Chapter 19
Resources

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Contents

Temperate anguillid eels are enigmatic species that have captured the curiosity of scientists for hundreds of years, and have also historically been exploited as a fisheries resource. In particular, fishing of American, European, and Japanese eels has been consistent, and severe declines in population size have been observed since the 1970s. Scientists and resource managers have been studying eel biology and fisheries to understand the status of eel resources and the causes of eel population decline. However, many knowledge gaps remain owing to the limited scientific data and knowledge on specific aspects of eel biology, ecology, and the interacting effects of changes in marine and freshwater environments and human activities. In this chapter, we provide an overview of the current state of Japanese eel resources and their management through the regulation of fishing, aquaculture, and trade. The first half summarizes the latest assessment of eel resources and describes the challenges for data collection and knowledge generation owing to the complex life cycle of the Japanese eel and numerous uncertainties related to its ecology. The key challenge is to improve the accuracy and timeliness of the temporal and spatial data obtained from catch statistics and field research. The second half outlines the updated domestic regulations for Japanese eel catch/fishery and aquaculture and the ongoing international efforts to conserve Japanese eel resources. Resource managers have implemented a variety of policies and tools based on the best scientific knowledge

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available while generating a collective will among countries/regions to adopt a coordinated approach to conserving Japanese eel resources.

19.1 Current State of Resources

Japanese eel has long been a popular commercially harvested species in eastern Asia, and the history of eel fisheries in Japan extends back to the Edo era (1603–1868). Official data of eel catches in Japan have been available since 1894, and they indicate that the domestic yellow eel catch was stable at 3000–4000 tons in the early nineteenth century (Hakoyama et al. 2016). However, this decreased during World War II, and although it recovered temporarily to the 3000-ton range in the 1960s, the catch has been declining since 1970 (Fig. 19.1a). Although the domestic catch exceeded 600 tons in the early 2000s, it fell to 500 tons after 2005, then to less than 100 tons after 2015, and in 2020 the catch plummeted to 65 tons. While a decrease in inland fishermen during this period may have contributed to this trend, it cannot be estimated because of the lack of necessary data. However, a survey that assessed fishing effort (catch per unit effort, CPUE) revealed that during 2003–2016, the CPUE of yellow eels in Okayama Prefecture, western Japan, decreased by 1/3 in both longline and small set-net fisheries (Kaifu et al. 2018). It is important to note that, although farmed eels account for most of the domestic supply in Japan, wild yellow eels (developmental stage) are still caught by longlines or traps set in freshwater and brackish waters (Mochioka 2019).

Although domestic eel farming using wild-caught elver eels (juvenile stage) began in 1879, the eel farming industry only became viable in the 1920s as the methods for raising glass eels advanced. Consequently, the number of inland fishermen (the number of fishery management entities in lakes that mainly target yellow/silver eels) decreased remarkably (Hakoyama et al. 2016) and aquaculture production in the 1930s exceeded the wild catch of yellow eels (Tanaka 2019). Aquaculture production peaked at 39,704 tons in 1988 and has been stable at ~15,000–20,000 tons since 2000.

Aquaculture production relies on the catch of wild glass eels, which, like the yellow eel catch, has declined. Glass eels are harvested in 4 jurisdictions: Japan, China, Korea, and Chinese Taipei. In Japan, the catch period generally extends from December to April. Harvesters catch eels by scooping or by using set nets in coastal estuaries and river mouths. Glass eel catches are managed by prefectural governments under a permit system. Prefectural governors typically restrict the catch period, fishing gear, and fishing areas. In the 1960s, domestic total seed catch was often between 150 and 200 tons; however, catch declined in the 1970s, and since the 1980s, the annual catch has been <25 tons (Fig. 19.1b). In these early catch statistics, seeds caught in the sea had “glass eel” labels as their item names or footnotes that denoted them as glass eels. The eels caught in inland waters had no clear description or labels, but the quantities collected from rivers and lakes were recorded. According to the Minister’s Secretariat Statistics Department, most seeds

