were analysed for the period of 2009–2016 and some of the reporting issues described in more detail below were identified when analysing this dataset. While it is recognised that reporting is an implementation issue (see Section 6), these issues are presented first to enable readers to better understand the complexities surrounding the trade data that are presented throughout the report.

3.1 Discrepancies between importer and exporter reported data

CITES eel trade data show several very significant discrepancies between the exporter and importer reported data. These discrepancies are most apparent for trade in eel meat and bodies, and the magnitude of the difference could not be explained by the possible reasons outlined above. That being said, most of the major discrepancies were typical of the earlier years of the eel listing (2009–2011)

and thus could be related to difficulties in adhering (at the time) to the new requirement for reporting *A. anguilla* trade. For example, it is likely that some of the eels originating in Europe and exported to Asia before 2009 were later re-exported with some of this trade being reported correctly as re-exports (e.g. with country of origin unspecified/unknown) and some incorrectly as direct export with the country of export provided as the country of origin. There were several examples of the country of export not being a range State in apparent direct trade, and where the reported country of origin was not a range State in indirect trade. There were however other examples also from recent years (2015–2016), where the country of import or (re-)export was reported as unspecified (“XX”), which could not be explained using this logic and is unusual in CITES trade data.

While the reporting of trade data under CITES is based on a calendar year cycle, the fishing season for glass eels crosses calendar years, e.g. in Europe the season generally lasts from October to April. Therefore, reporting and analysing data by year does not allow for proper capture of aspects typical of a particular fishing season. In that respect, it is useful to complement CITES trade data with the analysis of Customs data, especially if these can be obtained per month and thus analysed by fishing season (see section on Customs data analysis below).

3.2 Discrepancies in reporting source code

As for the reported source of specimens in trade, there were some CITES source codes reported during 2009–2016, which were either likely reporting errors (e.g. “A” – plants that are artificially propagated) or likely related to a mis-understanding of the use of appropriate source codes for eels (e.g. “R” – ranches specimens, “C” – animals bred in captivity, “F” – animals born in captivity). The latter source codes, suggesting breeding in captivity, should not have been used under any circumstance for eels as the closed-cycle captive breeding of eels is not currently possible on a commercial scale (Crook, 2010; Crook and Shiraishi, 2015).

3.3 Discrepancies in reporting term

CITES data also specify a term to describe the type of specimen in trade, for example live specimen or meat. In the CITES dataset for 2009–2016, two records did not provide this descriptive term, making the data less meaningful, especially considering that the same two records did not have a country of import specified either.

There is also a term available for juvenile life stages of fish species (“FIG” – “fingerling”, defined as “juvenile fish of one or two years of age for the aquarium trade, hatcheries or for release operations”), however there is no clear guidance for CITES Parties as to whether “LIV” – “live” cannot be used for juvenile stages. According to Customs data, a significant part of the trade in eels has been in glass eels, which ideally would have been reported in CITES trade data using the descriptive term “fingerlings” (EC, 2009d). However, only a total of eight trade records were reported using this term during 2009–2016. It is therefore impossible to tell from the CITES data what proportion of exports of live commodities overall (reported as LIV or FIG) might have been of glass eels, elvers, yellow eels or silver eels. It is apparent from information reviewed/collected during this study and from questionnaire responses, that a number of range States have life-stage specific quotas and exploitation and/or trade

laws and therefore the lack of specificity in CITES trade data limits accurate analysis of the situation and the implementation of national laws.

It is also important to note that it is estimated to take two years on average for *A. anguilla* larvae/juveniles to arrive at the continental shelf after spawning in the Sargasso Sea (Jacoby and Gollock, 2014) whereas the “Guidelines for the preparation and submission of CITES annual reports” define “fingerling” as “juvenile fish of one or two years of age for the aquarium trade, hatcheries or for release operations”. As noted above, countries use different values and units to differentiate between eel life stages/sizes (by weight, length or number of pieces per kg), both in Customs data and for eel management measures (such as restrictions on fishing/export). Furthermore, in their responses to CITES Notification No. 2018/018, several range States reported not having systems in place to differentiate between, and report trade in, the various life stages of live *A. anguilla*. The use of standardised (or comparable) definitions and Customs codes is essential for coordination and accurate monitoring of use and trade in *Anguilla* species (Shiraishi and Crook, 2015).

Moreover, CITES recommends that trade in live specimens is reported as number of individuals, with weight being an alternative unit, and vice versa for fingerlings. However, in the case of live eels, the European Commission recommended that these be reported by weight “kg” in the European Union as this is more appropriate for this species/commodity (EC, 2009d). Yet there are many CITES records reported as number of specimens, resulting in difficulties when interpreting and comparing the data. As many different sizes of live eels are traded, it is very difficult to estimate how many eels are contained in each shipment. Eels of different sizes are fished, they are grown to variable sizes in farms, depending on the countries, and they are consumed at different sizes, due to country preferences. The only approximate conversion factor available is for *A. anguilla* glass eels – estimated as approximately 3000 individuals per kg (Crook, 2010b).

In the European Union, the descriptive term “BOD” – “bodies” has been recommended to be used for frozen eels. Under CITES, the preferred unit for this term is number of specimens and kg is only the alternative unit. The term “MEA” – “meat” could also be used for frozen eels, where the preferred reporting unit under CITES is kg. Agreement on the consistent use of descriptive terms and the related preferred unit of reporting would greatly facilitate trade data analyses, yielding more meaningful findings.

Finally, live glass eels are transported in water. It is unclear if reporting of trade quantities by weight (kg) might have included the water in which they are transported, despite guidance set out in the ‘Guidelines for the preparation and submission of CITES annual reports’¹¹: “*the quantity recorded should be only the quantity of the specimen of the species named*”. It is also unknown if there is consistency between CITES reporting and Customs declarations with regards to reporting of weight.

¹¹ <https://cites.org/sites/default/files/notif/E-Notif-2017-006-A.pdf>

4. CITES Trade data analysis

4.1 Trade data analysis

4.1.1 Trade in live eels and fingerlings

Based on Customs data and seizure information, a large proportion of trade in live eels involves glass eels (or juvenile eels) for farming purposes. In contrast to this, according to CITES trade data, only eight records between 2009 and 2016 reportedly involved fingerlings, representing a total of 20 t and 4500 specimens, based on exporter data. Based on exporter data, the largest export of fingerlings (14 t) was by France in 2009–2010 (13 t based on importer data), followed by Morocco exporting 5 t in 2010. Turkey reported exporting 4500 specimens¹² in 2013 to South Korea (although South Korea reported the import of 4500 kg of live eels so this may have just been a clerical error by Turkey). Based on exporter data, most of the fingerlings were imported by China (15 t) in 2009–2010, followed by Hong Kong Special Administrative Region (SAR) (4 t in 2010) and South Korea. Based on importer data, all the fingerlings (14 t) were imported by China.

As it was assumed that at least some of the trade reported under CITES as “live” eel, involved glass eels the full analysis of live eel trade below involved records reported as “live” and “fingerlings” together.

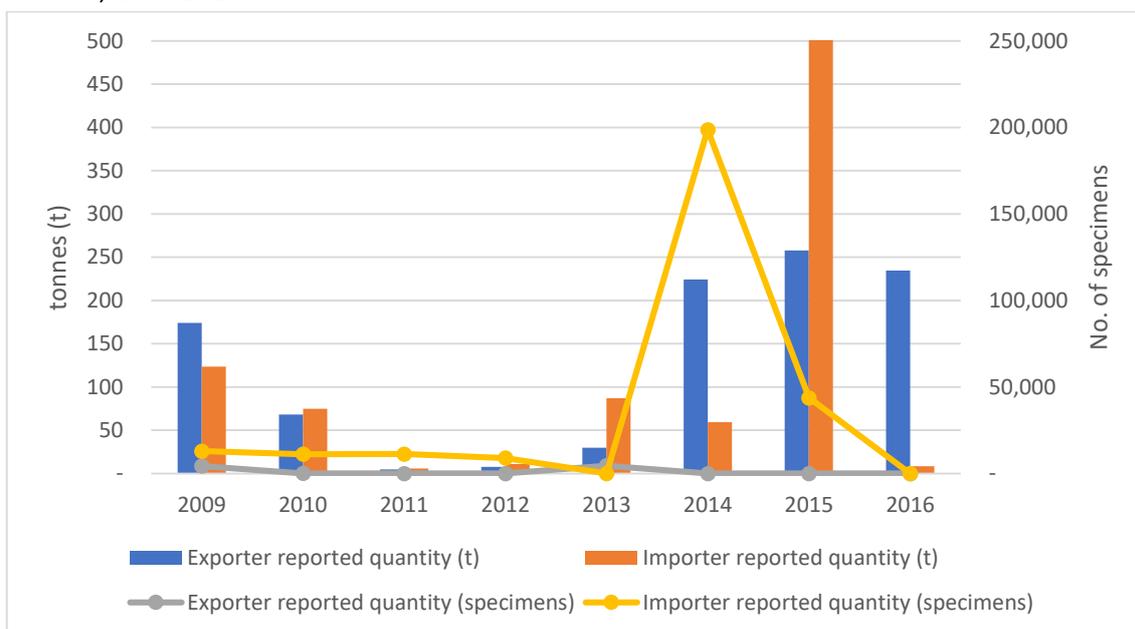
Direct trade in live eels and fingerlings

Quantities in trade

Overall, a total of 1001 t (based on exporter data) or a total of 872 t (based on importer data) of live eels and fingerlings were reported in direct trade between 2009 and 2016. In addition, a total of 8881 specimens (exporter data) and 286 615 specimens (importer data) were reported in trade during the same period. Annual trade (Figure 3) shows a decline following the CITES listing, reaching the lowest levels in 2011 with about 5 t (exporter data) and 6 t (importer data), and then increasing again to levels higher than in 2009 with 2015 showing a peak at 258 t (exporter data) and 502 t (importer data). 2016 saw a decline for importer data but remained similar to levels in previous years based on exporter data. The discrepancies between exporter and importer data are of concern in particular for 2014 and 2015 (the years with the largest differences between the two datasets) although it is possible that some of the trade reported by the exporters in 2014 was reported in 2015 by the importers, due to the eel fishing season in Europe usually beginning at the end of a calendar year and ending in the subsequent year. Also, there may be a mismatch between how exporters and importers report the same trade, with exporters possibly having a preference for reporting by weight (kg) while importers prefer reporting in number of specimens. It is also possible that the unit was misreported by the importer with the unit omitted.

¹² This report refers to “specimens” when no unit was reported. This however should not be confused with scientific specimens.

Figure 3. Direct trade of live *A. anguilla* and fingerlings, as reported by weight (t) and in number of specimens, 2009–2016.



Source: CITES Trade Database

Countries of export

The main country of export of live eels and fingerlings based on records reported by weight (t) was Morocco, totalling 757 t based on exporter data and 355 t based on importer data during 2009–2016 (see Table 2).

Table 2. Main countries for direct exports of live eels and fingerlings, as reported by weight (t) and number of specimens, 2009–2016

Top exporters live and fingerlings (based on exporter reports)	Top exporters live and fingerlings (based on importer reports)
<ol style="list-style-type: none"> 1. Morocco (757 t) 2. Norway (193 t) 3. Algeria (25 t) 	<ol style="list-style-type: none"> 1. Morocco (355 t) 2. Tunisia (351 t) 3. Norway (113 t)
<ol style="list-style-type: none"> 1. Turkey (4500 specimens in 2013) * 2. Greece (4258 specimens in 2009) 	<ol style="list-style-type: none"> 1. Morocco (170 092 specimens, most in 2014) 2. Tunisia (62 553 specimens, most in 2014) 3. Algeria (30 000 specimens, all in 2015).

Source: CITES Trade Database

* It is possible there was a reporting error and the trade involved 4500 kg

It is noted that Morocco was a main country of export of live eels and fingerlings according to reports by weight (both exporter and importer datasets) and also according to reports by importers in number of specimens, with most of the trade having occurred in recent years (2014–2016). It is assumed that due to the ban of glass eel export by Morocco in 2013 (see Section 6.1), these are eels >30cm, the only other fishery permitted in this range State. It is also noted that according to importer data, Tunisia was the second largest exporter during 2009–2016, while this trade has not been reported by Tunisia

(i.e. exporter data), but by South Korea, the main importer of live eels from the country according to CITES data. Again, it is assumed that these eels are >30cm, as per Tunisian law (see Section 6.1).

Countries of import

Overall, despite discrepancies between the data sources, South Korea was the largest direct importer of live eels and fingerlings during 2009–2016, with the bulk of the imports occurring in the recent years (2014–2016, see Table 3). It should be noted that trade between China and Hong Kong SAR is not reported to CITES by China (Agriculture, Fisheries and Conservation Department of the Government of the Hong Kong SAR, pers. comm. to TRAFFIC, March 2018).

Table 3. Main countries of direct import of live eels and fingerlings, as reported by weight (t) and number of specimens, 2009–2016

Top importers live and fingerlings (based on exporter reports)	Top importers live and fingerlings (based on importer reports)
<ol style="list-style-type: none"> 1. South Korea (692 t, most trade in 2014-2016) 2. Denmark (217 t, all from Norway) 3. Sweden (66 t, all from Norway) 4. Hong Kong SAR (53 t, all from Morocco) 5. China (18 t, most from France initially, then from Morocco in 2013-2016) 	<ol style="list-style-type: none"> 1. South Korea (639 t, in 2012-2015) 2. Denmark (113 t) 3. Italy (40 t) 4. Hong Kong SAR (30 t) 5. China (17 t)
<ol style="list-style-type: none"> 1. South Korea (4500 specimens, in 2013 from Turkey) 2. Russia (3908 specimens, in 2009 from Greece) 	<ol style="list-style-type: none"> 1. South Korea (226 196 specimens, most in 2014 from Morocco and Tunisia) 2. Tunisia (30 000 specimens, in 2015 from Algeria) 3. Sweden (20 934 specimens, in 2009-2010 from Norway)

Source: CITES Trade Database

The discrepancy between exporter and importer data was significant – according to exporter data South Korea imported 4500 specimens while according to importer data, South Korea imported 226 196 specimens. It is also notable that Tunisia ranked as the second largest importer based on importer data, with the specimens exported from neighbouring Algeria, while Algeria did not report the corresponding export.

Reported source and purpose of live eels/fingerlings in direct trade

As the closed cycle captive breeding of *Anguilla* eels is not yet possible on a commercial scale, it is not surprising that during 2009–2016, most of the trade in live eels and fingerlings reported by weight (t) involved specimens taken from the wild “W” both based on exporter and importer data. According to exporter data only 0.3 t were reported with a different source code, Pre-Convention “O” (2 t in 2009 and in 2010). According to importer data, in addition to reports of 47 t of “O” source in 2009–2012, there were also reports of 4 t of captive bred “C” source in 2015 and 2 t of ranched ‘R’ source (in 2010–2012). Similar sources can be observed for trade reported in number of specimens.

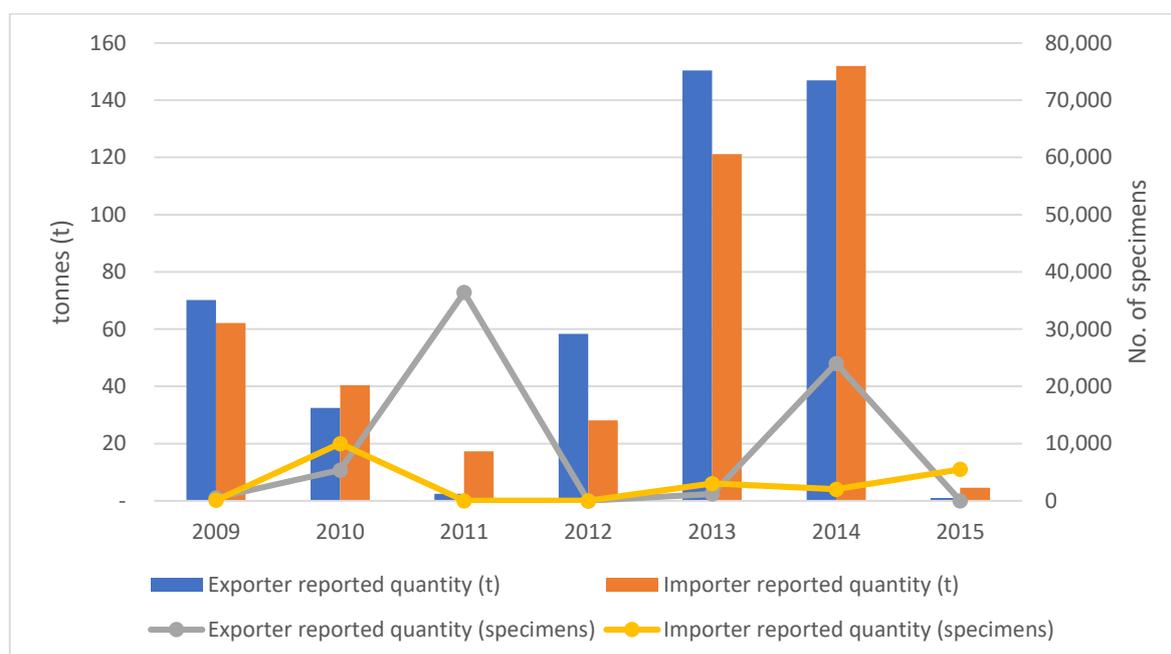
Most trade of live eels and fingerlings reported by weight (t) was stated to have taken place for commercial purposes during 2009-2016, with the exception of 0.2 t in 2009 with source code “B” – breeding in captivity or artificial propagation - based on exporter data and 2 t in 2014 reported for the same purpose. Section 3 above on reporting issues discusses the mis-use of source and purpose codes in more detail.

Indirect trade (re-exports) of live eel and fingerlings

Quantities in trade

A total of 462 t of live eels and fingerlings were re-exported during 2009-2016 based on exporter data, with importer data showing a similar total of 425 t. Overall, indirect trade shows similar patterns as direct trade with declines from 2009 to 2011 for trade reported by weight and increases in 2013-2014, although reported re-exports dropped in 2015 and no re-exports were reported for 2016 (Figure 4). Discrepancies between exporter and importer data reported by weight (t) appear less significant than for the direct trade dataset. As for trade reported in number of specimens, a total of 67 455 (exporter data) and 20 572 (importer data) specimens were traded during this period.

Figure 4. Re-exports of live *A. anguilla* (including. fingerlings), as reported by weight (t) and number of specimens, 2009–2016.



Source: CITES Trade Database

Countries of re-export

The top countries of re-export of live eels and fingerlings are listed in Table 4 – China was the principal re-exporter by weight according to both exporter and importer data, followed by Croatia; Greece and Croatia reported the most re-exports by number of specimens. It is important to note that Croatia only became an EU Member State in July 2013. Therefore, CITES trade between Croatia and other EU Member States was reported for 2009-2013, and the significance of Croatia with regards to eel re-exports in the early years of the listing is mainly due to the fact that trade between Croatia and the

Netherlands was reported to CITES (see Table 4), unlike trade between other EU Member States. There is one eel farm in Croatia which has been functioning for 13 years. After the EU trade ban came into force in 2010, the farm was no longer able to acquire glass eels from EU range States (as Croatia was not in the EU then) and production and consequent re-export, declined significantly (Croatia's response to CITES Notification No. 2018/18).

Table 4. Main countries of re-export of live eels and fingerlings, as reported by weight (t) and number of specimens, 2009–2016

Top re-exporters live and fingerlings (based on exporter reports)	Top re-exporters live and fingerlings (based on importer reports)
<ol style="list-style-type: none"> 1. China (355 t, in 2012-14, most imported by Japan) 2. Croatia (97 t, in 2009-2010, imported by the Netherlands) 3. Spain (7 t, in 2010-11, imported by China) 	<ol style="list-style-type: none"> 1. China (301 t, in 2012-14 most imported by Japan), 2. Croatia (118 t, in 2009-2011, imported by the Netherlands) 3. unspecified country ('XX', 3 t, imported by South Korea in 2015) 4. Morocco (2 t in 2015, imported by South Korea)
<ol style="list-style-type: none"> 1. Greece (31 355 specimens, in 2009-2011 most imported by Russia) 2. South Korea (25 200 specimens, most in 2014 most imported by South Korea) 3. Croatia (10 900 specimens, in 2011 imported by the Netherlands) 	<ol style="list-style-type: none"> 1. Croatia (10 000 specimens, in 2010 from the Netherlands) 2. unspecified country ('XX'; 5500 specimens, in 2015 imported by South Korea) 3. China (5000 specimens in 2013-2014 imported by Japan)

Source: CITES Trade Database

Countries of import

Based on both exporter and importer data, the main importers of live eels and fingerlings being re-exported by weight (t) were Japan (352 t/301 t respectively, in 2012–2014) and the Netherlands (97 t/118 t respectively, in 2009–2011). Looking at reports by number of specimens, the main importers according to re-exporter data were Japan (24 000 specimens in 2014), Russia (19 600 specimens in 2010–2011) and the Netherlands (10 900 specimens in 2011). Based on importer data, the Netherlands was the main importer by number of specimens (10 000 specimens in 2010), followed by South Korea (5500 specimens in 2015) and Japan (5000 specimens in 2013–2014).

Countries of origin

As for the main countries of origin of live eels and fingerlings, both datasets show France as the primary country of origin by weight (337 t/351 t based on exporter/importer data, during 2009–2014). China was the main reported re-exporter for these eels and Japan the main final importer. The secondary country of origin was Spain (59 t/48 t based on exporter/ importer data), with China as the only reported re-exporter for these eels, all trade occurring in 2014 and most of the trade destined for Japan as final importer. The third most important country of origin was Morocco (36 t/21 t based on exporter/importer data), with most of the trade occurring in 2014 and all trade being re-exported by China and again ending up mainly in Japan.