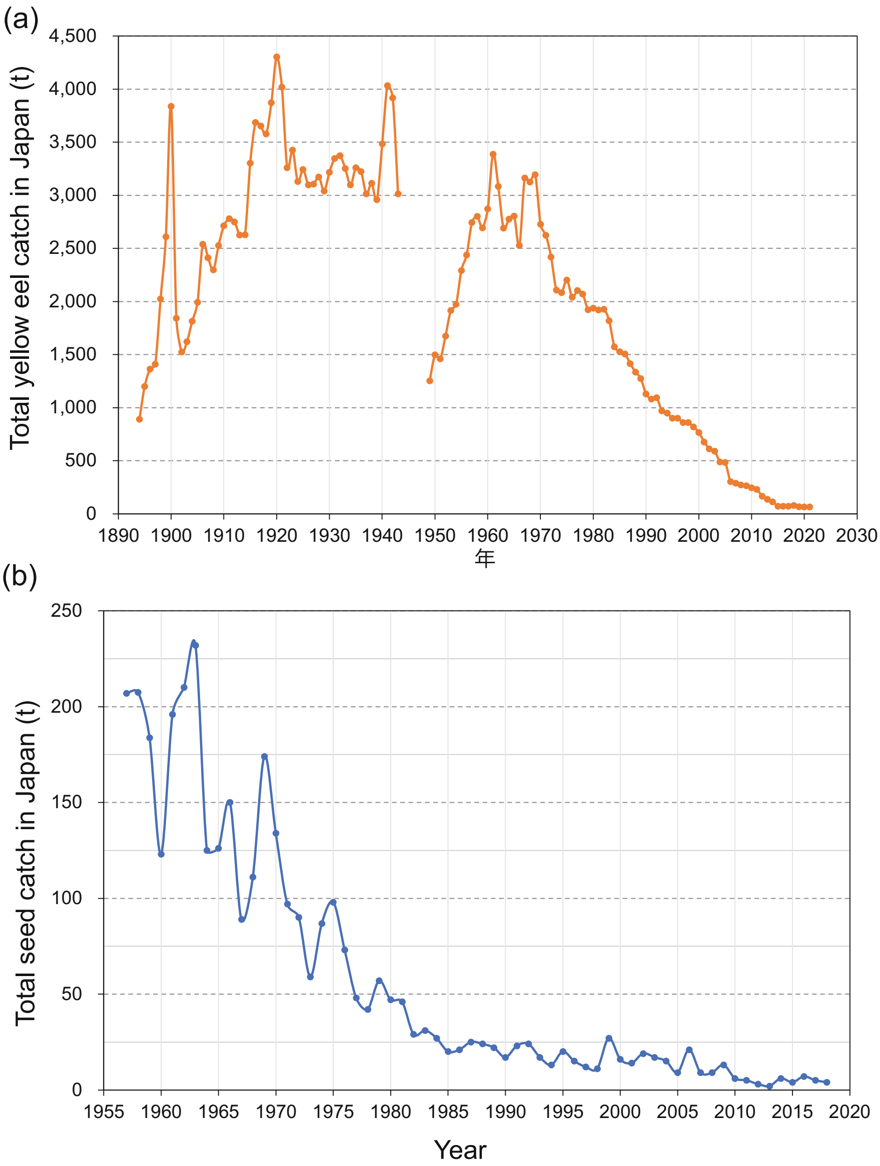

Fig. 19.1 (**a**) The catch of Japanese yellow eels in Japan based on fisheries statistics of the Government of Japan. (**b**) Total seed catch of Japanese eel (including glass eels and elver eels) in the sea and inland waters of Japan. Data from fisheries statistics of the Government of Japan (Hakoyama et al. 2016*;* The annual report of catch statistics on fishery and aquaculture in 2018)

were assumed to be glass eels; however, some elvers might have been included in the data (personal communication).

Around 1960, the developing eel aquaculture industries of Shizuoka, Aichi, and Mie prefectures, central Japan, introduced large numbers of elvers from the Tone River system in Ibaraki and Chiba, north of Tokyo. During the fishing season, from mid-March to late October, the seeds collected from the lower Tone River included elver eels that were 5–20 g and 15–25-cm long. Of these, 60% were supplied to Shizuoka, Aichi, and Mie prefectures as seeds for eel farming (Matsui 1972). Since 1978, the catch season for seeds in 9 major aquaculture prefectures has been limited to glass eels during winter (Eel Culture Research Council 1980). This suggests that eels caught around 1960 included more elver eels than recent catches. If this is the case, the rate of decrease in glass eel catch is likely to be smaller than that shown in Fig. 19.1b.

Recent glass eel catch data show a decrease to <10 tons in 2010–2013, a slight increase to 15 tons in 2014–2017, a reversion to <10 tons during the 2018–2019 fishing season, and then 3.7 tons in the 2019 fishing season (Fig. 19.2a). Although the catch increased considerably in the 2020 fishing season to 17.1 tons, the catch for the 2021 fishing season decreased to 11.1 tons. These fluctuations in catch are small compared to the considerable decline evident since the 1960s (even if a proportion of the 1960s catch contained elvers), and indicate that the Japanese eel now remains at a relatively low population size.

The trend for decline in the catch of Japanese eel in Japan is mirrored in the data from other jurisdictions across the species distribution. The global catch of Japanese eel decreased from 3619 tons in 1969 to 121 tons in 2019 (Fig. 19.2b). Regarding recent glass eel catches (from 2009 to 2021), China had the highest annual catch, followed by Japan (Fig. 19.2a); these 2 countries account for most of the total catch. During the last several decades, the total number of glass eels caught in the 4 jurisdictions has fluctuated from year to year, ranging from 20 to 90 tons. In the 2019 fishing season, the catches were 3.7 tons in Japan, 14.5 tons in China, 0.6 tons in Korea, and 2.75 tons in Chinese Taipei, but the catches in the 2020 fishing season increased significantly to 17.1 tons in Japan, 50 tons in China, 4.5 tons in Korea, and 5.2 tons in Chinese Taipei. In the 2022 catch season (November 1, 2021 to April 30, 2022), the catches were 8.3 tons in Japan, 2.2 tons in Korea, and 1.6 tons in Chinese Taipei.

Although catch datasets may not provide the full picture, they are the most comprehensive data available for the Japanese eel and clearly reflect an overall long-term decline in population size, which remains low. The Japanese eel is listed as an endangered species by both the Japanese Ministry of the Environment and IUCN (categorized as endangered IB in 2013 and 2014, respectively). Although it is difficult to identify the causes of the population decrease in this species, changes in the marine environment, overfishing, and the deterioration of freshwater and estuarine habitats are regarded as important factors. The population assessment of this species is challenging, mainly because of its complex life cycle and numerous ecological uncertainties; only one population assessment has been made to date (Tanaka 2014). However, the decline in the Japanese eel population continues to be