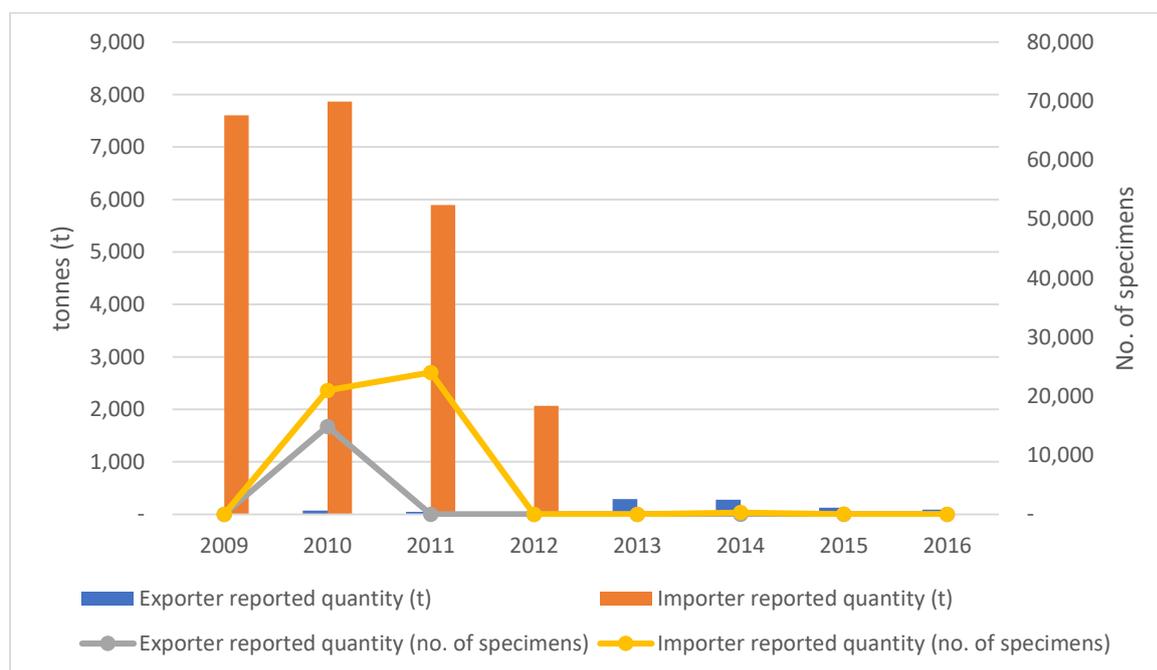
4.1.2 Meat and bodies

Direct trade of meat and bodies

Quantities in trade

Figure 5 shows the major discrepancies between importer and exporter data for trade in eel meat and bodies between 2009 and 2016, with importer reported trade being considerably greater in the earlier years of the listing (2009–2012). The total amount of trade reported by exporters over the 2009–2016 period was 912 t. In comparison, total trade reported by importers over the same period was over 20 times greater, namely 23 439 t. Importer data show a declining trend from a peak of 7867 t in 2010 to zero in 2013. However, a different pattern and magnitude of trade can be observed based on exporter data with a peak in 2013 (292 t) and a decline in 2015–2016 (decreasing to 87 t in 2016). Trade reported in number of specimens involved a total of 14 871 specimens (exporter data) in 2009–2016 and 45 319 specimens (importer data). Trade reported in number of specimens also peaked in 2011 with 14 866 specimens (exporter data) and 24 009 specimens (importer data). The reported source of meat and bodies in trade according to importer data between 2009 and 2012 was typically Pre-Convention (“O”). Trade in later years was reported mainly as wild (“W”) source.

Figure 5. Direct exports of *A. anguilla* meat and bodies, as reported by weight (t) and number of specimens, 2009–2016.



Source: CITES Trade Database

Countries of export

The main countries of export of *A. anguilla* meat and bodies for 2009–2016 are listed in Table 5. These were Tunisia, Morocco, Turkey and China. China is not a range State for *A. anguilla* and thus these were likely re-exports.

Table 5. Main countries of direct export of *A. anguilla* meat and bodies, as reported by weight (t) and number of specimens, 2009–2016

Top exporters - <i>A. anguilla</i> meat and bodies (based on exporter reports)	Top exporters <i>A. anguilla</i> meat and bodies (based on importer reports)
1. Tunisia (452 t) 2. Morocco (435 t)	1. China (although not a range State, 23 423 t) 2. Tunisia (16 t)
1. Turkey (14 866 specimens, in 2010)	1. China (40 480 in 2010-2011)

Source: CITES Trade Database

Countries of import

The top countries/territories of import are listed in Table 6 – by weight these were Hong Kong SAR and South Korea (according to exporter data) and Japan and Denmark (according to importer data).

Table 6. Main countries of direct import of *A. anguilla* meat and bodies, as reported by weight (t) and number of specimens, 2009–2016

Top importers - <i>A. anguilla</i> meat and bodies (based on exporter reports)	Top importers - <i>A. anguilla</i> meat and bodies (based on importer reports)
1. Hong Kong SAR (382 t, in 2010-2014) 2. South Korea (286 t in 2013 to 2016) 3. Egypt (51 t) 4. China (50 t) 5. Russia (42 t)	1. Japan (23 104 t) 2. Denmark (237 t, in 2009-2010)
1. Austria (14 866 specimens in 2010)	1. Japan (40 480 specimens traded in 2010-2011) 2. South Korea (4809 specimens, in 2014-2015).

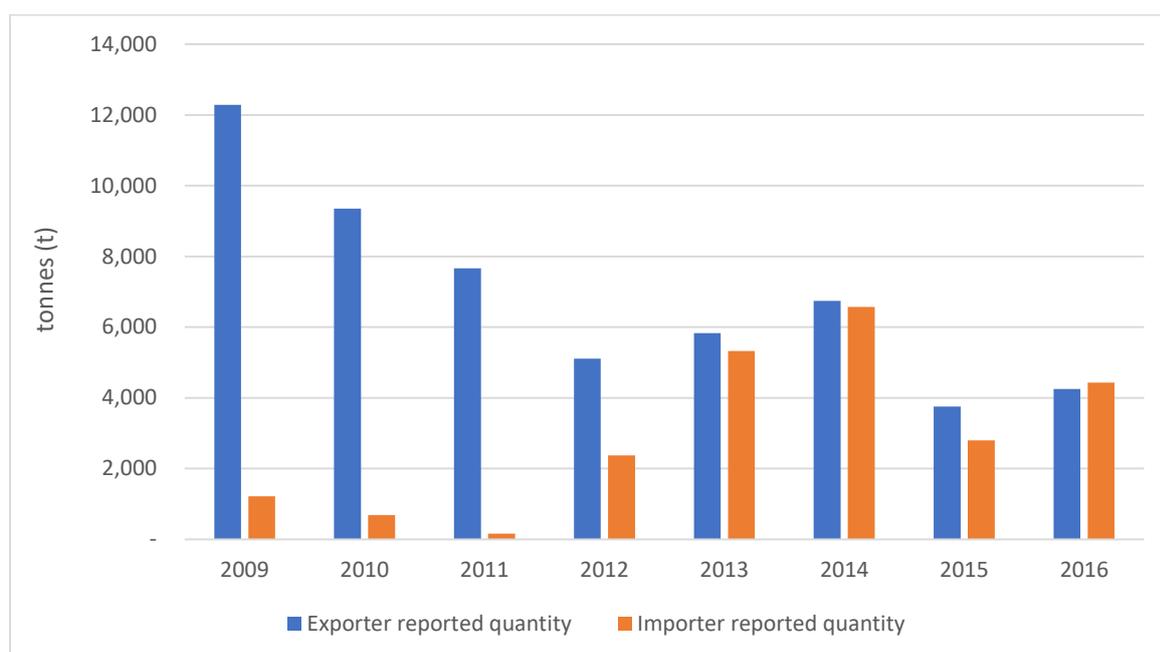
Source: CITES Trade Database

Indirect trade (re-exports) of meat and bodies

Quantities in trade

During 2009–2016, a total of 54 975 t of meat and bodies were re-exported based on exporter data and 23 557 t based on importer data. As shown in Figure 6, exporter data were significantly higher in the early years of the listing, in 2009–2012, and the two datasets became more consistent for 2013–2016. It is possible that some of re-exports reported by exporters were reported as direct imports by the importers during the early years of the listing – that could partially explain the large mismatch of the two datasets and the larger importer reports in direct trade. For example, a total of 12 t of *A. anguilla* meat and bodies were re-exported in 2009 based on exporter data and only 1 t based on importer data, a difference of 11 t. While in direct trade in the same year, 2 t were exported based on exporter data and 8 t based on importer data, a difference of 6 t.

Figure 6. Re-exports of *A. anguilla* meat and bodies, reported by weight (t), 2009–2016.



Source: CITES Trade Database

Countries of re-export

Table 7 provides an overview of the top countries of re-export of *A. anguilla* meat and bodies in 2009–2016 – according to both datasets, these were China, Denmark and Japan.

Table 7. Main countries of re-export of *A. anguilla* meat and bodies, as reported by weight (t), 2009–2016

Top re-exporters - <i>A. anguilla</i> meat and bodies (based on exporter reports)	Top re-exporters - <i>A. anguilla</i> meat and bodies (based on importer reports)
1. China (54 475 t – out of a total of 54 975 t)	1. China (23 472 t – out of a total of 23 557 t)
2. Denmark (407 t, in 2009-2012)	2. Japan (58 t, in 2010 to 2013)
3. Japan (67 t, most in 2012-2014)	3. Denmark (27 t, in 2012).

Source: CITES Trade Database

As China was the principal re-exporter of eel meat and bodies, the following sections focus on re-exports from China.

Countries of import

The principal importer of eel meat and bodies from China, based on exporter data was Japan (48 865 t, 2009–2016). The second largest importer was the EU (2957 t, imported by Poland, Denmark, Germany, Belgium, the UK, the Netherlands, Italy and Portugal, in order of importance) during 2009–2013. Importer data show a similar pattern with Japan (21 390 t 2012–2016) as the main importer, followed by the EU (2021 t, mainly in 2009–2011), the USA (53 t, in 2016) and Australia (8 t, in 2014).

Countries of origin

Based on exporter data, most of the eel meat and bodies re-exported by China were reported as originating in an unspecified country of origin (“XX”, 30 878 t, 2009–2012), followed by France (18 007 t, 2012–2016), Spain (3950 t, 2012–2016) and Morocco (1640 t, 2014 and 2016). Importer data show similar patterns: most of the eel meat and bodies re-exported by China were reported as originating in France (16 551 t, 2009–2016), followed by Spain (3415 t, 2012–2016), then unspecified country of origin (“XX”, 1931 t, in 2009–2012), Morocco (1553 t, 2014- 2016) and Romania (22 t in 2013). Despite importer and exporter data being similar, quantities of *A. anguilla* traded by Morocco are much higher than would appear possible based on catch quotas that were implemented in 2013 – 2 t glass eel and 7 t >30cm eel (also see Section 6.1).

In addition to trade reported by weight, there were three records with no unit, all reported by importers:

- 25 000 bodies reported having been imported by Denmark in 2011 from China with country of origin reported as unspecified (“XX”);
- 7870 specimens of meat reportedly originating from France and imported by Japan via China in 2014;
- 5000 specimens of meat reportedly originating from France and imported by Thailand via China in 2015.

4.1.3 Skins, skin pieces, leather products and garments

A total of 49 trade records (out of a total of 397 for all eel commodities between 2009 and 2016) involved skins, skin pieces, leather products (small and large) and garments (hereafter collectively referred to as “skins/leather products”). Apart from a single small leather product exported from the UK to Hong Kong SAR in 2009, only re-exports were reported, with the majority re-exported by Mexico (29 518 skins/leather products in 2009–2015). There appeared to be an overall decline in trade over the years from 13 288 skin/leather products in 2009 to 8 in 2013, 42 in 2014 and 212 in 2015. Based on importer data, a similar declining trend can be observed. No trade was reported for 2016 based on either dataset.

The USA was the main importer of *A. anguilla* skins/leather products according to both datasets (28 806 skins/leather products out of a total of 29 529 specimens, exporter data) with the majority of the trade occurring in the earlier years of the listing (2009–2012). Based on exporter data (i.e. mainly Mexico’s re-exports), all of the trade reportedly originated from South Korea, although South Korea is not a range State. Based on importer data (mainly data reported by the USA), South Korea was also reported as the main country of origin (22 925 specimens in 2009–2015). Other reported countries of origin included the British Indian Ocean Territory (132), Indonesia (72), North Korea (26) and the USA (18), none of which are range States for *A. anguilla* and so should not appear as countries of origin.

In their response to CITES Notification 018/2018, the USA has noted that identification of eel meat and other eel products is a considerable challenge to CITES implementation. With regards to eel skin and leather products, invoices may only say “eel” and with multiple countries involved in the leather trade, importers are unsure of the origin or species. Although leather goods declared as “eel” most

often involve hagfish, importers declare a variety of species including moray and conger eels, or various species of Anguillidae (United States’ response to CITES Notification No. 2018/18). Therefore it is likely that much of the trade reported as *A. anguilla* in the CITES Trade Database is not in fact this species; hence the various non-range States being declared as countries of origin.

Based on exporter data, small leather products were the most common *A. anguilla* skins/leather products in trade (16 221 specimens in 2009–2015). The second most common commodity was skins (13 300 skins, almost all traded in 2009). Based on importer data, small leather products were also the most common commodity (23 123 specimens, mainly in 2009–2012). In contrast, there was only one specimen of skin traded in 2012, with garments coming second (24 specimens in 2010), followed by large leather products (15, in 2009) and skin pieces (11, in 2010).

4.1.4 Other trade terms (derivatives, extracts and unspecified specimens)

A total of only five records between 2009 and 2016 involved trade in other types of specimens of *A. anguilla* (derivatives, extracts and unspecified specimens); these are listed in Table 8. Of these, two records are notable: these involved a total of 97 t of unspecified specimens reported by Tunisia as exporter, with unknown (“XX”) as country of import.

Table 8. Trade in *A. anguilla* derivatives and extracts, unspecified specimens, 2009–2016

Year	Importer	Exporter	Origin	Importer reported quantity	Exporter reported quantity	Term	Unit	Purpose	Source
2010	USA	Sweden		130		Extract		T	W
2016	Japan	China	Spain		13 500	derivatives	kg	T	W
2016	Japan	China	France		5500	derivatives	kg	T	W
2016	XX	Tunisia			5000	unspecified	kg	B	W
2016	XX	Tunisia			92 321	unspecified	kg	T	W

Source: CITES Trade Database

4.1.5 Concluding remarks on trade reported under CITES

Based on the CITES trade data analysis of *A. anguilla* commodities for 2009–2016, the largest volume (weight) of trade in this species involved meat and bodies, and live specimens (including fingerlings). Live *A. anguilla* glass eels are exported to East Asia for growing out in farms, to be later re-exported for consumption, either as live or frozen (meat and bodies) eels. Therefore, the trade of these two commodity types are strongly interlinked.

The analysis of CITES trade data for 2009–2016 found that the main players in the international trade in *A. anguilla* meat and bodies, and live specimens (including fingerlings) include:

- Main countries of origin: Morocco, Tunisia and Turkey, especially in recent years, and EU Member States in the early years of the listing (2009–2012);
- Main countries of import: South Korea, Japan, China, Russia and EU Member States;
- Main re-exporters: China, Morocco, Japan and EU Member States.

Several CITES Parties play multiple roles in eel trade, demonstrating the complexities of global eel trade chains. More information on these trade chains are provided in the following section – Customs data analysis. Please also see concluding remarks in Section 5 for discrepancies between Customs and CITES data.

Accurate and reliable reporting of trade data facilitates the analysis and thereby the understanding of trade patterns and levels and thus can inform various decisions to regulate international trade. However, several reporting issues have been identified over the years through the analysis of trade data of eels (TRAFFIC, 2015; TRAFFIC, 2017a). Some of the issues are more general, while others are more taxon specific. Many of the issues above were discussed at the London Workshop and below are summary conclusions:

- The reporting of as complete information as possible by CITES Parties in their annual reports (without omitting key information, such as term and country of import) would strengthen data sets;
- In the context of reporting trade in *A. anguilla*, formulating guidance would help CITES Parties with their reporting, avoid incorrect uses of source codes (especially ‘C’ and ‘F’) and strengthen data sets;
- Agreement on the consistent use of descriptive terms (“LIV” vs “FIG”, “BOD” vs. “MEA” for frozen eels) and the related preferred unit of reporting (e.g. currently number of specimens for “LIV”) would greatly facilitate trade data analyses, yielding more meaningful findings;
- The definition for fingerlings may warrant adjustment to make it applicable to eel species (see also Customs data);
- As live glass eels are transported in water, it would be of use to clarify whether reporting of trade quantities by weight (kg) should include the water in which they are transported, taking into account consistency with information required in Customs declarations;
- As the *A. anguilla* fishing season for glass eels crosses calendar years, (in Europe the season generally lasts from October to April), complementing CITES trade data analyses with Customs data (available by month) would help to capture trends typical of a fishing season;
- A lesson learnt from the early years of the CITES listing is that there should be agreement and clarity among Parties on how to report re-exports of pre-Convention specimens (i.e. these should not be recorded as exports from non-range States even if the country of origin is unknown), which may be useful to consider for future listing of other species.

5. Customs data analysis

5.1 Customs trade data analysis

5.1.1 Exports from the EU to non-EU countries/territories between 2008-2017

Total exports of the five commodities of *Anguilla* spp. (live, fresh, frozen, smoked and prepared) by weight from EU to non-EU countries/territories between 2008 and 2017 based on EUROSTAT data are shown in Table 9. Since the Customs code for prepared eel was introduced in 2012, the scale of trade in prepared eel prior to this date is not known.

The total export of eel related products reached a peak at ~260 t in 2012 due to a sharp increase in exports of frozen eel, after which it declined to less than 50 t in 2015 and 2016. As Customs data do not differentiate between the *Anguilla* species in trade, it is unknown as to whether live eel trade reported in Eurostat or other Customs trade data is in fact *A. anguilla*. It should be noted however, that for glass eels and elvers used for aquaculture – as opposed to larger eels - reported *Anguilla* Customs trade from *A. anguilla* range States to Asian transport hubs/farming destinations is more likely to be *A. anguilla*, as survival times for glass eels in transport are limited.

While there was no major decrease in the volume of exports of fresh and smoked eel, exports of live eel considerably declined after the EU trade ban, which came into effect in December 2010. However, it should be noted that trade in pre-Convention live specimens was permitted until 1st April 2011. Therefore, the maximum possible period of export permit validity was June 2011 for exports of post-Convention (W) live specimens and October 2011 for pre-Convention (O) live specimens (Table 10). This means that commercial exports of *A. anguilla* live eels have not been permitted since 2012, and exports of other eel products have not been permitted from 2013 (see Table 10). The fact that there are records of exports of live glass eel from the EU in 2012-2016 (see Table 9), in particular, raise concerns over possible illegal trade.

Table 9: Total EU eel exports to non-EU countries and territories, 2008-2017, by weight (t)

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Live (all sizes)	59.3	15.3	23.9	7.5	0.1	0	4.3	1.2	0.3	0
< 12 cm					0	0	3.6	1.2	0.2	
≥12-<20cm							0.1			
≥20cm					0.1	0	0.6		0.1	0
Fresh	0.3	0	0	10.7	45.3	1	4.1	3.4	3.9	5.5
Frozen	19.3	18	26.6	93.8	156.6	24.9	0.7	2.1	2.2	1.5
Smoke	15.8	18.8	14.4	15.5	9.8	15.8	11.2	5.3	11.4	9.2
Prepared					46.8	50.4	35.4	27.6	24.8	33.7
Total	94.7	52.1	64.9	127.5	258.6	92.1	55.7	39.6	42.6	49.9

Note: Values of 0 refer to unit value of less than 50 kg. Customs codes for live eel (different life stages) and prepared eel were introduced in 2012. Cells with lines indicate that data were not available for these years, due to the Customs codes not being in existence. Shaded cells show totals for live eel from 2012 onwards, reported under the three separate size classes.

Source: EUROSTAT (2018)

Table 10: Cut off dates for permitted exports of *A. anguilla* eel commodities from the EU.

Commercial exports of <i>A. anguilla</i> from the EU	Cut off dates [#]	First full calendar year when trade was no longer permitted*
Post-Convention (W) live specimens and other products	December 2010 (June 2011)	2012
Pre-Convention (O) live specimens	April 2011 (October 2011)	2012
Pre-Convention (O) other products	April 2012 (October 2012)	2013

Notes: [#]Date of maximum permit validity (six months) in parentheses; *January – December; W = Wild; O = Pre-Convention

Table 11 shows all reported exports of live *Anguilla* glass eel (less than 12 cm)¹³ from the EU that would fall outside permitted periods if they were *A. anguilla*. All exports with reported weight (over 50 kg) were to Hong Kong SAR and occurred between December and May (which fall within the *A. anguilla* glass eel fishing season).

Table 11: Reported live *Anguilla* glass eel (less than 12 cm) exports from EU Member States over 50 kg, 2012–2017.

Year (September to August)	EU Member State	Destination	Quantity (kg)	Reported price (EUR) per kg
2013–2014	France	Hong Kong SAR	3200*	303
2014–2015	France	Hong Kong SAR	1600	359
2015–2016	UK	Hong Kong SAR	200**	511

*There was also one small quantity of exports (less than 50 kg) from France to Hong Kong SAR in the 2013–2014 fishing season.

**There were also two small quantities of exports (less than 50kg each) from the UK to Hong Kong SAR in the 2015–2016 fishing season.

Source: Eurostat (2018).

According to Eurostat data, the average price of shipments varied depending on the fishing season. The average price of monthly glass eel shipments increased from EUR 303/kg in the 2013–2014 eel year to EUR 511/kg in 2015–2016. There were also six smaller unknown quantities exported (less than 50 kg) therefore details of weight totals were not provided:

- Denmark to Greenland in July 2012;
- France to Hong Kong SAR in December 2013;
- Spain to Andorra in June 2014;
- Sweden to Norway in February 2015; and
- the UK to Hong Kong SAR in December 2015 and April 2016.

No glass eel exports (Customs code 03019210) were recorded in EUROSTAT in the 2012–2013 and 2016–2017 fishing season.

¹³ Over 50kg, below this weight quantities are not recorded in EUROSTAT.

Hong Kong Customs (see Section 5.1.3 for more detailed East Asian Customs data) reported imports of similar quantities of live eel from France in the 2013–2014 fishing season, however under the Customs code “other live eel”. Imports of live eel fry from France were recorded by Hong Kong SAR under the Customs Code “live eel fry” in the 2014–2015 fishing season. Hong Kong Customs reported imports of live eel fry from the UK in the 2015–2016 fishing season, however import data available in two forms, by origin and by supplier, suggest that 727 kg of imports recorded in January 2016 were originating in the UK and shipments totalling 13 kg were from Americas and traded via the UK. There were six records of exports of larger sized live eels from the EU to non-EU countries between 2012 and 2017, totalling 900 kg:

- eels of 12–20cm:
 - 100 kg from the UK to Switzerland in October 2014,
- eels larger than 20 cm:
 - 100 kg from Denmark to Greenland in July 2012;
 - 600 kg from Netherlands to Azerbaijan in August 2014, and
 - 100 kg from Italy to Egypt in December 2016.

There were also five unknown smaller quantities of exports (all less than 50 kg) from Denmark to Greenland in October and December 2012, January and February 2013, and from Germany to Bermuda in March 2017. The average price of larger live eels exported from the EU to the non-EU countries/territories (assuming all smaller shipment was 50 kg) according to Eurostat data was less than EUR 15/kg.

As noted in the methods there are reports in Asia and the Americas of other eel-like species being traded under Customs codes which should only be used for *Anguilla* species. This has also been reported for the EU – Ireland has established that *Anguilla* eel exports reported in Customs data from 2009 onwards were in fact Conger Eel (*Conger conger*) and should have been coded as 03028990 “Fresh or chilled fish” (Ireland’s response to CITES Notification No. 2018/018).

The EU can be used as a transit point for trade in *A. rostrata* from the Americas to East Asia, resulting in potentially mixed-species shipments of live *Anguilla* leaving the EU. In order to establish whether this may have been the case for the reported glass eels exports from France and the UK, timings and quantities of EU imports of glass eels from *A. rostrata* range States were also downloaded. There were six monthly records of imports of glass eels from *A. rostrata* range States during 2012–2017 (Table 12), in addition to five smaller unknown quantities (all less than 50 kg) from the USA to the UK in October 2012, November 2013 and November 2014, the Dominican Republic to the UK in January 2015 and the USA to Portugal in June 2015.

Table 12: Reported live *Anguilla* glass eel (less than 12 cm) imports into EU Member States over 50 kg, as reported by weight (kg), 2012–2017.

Year	Export country	Destination	Quantity (kg)
July 2014	Canada	Belgium	1,000
February 2016	Canada	Netherlands	28,000
March 2016	Canada	Netherlands	28,000
July 2016	Canada	Netherlands	28,000
July 2016	USA	Spain	900

Source: Eurostat (2018).

Considering that it is unrealistic that the Netherlands imported 84 t of live eel fry with a value of less than EUR 15/kg from Canada in 2016, there may have been mis-use of Customs code (i.e. larger eels were traded). Small quantities of glass eels imported to the UK from the USA and Dominican Republic could legally have been re-exported to Hong Kong SAR. However, the other quantities, destinations and periods rarely match those reported as (re-)exports by France, suggesting that these were in fact exports of *A. anguilla* (which should not have been permitted).

Furthermore, it is important to note that *A. rostrata* is now being farmed in the EU – Denmark has reported importing this species from the USA and Canada in recent years to supply its farms (Denmark’s response to CITES Notification No. 2018/018). In addition, the other principal farming country in the EU, the Netherlands, has reported a reduction in the number of farms (from 16 to 11) and production (from 2755 to 2150 t) between 2011 and 2017 (the Netherlands’ response to CITES Notification No. 2018/018). Imports of live eel from *A. rostrata* range States maybe therefore be filling these production gaps.

5.1.2 Exports from the non-EU European eel range States to other countries/territories between 2008 and 2016

Total exports by weight of the four commodities of *Anguilla* spp. (live, fresh, frozen and prepared) from non-EU *A. anguilla* range States¹⁴ to other countries and territories between 2008 and 2016 based on UN Comtrade data are shown in Table 13.

¹⁴ *A. anguilla* range States were confirmed from the IUCN Red List (<http://www.iucnredlist.org/details/60344/0>) and Species+ (https://www.speciesplus.net/#/taxon_concepts/3973/distribution)

Table 13: Total eel exports from non-EU *A. anguilla* range States to other countries and territories, as reported by weight (t), 2008–2016.

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Live	381.1	134.9	94.1	17.9	10.7	65.2	247.4	332.2	270.7
Fresh	39.8	37.1	6.9	5.2	6.3	37.0	1.0	0.2	0.7
Frozen	34.5	20.1	64.2	52.6	9.5	167.4	691.6	20.2	54.8
Prepared					4.7	7.9	92.2	528.2	782.8
Total	455.4	192.0	165.1	75.7	31.1	277.5	1,032.1	880.7	1,109.0

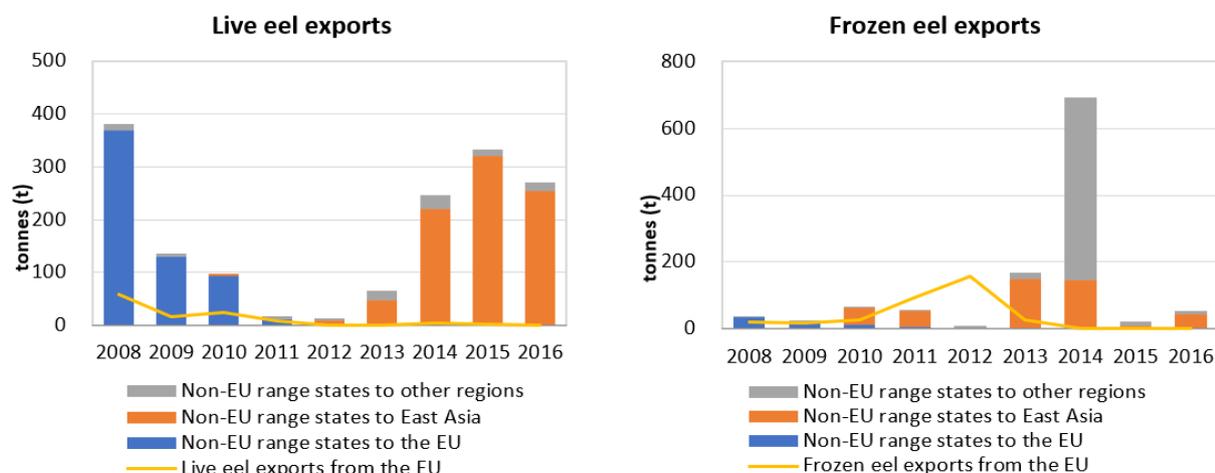
Note: Non-EU *A. anguilla* range States reporting trade were Albania, Algeria, Belarus, Egypt, Iceland, Lebanon, Morocco, Norway, Russia, Switzerland, Tunisia, Turkey and Ukraine.

Source: UN Comtrade (2018).

Total eel exports (including prepared eel since 2012), declined from 455 t in 2008 to 165 t in 2009 when the CITES regulation came into effect and to 76 t in 2011 after the EU trade ban began in 2010. Total exports increased gradually after that, reaching over 1000 t in 2014 and ranging between 800 and 1100 t in 2015 and 2016. Prepared eels were the most exported commodity by weight during 2012–2016 due to an increase in exports from Belarus (from 5 kg in 2013 to ~530 t in 2015), almost all of which seems to be imported from China and re-exported to Russia. Except for this, live eels were the most exported commodity by weight and value, followed by frozen eels. While Norway and Turkey were the main exporters of live eels and frozen eels in 2008–2009, Morocco became the dominant exporter of live eels and frozen eels from 2010, accounting for 64% and 88% of exports respectively between 2010 and 2016.

Figure 7 shows the changes in the roles of the EU and non-EU *A. anguilla* range States during 2008–2016 in relation to eel trade. According to UN Comtrade data, prior to the CITES listing non-EU *A. anguilla* range States exported live and frozen eels to the EU. When the CITES listing came into force in 2009 and trade in *A. anguilla* to and from the EU was banned in 2010, the importance of non-EU *A. anguilla* range States as suppliers of live and frozen eels to East Asia increased significantly.

Figure 7: Exports of eel commodities from the EU and non-EU *A. anguilla* range States, as reported by weight (t), 2008–2016.



Note: Non-EU *A. anguilla* range States reporting trade were Albania, Algeria, Belarus, Egypt, Iceland, Lebanon, Morocco, Norway, Russia, Switzerland, Tunisia, Turkey and Ukraine. Exports of frozen eels (approximately 500 t) from Morocco to Mali (other regions) recorded in 2014 could be a reporting error as Mali did not report any imports.
Source: UN Comtrade and Eurostat (2018).

Live exports of *Anguilla* spp. from individual non-EU *A. anguilla* range States between 2008 and 2016 are shown in Table 14.

Table 14: Live exports of *Anguilla* spp. from non-EU *A. anguilla* range States, as reported by weight (t), 2008–2016.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
Morocco	57.7	28.9	0.4			9.0	184.3	263.3	209.5	753.1
Tunisia	85.3	25.0	62.0	12.0	10.7	56.1	63.0	68.9	61.2	444.3
Norway	210.0	65.3	31.7							306.9
Algeria	14.3	14.2								28.5
Egypt	3.7			5.9			0.0			9.6
Turkey	8.3	0.9								9.2
Albania	1.7	0.6								2.3
Switzerland	0.1	0.0								0.2
Belarus									0.0	0.0
Total	381.1	134.9	94.1	17.9	10.7	65.2	247.4	332.2	270.7	1,554.0

Note: Values of 0.0 refer to unit value of less than 50 kg.
Source: UN Comtrade (2018).

According to UN Comtrade, exports of live *Anguilla* spp. from non-EU *A. anguilla* range States increased suddenly from 65 t in 2013 to 248 t in 2014, reaching a peak at 322 t in 2015 due to increase in exports from Morocco and Tunisia. Destinations of live eels from Morocco were Spain and Netherlands until 2009; this changed to South Korea and China from 2013 onwards. Between 2009 and 2016, South Korea was the main destination (657 t in total), accounting for 92% of live eel exports from Morocco. Live eel exports from Tunisia reached a peak at 95 t in 2007, after which it declined

gradually to 11 t in 2012, increasing again to 69 t in 2015. The main destinations of live eel from Tunisia were South Korea, accounting for 52% between 2009 and 2016, followed by Italy and Egypt. Although Italy was the only destination of live eel from Tunisia until 2011, South Korea and Egypt became the principal destination from 2012 onwards. Exports of live eel to South Korea increased to ~58 t in 2015 and exports of live eel to Egypt reached ~20 t in 2014.

To estimate the proportions of live eel fry and other live eels exported from Morocco and Tunisia and identify the trade routes and final destinations of glass eels, the average price per kg by destination was calculated:

- average price of live eel from Tunisia ranged from USD3 to 16 per kilo during 2009-2016 irrespective of the destination; and
- average price of live eel from Morocco varied considerably depending on the destination. For example, the average price of live destined for:
 - South Korea, the USA and Japan was USD14-17 per kilo; and
 - Hong Kong SAR, China, Thailand, Malaysia and Viet Nam ranged between USD22 and 604 per kilo (highlighted in grey in Table 15).

Table 15: Live eel exports from Morocco by destinations, as reported by weight (t), 2009-2016.

Destination	2009	2010	2011	2012	2013	2014	2015	2016	Total
South Korea						177.1	258.8	200.6	636.5
Hong Kong SAR		0.4			9.0	3.2	3.6	8.5	24.7
Spain	16.9								16.9
Netherlands	12.0								12.0
USA						4.0			4.0
China							0.6		0.6
Thailand							0.1	0.3	0.4
Malaysia								0.1	0.1
Viet Nam							0.1		0.1
Japan						0.0			0.0
Total	28.9	0.4	0.0	0.0	9.0	184.3	263.3	209.5	695.3

Source: UN Comtrade (2018).

Note: Values of 0.0 refer to unit value of less than 50 kg and grey cells indicate the average price per kilogram was over USD 22 and may include trade in live eel fry.

This suggests that while most live eels exported from Morocco to South Korea, the USA and Japan were larger sized live eels, live eel fry was included in the exports to Hong Kong SAR, China, Thailand, Malaysia and Viet Nam. East Asian Customs data show a similar trend (see Section 5.1.3); South Korea's other live eel imports accounted for more than 95% of live eel imports from Morocco in 2014–2016, China only recorded live eel fry imports and Hong Kong SAR reported both imports of live eel fry and other live eel during 2009–2016. East Asian countries/territories started to report importing live eel fry from Malaysia and Thailand in 2012 (where no glass eel fishing or farming exists¹⁵) and Viet

¹⁵ As per Malaysia's response to CITES Notification No. 2018/018, and research relating to Thailand who did not respond to CITES Notification No. 2018/018.

Nam in 2013 (where *Anguilla* eel export is banned except for farmed eels) (SEAFDEC, 2018, unpublished data). Live eel exports from Morocco to Southeast Asia (Thailand (140 kg in 2015, 280 kg in 2016), Malaysia (140 kg in 2016) and Viet Nam (137 kg in 2015)) were likely to be live eel fry and therefore these countries were possibly used as transit for *A. anguilla* exports to East Asia for farming.

5.1.3 Live eel imports into East Asia

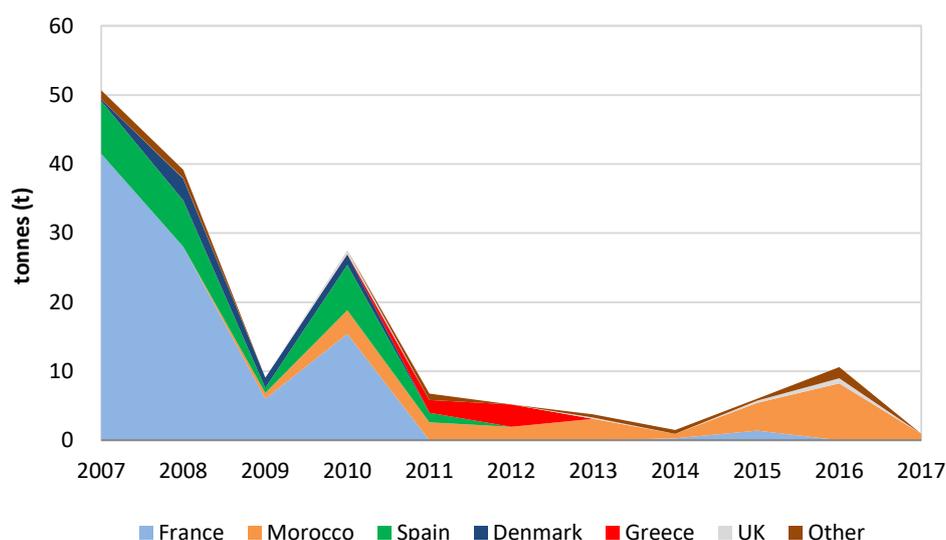
This section focuses on imports into Asia of live eels, in particular live eel fry, from *A. anguilla* range States. East Asian countries/territories play an important role in catch, trade, farming and consumption of *Anguilla* spp. and the impact of export of *A. anguilla* glass eels for farming in East Asia since the 1990s was one of the reasons *A. anguilla* was proposed for listing in CITES (CITES, 2007a). As East Asian countries/territories differentiate between trade in small sized live eels for farming (including glass eels, elver, 'kuroko'¹⁶ and young eels) and larger sized live eels for consumption, imports from *A. anguilla* range States as recorded by East Asian Customs authorities can be used to estimate the proportions of live eel fry and other sized live eels exported from non-EU *A. anguilla* range States (these life stages not being differentiated in UN Comtrade) as well as imports from the EU which fall outside times for permitted trade.

According to East Asian Customs data, imports of live eel fry for farming from *A. anguilla* range States into East Asia declined from ~39 t in 2008 to 9 t in 2009 but increase again to 28 t in 2010. Since 2011, annual imports of live eel fry from *A. anguilla* range States remained less than 10 t except in 2016 (see Figure 8). France and Spain were the principal source countries among *A. anguilla* range States until 2010 before commercial trade in all commodities of *A. anguilla* to and from the EU was banned in December 2010. Imports from non-EU *A. anguilla* range States, especially from Morocco began in 2009 and gradually increased over the years, despite a ban for export of glass eels being imposed in this range state since 2013 (see Section 6.1).

Imports of *Anguilla* live eel fry for 2009–2017 from *A. anguilla* range States to East Asia as reported by East Asian Customs are shown in more detail in Table 16. Imports of live eel fry (all sizes) were reported by China, South Korea and Hong Kong SAR, but no imports were reported by Japan and Taiwan between 2008 and 2016. China was the dominant importer until 2010, after which Hong Kong SAR imported 70–99% of live eel fry from *A. anguilla* range States during 2011–2014; imports as reported by South Korea and China increased in 2015 and 2016. As there are no eel farms in Hong Kong SAR (Agriculture, Fisheries and Conservation Department of the Government of the Hong Kong SAR, pers. comm. to TRAFFIC, November 2017), live eel fry imported into Hong Kong SAR are believed to be re-exported to other East Asian countries/territories. Table 16 suggests that Hong Kong SAR is used as a trade hub for imports from the EU, and those from Morocco until 2014. Import records from the EU - Greece, France, the UK and Italy - as reported by East Asia which fall outside times for permitted trade totalling nearly 7.7 t between 2012 and 2016, are highlighted in grey. In addition, there is a reported import of 200 kg of glass eels from Tunisia into South Korea in 2014 although glass eel exports are not permitted from Tunisia (Tunisia's response to CITES Notification No. 2018/018).

¹⁶ A Japanese word used in some countries in East Asia to describe young eels – for example, in the Philippines, it is used to describe eel of an exportable size i.e. >15cm.

Figure 8: Imports of live eel fry for farming from *A. anguilla* range States as reported by East Asian countries/territories, as reported by weight (t) 2007–2017.



Source: East Asian Customs data: China Customs Information Centre; Hong Kong Trade Development Council http://bso.hktdc.com/bso/jsp/bso_home.jsp; Ministry of Finance, Trade Statistics of Japan <http://www.customs.go.jp/toukei/info/>; Korea International Trade Association <http://global.kita.net/>; Taiwan Bureau of Foreign Trade <http://cus93.trade.gov.tw/FSCE000F/FSCE000F>. All sizes of “live eel fry” for farming are grouped together.

Table 16. Live eel fry imports from *A. anguilla* range States reported in East Asian Customs data, as reported by weight (kg), 2009–2017.

Hong Kong SAR

Source	Commodity	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Algeria	Eel fry							69	509		578
Belgium	Eel fry			600							600
Egypt	Eel fry						325	203			528
France	Eel fry	995	1734				280	1400			4,409
Greece	Eel fry		51	1846	3124						5,021
Ireland	Eel fry					440*					440
Italy	Eel fry							32	1100		1132
Morocco	Eel fry	837	2283	2242	1973	2394	455				10 184
Spain	Eel fry		3398	1360							4758
UK	Eel fry		553			200		304	727		1784
Total	Eel fry	1832	8019	6048	5097	3034	1060	2008	2336	0	29 434

* Identified as a mistake by Hong Kong Customs, but the record still appears in the official online annual data.

China

Source	Commodity	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
France	Live eel fry	5010	13 679								18 689
Morocco	Live eel fry		1130	100			208	570	3998	930	6936
Spain	Live eel fry	750	3187								3937
Romania	Live eel fry			360							360
Total		5760	17 996	460			208	570	3998	930	29 922

South Korea

Source	Commodity	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Denmark	Live eel fry	1500	1500								3000
Greece	Live eel fry				75						75
Morocco	Live eel fry			270							270
Tunisia	Glass eel (≤0.3g)						200				200
Morocco	Young eel (>0.3g and ≤51 g)					699		3460	4253		8412
Total		1500	1500	270	75	699	200	3460	4253	0	11 957

Note: Customs codes for live eel fry (different life stages) were introduced in South Korea in 2013. Blank cells indicate that data were not available. Cells with lines indicate that data were not available for these years due to the Customs codes not being in existence. Grey shading indicate records that fall outside times for permitted trade and appear to be in contravention of the EU trade ban.

Source: Hong Kong Trade Development Council http://bso.hktdc.com/bso/isp/bso_home.jsp, Korea International Trade Association <http://global.kita.net/>, Ministry of Finance, Trade Statistics of Japan http://www.customs.go.jp/toukei/info/index_e.htm, and Taiwan Bureau of Foreign Trade <http://cus93.trade.gov.tw/ENGLISH/FSCE/> (no reported trade found for Japan and Taiwan). All downloaded October 2015. Data from China Customs Information Centre requested via China Cuslink Co. Ltd. in March 2018.