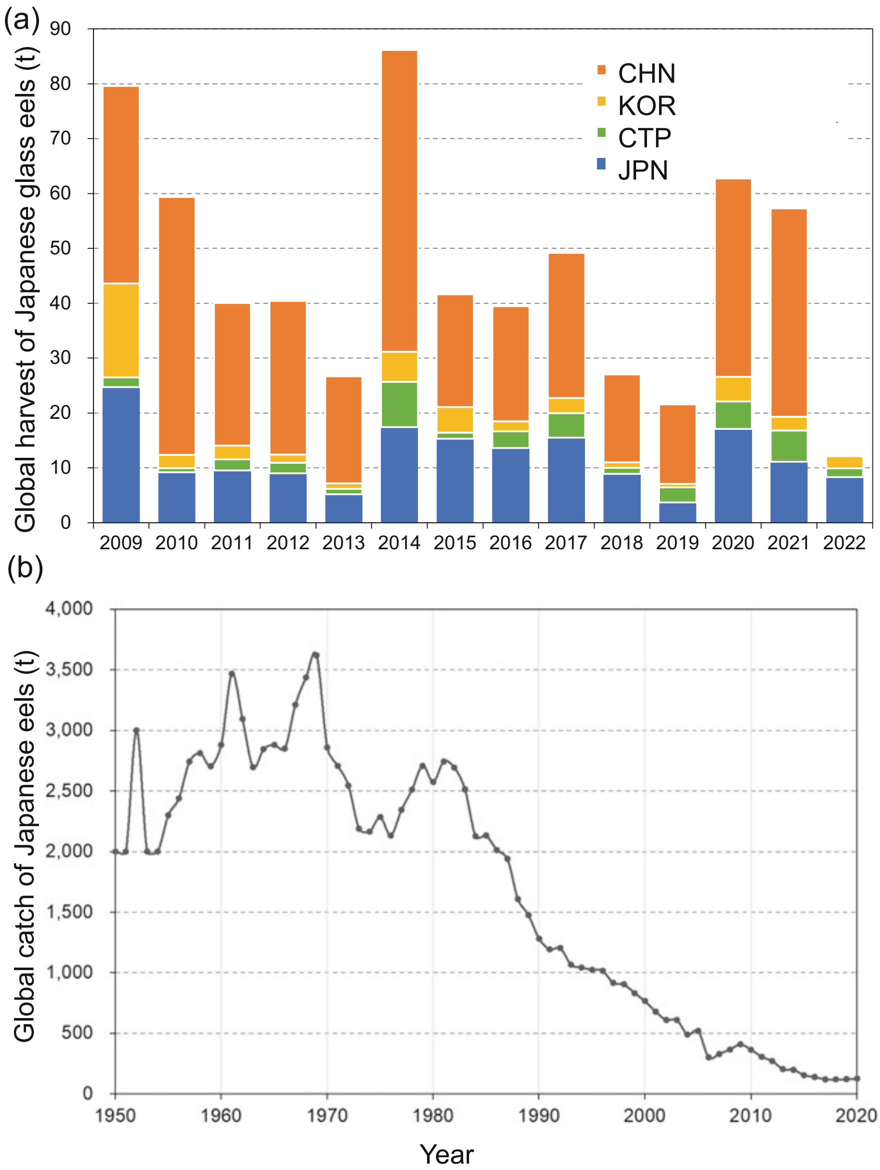

Fig. 19.2 (**a**) Global harvest of Japanese glass eels. These data are based on the Joint Press Release of the Informal Consultation on International Cooperation for Conservation and Management of Japanese Eel Stock and Other Relevant Eel Species (Fisheries Agency of Japan, https://www.jfa.maff.go.jp/j/press/sigen/attach/pdf/170711-2.pdf and https://www.jfa.maff.go.jp/j/press/sigen/attach/pdf/210727-7.pdf, accessed on August 31 2023). CHN China, KOR Republic of Korea, CTP Chinese Taipei, JPN Japan. (**b**) Global catch of wild Japanese eel (including all stages). These data are based on FAO 2021 statistics

of concern to Japanese and international communities, especially those from the eel industry and conservation managers. Thus, in 2019, the Fisheries Agency of Japan launched a multidisciplinary research project with the goal of developing a comprehensive assessment of Japanese eel populations. This project includes research on population genomics and effective population size (N_e) of the Japanese eel.

Elucidating the population genetic structure of organisms is indispensable, not only for defining the management units of natural resources, but also for accurately estimating N_e, which can be used to evaluate population viability and perenniality. In recent years, the population genetic structure of the Japanese eel has been the subject of intense debate, but the majority of studies now clearly indicate that Japanese eels exist as a single panmictic population (Ishikawa et al. 2001; Han et al. 2010; Gong et al. 2019; Yu et al. 2020) and should be managed accordingly. Current research focuses on estimating the long-term and current N_e of the Japanese eel, which is different from a standard measure of population size in that it estimates the number of individuals that effectively contribute to the next generation (thus, it is generally smaller than the actual population size), and when estimated from genomic data, it is independent of fisheries catch statistics.

Assessing historical changes in N_e can provide an evolutionary perspective on current population dynamics. Whole genome level analyses using pairwise and multiple sequential Markovian coalescent (PSMC and MSMC) methods (Mather et al. 2020) have indicated that 1–4 million years ago (Ma) N_e decreased, then from ~1 Ma up until ~22,000–30,000 years ago, the Japanese eel population steadily increased in N_e, peaking at ~80,000 individuals (Faulks et al. 2022; Fig. 19.3). During the Last Glacial Maximum (LGM;19,000–33,000 years ago), N_e decreased to ~60,000 individuals. Owing to the restricted power of the PSMC and MSMC methods to detect changes within the last 20,000 years, changes in the population size of the Japanese eel following the LGM are still unknown. However, ongoing studies using single nucleotide polymorphism data and linkage disequilibrium analyses (Waples and Do 2010) indicate that the current N_e is ~20, 000 (Sekino M, personal communication). Overall, these results indicate that the Japanese eel has experienced several population bottlenecks and that levels of genetic diversity are relatively low. This background indicates that the Japanese eel may be sensitive to further declines in population size, which may affect the ability of the species to adapt to future environmental changes.

A lack of progress has been made in developing mathematical methods to predict the population dynamics of the Japanese eel and contribute to management strategies because it is difficult to fully understand the species' biology and identify the causes of population decline. Future research must ascertain population trends and work towards the sustainable harvest of Japanese eels. To achieve this, it is necessary to improve the accuracy and timeliness of temporal and spatial data, expand our knowledge regarding fluctuations in the N_e of the species, and use the best available data for the development of a mathematical model for population management. Additionally, enhancing scientific cooperation and communication with other jurisdictions within the distributional range of the Japanese eel is important.