Table 17 shows all imports of other live eels (larger sized eels for consumption) for 2011–2017 (there being no reported trade between 2006 and 2010) between *A. anguilla* range States and East Asia reported by East Asian Customs. Imports of other live eels were reported by Japan, South Korea and Hong Kong SAR, but no imports were reported by China and Taiwan. Imports of other live eels increased gradually and reached a peak of 354 t in 2014, after which they slightly decreased to ~265 t in 2016 and 2017. 80% of East Asia's other live eel imports came from Morocco and Tunisia. Although Japan reported imports of other live eels from France and Spain in 2012–2014, they had been grown out in China and then re-exported to Japan¹⁷ (Japan Customs, pers. comm. to TRAFFIC, in 2015). 80% of live eel imports from *A. anguilla* range States were reported by South Korea. Imports totalling 16.4 t from the EU - Bulgaria and France - which fall outside times for permitted trade were reported by Hong Kong SAR in 2012-2014, (highlighted in grey in **Table** Table 17). According to Hong Kong Customs, which reports two different types of imports (by origin and by exporter), the shipments from Bulgaria in 2012 and 2016 were reported as traded via Bangladesh while those from France were reportedly shipped directly to Hong Kong SAR.

¹⁷ Japan Customs supposedly reports imports as per origin of commodity and the country of origin does not change unless it is substantially transformed (such as changes in tariff classification). However, this rule appears to be applied inconsistently as Hong Kong SAR is reportedly the main origin of most glass eels imported in to Japan despite the fact that glass eel fishing does not exist in Hong Kong SAR and therefore it cannot be the country of origin for this commodity.

Table 17. 1 Other live eel imports from *A. anguilla* range States reported in East Asian Customs data, as reported by weight (kg), 2011–2017.

Importer	Source	2011	2012	2013	2014	2015	2016	2017	Total
Japan	France		27 380*	98 849*	61 784*				188 013
	Morocco			3000	17 001				20 001
	Spain				45 123*				45 123
	Tunisia			300	0				300
South Korea	Egypt						9475	10 046	19 521
	Morocco				163 938	252 893	199 429	201 633	817 893
	Tunisia		7623	47 376	60 794	61 464	44 225	44 326	265 808
	Turkey							2920	2920
Hong Kong SAR	Bulgaria		10 167				2564		12,731
	France			16	3540	120			3676
	Macedonia	800							800
	Morocco			1601	1380	3108	7995		14 084
	Tunisia		0	1990	0	0	0		1990
Total		800	45 170	153 132	353 560	317 585	263 688	258 925	1 392 860

* The origin of these eels is France and Spain, but they have been grown out in China and then re-exported to Japan.

Note: Blank cells indicate that data were not available. Grey shading indicate records that fall outside times for permitted trade and appear to be in contravention of the EU trade ban.

Source: Hong Kong Trade Development Council http://bso.hktdc.com/bso/jsp/bso_home.jsp, Korea International Trade Association <http://global.kita.net/>, Ministry of Finance, Trade Statistics of Japan http://www.customs.go.jp/toukei/info/index_e.htm, and Taiwan Bureau of Foreign Trade <http://cus93.trade.gov.tw/ENGLISH/FSCE/> (no reported trade found for China and Taiwan). All downloaded October 2015. Data from China Customs Information Centre requested via China Cuslink Co. Ltd. In March 2018.

5.1.4 Comparison with East Asian farming data

Although eel farms in East Asia introduce live eel fry to be grown out on a yearly basis, which originates from various countries/territories, data on the volume of input and farming production by species are rarely available. China, Japan, South Korea and Taiwan released farming and trade data with the Joint Press Release on the occasion of the Tenth Meeting of the Informal Consultation on International Cooperation for Conservation and Management of *A. japonica* Stock and Other Relevant Eel Species in June 2017¹⁸. The quantities of *A. anguilla* eel fry introduced into farms in China and South Korea reported in the release are shown in Table 18. This shows that live *A. anguilla* eel fry used for farming in China decreased from 45 t in the 2008–2009 fishing season to zero in 2011–2012; it increased again to 4.5 t in 2015–2016. *A. anguilla* input declined in South Korea as well from 1.5 t in the 2008–2009 and 2009–2010 fishing seasons to 100 kg in 2011–2012. However, other data sources suggest that

¹⁸ The joint press release was submitted by Japan at the 29th meeting of the Animals Committee in July 2017 as an information document: <https://cites.org/sites/default/files/eng/com/ac/29/inf/E-AC29-Inf-13.pdf>

more *A. anguilla* was input for farming every year (Fan and Quin, 2016); this suggests that the demand for *A. anguilla* glass eel still seems to be high in China, as 20 t of *A. anguilla* eel fry were reported to be inputted into eel farms in the 2014-15 fishing year alone (Fan, 2016). Fan and Qin (2016) also stated that the annual volume of *A. anguilla* glass eel input is stable at around 10 t, after falling sharply when *A. anguilla* was listed in CITES Appendix II. It has also been suggested that some may have been illegally exported from the EU; ICES (2016) indicated that 32.2% of the estimated total EU catch of glass eel in 2015 (51.6 t) was not accounted for in final sales, with a similar percentage in 2016 (37.3% of 59.2 t).

Table 18: *A. anguilla* live eel fry input into eel farms in China and South Korea, as reported by weight (t), 2008–2016.

	2008–9	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16
China	45	10.5	19	0	0	0		4.5
South Korea	1.5	1.5	0.3	0.1				

Note: The period of the data relates to the glass eel fishing season, from 1st November to 31st October the following year. "0" means data was identified as zero.

Source: Joint Press Release on the occasion of the Tenth Meeting of the Informal Consultation on International Cooperation for Conservation and Management of *A. japonica* Stock and Other Relevant Eel Species (<https://cites.org/sites/default/files/eng/com/ac/29/inf/E-AC29-Inf-13.pdf>)

5.1.5 Intra-EU trade 2008–2016

This section focuses on trade between the EU Member States (intra-EU trade) based on Eurostat data to examine the trends after the CITES listing came into force in March 2009, and trade in *A. anguilla* to and from the EU was banned in December 2010, as *A. anguilla* can be traded within the EU without CITES permits (including after the trade ban). Intra-EU trade data are collected from intra-EU traders if its trade exceeds a certain threshold established by each Member State – the current thresholds cover more than 92% of dispatches and 87% of arrivals (EC, 2014a). However intra-EU trade may be underestimated if a large number of small quantities below the specified thresholds were traded. Eurostat do not differentiate species and eel commodities are imported from non-EU countries/territories; trade in eel commodities in the EU could therefore include *A. anguilla* and other *Anguilla* spp.

The amount of eel commodities dispatched (the equivalent of “exported” within the EU) within the EU declined from approximately 8000 t in 2008 to less than 5000 t in 2016 even though dispatches of prepared eel were not included in the data for 2008–2011 (see Table 19). Live eels were the most dispatched commodity, with over 30 000 t being traded during 2009–2016 and accounting for 70% of all dispatches of eel commodities. Larger sized eels (≥ 20 cm) accounted for 76% and 54% of all live eel dispatches, by weight and value respectively, during 2012-2016.

Table 19. Total eel dispatches within the EU, as reported by weight (t), 2008–2016.

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Live	5594	5773	5077	4222	4236	3668	3723	3545	3350
<12cm					892	861	651	622	665
≥12-<20cm					71	82	113	164	256
≥20cm					3274	2725	960	2759	2429
Fresh	1052	725	634	586	815	49	808	754	697
Frozen	1095	1360	924	758	359	479	936	437	390
Smoked	323	306	250	161	110	83	83	59	92
Prepared					452	476	383	374	343
Total	8064	8165	6885	5728	5973	5455	5932	5169	4872

Source: Eurostat (2018).

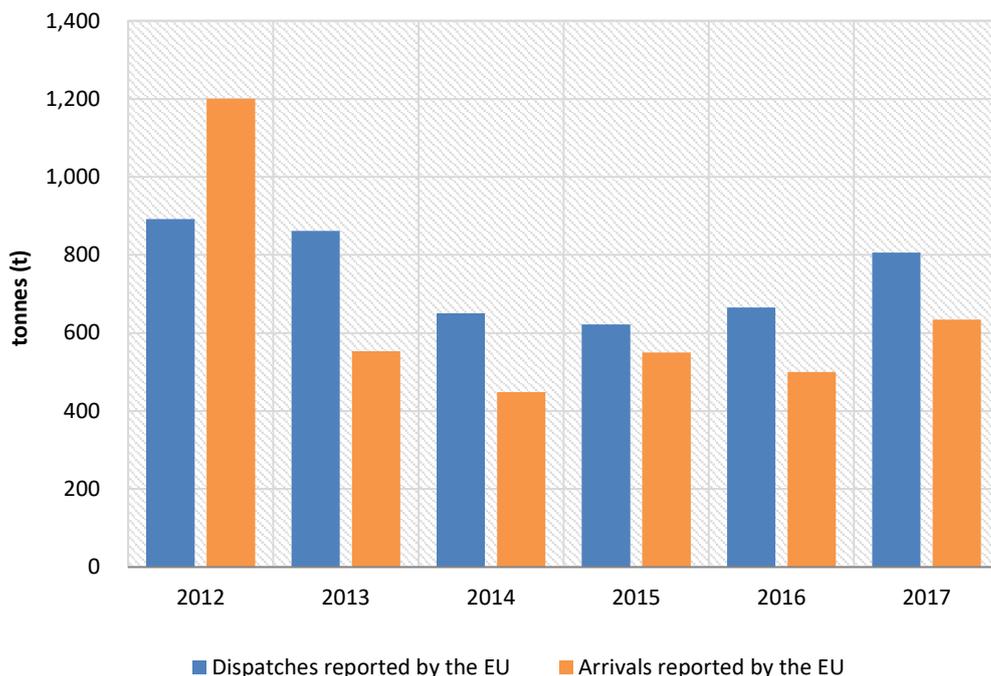
Note: Cells with lines indicate that data were not available for these years, due to the Customs codes not being in existence.

The reported average value of live eels (all sizes) dispatched during 2008–2016 was between EUR 9/kg and EUR 15/kg with no significant change over the years. The average price of glass eels was EUR 26/kg, in comparison to EUR 300–520/kg for (allegedly illegal) exports of live glass eel (less than 12cm) outside the EU (see Table 11). This price was also much lower than the average annual trade price of glass eels in the EU for the 2015 and 2016 fishing season (EUR 291/kg and EUR 370/kg respectively; ICES, 2016), suggesting Customs codes may be being mis-used. The average price between 2012 and 2016 for elvers (≥12 cm but <20 cm) was EUR 18/kg and for larger sized eels (≥20cm) EUR 9/kg.

According to Eurostat, the principal EU traders in live eel (all sizes) within the EU have not changed considerably over the years. Dispatches of glass eels were reported by 14 EU Member States between 2012 and 2016 (live eels could not be exported from the EU after 2012, however they could still be legally traded within the EU), with the Netherlands and Germany accounting for 90% of all reported dispatches by weight. While dispatches reported by most Member States declined, those from France increased slightly from 21.6 t in 2012 to 29.9 t in 2016. The average unit value of dispatches reported in Eurostat varied; the price of glass eels dispatched from the Netherlands, Germany and Denmark were less than EUR 20/kg, while dispatches from France, Spain, the UK, Portugal and Sweden ranged between EUR 150/kg and EUR 530/kg. It is important to note that France opened its first eel farm in 2015, resulting in larger size eels also being dispatched from France in recent years. French-caught glass eels have been grown out and dispatched to the Netherlands and Germany, totalling between 42 and 55 tonnes per year in 2015-2017 (France's response to CITES Notification No. 2018/018).

Figure 9 shows the quantity of dispatches and arrivals (equivalent of "imports" within the EU) of glass eels reported by EU Member States between 2012 and 2017. While both show a similar declining trend, there were 70–310 t of discrepancies between dispatches and arrivals each year. The arrivals exceeded dispatches by 310 t in 2012, whereas dispatches exceeded arrivals in 2013–2016. Considering that annual glass eel landings in the EU ranged around 40–60 t during 2009–2016 (ICES, 2017), the quantities of dispatches and arrivals of glass eels are 8–20 times higher than glass eel landings in the EU, suggesting glass eels are traded multiple times within the EU. Alternatively this trade could also include eels fished illegally and/or not reported.

Figure 9: Dispatches and arrivals of glass eels reported by EU Member States, by weight (t), 2012–2017.



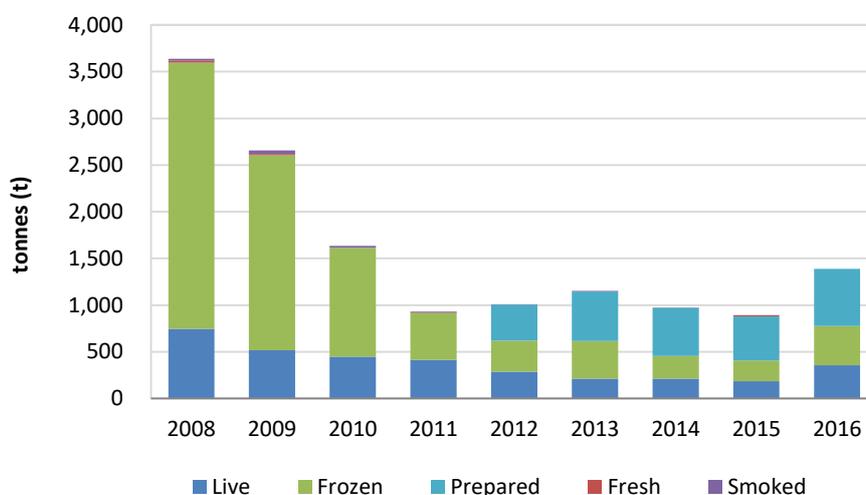
Source: Eurostat (2018).

5.1.6 Imports of *Anguilla* eel commodities into the EU

As illegal trade in *A. anguilla* glass eels is ongoing (see Section 7) and eels can be traded after having been grown out in farming facilities, it is important to ensure the legality of re-exported and (re-)imported specimens. Enforcement and implementation complications arise when there is a market for other *Anguilla* species and farmed *A. anguilla* eels and eel products are re-imported into range States, especially from East Asia where several *Anguilla* spp. are farmed and mixing shipments of these species could occur. The EU banned imports of *A. anguilla* eels and eel commodities from December 2010 and agreed the cut-off dates after which specimens of *A. anguilla* can no longer be considered pre-Convention (see Table 22 for full details); from 2015 onwards (re-)imports into the EU of any *A. anguilla* commodity type for commercial purposes were no longer permitted.

Imports of the five commodities of *Anguilla* spp. (live, fresh, frozen, smoked and prepared) into the EU from non-EU countries and territories between 2008 and 2017, based on Eurostat data, are shown in Figure 10.

Figure 10: Total EU eel imports from non-EU countries and territories, reported by weight (t), 2008–16.



Note: Customs codes for prepared eel were introduced in 2012.

Source: EUROSTAT (2018).

Imports of live, fresh, frozen and smoked eel declined considerably from ~3,700 t in 2008 to ~950 t in 2011 and to less than 500 t in 2015. Since 2012 when trade data for prepared eel is available, prepared eels were the most imported commodity by weight and value, making up 47% of the weight and 58% of the value. There was a slight increase in imports of live, frozen and prepared eel in 2016. Imports of frozen eel fell considerably mainly due to decrease in imports of frozen eel from China; frozen eel imports from China declined from ~2400 t in 2008 to 216 t in 2011. China was the principal trading partner of prepared eels during 2012-2016 as well, accounting for 93% of all prepared eel imports by weight. A comparison of CITES trade data and China’s Customs data suggest that while *A. anguilla* meat exports and the estimated percentage of *A. anguilla* declined over the years, more than 10% of eel products are still estimated to be *A. anguilla* in 2015-2016 (Table 20).

Table 20. *A. anguilla* meat exports and fresh, frozen and prepared eel exports from China, as reported by weight (t), 2009–2016.

	2009	2010	2011	2012	2013	2014	2015	2016
Exports of fresh, frozen and prepared eel, China Customs data	33 459	37 853	37 003	33 481	31 834	33 928	38 183	36 397
Exports of <i>A. anguilla</i> (meat), CITES data	12 284	9304	7521	4861	5767	6732	3752	4253
Estimated percentage of <i>A. Anguilla</i>	37%	25%	20%	15%	18%	20%	10%	12%

Note: China did not report any exports of *A. anguilla* bodies to CITES.

Source: CITES trade database (exporter reported data) and China Customs (2018).

5.2 Concluding remarks on Customs trade data

The analysis of various Customs datasets allows for a better understanding of international trade in eels, all of which is not captured in CITES trade data. Advantages include, for example, the possibility to analyse intra-EU trade dynamics, as these data are not recorded under CITES. Customs data also provide useful additional information on trade patterns involving other eel species, affected by the CITES listing of *A. anguilla*, for example highlighting an increase in *A. rostrata* transiting through EU Member States on the way to East Asia.

CITES trade data can also be cross-checked using Customs data and any discrepancies identified and followed-up for clarification. For instance, Customs data have revealed a number of exports from EU Member States, which should not have been permitted according to the EU trade restrictions in place. The EU has been regularly monitoring Customs data and followed up with the relevant countries to prevent such trade from happening (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*¹⁹). Other examples of discrepancies between the CITES and the Customs datasets are provided below.

Morocco

According to CITES trade data, live eel export from Morocco to Hong Kong SAR exceed imports recorded by Hong Kong Customs, except in 2009 and 2016. Hong Kong SAR reported 837 kg of imports of live eel fry from Morocco in 2009, which was not recorded in the CITES Database (by neither the importer nor exporter) or UN Comtrade as exports from Morocco, and therefore could have been illegally traded. In 2016, ~4,600 kg *A. anguilla* live eel was exported from Morocco to Hong Kong SAR according to exporter data in the CITES Trade Database. However, records of live eel exports in UN Comtrade, imports by Hong Kong Customs and by importers in the CITES Database all show trade being over 7900 kg. Live eel exports recorded in UN Comtrade were less than those in the CITES trade database in 2010, 2013, 2014 and 2015. It also appears that glass eels have been exported after ban was imposed in 2013 (see Section 6.1).

Tunisia

As noted above, Tunisia has not reported any exports of live *A. anguilla* to CITES during 2009-2016²⁰ despite importer records indicating 306 t of live *A. anguilla* were imported from Tunisia during 2012–2015. This is also inconsistent with Tunisia’s live eel export data recorded in UN Comtrade and/or importer’s Customs data.

Table 21 shows that CITES importer recorded quantities exceeded live eel imports from Tunisia as reported by Korean Customs by more than 25 t in 2013 and by 120 t in 2015. In addition, based on UN Comtrade, Tunisia reportedly exported more than 60 t of live eel and 6 t of frozen eels to Egypt during 2009-2016, however, Egypt only recorded ~4.5 t of live eel imports from Tunisia during the period. According to the CITES Trade Database, Tunisia reported exports ~52 t of *A. anguilla* meat between 2009 and 2016, but no live *A. anguilla* imports were reported by Egypt.

¹⁹ This topic of discussion has been raised at numerous Enforcement Group meetings, rather than a specific meeting in one year. Similar references will be marked with an asterisk *.

²⁰ Tunisia has submitted its annual reports up to 2016, except for 2012 (last updated 29.01.2018)
https://www.cites.org/sites/default/files/annual_reports.pdf

Table 212: Live eel trade between Tunisia and Korea, as reported by weight (t), 2012–2016.

	2012	2013	2014	2015	2016
Exporter (Tunisia) reported quantities (CITES)	unknown	0	0	0	0
Exporter (Tunisia) reported quantities (UN Comtrade)	10.0	34.2	40.7	57.7	44.5
Importer (South Korea) reported quantities (CITES)	4.0*	72.8	43.2*	184.8	unknown
Importer (South Korea) reported quantities (Korean Customs)	7.6	47.4	61.0	61.5	44.2

Note: Live eel trade is not recorded during 2009-2011. Korea has not submitted its annual report for 2016 as of 20 March 2018. Tunisia has submitted its annual reports up to 2016, except for 2012.

*Korea also reported 8,960 and 33,184 (without unit) of live *A. anguilla* imports from Tunisia in 2012 and 2014 respectively.

Source: UN Comtrade, CITES Trade Database and Korean Customs (2018).

It has been demonstrated that Customs and farming data can provide useful additional information complementing information available from CITES trade data. The following conclusions have been reached regarding these datasets:

- Standardised or comparable definitions/codes for the different eel life stages would facilitate trade data analyses;
- Coordinating any future changes to Customs codes to ensure this is applicable across all *Anguilla* range States would facilitate trade data analyses. This is also relevant to fisheries/other management measures, such as limits on export set by length or weight;
- Customs and farming data is useful for cross-checking trade reported under CITES to help identify discrepancies, and where follow-up and clarification by relevant Parties is needed;
- Customs data is a useful resource for monitoring possible impacts of the CITES listing of *A. anguilla* on other eel species;
- Sharing of relevant information by Parties which use *A. anguilla* for farming on their operations and supporting information for issuing re-export certificates (e.g. farming output, traceability and origin of live eel fry) with both range States, and Parties involved in international trade of the species, would be very useful in understanding trade dynamics.

6. Implementation issues

As highlighted in Sections 3-5 there are significant complexities relating to the reporting of trade in this species. In this section, other implementation issues that have arisen are examined.

The making of a Non-Detriment-Finding (NDF) is required for trading species listed in CITES Appendix II. As previously stated, the EU SRG have not been able to make a NDF for *A. anguilla* and this, and NDFs made by other range States is discussed below. Linked to this, the EU export ban which resulted from the SRG being unable to make a NDF has meant that in addition to monitoring pre-Convention specimens, there are also pre-EU-ban specimens to consider. Traceability generally has proved challenging and improved regional and international collaboration would undoubtedly help to address some of the issues described below.

6.1 Non-Detriment Findings

As per Article IV of the text of the Convention, export of an Appendix II listed species ‘will not be detrimental to the survival of that species’. As such, a listing does not prevent trade, but requires a positive ‘Non-Detriment Finding’ (NDF), made by the appropriate Scientific Authority (SA). A new Resolution relating specifically to making NDFs was adopted at CoP16 and revised at CoP17 (Resolution Conf. 16.7 (Rev. CoP17)^{21 22}). It is deliberately broad such that regional and species-specific circumstances can be taken in to account. More specific guidance on performing NDFs was provided by IUCN²³ (Rosser and Haywood, 2003) and a number of relevant documents, including case studies, can be found on the CITES website - <https://www.cites.org/eng/prog/ndf/index.php>. This includes the outputs of the ‘International Expert Workshop on CITES Non-Detriment Findings’ in Cancun, Mexico from November 17th to 22nd 2008. A fishes-specific document was produced²⁴, and the European eel, specifically in Sweden, was used as case study – note the dates were post-listing but pre-implementation. The following was stated in relation to making a NDF for *A. anguilla*:

“...two quite different standpoints were recently taken. One advocates a local approach, i.e. to look at the situation at the river basin or country level, trying to estimate if there are local surpluses that could be exported out from the species’ natural distribution range or not. The other view is to consider the whole population as such and weigh between deficits in some areas against surpluses in other areas and from that balance decide if there is room for exports without being detrimental to the survival of the species. In the first case a NDF might be possible, whereas in the latter case it is impossible and [export should cease].”

Gaynor (2014) noted that *A. anguilla* is one of the most challenging species to try to make a NDF for. There are a number of reasons why this is particularly difficult for *A. anguilla*, including:

- It is considered to be panmictic i.e. from a single population.

²¹ <https://www.cites.org/sites/default/files/document/E-Res-16-07-R17.pdf>

²² The revision at CoP17 was as a result of a document submitted to the CoP by Australia, encouraging the sharing of experiences and examples of making NDF for the benefit of other species range States and the management of the species across its range.

²³ <https://portals.iucn.org/library/sites/library/files/documents/SSC-OP-027.pdf>

²⁴ http://www.conabio.gob.mx/institucion/cooperacion_internacional/TallerNDF/Links-Documentos/WG-CS/WG8-Fishes/WG8-FR.pdf

- It has a complex life-cycle with multiple life stages (see Figure 1).
- It has an extensive range crossing three continents and multiple regional bodies and/or management regimes.
- There are fundamental knowledge gaps in the biology and management of the species that hinder stock assessments, such as:
 - An estimate of spawning biomass
 - The scale of density dependant mortality
 - Sex ratios
 - The relationship between recruitment and spawning stock
 - The effectiveness of management interventions e.g. EU Council Regulation (EC) No 1100/2007
 - The effectiveness of re-stocking on the replenishment of the spawning stock
- There are multiple threats to the species that may impact the species cumulatively and/or synergistically and assessing the impact of exploitation and associated trade in isolation is very difficult.
- It is traded both live and processed in a number of different forms all of which can be reported in multiple formats (see Sections 3-5).
- There is evidence of significant illegal fishing and trade which confound attempts to assess existing legal fisheries and trade (see Section 7)
- As wild stock has to be used to seed farms around the world (and often in non-range States), monitoring of the input and output of farmed eels is challenging.

Due to these various challenges, and the threatened status of the species, the Scientific Review Group (SRG) – the EU body designated to make NDFs for species listed in the EU Wildlife Trade Regulations²⁵ - at their 53rd meeting (14/09/10)²⁶ stated:

*Anguilla anguilla - **implementation of the listing:** The SRG expressed its deep concerns about the population status of the species, the current levels of fishing and a wide majority of its members was of the opinion that a regime should be adopted whereby exports and imports of all specimens and commodities would not be allowed.*

In the subsequent 54th meeting (3/12/10)²⁷ it was further stated:

*Anguilla anguilla - **implementation of the listing:** The SRG assessed the situation for export of European eels: it was agreed that it was not possible to perform a "non-detriment finding" for the export of European eels, i.e that it was not possible for the SRG to consider that the capture or collection of European eel specimens in the wild or their export will not have a harmful effect on the conservation status of the species or on the extent of the territory occupied by the relevant population of the species. The SRG would reassess the situation by the end of 2011.*

²⁵ <http://ec.europa.eu/environment/cites/pdf/srg/guidelines.pdf>

²⁶ https://circabc.europa.eu/sd/a/c07a4a45-ad49-43e8-af7d-f0d5b8b032b6/53_summary_srg.pdf

²⁷ https://circabc.europa.eu/sd/a/49ab3fc9-646b-4b35-ac42-f0333479ce24/54_summary_srg.pdf

At this point, import and export outside of EU Member States ceased. As such, since December 2010, and with some exceptions (see Table 22), trade of European eels is only permitted between EU Members States or between non-EU Member States, be they European eel range States or otherwise (Crook, 2011). The SRG has a watching brief on the European eel and reviewed the ban most recently at their 81st meeting (13/11/17)²⁸ where it was stated:

*The SRG found that the status of the species remained critical and that, like for previous years, it was not possible to perform a "non-detriment finding" for *Anguilla anguilla*. The SRG therefore agreed that the zero quota for the export and negative opinion for import of this species should be maintained until the end of 2018.*

Since this time, the EU has taken steps to assess the impact of trade on the European eel, and specifically related to NDFs, held a workshop in 2015 in an attempt to define criteria/indicators for making an NDF for the species (ICES, 2015). The resulting report stated the following:

The Workshop concluded that it was possible to identify a number of indicators, with thresholds suggested for some of these, which could be used to guide an NDF-assessment of international trade in European eels, and that suggested indicators could include the following:

- *population indices should be above levels at which the species might qualify for listing in Appendix I of CITES; for European eel this level was adjudged to be 15% of historical baseline, and recruitment time-series are the longest and most reliable data that could constitute an index of abundance;*
- *a modified precautionary framework considering both anthropogenic mortalities and biomass reference points (40% of pristine biomass and the corresponding mortality rate);*
- *indices indicating that recruitment is trending positively, reflect a recovering population, and are within confidence limits of reference baseline; and*
- *the implementation of effective eel management plans (or their equivalents).*

All the suggested indicators should be considered together, where data are available; criteria a) and the implementation of an eel management plan (d) were seen as essential first steps, after which the other indicators could be assessed. The indicators rely on data that are of variable quality and completeness and so a precautionary approach should be taken in cases of uncertainty or where data quality are poor.

The workshop also considered the geographical scale under which an NDF should be made, considering the panmictic nature of the species, and indicated that as a precautionary approach, a NDF should be made across the entire species' range. NDFs at smaller scales are possible but should be made in the context of the full range and acknowledge the risks and benefits of such an approach. In addition, it was proposed that these guidelines may also be applied to other anguillid eels.

Outside of the EU, Norway, in relation to NDFs, stated in their response to CITES Notification No. 2018/018 that no NDF has been carried out to date but that:

²⁸ https://circabc.europa.eu/sd/a/880c1312-acfe-46f9-bf24-8e0f0e7e1381/81_Summary_SRG.pdf

Norway has followed advice set by OSPAR²⁹ and a transition period for the industry was introduced prior to cessation of all export in 2010. However, work on an NDF started winter 2018.

Turkey indicated in their response to CITES Notification No. 2018/018 that they had made a national-level NDF using 'Customs / Trade data analysis' and 'Fisheries dependent data', however, no supporting information was provided with the submission. It is stated in the most recent ICES WGEEL Country reports³⁰:

'In Turkey, the European eel fisheries are restricted to only yellow and silver eel stages. There are no aquaculture activities and also no glass eel fisheries. In addition, there is a regulation of restriction in fisheries on the smaller than 50 cm eel. This regulation provides additional protection of eel population'.

Tunisia indicated in their response to CITES Notification No. 2018/018 (translated from French) that they had made a national-level NDF using 'Customs / Trade data analysis' and 'Fisheries dependent data', however, no supporting information was provided with the submission.

No other non-EU range States submitted a response to CITES Notification No. 2018/018 and no further information was found on the making of NDFs. However, at AC29 (AC29 Com.5 (Rev. by Sec.)³¹), Tunisia, Algeria and Morocco were identified as range States of *A. anguilla* to be progressed to Stage 2 of the Review of Significant Trade (RST), as a result of analysis carried out by UNEP WCMC.

The CITES RST procedure (defined in Resolution Conf. 12.8 (Rev. CoP17)³²) was designed to identify species that may be subject to unsustainable levels of international trade, and to identify problems and solutions concerning effective implementation of the Convention. As a consequence, submissions to the Secretariat were provided by all three countries in relation to the RST which yielded information pertinent to the making of NDFs.

In support of Tunisia's questionnaire response, further information on the making of an NDF was available from their RST submission. Their eel export quota was set in 2010 at 135 t on the basis of fisheries dependant monitoring from 2000-2009 analysed by the Institut National des Sciences et Technologies de la Mer (INSTM) and La Direction Générale de la Pêche et de l'Aquaculture (DGPA). This analysis applied only to eels over 30cm, the legal size limit for catch and export in Tunisia³³. The Tunisian fishery occurs across four management units and catch is recorded by location, quantity, date, gear-type³⁴ and vessel/fisher name. Catches are verified to ensure they are of exportable size and CITES permits are issued by the Management Authority (MA). Since 2010, a national working group composed of representatives from INSTM, DGPA, and the national MA, La Direction Générale des Forêts (DGF) monitors the state of the eel stock and agrees the annual quota, which has remained

²⁹ The Convention for the Protection of the Marine Environment of the North-East Atlantic.

³⁰ http://ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2017/WGEEL/WGEEL_CRs_2017.pdf

³¹ <https://cites.org/sites/default/files/eng/com/ac/29/com/E-AC29-Com-05-R.pdf>

³² <https://cites.org/sites/default/files/document/E-Res-12-08-R17.pdf>

³³ Decree of 28 September 1995 (Article 9) on the regulation of the fishing industry

³⁴ Mesh size is regulated via of the Decree of 28 September 1995 (Articles 5 and 20)

unchanged since 2010. A management plan³⁵ and a supporting document³⁶ were referenced, but copies not provided.

Research relating to age structure, growth, reproduction, diet, recruitment and migration to the sea was also referenced. Modelling has also been carried out in order to assess the impact of the fishery on the continental population. It was stated that escapement of eels was ‘more than 40%’, which was interpreted as referencing the level outlined in EU Council Regulation No 1100/2007, however the latter relates to ‘40 % of the silver eel biomass relative to the best estimate of escapement that would have existed if no anthropogenic influences had impacted the stock’ and it is not clear whether the Tunisian metric use the same definition.

Algeria’s response (translated from French) states that exploitation of *A. anguilla* is considered artisanal, and that there are only four licensed concessions in the country. Further management measures relating to gear, fishing season and marketable size (>30cm) have been established as well as a ban on glass eel and elver exploitation except for scientific purposes and ‘growing-on’ – no supporting text was provided for these measures. It was acknowledged that, in the absence of a national management plan for *A. anguilla*, there was uncertainty in relation to the species and as such, a precautionary annual quota of 12 tonnes – three tonnes for each of the four concessions – has been set. Due to lack of capacity, a request for an expert assessment of the national status of *A. anguilla* was made by Algeria.

Morocco’s response (translated from French) states that in 2009, le Haut Commissariat aux Eaux et Forêts et à la Lutte contre la Désertification (HCEFLCD), established a number of precautionary measures to sustainably manage eels. In 2013, a national study on eel stocks was carried out which collated all available scientific data on the species in order to determine a sustainable catch. This involved the utilisation of modelling software developed by the ICES WGEEL and applied to the four main fishing areas in Morocco – Sebou Estuary; Merja Zerga, Oued Drader and Canal Nador lagoon complex; Loukkos Estuary; and Moulouya Estuary. As a result, in 2013, HCEFLCD closed the fisheries in all sites except the Sebou Estuary where a quota of two tonnes of glass eels and seven tonnes of eels >30cm has been set³⁷. The glass eel fishery is solely for on-growing at farms established by the companies³⁸ – export of glass eels (<10cm) is illegal³⁹.

In addition, since 2013, an action plan has been developed with the aim of rebuilding eel stocks and reducing mortality, particularly in relation to fisheries. This action plan is based on relevant geographic, scientific and socio-economic data and is structured around the following six areas of intervention:

³⁵ DGPA. 2010 - Projet de Plan de Gestion Anguille de Tunisie. Direction Générale de la Pêche et de l’Aquaculture. Ministère de l’Agriculture, Tunisie. 108p.

³⁶ Farrugio, H. & Elie, P. 2011- Etat de l’exploitation de l’Anguille Européenne (*Anguilla anguilla*, Linné 1758) et éléments pour l’élaboration de plans de gestion dans la zone GFCM. Rapport FAO GFCM:SAC13/2011/Dma.1. 48p.

³⁷ It appears that this has increased in the 2017-2018 season: ‘The capture quotas for the Sebou river and its tributaries for the season 2017-2018 are 2000kg of glass eels measuring less than 10 centimetres and 22 tonnes of wild eel of more than 30 centimetres’ http://www.eauxetforets.gov.ma/files/editor_upload/file/Dwn/peche/Arr%C3%AAt%C3%A9-annuel%202017-2018.pdf

³⁸ It is stated that amalgamation of the fishery and farming of eels improves traceability and reduces illegal activity.

³⁹ Confirmed through direct contact with Morocco’s CITES Management Authority.

- Introduction of a fishing quota
- The transfer of the right to fish
- The implementation of a directive on the sustainable exploitation of the eel,
- Establishment of an annual restocking program,
- Establishment of a traceability system for fishery and aquaculture products
- Combatting poaching and illegal trade

A scientific monitoring program has also been established.

In conclusion, it appears there are a range perspectives as to whether a NDF can be made and if so what information and mechanisms are appropriate to incorporate in the assessment. However, as stated previously, there are a number of species-specific issues that make *A. anguilla* a particularly challenging case, and arguably the most important being the panmictic nature of the stock. As raised in the ICES workshop held in 2015, making NDFs at the national level should be done with careful consideration:

With respect to the spatial scale on which an NDF might be assessed, in the absence of decisive evidence on what part of the continental stock successfully contributes to reproduction, the precautionary approach is to assume that any or all parts of the continental stock might contribute to reproduction. Taking this point into account, it may be feasible to undertake an NDF assessment at smaller spatial scales than the entire population (and there could be valid reasons for doing so) but the risks and benefits need to be considered.

As such, there would be enormous value in range States collaborating on future efforts and considering the harmonisation of how NDFs are made.

6.2 Pre-Convention/pre-ban specimens

6.2.1 Dates for permitted trade of *A. anguilla*

In the years following the CITES Appendix II listing of *A. anguilla*, coming into force in March 2009, the EU set several dates after which specimens of *A. anguilla* could no longer be traded (Table 22) (EC, 2009c; TRAFFIC, 2015).

Commercial trade in all commodities of *A. anguilla* to and from the EU was banned in December 2010, however, pre-Convention specimens were the exception to this (as set at the 48th Meeting of the EU Management Committee on Trade in Wild Fauna and Flora [COM 48] on 21st September 2009) (Table 22) (EC, 2009c; TRAFFIC, 2015):

- trade in pre-Convention live specimens was permitted until 1st April 2011;
- trade in pre-Convention eel products was permitted until 1st April 2012;

- re-imports of live specimens or other eel products from third countries derived from eels legally exported from the EU between 13th March 2009 and 3rd December 2010 were permitted only until December 2013⁴⁰.

Table 22. Dates for permitted trade in *A. anguilla* eel commodities from and to the EU, and the first full calendar years when trade was no longer permitted. Source: TRAFFIC. (2015).

Dates agreed at EU COM/SRG meetings	Commercial EU trade bans for <i>A. anguilla</i>	Maximum possible length of validity of CITES permit	First full calendar year* when trade was no longer permitted
December 2010	(Re-)exports of post-Convention (W) live specimens and other products	June 2011	2012
December 2010	(Re-)imports of post-Convention (W) live specimens and other products derived from eels exported after 3 December 2010	December 2011	2012
April 2011	(Re-)exports of pre-Convention (O) live specimens	October 2011	2012
April 2011	(Re-)imports of pre-Convention (O) live specimens	April 2012	2013
April 2012	(Re-)exports of pre-Convention (O) other products	October 2012	2013
April 2012	(Re-)imports of pre-Convention (O) other products	April 2013	2014
December 2013	Re-imports of live specimens or other products derived from eels legally exported from the EU between 13 March 2009 and 3 December 2010	December 2014	2015

Note: *January – December; W = Wild; O = Pre-Convention

As a result, CITES enforcement authorities have been dealing with several dates in relation to permitted trade in different *A. anguilla* specimens to and from the EU, which has resulted in considerable confusion as to what constituted permitted trade and has provided opportunity for traders to mis-declare specimens to circumvent controls.

Enforcement and implementation complications arising from these various dates and the complexities of global *A. anguilla* trade include:

- The dates agreed at the EU Management Committee Meeting on Trade in Wild Fauna and Flora (COM) and SRG meetings referred to the issuance of CITES documents to allow for maximum possible periods of permit validity; six months for export permits and 12 months for import permits. This meant that there were a number of different dates for permitted eel trade to and from the EU (Table 22) (TRAFFIC, 2015);
- Live *A. anguilla* caught prior to the CITES listing coming into force in March 2009 were permitted to be grown out in farms before being converted into eel products (Crook, 2010a).

⁴⁰ As per Commission letter sent to all third countries on 1st October 2013: Import export regime of European Eel *Ref. Ares(2013)3152470 - 01/10/2013*

Subsequent trade in these *A. anguilla* products, particularly processed and frozen products which can have a shelf life of several years, was legitimate, however there were opportunities for traders to exploit this and include *A. anguilla* that were caught after the CITES listing came into force in shipments (Briand, *et al.* 2008; Crook, 2010a);

- Prior to reaching the dates after which eel trade was no longer permitted, the introduction of dead frozen glass eels caught prior to the CITES listing into the global market for consumptive purposes further complicated the process in ensuring legitimate trade of eel products (Briand, *et al.* 2008; Crook, 2010a). A long history of mis-declared trade in frozen dead glass eels to Spain was known to occur (Briand, *et al.* 2008), and although Spain is the main consumer of frozen dead glass eels, there was still demand in other parts of the world including South America (Briand, *et al.* 2008). The scope for traders to mis-declare specimens as pre-Convention was particularly relevant for frozen dead glass eels as these were converted into preserved products that had shelf lives of several years;
- The farming of juvenile “slow-growers” (eels which grow at much slower rates for several years due to differences in environmental factors [Jacoby and Gollock 2014]) in East Asia, predominantly China, resulted in large quantities of pre-Convention *A. anguilla* specimens re-entering trade several years after the listing (Crook, 2010a; TRAFFIC, 2015). An incomplete understanding of East Asian farming operations⁴¹ (Shiraishi and Crook, 2015) and traceability along the eel supply chain created more uncertainties in ensuring legitimate global trade (TRAFFIC, 2015). While this was only an issue for EU enforcement officers until December 2013 (Table 22), there have been recent examples of East Asian countries claiming to still be trading in “slow-growers” (see section 6.3.2); and
- While the EU set trade bans, trade data analysis indicates that Non-EU range States continue to export shipments of live European glass eels to East Asia for farming purposes (TRAFFIC, 2015). Prior to reaching the dates in which eel trade was no longer permitted (Table 22), the EU faced challenges in ensuring legality of re-imports back into the EU from East Asia due to the inability to determine the origin of these specimens (Crook, 2010a; TRAFFIC, 2011).

6.2.2 Monitoring re-imports

Despite the commercial trade ban in all wild post-CITES listing commodities of *A. anguilla* to and from the EU since December 2010, live *A. anguilla* and eel products could still be re-imported into the EU from third countries, such as China, provided they were derived from *A. anguilla* legally exported from the EU (or elsewhere) prior to the CITES listing, and between 13th March 2009 and 3rd December 2010. In the years immediately following the CITES listing, EU Member States raised concerns that no clear method of monitoring the legality of future shipments was available (TRAFFIC, 2011). There was a potential risk of the EU re-importing considerably larger quantities of specimens than were originally legally exported from the EU, as well as opportunity for traders to mis-declare specimens as pre-Convention (TRAFFIC, 2011).

⁴¹ There is a lack of understanding regarding the farming production methods utilised, such as the average time taken for eels to reach consumption size, and the origin of eels that were [and are] grown out in East Asian farms (Shiraishi and Crook, 2015).

The EU looked into options of developing a monitoring mechanism for this purpose, however in all cases this involved a considerable amount of data manipulation and interpretation, yielding unreliable results (TRAFFIC, 2011).

The possibility of developing a real-time trade database for re-import permit applications for Chinese-farmed *A. anguilla* trade, proved unworkable. This was because there was no way of accounting for Chinese-farmed *A. anguilla* being consumed in-country and re-exported to countries outside the EU, in that trade in *A. anguilla* is variably reported to CITES in weight and number of specimens (TRAFFIC, 2011).

Another method considered was to try and estimate the maximum potential production of farmed *A. anguilla* in China derived from specimens that had been re-exported between March 2009 and December 2010 (TRAFFIC, 2011). As a minimum requirement the following information would need to be collected to calculate these figures:

- total weight of live juveniles (as reported to the different life stages) exported from the EU to China and Hong Kong SAR for farming purposes between 13th March 2009 and 3rd December 2010;
- the total weight of *A. anguilla* re-exported from China with origin declared as an *A. anguilla* range State;
- conversion factors including weight to number of individuals for the various life sizes involved;
- conversion factors for live eels to product weight (e.g. frozen fillets); and
- minimum percentage of mortality (in transport and in farms).

This method relied on using several conversion factors, expert information and trade data from EU Member States and the main farming countries in East Asia (TRAFFIC, 2011). Gathering this information was particularly complicated because nearly all glass eels imported in Hong Kong SAR are then shipped to China for farming (Crook and Nakamura, 2013; Shiraishi and Crook, 2015), as well as the fact that there is an incomplete understanding of the farming operations in East Asia (Shiraishi and Crook, 2015). In addition, several assumptions would have to be made, including the fact that species and origin on permits referred to all individuals in the shipment and not a mix of different species, life stages and specimens of different growth rates (TRAFFIC, 2011).

The complexities involved in gathering accurate information, the work involved in manipulating and interpreting the data and the significant margin of error involved in these extrapolations, meant that this was not a viable option of monitoring re-imports of *A. anguilla* (TRAFFIC, 2011). This resulted in EU Member States being unable to accurately trace the quantities of *A. anguilla* permitted for re-import into the EU and therefore the COM decided to set a date to no longer allow re-imports.

These issues were further complicated by the fact that non-EU range States continued to potentially legally export *A. anguilla* to East Asia for farming purposes (TRAFFIC, 2015). China was reportedly using “slow-growers” (derived from specimens imported from the EU prior to the trade ban in December 2010) (Crook, 2010a), whilst simultaneously reportedly importing specimens of *A. anguilla* from North African range States, such as Morocco and Tunisia (TRAFFIC, 2015). Due to the lack of understanding

surrounding the management of *A. anguilla* populations in North Africa and their regional fishing regulations, EU Member States have often been unsure as to the provenance and origin of China's re-exports of *A. anguilla* (whether they were legally exported specimens from North Africa or illegally acquired EU stock) and could therefore not ensure the legality of shipments coming back into the EU (TRAFFIC, 2015).

6.3 Traceability along the eel supply chain

EU Council Regulation (EC) No 1100/2007 was established to ensure protection and sustainable use of the species and encouraged the development of EMPs in each EU Member State with river basins in their national territory that constitute habitats for *A. anguilla* (Official Journal of the European Union, 2007)⁴². The objective of these EMPs was to reduce anthropogenic mortalities to achieve an escapement of silver eel to the spawning population that equals or exceeds a target set at 40% of the potential biomass that would be produced under conditions if no anthropogenic influences were impacting the stock (Official Journal of the European Union, 2007).

This regulation also set out a clear framework as to the EU's obligations concerning traceability of *A. anguilla* trade. Under Article 12 "Control and enforcement concerning imports and exports of eel", it explicitly states that "*No later than 1 July 2009, Member States shall: – take the measures necessary to identify the origin and ensure the traceability of all live eels imported or exported from their territory...*" (Official Journal of the European Union, 2007). However, there were significant set-backs in developing EMPs and a harmonised European-wide system to ensure traceability is not in place (Chailleux and Stein, 2017; DEFRA, 2015; EC, 2014b). Furthermore, a recent Sustainable Eel Group (SEG) report states that for the past two fishing seasons it is estimated that approximately 50% of the annually declared glass eel catches in the EU are not traceable due to the lack of an effective traceability system (Anonymous, 2018). The evaluation of EU Council Regulation (EC) No 1100/2007 was started in April 2018 by the European Commission.

In addition to the above, in the EU Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy, and Commission Implementing Regulation (EU) No 404/2011 of 8 April 2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy also provide the legal framework in the EU for the traceability of marine fish. However, for eels, these regulations only apply during the marine part of their lifecycle in the sea, i.e. if they are caught in the marine environment and not in inland fisheries. Therefore, these regulations cover a small proportion of eels.

6.3.1 Difficulties in ensuring traceability of *A. anguilla*

Various factors impede the EU's ability in tracking shipments to determine the legality of live European glass eels in trade and the effective implementation of the CITES listing. These include:

⁴² <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R1100&from=EN>

- the natural range of *A. anguilla* exceeds the borders of the EU, and consequently *A. anguilla* of different origins, such as from North African range States, cannot, at the time of writing, be distinguished by genetics;
- the lack of available marking techniques to identify the origin of wild *A. anguilla* stock; and
- a lack of accurate record keeping, reporting and documentation requirements along the eel supply chain from the fisheries and veterinary authorities, to aquaculture businesses and traders in the original exporting country within the EU, to the farms in Asia (Crook, 2010a).

Some EU Member States have set requirements with regards to issuing certificates for internal EU trade in *A. anguilla*, such as Portugal (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*), or only allowing intra-EU trade in eels if the quantity and legal origin of the eels (fished or farmed in-country in accordance with national and EU legislation and national EMPs) has been attested by regional fisheries authorities, such as Greece (Greece's response to CITES Notification No.2018/18). These measures have not been made a requirement across the EU, however. Due to the complexities surrounding commercial trade in *A. anguilla* for use in farming and restocking for both fisheries and conservation purposes, and processing within the EU, the lack of certificates clearly stating the purpose of the transaction has hampered attempts to determine the origin of eels harvested and traded within the EU (Crook, 2010b).

Without a harmonised EU-wide tracking system, there is little clarity as to where any possible illegality commences in the glass eel supply chain; at the point of fishing, first point of sale (i.e. to an unauthorised buyer/holding facility), or after they have crossed an internal EU border and are no longer traceable. Furthermore, while efforts have been made by the SEG to encourage those who have achieved its 'Standard' to keep accurate and timely records and e-Declaration systems, this is not policed, no auditing system is entirely safe against fraudulent activity, and not all those involved in eel fishing and farming are linked to the Standard (SEG, 2017).

EU Member States have regularly raised concerns over loopholes with regards to traceability along the eel supply chain that challenge the effective implementation of the CITES listing (DEFRA, 2015; European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015). One issue that has been highlighted is the lack of tracking requirements for dead glass eels for consumption (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015), which according to Briand, *et al.* (2008) has been used by traders to evade CITES controls. For example, there were several cases of mis-declared trade in frozen dead glass eels to Spain and this black market was used to in the past to introduce illegally caught live glass eels into trade. As a result of the mortality of a proportion of the glass eels legally fished, there was opportunity for the dead glass eels to be reported as legal catch of live eels. These were then shipped to Spain for consumption and the same quantity of illegally caught live eels could easily be introduced into legal trade (Briand, *et al.* 2008; Crook 2010a).

Problems related to traceability have also resulted in difficulties implementing new national eel regulations. For example, in Ireland, fishing of eels is prohibited, as is the possession, sale or purchase of any eels caught within the State. However, eels can be legally imported from other EU Member States; due to the lack of an EU-wide traceability system, the origin of these eels cannot always be

confirmed and this has resulted in difficulties enforcing the national byelaws (Ireland's response to CITES Notification No. 2018/18).

Multiple/regional regulations on internal fishing in some of the main EU source countries further complicate the process of tracking *A. anguilla* catches to ensure legality. In Spain there is a National EMP as well as 12 specific EMPs; 11 EMPs for the Autonomous Communities with *A. anguilla* populations, and one EMP for the Ebro River Basin which also has *A. anguilla* population. The National EMP defines the structure and methodology, the monitoring and the evaluation measures and the objectives at national level, whereas each Autonomous Community, with exclusive competences on eel fisheries, created an EMP in accordance with article 2(1) of Council Regulation (EC) No 1100/2007 (A. Galilea Jiménez, Spanish CITES Management Authority, pers. comm. to author, 2018). Each plan/community consequently has different harvest restrictions, for example:

- In Andalucía, fishing of *A. anguilla* has generally been prohibited since 2010, with only some farms permitted to fish and grow out a certain number of *A. anguilla* per annum;
- In Galicia, recreational fishing activity has been completely forbidden, while commercial yellow and silver *A. anguilla* fishing is permitted if performed from a fishing boat using a limited number of fishing gears;
- In Cantabria, there is no professional fishing of yellow or silver *A. anguilla*, and the catches of recreational fishery are insignificant. However, both, professional and recreational glass eel fisheries exist in this region. Recreational fishermen must have the maritime fishing licences and cannot sell the catches, whereas professional fishermen sell their catches in the market or in other licensed establishments. Glass eel fishermen fish inland and they are only allowed to use one sieve ($\leq 1.2 \text{ m}^2$) per fishermen; and
- In the Basque country no professional yellow or silver *A. anguilla* fishing is permitted and the recreational fishery for yellow and silver eel was forbidden in 2009. However, European glass eel fishing is ongoing, and it is mandatory to report the catches and effort data.

These variations in regulations provide an opportunity for fisherman and traders to mis-declare eel specimens as having been fished in a region that allows commercial activity, with the intention to re-export the specimens within or out of the EU (A. Galilea Jiménez, Spanish CITES Management Authority, pers. comm. to TRAFFIC, 2018).

Countries in Asia have also raised concerns over the lack of traceability and consequent unknown source of *A. anguilla* in farms. In 2014, Japanese authorities raised concerns over the legality of live farmed *A. anguilla* "slow-growers" which were being imported into Japan from China. Chinese authorities claimed these were derived from European glass eels legally imported from the EU in 2010. The Japanese Fisheries Agency requested that Chinese authorities further investigate the traceability of these eels as the suggested grow-out periods were much longer than those for *A. japonica* in Japan (TRAFFIC, 2015). A few days later the Chinese government notified Japan that the stock for re-exported French-origin *A. anguilla* would expire by early 2015 and consequently re-exports of French-origin *A. anguilla* to Japan would end after January 2015 (The Japan Times, 2014; TRAFFIC, 2015). However, it was then cited that China may continue to allow re-exports of *A. anguilla* until September 2016, stating that growing out rates for glass eels were longer than expected due to the new techniques used during the farming process (TRAFFIC, 2015). Grow out rates continue to be

questioned by authorities in several importing countries, yet they are reported as legal by authorities in China making it very difficult to reject the imported shipment (TRAFFIC, 2015). The same issue applies to eel products. It was observed that, on average, it takes 18 months for *A. anguilla* to reach commercial size in China (Han, 1999), however this grow out period could last two to three years, in part due to restrictions over the use of chemicals since the 2000s (Shiraishi and Crook, 2015; TRAFFIC, 2015;). Furthermore, after the CITES listing, the Bureau of Fisheries of China (2007) encouraged the growing of larger-sized eels to maximise profits (Shiraishi and Crook, 2015).

After the CITES listing of *A. anguilla*, the EU's SRG set up a Working Group on *A. anguilla* to consider the development of NDFs and to advise on setting export quotas for *A. anguilla* with the view to enable traceability of those catches that are destined for export (EC, 2009a; Crook, 2010b). However, setting these export quotas was reliant on there being the necessary mechanisms in place to quantify catches of eels. EU Member States were therefore required to issue internal EC trade certificates to control internal trade before specimens could be exported from a different Member State from which it was harvested, as stated in Notification to the Parties No. 2009/20 (EC, 2009b; Crook, 2010b).

Initially, export quotas were set for glass eels only, with the view to consider setting export quotas for all other eels and eel products in later years. At the 47th meeting in March 2009, the SRG agreed on the following (EC, 2009b; Crook, 2010b):

- export quotas would be set for 1st November to 31st October to encompass glass eel fishing seasons across the species range within the EU;
- baseline of catches against which future export quota reductions would be measured would be taken from the 2007/2008 fishing season;
- export levels for the 2008/2009 fishing season were set at a maximum of 85% of this baseline; and
- export levels for the 2009/2010 season were set at a maximum of 43% of the baseline for those countries with approved national Eel Management Plans and zero for those with no approved plans.

However, at COM 48 in September 2009 it was decided to set export levels for the 2009/2010 glass eel fishing season at 21.5% of the baseline for those Member States with approved EMPs in place, due to the sharp decline in catches of glass eels during the 2008–2009 fishing season (Crook, 2010b). Then in December 2010, the SRG concluded that it was not possible to perform a NDF for the export of *A. anguilla* (see Section 6.1), and subsequently there has been a zero-quota policy and EU CITES Management Authorities do not allow export of eels (EC, 2014b).

6.4 Transhipments of American eels

Following the CITES listing of *A. anguilla* and the establishment of zero quotas by EU Member States, there was an increase in demand, harvest and trade of other *Anguilla* species to meet ongoing demand in Asia, particularly to supply their farming operations (CITES, 2017a). Amongst the species involved in this trade was *A. rostrata*, the American eel, which is also believed to spawn in the Sargasso Sea in the Western Atlantic Ocean (Tesch, 2003), of which fishing of glass eels or elvers occurs mainly in the

USA and Canada, but also across its southern range in the Dominican Republic, Haiti and Cuba (Jacoby, *et al.* 2017).

Some shipments of *A. rostrata* are legally transited through European airports and holding facilities *en route* to Asia (Jacoby, *et al.* 2017; TRAFFIC, 2015; TRAFFIC, 2017a; the UK's response to CITES Notification 2018/018). For example, according to Customs data, between January and May 2016 a total of 2000 kg of glass eels from the USA, Canada and Haiti were reported as traded via Italy and the UK before being re-exported to Hong Kong SAR (TRAFFIC, 2017a). As there is the possibility of traders mixing shipments of *A. rostrata* with *A. anguilla* whilst specimens are in transit through EU Member States, this has resulted in another complexity for enforcement officers trying to ensure the legality of shipments *en route* to East Asia, particularly as accurate species identification of glass eels requires DNA barcoding (Silfvergrip, 2009; Stein *et al.*, 2016). Furthermore, it is important to note that *A. rostrata* is now being farmed in the EU – Denmark has reported importing this species from the US and Canada in recent years to supply its farms (Denmark's response to CITES Notification No. 2018/018).

6.5 Overlapping jurisdictions

The range of the *A. anguilla* spans Europe, Mediterranean Asia and North Africa. European range States include countries that are not members of the EU, and this has consequently caused confusion regarding permits required when live eels are fished in water bodies with over-lapping jurisdictions, such as Kaliningrad (which borders Poland and Lithuania along the Baltic coast, but is part of the Russian Federation), and the Bodensee (between Germany, Austria and Switzerland). A decision was made in 2008 at COM 45 that any live specimen of *A. anguilla* caught by fishermen from the Bodensee lake and landed on EU-member states shores (i.e. Germany and Austria) would not require EU CITES import permits. However, those live specimens which were landed on the shores of Switzerland and were subsequently imported into the EU would require EU CITES import permits (EC, 2008).

6.6 Regional and international collaboration

6.6.1 Regional cooperation

A. anguilla is a panmictic species and considered to be made up of one population ranging across the continental waters of most of Europe and some parts of Mediterranean Asia and Northern Africa before spawning in the Sargasso Sea (Jacoby and Gollock 2014). Due to the overlapping range of the species across the EU, significant complexities arose with the implementation of the CITES listing as it relied upon effective co-operation not only between the different EU Member States, but also the different authorities within each country. Effective implementation of such a complex species required the involvement of:

- inland and maritime water authorities;
- fisheries authorities;
- veterinary authorities;
- national police inspectorates;
- Customs authorities;
- Other CITES enforcement authorities; and

- CITES Management Authorities (TRAFFIC, 2015).

However, range States had limited experience of implementing a CITES listing of a commercially important native fisheries species found in both marine and freshwater environments across a very wide range. Some examples of issues that arose, noted by EU Member States, include:

- *Lack of information sharing between different authorities within one EU Member State.*
CITES Management Authorities and fisheries authorities have been slow in passing on information to enforcement authorities regarding national trade restrictions, and the months when fishermen are focusing on catching the different life stages of *A. anguilla*. If enforcement officers had access to this information they would be much better equipped to target operations towards specific types of illegal trade depending on the time of year (Crook 2010a, European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*).
- *Lack of effective cooperation between EU Member State authorities due to differences in national approaches to enforcement set out by national legislation.*
Difficulties in effectively sharing illegal eel trade information, such as:
 - lack of information sharing on specific crime groups;
 - inconsistent communication throughout the European glass eel fishing seasons;
 - insufficient sharing of photos of previously seized shipments; and
 - insufficient sharing of information on new smuggling techniques (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*).
- *Different priorities across EU Member States.*
Not all EU Member States are implicated in *A. anguilla* fishing and trade—the main source countries of European glass eels within Europe include Spain, Portugal, France and the UK, while other EU countries such as Bulgaria, Greece and Hungary are used as transit countries (EC, 2016). This means that some authorities were focused on different priorities within their territories (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*).

6.6.2 International cooperation

East Asian countries/territories in particular, play important roles with regards to the traceability and legality of live *A. anguilla* and eel products (TRAFFIC, 2015; TRAFFIC, 2017a). While Hong Kong SAR does not have farming operations for eels, it is used as a transit hub for importing glass eels from various sources destined for re-export to East Asia (Crook and Nakamura, 2013; Crook, 2014). China is subsequently a major market for farming operations, having used pre-Convention European glass eels, those legally exported prior to the EU trade ban in December 2010 and those exported from North Africa (Crook, 2010a).

EU Member States have however faced challenges with regard to cooperation, communication and information sharing with some of the trading partners, such as China and Hong Kong SAR (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015). For

example, some EU Member States have had difficulties getting clarification to determine the validity of Customs records or additional information on seizures made in Asia or shipments re-imported back into the EU, which has hindered enforcement efforts and investigations or effective implementation (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015). This lack of co-operation and associated traceability was particularly concerning for EU Member States as China have been claiming to be simultaneously using a mixture of “slow-growers” (derived from specimens imported from the EU prior to the trade ban in December 2010) and imported specimens of *A. anguilla* from North African countries, such as Morocco and Tunisia. This is further confounded by concerns over China using illegally imported specimens from the EU and other countries (TRAFFIC, 2015). This means that EU Member States have often been unsure as to the provenance and origin of China’s re-exports of *A. anguilla* and could therefore not ensure the legality of shipments coming back into the EU.

6.7 Conclusions regarding implementation issues

Ensuring trade is traceable and sustainable are two fundamentals of a CITES Appendix II listing. The above text highlights issues relating to these, as well as the importance of improving international co-operation. It also highlights how the EU ban added further complexities to monitoring trade. NDFs were a specific point of discussion at the London Workshop and many of the points raised in the study were echoed in the meeting. Below conclusions arising from this section are outlined:

Non-Detriment Findings

- Collaboration of range States on a stock-wide NDF and/or considering the harmonisation of how NDFs are made would be useful considering the life history of the species.

European Union

- Further harmonisation of EU Member States’ Eel Management Plans, particularly in relation to regional regulations on internal fishing would reduce the opportunity for traders to mis-declare specimens; i.e. as having been fished in a region that allows commercial activity, with the intention to re-export the specimens out of the EU or trade them within the EU). The ongoing review of Council Regulation (EC) 1100/2007 may provide opportunity for this;
- The development of national/intra-EU strategies by EU Member States to combat illegal fishing and regulate trade is required;
- Developing the requirement of internal certificates to accompany commercial *A. anguilla* shipments within the EU would help with implementation of the listing (also applicable to traceability below).

Traceability along the eel supply chain

- Tracking requirements should be in place for glass eels reported as dead for consumption.

International and inter-agency co-operation

- Information sharing and communication among different competent authorities at the national, regional (EU) and international level – including importing Parties – could be strengthened.

- Information on North African *A. anguilla* range State management measures and fishing regulations would be of use, especially to other range States and trading partners;

7. Illegal trade and enforcement

In the years following the various international conservation measures described above, the black-market trade in live *A. anguilla* to meet demand in East Asia, particularly in glass eels, increased significantly due to the restricted availability of specimens for farming caused by decline in stocks, and establishment of export quotas and trade bans (Crook 2010a; European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). Evidence of mis-declaration of specimens has been reported by enforcement authorities across the EU, and the dynamics of smuggling operations to evade controls has become more organised and sophisticated in recent years (Crook 2010a; European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). The following sections discuss mis-declaration, smuggling and enforcement challenges.

7.1 Mis-declaration of *A. anguilla*

Known methods of mis-declaration of *A. anguilla* to circumvent controls include (Crook, 2010a):

- mis-declaration of specimens as pre-Convention;
- mis-declaration of specimens as post-Convention, specifically for re-imports into the EU; and
- mis-declaration of species.

During the first few years of the CITES listing and prior to reaching the cut-off dates for permitted trade (Table 22), another complication for enforcement arose from the mis-declaration of pre-Convention specimens to circumvent controls (Crook, 2010a; TRAFFIC, 2011). Furthermore, there were concerns over the mis-declaration of specimens as post-Convention (i.e. exported legally between March 2009 and December 2010) for those specimens being re-imported back into the EU from East Asia (Crook, 2010a; TRAFFIC, 2011). As eel farms in China often use a mix of *Anguilla* species and there is a lack of clarity over precise methods used in farming operations in the region (Shiraishi and Crook, 2015), it was extremely challenging for enforcement officials to ensure the legality of returning shipments. This was further augmented due to the lack of traceability along the eel supply chain meaning there was the potential risk of the EU re-importing much larger quantities of specimens than were originally exported from the EU between March 2009 and December 2010 (TRAFFIC, 2011). The black market for frozen eels has also posed challenges for enforcement officers (Crook, 2010a; European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015). Due to some fishing practices resulting in a high mortality rate of glass eels legally fished - which can be up to 40% - traders have used this as an opportunity to report the dead glass eels as legal catch of live eels. These were then shipped to Spain for consumption and the same quantity of illegally caught live eels could easily be introduced into legal trade (Briand, *et al.* 2008; Crook 2010a). EU Member States have also reported several re-imports of frozen eel products falsely declared as *A. japonica*. For example, in 2009, two 25 tonne shipments of frozen eels coming from China were seized in Poland. In both cases, the specimens were declared as *A. japonica*, however after DNA tests were conducted, it revealed the presence of both *A. anguilla* and *A. japonica* in the first shipment, and a mixture of *A. rostrata*, *A. japonica* and *A. anguilla* in the second (Crook, 2010a). In 2015, Germany reported internal seizures involving 24 t of *A. anguilla* and *A. rostrata* meat that had been imported from China, and falsely declared as *A. japonica* (TRAFFIC, 2017b).

7.2 Smuggling

The concealment of live *A. anguilla* and eel products with the intention to circumvent controls has been documented by various sources including CITES authorities and media publications, and traders are regularly developing new ways to avoid detection (Crook, 2010a; CITES, 2017b; EC, 2016). Known smuggling methods include:

- transporting shipments via air freight within containers of other goods;
- hiding specimens in personal baggage;
- travelling via road; and
- shipping specimens from the EU through North Africa *en route* to Asia.

Seizure information provided by EU Member States reveals that European glass eels have been smuggled on a commercial scale through air freight whereby specimens are hidden within shipments of other fishery products. For example, in February 2014, Portuguese authorities seized two live glass eel shipments totalling 272 kg (estimated at a value of EUR 400 000 in China) which were hidden among other goods, in air freight destined for China (EC, 2016).

In recent years, authorities have increasingly reported the involvement of organised criminal networks in the movement of legally and illegally sourced European glass eels from the EU to East Asia, principally to China, and have seen traders regularly change travelling routes and their *modus operandi* to circumvent controls (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015; A. Galilea Jiménez, Spanish CITES Management Authority, pers. comm. to TRAFFIC, 2018). Methods include:

- EU Member States have reported smuggling of *A. anguilla* and eel products via road with specimens concealed in numerous ways. For example, in 2015, Poland reported a seizure of approximately 500 kg of frozen eel meat at a road border point with Russia. The specimens had been concealed in the walls of the car and were destined for export out of the EU (CITES 2017b).
- There are several reports of traders smuggling smaller quantities of glass eels in chlorine-free water filled plastic bags in personal baggage to avoid detection (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). For example, on 5 January 2016, four items of luggage containing plastic bags filled with live glass eels, water and oxygen were seized at Hong Kong International Airport after export from Madrid. These eels were tested using DNA analysis and the species was confirmed as *A. anguilla* (Stein, *et al.* 2016). In 2017, Dutch authorities seized 72 kg of live *A. anguilla* at Schiphol airport which were hidden in water filled plastic bags in suitcases destined for China (NVWA, 2017).

During the 2015-2016 glass eel fishing season, EUROPOL initiated Operation LAKE, a European initiative aimed at combatting illegal eel trade and dismantling organised networks involved in the associated illegal activities (Europol, 2017). This initiative was set up alongside law enforcement and CITES management authorities from France, Greece, Italy, Portugal, Spain and the UK, and Eurojust (The European Union's Judicial Cooperation Unit) (Europol, 2017). As part of this initiative, authorities in Spain (SEPRONA) set up investigations to intercept illegal shipments of glass eels *en route* from the

EU to East Asia. A Chinese syndicate had set up facilities near Barajas Airport (Madrid) to keep large quantities of glass eels. From there they were packed into suitcases ready to transport in oxygenated water-filled plastic bags as personal luggage to East Asia (Hong Kong SAR mainly). By the next season, 2016-2017, in the framework of Operation LAKE at Europol, SEPRONA launched an investigation into another company involved in eel trade. Large quantities of glass-eels were being transported using trucks through Italy to Greece, in refrigerated isolated tanks with oxygenated water and filtration systems to keep the glass eels alive. Then the glass-eels were unlawfully sent via air cargo to China as mis-declared goods (A. Galilea Jiménez, Spanish CITES Management Authority, pers. comm. to TRAFFIC, 2018).

Further seizures also occurred under the umbrella of Project LAKE (Europol, 2017, Europol, 2018):

- Operation Abaia, Greek and Spanish authorities, supported by Europol and Eurojust, dismantled an international criminal network suspected of having smuggled 10 t of eels from the EU to China. These raids led to the arrest of 32 individuals and 2 t of *A. anguilla* worth EUR 2 million;
- The Portuguese Service for Protection of Nature and Environment (SEPNA), which is part of the National Republican Guard (GNR), also arrested seven people suspected of glass eel trafficking and the ASAE, the authority responsible for food safety and economic surveillance, seized 120 kg of glass eels at Lisbon airport;
- Operation CIVELLES II saw the Central Office on the Fight against Threats to Environmental and Public Health of the National Gendarmerie of France (OCLAESP) and the Customs authorities seize almost 1.2 t of eels;
- In 2017, UK Border Force arrested an individual for attempted smuggling of 500 kg of glass eels through Heathrow airport *en route* to Asia; and
- In 2018, In Operation Elvers led by the Spanish Guardia Civil in collaboration with the Portuguese authorities and supported by Europol, ten members of an organised crime group involved in illegally exporting glass eels to Asia were arrested. The group was based in Spain, but also operated out of Portugal and Morocco, confirming some of the glass eels had been shipped from Europe via Morocco to Asia.

Combating illegal trade of *A. anguilla* is still very much a priority for enforcement authorities across the EU (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015). Stricter controls related to glass eel exports, associated enforcement effort at the main ports of exit to Asia, and cooperative investigative operations by EU Member States have made it more difficult for traders to evade controls in the EU. Consequently, traders have shifted to alternative illegal trade routes and have been reported smuggling glass eels from the EU through North Africa *en route* to Asia (Crook, 2010a; TRAFFIC, 2015; TRAFFIC, 2017a). There is information to suggest that there were small shipments of European glass eels from France and Spain *en route* through Morocco and destined for China during the last fishing season (TRAFFIC, 2017a). In January 2018, Spanish authorities arrested an individual attempting to smuggle 65 kg of live *A. anguilla* from the port in Tarifa, Spain destined for Morocco. The specimens were being transported in a van in water-filled plastic bags and were concealed in four large suitcases (La Guardia Civil, 2018).

7.3 Enforcement challenges

In addition to changes in legislation, the dynamics of smuggling operations, concealment methods and transport routes being used, enforcement officers face challenges with regard to handling and identifying eel species.

7.3.1 Handling /controls by Customs officers

Enforcement officers regularly face a range of challenging situations when handling shipments of live specimens and traders are known to exploit the hesitance of enforcement officers to intercept shipments of live animals to circumvent CITES controls (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). This is particularly the case for live European glass eels, an exceptionally high value commodity which has reportedly been sold for between EUR 1200 and 1500 per kg in East Asia (EC, 2016), and requires transportation under certain controlled atmospheres to avoid high rates of mortality (Crook, 2010a).

On a commercial scale, live European glass eels exported via air freight are transported in small Styrofoam boxes that are packaged within larger refrigerated containers. Traders use a variety of different sized boxes with trays separating several layers of glass eels which are mixed with water in a proportion of 1/3 water to 2/3 fish. Ice is added to each box, the atmosphere inside is enriched with oxygen and boxes are then sealed, either with tape or shrink wrap. Under these conditions, glass eels can survive for 36 hours (Crook, 2010a).

To ensure their survival, the glass eels must be kept moist and in an oxygenated atmosphere. If officials wish to inspect a shipment, to determine the actual weight, quantity, species and size of the specimens, they must open the sealed container containing ice and water to verify its contents match those on the CITES permit. In doing so, the oxygenated atmosphere would be lost, and the specimens may be damaged if handled by an inexperienced individual. Due to the high value of glass eels, even randomised inspections of shipments for enforcement purposes could lead to considerable loss to a legitimate trader (Crook, 2010a).

Furthermore, there are also difficulties regarding the subsequent handling of seizures. Enforcement officers have raised concerns over finding suitable storage facilities, transport and locations for release (live specimens often require to be returned to their country of origin), and as such a large number of seized eels die prior to their release (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015; Spain's response to CITES Notification No. 2018/18; UK's response to CITES Notification No. 2018/18).

Finally, although combating illegal eel trade in the EU may be a priority for CITES enforcement official, detection of eels is not necessarily considered a priority for security and baggage controls at airports. In addition, the majority of passengers and commodities pass through green channels and therefore do not undergo additional checks (Spain's response to CITES Notification No. 2018/18).

7.3.2 Species identification

Combatting illegal trade of *A. anguilla* continues to be a priority for enforcement officers to ensure legality and compliance with international regulations (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC, 2015), however, unlike some animal and plant species which are easily identifiable, this is a more complex issue for the genus *Anguilla*. With some animal and plant species, enforcement officers can use geographical provenance as a good indication of the species and can often take this into account when verifying the legality of import and export shipments (Crook, 2010a). While this can be the case for exports of live European glass eels from the EU as many are the main source countries of the species, this is not possible for other eel products and re-imports of *A. anguilla* into the EU from Asia, as there is a large market for other species, such as *A. japonica* (Crook, 2010a).

Experts have advised that on-the-spot identification of *Anguilla* species cannot be accurately carried out using photos and keys and that DNA analysis carried out by an accredited scientific institution must be used to identify species (EC, 2012). Suggested protocols for Customs officers and accredited institutions on species identification have been produced (Crook, 2010a; Silfvergrip, 2009), however there is significant margin for error due to lack of training and inexperience, and the meticulous sampling techniques required to obtain accurate results. The Swedish Natural History Museum and the Swedish Environmental Protection Agency, in collaboration with the CITES Secretariat and FishBase, developed an online eel identification tool specifically aimed at enforcement officials, which can be used to try to identify the species in trade (<http://artedi.nrm.se/eel>) (Crook, 2010a). Nevertheless, the challenges associated with relying on morphology when trying to identify species, particularly in the absence of key morphological characters in juvenile specimens and processed products, have been recognised. DNA barcoding has emerged as an effective method for species identification, has been used to identify protected species in trade such as endangered turtles and protected aquatic species (Asis, *et al.* 2014; Rehman, *et al.* 2015), and was successfully used in identifying illegally traded *A. anguilla* from EU Member States to Asia (Stein, *et al.* 2016).

These tools aid enforcement officers in identifying the species contained in shipments and it has also been acknowledged that awareness of such protocols and associated identification schemes (molecular and morphological) serve as a deterrent to traders for future mislabelling of *Anguilla* shipments (Crook, 2010a). It has been noted, however, that questioning the authenticity of a declared species is at the discretion of Customs officers, therefore in the past some illegal trade may have not been detected if DNA analysis was not requested. As eels are now considered a priority species in the EU, it has been recommended that all shipments declared as non-CITES listed *Anguilla* spp. be checked (Poland's response to CITES Notification No. 2018/018).

Hong Kong Customs has reported difficulties in relation to *Anguilla* species identification. Hong Kong is a trade hub for eels destined for farming operations in East Asia, and as such Customs handle various species of live eel fry. Customs can detain passengers only for a certain period of time (several hours), which is not always long enough to obtain the results of DNA analysis (Agriculture, Fisheries and Conservation Department of the Government of the Hong Kong SAR, pers. comm. to TRAFFIC, November 2017).

7.4 Conclusions regarding illegal trade and enforcement

At the London Workshop during the discussions of the working group on illegal trade the same or similar issues were raised as outlined in this section but also in other sections of the study (e.g. on reporting and traceability). In terms of reporting, the workshop participants agreed that reporting of seizures to CITES and the sharing of seizure information, including life stage information, should be encouraged. They also recommended the review of the descriptive terms ('live' and 'fingerlings') used in reporting trade under CITES in general as also suggested by this study. The workshop participants also recognised that timely and robust systems for reporting catches would facilitate the enforcement of regulations. The need for improved traceability along the supply chain was noted suggesting that special attention should be paid to the intra-EU movement of *A. anguilla* for restocking and consumption purposes. The discussions at the workshop also highlighted the need for systematically carrying out DNA tests on seized specimens to determine the species, using methods acceptable in subsequent prosecutions. In terms of enforcement methods, the workshop participants acknowledged the example from Spain as a good practice, which extrapolated previous illegal trade information to determine levels of illegal trade. Improved collaboration was also a recurring theme, also noted in this study. The discussions also explored options for collaboration beyond the authorities, with stakeholders such as local communities, scientific institutions and traders.

The conclusions from this study are outlined below. Several issues raised in, and conclusions from, previous sections are also relevant for illegal trade and enforcement of eel trade controls, such as those on traceability and reporting. These are however not repeated here.

International and inter-agency co-operation

- The regular sharing of enforcement (Customs and seizure) information from Trading Parties, especially importers and re-exporters, with *A. anguilla* range States could help with combatting illegal trade.

Enforcement challenges

- Improved training of enforcement officers handling and inspecting shipments of live *A. anguilla* would be useful as the specimens may be damaged if handled by an inexperienced individual.

Species identification

- In order to address identification issues concerning *Anguilla* species in trade, the consideration of potential challenges and benefits of available techniques and mechanisms would be useful.

8. Effectiveness of the CITES Appendix II listing

In this section, we will summarise the effectiveness of the listing as determined by research carried out during the drafting of the study, Parties to responses to CITES Notification No. 2018/018 and discussions during the workshop held in London, 18th-20th April 2018. A fuller summary of the discussions held at the London Workshop can be found in the associated report submitted to the Animals Committee.

There has been growing concern over the status of *A. anguilla* over the past decades (ICES Advice, 2008; ICES Advice, 2016; ICES Advice, 2017) and the CITES listing of *A. anguilla* in 2007, which came into force 18 months later in March 2009, was a fundamental instrument in acknowledging population decline and that the species required protection (CITES, 2007b; European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). At the EU level, the CITES listing of European eels combined with EU Council Regulation (EC) No 1100/2007 have led to the adoption of management and conservation measures specifically designed to stimulate the recovery of species, in particular the escapement of adult eels and ultimately the recruitment of glass eels. These measures have led to a reduction of legal fishing effort and catches of eels. Other measures, notably to improve the river continuity to allow eels to migrate, have also been put in place (EU response to CITES Notification 2018/018).

Individual member States have also reported improved management of the population as a result of the CITES listing, due to more attention being paid to the species from both environmental and fisheries administrations (Poland's response to CITES Notification No. 2018/018). However, in view of the specificities of the life cycle of eels – for example, the average generation length has been estimated as 15 years (Jacoby and Gollock, 2014) it will take time before measurable progress can be identified as a result of the CITES listing and other management and conservation measures (EU response to CITES Notification 2018/018).

While CITES has been criticised in terms of its effectiveness, resulting in limited conservation successes due to various factors, including non-compliance, over-reliance on regulation, lack of knowledge and monitoring of species (Challender, *et al.* 2015), it has set a clear framework for CITES Parties, EU Member States and international governmental organisations (IGOs) to protect the species, in relation to unsustainable exploitation and trade. Further, it has raised the profile of trade in *A. anguilla* across various fora within the EU, and internationally (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*).

Furthermore, in 2014 the species was added to Appendix II of the Convention on Migratory Species (CMS)⁴³, which calls on all Parties to the Convention, covering the near entire distribution of *A. anguilla*, for co-operative conservation actions to be developed – these were agreed at the 12th Conference of the Parties in Manila in 2017⁴⁴.

⁴³https://www.cms.int/sites/default/files/document/Doc_24_1_18_Prop_II_12_Rev.1_Anguilla_anguilla_%28European_eel%29_MCO_E.pdf

⁴⁴ https://www.cms.int/sites/default/files/document/cms_cop12_ca.12.1_european-eel_e.pdf

As a result of the conservation measures put in place, several EU Member States have also developed strategies to combat illegal fishing and regulate trade. These include:

- *Regulating internal trade within the EU and improving traceability*

In Portugal, all stakeholders which trade or transfer specimens of *A. anguilla*, including live glass eels, need to be registered at the national CITES Management Authority and all shipments need to be accompanied by internal trade certificates. Between January and February of each year, all registered entities need to send an update of the movements of specimens from the previous year (J. Loureiro, Portuguese CITES Management Authority, pers. comm. to TRAFFIC, 2018).

For the 2009–2010 glass eel fishing season the French Management Authority requested that all traders apply for internal certificates for trade in live European glass eel. Traders were also requested to provide an indication of purpose of the trade to aid traceability, for example destined “for immediate consumption”; “for farming and later consumption”, “re-stocking”, and “export”, and, when the indicated purpose was re-stocking, to provide evidence that the re-stocking actions were enshrined in a French EMP in accordance with EU Council Regulation (EC) No 1100/2007. The same system applied for the following two glass eel fishing seasons (2010–2011 and 2011–2012), with the exception that the purpose of the trade could not be “export” after 3rd December 2010 (the trade ban set by the EU). Considering the EU trade ban and the need to make best use of the limited available human resources within the French CITES Management Authorities, it was decided that the Internal Trade Certificates scheme would not be used from the 2012–2013 fishing season onwards. As a result, since 2012 when enforcement officers control the legality of the glass eels and eels at other biological stages in trade, they directly consider the documents required under the French fishing regulations (Crook, 2010a; M. Ciambelli, French CITES Management Authority, pers. comm. to TRAFFIC, 2018).

- *Development of new legislation/reporting requirements*

The UK brought in three new regulations to implement Council Regulation (EC) No 1100/2007. These include:

- “The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008” on 26th January 2009 (Scottish Ministers, 2009);
- “The Eels (England and Wales) Regulations 2009” on 15th January 2010 (Secretary of State and Welsh Ministers, 2009); and
- “The Eel Fishing Regulations (Northern Ireland) 2010 on 1st June 2010 (Department of Culture, Arts and Leisure, 2010).

Under Part 2 of “The Eels (England and Wales) Regulation 2009” there are strict reporting requirements to control illegal fishing and trade, and to ensure traceability of all catches, exports and imports of eels, particularly glass eels. For example:

1. Any person with the authority to fish for eels is required to submit an eel catch return including information, such as the total weight of eels caught of 12 cm or less in length, and the total weight of those specimens retained dead and alive;

2. Any aquaculture production business must keep an accurate record of any eels received, such as the name and fishing license identification number of the person who caught the eels, and the destination of any eels sold;
 3. Any person who imports live eels in England and Wales from any country including EU Member States must provide detailed information on the eels obtained, including information on the aquaculture business who provided the eels, where the eels were caught and the fishing license identification number of the person who caught the eels and prepare and sign a certificate to that effect;
 4. Any person who exports live eels from England and Wales must provide detailed information on the eels destined for trade, including where and the date on which the eels were obtained (such as the aquaculture business or the river basin) and be satisfied that any eels caught from a river basin were caught in a manner that was consistent with the EMP prepared for that river basin, and prepare and sign a certificate to that effect; and
 5. Any consignee must not accept a shipment of eels unless it is accompanied by a certificate that details the relevant information on imports and exports (points 3 and 4) and where eels have been added to the consignment, a copy of the certificate accompanying the other consignment as well. All consignees must retain the certificate for 12 months from the date of the certificate and allow the Environment Agency to inspect the certificate at a reasonable time.
- *Collaborative investigations within the EU to combat illegal trade*
By raising the profile of *A. anguilla*, the EU has taken the opportunity to, *inter alia*, improve co-operation within its borders and it has set up collaborative operations to combat illegal trade (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). During the 2015–2016 European glass eel fishing season, EUROPOL initiated a collaborative EU-wide operation, Operation LAKE, aimed at combatting illegal trade of *A. anguilla* and dismantling organised networks involved in the associated illegal activities. This initiative was set up alongside law enforcement and CITES Management Authorities from France, Greece, Italy, Portugal, Spain and the UK and Eurojust and has set a good example of what can be achieved through international cooperation against wildlife crime (Europol 2017). Operational activities carried out during the 2016–2017 fishing season saw 48 people arrested and 4000 kg of glass eels seized which amounted to approximately EUR 4 million. It was also proven that more than 10 t of glass eels had been smuggled from the EU to China between 2016–2017, with an estimated profit of EUR10 million (Europol 2017).
 - *Prioritising A. anguilla within EU enforcement discussions*
Since the CITES listing of *A. anguilla*, the species and its protection has also been a major point of discussion at the bi-annual EU Enforcement Group meetings (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*). These meetings bring together representatives from each of the 28 EU Member State's authorities that have responsibility for monitoring compliance with the Regulations, such as Customs, Police and Wildlife Inspectorates, as well other international organisations, such as Europol and Interpol, and other relevant stakeholders. It provides a forum for these experts to exchange information, experience and expertise on wildlife trade control related topics (EC, 2018). As

part of these meetings, in relation to eels, the European Commission and EU Member States have:

- made efforts to better co-operate with China and Hong Kong SAR;
- held discussions with industry, such as SEG, on issues in implementing the CITES Appendix II listing, clarifying information and improving collaboration; and
- set up an illegal eel trade working group focusing on facilitating information exchange, smuggling, traceability and permitted trade (European Commission, as Chair of the Enforcement Group Meetings, pers. comm. to TRAFFIC*).

At the London Workshop there was broad agreement that it was key to recognise that listing any species was not an achievement in its own right and that implementation was critical. Similar to the content of this study, it was recognised that the listing had raised the profile of the species and mobilised political will. However, it was also recognised that the listing, and the EU response to the listing, had shifted exploitation and trade to other species, and potentially caused an increase in illegal trade – whether the overall catch, both legal and illegal, before and after the listing has changed was also discussed. It was acknowledged that a trade ban alone could not address the situation and an assessment of demand and whether it could be met sustainably was required. There were discussions around what metrics would be useful to determine the effectiveness of the listing. A recent paper (Friedman, *et al.* 2018) aimed to assess the effectiveness of CITES Appendix II listings of sharks and rays in South East Asia and used five criteria/indicators – governance, fishery, stocks, markets and socio-cultural – to assess this. It may be possible to use similar criteria for the eel but it would need to be agreed at which level this occurred e.g. river-basin, national, range-wide. Further discussion focussed on using the guiding principles of CITES - to ensure any trade is sustainable, legal and traceable – to determine whether the listing had been effective. As has been stated previously in the document, it was acknowledged that there are issues relating to all of these criteria - determining a sustainable catch has presently not been possible; illegal trade is clearly occurring and to what level is difficult to quantify; and there is no harmonised range-wide, traceability mechanism for the species and its multiple life-stages.

Ultimately, it was agreed that assessing the effectiveness at present was challenging due to a number of confounding factors, such as, a lack of agreed metrics, the panmictic life history of the species, the multiple threats that potentially impact stock status and the generation length of the species being greater than implementation of the listing. Further, as the CITES listing, Council Regulation (EC) No 1100/2007 and the EU import/export ban all came in to effect within the period of three years, and had an impact on exploitation and/or trade, it is difficult to determine whether one, some or all of them drove observed changes. It was highlighted at the workshop that the effectiveness of Council Regulation (EC) No 1100/2007 would be reviewed in the next 12 months⁴⁵, and as such, the challenges raised above will hopefully be helpful in this process.

⁴⁵ http://ec.europa.eu/info/law/better-regulation/initiatives/ares-2018-1986447_en

9. Summary of conclusions

The conclusions made throughout the document are collated below:

Reporting of CITES trade data

- The reporting of as complete information as possible by CITES Parties in their annual reports (without omitting key information, such as term and country of import) would strengthen data sets;
- In the context of reporting trade in *A. anguilla*, formulating guidance would help CITES Parties with their reporting, avoid incorrect uses of source codes (especially 'C' and 'F') and strengthen data sets;
- Agreement on the consistent use of descriptive terms ("LIV" vs "FIG", "BOD" vs. "MEA" for frozen eels) and the related preferred unit of reporting (e.g. currently number of specimens for "LIV") would greatly facilitate trade data analyses, yielding more meaningful findings;
- The definition for fingerlings may warrant adjustment to make it applicable to eel species (see also Customs data);
- As live glass eels are transported in water, it would be of use to clarify whether reporting of trade quantities by weight (kg) should include the water in which they are transported, taking into account consistency with information required in Customs declarations;
- As the *A. anguilla* fishing season for glass eels crosses calendar years, (in Europe the season generally lasts from October to April), complementing CITES trade data analyses with Customs data (available by month) would help to capture trends typical of a fishing season;
- A lesson learnt from the early years of the CITES listing is that there should be agreement and clarity among Parties on how to report re-exports of pre-Convention specimens (i.e. these should not be recorded as exports from non-range States even if the country of origin is unknown), which may be useful to consider for future listing of other species.

Customs data

- Standardised or comparable definitions/codes for the different eel life stages would facilitate trade data analyses;
- Coordinating any future changes to Customs codes to ensure this is applicable across all *Anguilla* range States would facilitate trade data analyses. This is also relevant to fisheries/other management measures, such as limits on export set by length or weight;
- Customs and farming data is useful for cross-checking trade reported under CITES to help identify discrepancies, and where follow-up and clarification by relevant Parties is needed;
- Customs data is a useful resource for monitoring possible impacts of the CITES listing of *A. anguilla* on other eel species;
- Sharing of relevant information by Parties that use *A. anguilla* for farming on their operations and supporting information for issuing re-export certificates (e.g. farming output, traceability and origin of live eel fry) with both range States, and Parties involved in international trade of the species, would be very useful in understanding trade dynamics.

Implementation issues

Non-Detriment Findings

- Collaboration of range States on a stock-wide NDF and/or considering the harmonisation of how NDFs are made would be useful considering the life history of the species.

European Union

- Further harmonisation of EU Member States' Eel Management Plans, particularly in relation to regional regulations on internal fishing would reduce the opportunity for traders to mis-declare specimens; i.e. as having been fished in a region that allows commercial activity, with the intention to re-export the specimens out of the EU or trade them within the EU). The ongoing review of Council Regulation (EC) 1100/2007 may provide opportunity for this;
- The development of national/intra-EU strategies by EU Member States to combat illegal fishing and regulate trade is required;
- Developing the requirement of internal certificates to accompany commercial *A. anguilla* shipments within the EU would help with implementation of the listing (also applicable to traceability below).

Traceability along the eel supply chain

- Tracking requirements should be in place for glass eels reported as dead for consumption.

International and inter-agency co-operation

- Information sharing and communication among different competent authorities at the national, regional (EU) and international level – including importing Parties – could be strengthened.
- Information on North African *A. anguilla* range State management measures and fishing regulations would be of use, especially to other range States and trading partners;

Illegal trade and enforcement

International and inter-agency co-operation

- The regular sharing of enforcement (Customs and seizure) information from Trading Parties, especially importers and re-exporters, with *A. anguilla* range States could help with combatting illegal trade.

Enforcement challenges

- Improved training of enforcement officers handling and inspecting shipments of live *A. anguilla* would be useful as the specimens may be damaged if handled by an inexperienced individual.

Species identification

- In order to address identification issues concerning *Anguilla* species in trade, the consideration of potential challenges and benefits of available techniques and mechanisms would be useful.

References

Asis, A.M.J.M., Lacsamana, J.K.M., and Santos, M.D. (2014). Illegal trade of regulated and protected aquatic species in the Philippines detected by DNA barcoding. *Mitochondrial DNA Part A*, 27 (1): 659–666. DOI: 10.3109/19401736.2014.913138.

Anonymous. (2018). Quantifying the illegal trade in European glass eels (*Anguilla anguilla*): Evidences and Indicators. *Sustainable Eel Group*, SEG-Report (1) Version 1.

Bureau of Fisheries, Ministry of Agriculture of China (2007). Influence of inclusion of European eel into CITES Appendix II on China eel industry and suggestions. http://www.moa.gov.cn/sjzz/yyj/xinwen/200710/t20071012_2091876.htm. (in Chinese)

Briand, C., Bonhommeau, S., Castelnaud, G. and Beaulaton, L. (2008). An appraisal of historical glass eel fisheries and markets: landings, trade routes and future prospect for management. In: *The Institute of Fisheries Management Annual Conference 2007*. Ed. C. Moriarty. Westport, Ireland.

Bustamante Quinto, D.S. and Segovia Tello, E.B (2006) *Proyecto de inversión para la exportación de anguilas con destino a los países asiáticos: China, Japón y Corea del Sur*. Thesis para la Escuela Superior Politecnica de Litoral, Guayaquil, Ecuador: <http://www.dspace.espol.edu.ec/bitstream/123456789/5561/1/D-36924.pdf>

Butts, I. A. E., Sørensen, S. R., Politis, S. N., & Tomkiewicz, J. (2016). First-feeding by European eel larvae: A step towards closing the life cycle in captivity. *Aquaculture*, 464, 451-458.

Challender, D.W.S., Harrop, S.R., MacMillan, D.C., (2015). Towards informed and multi-faceted wildlife trade interventions. *Global Ecology Conservation*, 3: 129–148.

Chailleux, A. and Stein, F. (2017). Increasing traceability of trade in eels by e-declaration system. The *1st UK International Eel Science Symposium*, London. Sustainable Eel Group. DOI:10.13140/RG.2.2.13317.04322.

CITES. (2007a). Proposals for amendment of Appendices I and II. Co14 Prop. 18. <https://www.cites.org/sites/default/files/eng/cop/14/prop/E14-P18.pdf>.

CITES. (2007b). Amendments to Appendices I and II of the Convention adopted by the Conference of the Parties at its 14th meeting, The Hague (Netherlands), 3–15 June 2007. Notification to the Parties. No. 2007/022.

CITES. (2017a). Conservation of and trade in *Anguilla* spp. 17th Meeting of the Conference of the Parties.

CITES. (2017b). Illegal trade in *Anguilla anguilla*. Sixty-ninth meeting of the Standing Committee Geneva (Switzerland), 27 November–1 December 2017. SC 69. Doc. 47.2

Crook, V. (2010a). Slipping through the controls: a review of illegal trade in European Eel *Anguilla anguilla*. *TRAFFIC report prepared for the European Commission*.

Crook, V. (2010b). Trade in *Anguilla* species, with a focus on recent trade in European Eel *A. anguilla*. *TRAFFIC report prepared for the European Commission*.

Crook, V. and Nakamura, M. (2013). Glass eels: Assessing supply chain and market impacts of a CITES listing on *Anguilla* species. *TRAFFIC Bulletin*, 25 (1): 24-30.

Crook, V. (2014). Slipping away: International *Anguilla* eel trade and the role of the Philippines. *TRAFFIC and ZSL, UK*.

Dekker, W., Casselman, J. M., Cairns, K., Tsukamoto, K., Jellyman, D. and Lickers, H. (2003). Worldwide decline of eel resources necessitates immediate action. Québec Declaration of Concern. *Fisheries* 28(12): 28–30.

Dekker, W. and Casselman, J. M. (2014). The 2003 Québec Declaration of Concern About Eel Declines—11 Years Later: Are Eels Climbing Back up the Slippery Slope? *Fisheries*, 39(12): 613–614.

Department of Culture, Arts and Leisure (2010) The Eel Fishing (Northern Ireland) Regulations 2010. No. 166. <http://www.legislation.gov.uk/nisr/2010/166/contents/made>.

Department for Environment, Food and Rural Affairs (DEFRA). (2010). Eel Management plans for the United Kingdom Overview for England and Wales.

Department for Environment, Food and Rural Affairs (DEFRA). (2015). Report to the European Commission in line with Article 9 of the Eel Regulation 1100/2007 Implementation of UK Eel Management Plans.

EC. (2008). Summary of Conclusions. 45th Meeting of The Committee on Trade in Wild Fauna and Flora. Brussels 10 September 2008.

EC (2009a). Implementation and practical aspects of exports of European eel (*Anguilla anguilla*) from the EC. Document of the Eel working group of the EU CITES Management Committee. COM 46/7.

EC. (2009b). Implementation of the Appendix-II listing of *Anguilla anguilla* within the European Community. Notification to the Parties. No. 2009/20.

EC. (2009c). Summary of Conclusions. 48th Meeting of The Committee on Trade in Wild Fauna and Flora. Brussels 21st September 2009. http://ec.europa.eu/environment/cites/pdf/ctwff/48_summary_com.pdf.

EC. (2009d). Summary of Conclusions. 46th Meeting of The Committee on Trade in Wild Fauna and Flora. Brussels 13th March 2009. http://ec.europa.eu/environment/cites/pdf/ctwff/46_summary_com.pdf.

EC. (2010). Summary of Conclusions. 54th Meeting of The Scientific Review Group on Trade in Wild Fauna and Flora. Brussels 3rd December 2010. https://circabc.europa.eu/sd/a/49ab3fc9-646b-4b35-ac42-f0333479ce24/54_summary_srg.pdf.

EC. (2012). Development of an Eel Guide for Enforcement. *TRAFFIC Briefing prepared for the European Commission*.

EC (2014a). Quality report on European statistics on international trade in goods: Data 2010-11. 2014 edition. *Publications Office of the European Union*, Luxembourg.

EC. (2014b). On the outcome of the implementation of the Eel Management Plans, including an evaluation of the measures concerning restocking and of the evolution of market prices for eels less than 12 cm in length. *Report from the Commission to the Council and the European Parliament*. COM 2014 (640).

EC. (2016). Commission Staff Working Document: Analysis and evidence in support of the EU action plan against wildlife trafficking. Accompanying document for the EU action plan against wildlife trafficking. COM 87. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016SC0038&from=EN>.

EC. (2018). Enforcement Group. European Commission website. http://ec.europa.eu/environment/cites/eg_en.htm.

EUROPOL. (2017). EU Law enforcement step up efforts to protect the environment – 48 arrested for trafficking endangered species. Press Release. <https://www.europol.europa.eu/newsroom/news/eu-law-enforcement-step-efforts-to-protect-environment-%E2%80%93-48-arrested-for-trafficking-endangered-species>.

EUROPOL. (2018). Glass eel traffickers earned more than EUR 37 million from illegal exports to Asia. Press Release. <https://www.europol.europa.eu/newsroom/news/glass-eel-traffickers-earned-more-eur-37-million-illegal-exports-to-asia>

Fan, H.P. (2016). The domestic and international trade trend as well as the industrial development of eels (in Chinese). China Society of Fisheries. *International fisheries research report for 2015*. <http://www.csfish.org.cn/csf/ah5/showInfo.asp?id=1476>.

Fan, H. and Qin, Z. (2016). Global eel farming development – from the perspective of glass eel input (in Chinese). <https://kknews.cc/agriculture/382omk8.html>.

Friedman, K., Gabriel, S., Abe, O., Adnan Nuruddin, A., Ali, A., Bidin Raja Hassan, R., Cadrin, S.X., Cornish, A., De Meulenaer, T., Dharmadi, Fahmi, Huu Tuan Anh, L., Kachelriess, D., Kissol Jr., L., Krajangdara, T., Rahman Wahab, A., Tanoue, W., Tharith, C., Torres Jr., F., Wanchana, W., Win, S., Yokawa, K. and Ye, Y. (2018). Examining the impact of CITES listing of sharks and rays in Southeast Asian fisheries. *Fish and Fisheries*. 00:1–15. <https://doi.org/10.1111/faf.12281>

Gaynor, K. (2014). An assessment of the challenges faced in making a Non-Detriment Finding (NDF) for *Anguilla anguilla* (European eel). Master's thesis, Universidad Internacional de Andalucía.

General Fisheries Commission for the Mediterranean (GFCM). (2016). Report of the 18th session of the Scientific Advisory Committee on Fisheries. Nicosia, Cyprus, 21–23rd March.

Han, Z.C. (1999). Freshwater aquaculture of European eel, in Xie, Z.M. (ed.), *European eel: Culture techniques*. Chinese Agriculture Publishing. Beijing. Chapter VI: 41–131. (in Chinese).

Henkel, C.V., Burgerhout, E., de Wijze, D.L., Dirks, R.P., Minegishi, Y., Jansen, H.J., *et al.* (2012). Primitive Duplicate Hox Clusters in the European Eel's Genome. PLoS ONE 7(2): e32231. <https://doi.org/10.1371/journal.pone.0032231>

International Council for the Exploration of the Sea (ICES) Advice. (2008). European Eel. ICES Advice Book No. 9, pp. 123-129.

International Council for the Exploration of the Sea (ICES) Advice. (2015). European eel (*Anguilla anguilla*) throughout its natural range. ICES Advice on fishing opportunities, catch, and effort. Northeast Atlantic Ecoregions. ICES Advice Book No. 9, pp 1-5.

International Council for the Exploration of the Sea (ICES) Advice. (2016). European eel (*Anguilla anguilla*) throughout its natural range. ICES Advice on fishing opportunities, catch, and effort. Northeast Atlantic. ICES Advice Book No. 9, pp 1-6.

International Council for the Exploration of the Sea (ICES) Advice. (2017). European eel (*Anguilla anguilla*) throughout its natural range. ICES Advice on fishing opportunities, catch, and effort. Ecoregions in the Northeast Atlantic. ele.2737.nea, pp. 1-6.

International Council for the Exploration of the Sea (ICES). (2015). Report of the Workshop on Eel and CITES (WKEELCITES), 10–12 March 2015, Copenhagen, Denmark. ICES CM 2015/ACOM:44. 57 pp.

International Council for the Exploration of the Sea (ICES). (2016). Report of the Working Group on Eels (WGEEL), 15–22nd September 2016, Cordoba, Spain. ICES CM 2016/ACOM:19. 107 pp.

International Council for the Exploration of the Sea (ICES). (2017). European eel. ICES Advice 2017 - <http://ices.dk/sites/pub/Publication%20Reports/Advice/2017/2017/ele.2737.nea.pdf>

Jacoby, D. and Gollock, M. (2014). *Anguilla anguilla*. The IUCN Red List of Threatened Species 2014: e.T60344A45833138. <http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T60344A45833138.en>.

Jacoby, D.M.P., Casselman, J.M., Crook, V., DeLucia, M., Ahn, H., Kaifu, K., Kurwie, T., Sasal, P., Silfvergrip, A.M.C., Smith, K.G., Uchida, K., Walker, A.M. and Gollock, M. J. (2015). Synergistic patterns of threat and the challenges facing global anguillid eel conservation. *Global Ecology and Conservation*, 4: 321–333.

Jacoby, D., Casselman, J.M., DeLucia, M. and Gollock, M. (2017). *Anguilla rostrata* (amended version of 2014 assessment). The IUCN Red List of Threatened Species 2017: e.T191108A121739077. <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T191108A121739077.en>.

La Guardi Civil. (2018). The Civil Guard intervenes 65 kgs. of eels live inside four suitcases. <http://www.sustainableeelgroup.org/wp-content/uploads/2018/01/Nota-prensa-Algeciras.pdf> (in Spanish).

Moriarty, C. and Dekker, W. (1997). Management of the European eel. *Irish Fisheries Bulletin* 15: 1-110.

Nederlandse Voedsel- en Warenautoriteit (NVWA). (2017). NVWA and customs seize 72 kilos of glass eel. News item. <https://www.nvwa.nl/nieuws-en-media/nieuws/2017/04/18/nvwa-en-douane-nemen-72-kilo-glasaal-in-beslag> (in Dutch).

Official Journal of the European Union. (2007). *Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel*. No. 248, 17–23. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32007R1100&from=EN>.

Rehman, A., Jafar, S., Raja, N.A. and Mahar, J. (2015). Use of DNA Barcoding to Control the Illegal Wildlife Trade: A CITES Case Report from Pakistan. *Journal of Bioresource Management*, 2(2).

Ringuet, S., Muto, F. and Raymakers, C. (2002). Eels, their harvest and trade in Europe and Asia. *TRAFFIC Bulletin*, 19(2): 80 – 106.

Rosser, A.R. and Haywood, M.J. (Compilers). (2002). *Guidance For CITES Scientific Authorities: Checklist to assist in making non-detriment findings for Appendix II exports*. IUCN, Gland, Switzerland and Cambridge, UK. xi + 146pp.

Schmidt, J. (1922). The breeding places of the eel. *Philosophical Transactions of the Royal Society B*, 211, 179–208. doi:10.1098/rstb.1923.0004

Scottish Ministers (2008). The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008. No. 419. http://www.legislation.gov.uk/ssi/2008/419/pdfs/ssi_20080419_en.pdf.

Secretary of State and Welsh Ministers (2009). The Eels (England and Wales) Regulations 2009. No. 3344. https://www.legislation.gov.uk/uksi/2009/3344/pdfs/uksi_20093344_en.pdf.

Silfvergrip, A. M.C. (2009). CITES Identification Guide to the Freshwater eels (Anguillidae). Report 5943, Version 1.1. March 2009. The Swedish Environmental Protection Agency, Stockholm. <http://www.naturvardsverket.se/Documents/publikationer/978-91-620-5943-9.pdf>.

Shiraishi, H. and Crook, V. (2015). Eel market dynamics: an analysis of *Anguilla* production, trade and consumption in East Asia. *TRAFFIC*. Tokyo, JAPAN.

Stein, F.M., Wong, J.C.Y., Sheng, V., Law, C.S.W., Schröder, B. and Baker, D.M. (2016). First genetic evidence of illegal trade in endangered European eel (*Anguilla anguilla*) from Europe to Asia. *Conservation Genetics Resources*, 8(4): 533–537.

Sustainable Eel Group (SEG). (2017). Review of the Sustainable Eel Group Standard, 2017: Log of Comments Received and Responses.

Tesch FW. (2003). *The Eel*. Oxford: Blackwell Science Ltd.

Teng, H.Y., Lin, Y.S. and Tzeng, C.S. (2009). A new *Anguilla* species and a reanalysis of the phylogeny of freshwater eels. *Zoological Studies*, 48: 808–22.

The Japan Times. China to run out of exports of endangered European eel by early next year. 28 July 2014. <http://www.japantimes.co.jp/news/2014/07/28/national/china-run-exports-endangered-european-eel-early-next-year/#.VBnCaflidWE4>

TRAFFIC. (2011). Illegal trade in European eel, *Anguilla Anguilla*. Discussion paper prepared by TRAFFIC for the 54th Meeting of the Committee on Trade in Wild Fauna and Flora (COM54) and the 22nd Meeting of the Enforcement Group (EG22). March 2011 (updated).

TRAFFIC. (2015). Overview of reported trade in *Anguilla anguilla* for 2012–2015, with a focus on illegal trade. *Internal briefing prepared by TRAFFIC for the European Commission*. Version 2.

TRAFFIC. (2017a). Overview of reported trade in *Anguilla anguilla* for 2014–2017, with a focus on illegal trade. *Internal briefing prepared by TRAFFIC for the European Commission*.

TRAFFIC. (2017b). Overview of important international seizures in the European Union–January to December 2015. *Briefing prepared by TRAFFIC for the European Commission*.

UN Comtrade (2018) *Global Anguilla export and import data of live, fresh, frozen and prepared/preserved eel for 2007-2016*. Downloaded February 2018: <http://comtrade.un.org/>

Vincent, A.C.J., de Mitcheson, Y.J.V., Fowlers, S.L. and Liebermann, S. (2013) The role of CITES in the conservation of marine fishes subject to international trade. *Fish and Fisheries*. DOI: 10.1111/faf.12035.