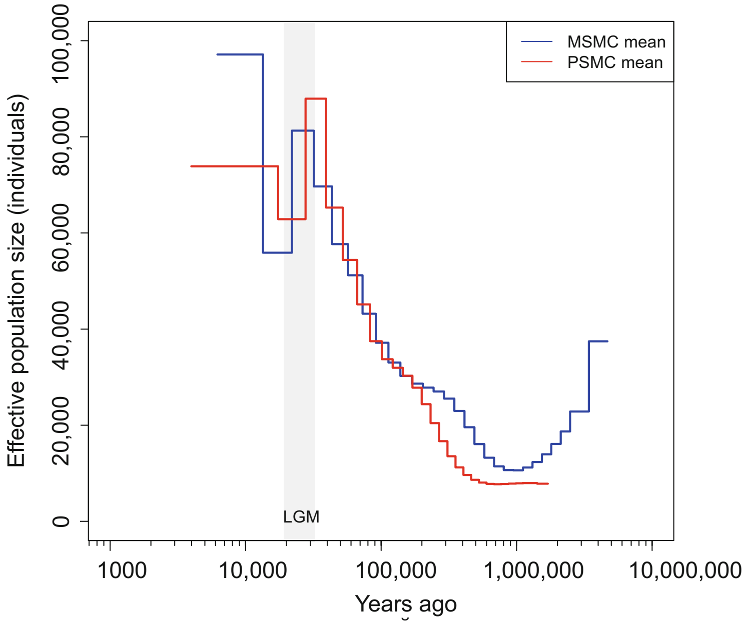

Fig. 19.3 Plot of the changes in effective population size N_e over the last ten million years for Japanese eel. N_e was estimated from the whole genome re-sequencing data of 11 individuals by using the pairwise and multiple sequentially Markovian coalescent (PSMC and MSMC) methods. Plot depicts the mean values of N_e for all 11 analyzed individuals; PSMC = red, MSMC = blue. LGM = Last Glacial Maximum 19,000–33,000 years ago

19.2 Resource Management

19.2.1 Precautionary Approach

As mentioned above, while there are concerns about the decrease in the Japanese eel population, scientific knowledge is still insufficient with regard to the mechanism of population decline, which would, if sufficiently understood, contribute to developing mathematical methods to predict population dynamics and contribute to management strategies. Researchers have posited various potential factors for the population decline, including environmental change and pollution in the marine environment, overfishing, habitat destruction due to river construction and segregation, disease by parasites, and an increase in predators; however, the importance of each factor and their interactions remains unclear (Knights 2003; Friedland et al. 2007; Bonhommeau et al. 2008; Chang et al. 2018; Chang et al. 2019; Drouineau et al. 2018; Righton et al. 2021). Therefore, it is necessary to adopt a precautionary approach (UNCED 1992; FAO 1996). Japan is doing this by implementing comprehensive measures, including population management and habitat restoration, for the sustainable use of Japanese eel resources.

19.2.2 Domestic Conservation and Management Measures

Japan has taken the following conservation and management measures: (1) regulating the catch of glass eels and adult eels; (2) granting aquaculture permits, including regulating inputs of eel seeds (glass eel and elver) into aquaculture ponds; and (3) regulating international trade.

19.2.2.1 Eel Catch

The catch of glass eels is regulated by prefectural governments according to prefectural fisheries adjustment rules. Although the catch of glass eels is prohibited in principle, prefectural governors can issue special catch permits for particular catch seasons because glass eels are necessary as aquaculture seeds. By setting the conditions of these permits, such as the catch period, gear, and location, prefectural governors can regulate the glass eel catch.

Prefectural governments also regulate catches of adult eels. They implement conservation and management measures, such as gear restriction, upper limits of catches, and catch suspension, based on prefectural fisheries adjustment rules, and licenses are granted for the class 5 common fishery right to catch eels in accordance with the Fishery Act. Each prefecture may have its own unique circumstances. For example, prefectures where eel aquaculture is active have introduced measures to protect and conserve spawning stocks, such as mandatory or voluntary suspension of eel fishing from October to March, when eels descend rivers to undergo spawning migration in the ocean. Recently, almost all prefectures where wild adult eels are distributed have prohibited the catch of silver eels that are descending to spawn.

To support stakeholders and ensure the implementation of eel resource management at the prefectural level, the national government provides technical advice to prefectural governments regarding the management of Japanese glass eel catch and adult eel fishing (Fisheries Agency of Japan, https://www.jfa.maff.go.jp/j/saibai/unagi.html, accessed on June 11, 2022). For example, the national government provides technical advice regarding the implementation of special glass eel catch permits issued by prefectural governments, including how to implement an appropriate system to report catch quantity and period, as well as how to provide guidance and law enforcement to effectively control the catch of glass eels when the upper limit is reached. For adult eel fishing, the national government provides advice regarding the restriction of fishing eels that descend the river to spawn in the ocean. In the technical advice, the national government also highlights the condition of granting a license for the class 5 common fishery right to catch adult eels; that is, those who are licensed are required to engage in activities to assist in the reproduction of eels (Article 168, Fishery Act; Fisheries Agency of Japan), mainly through the release of Japanese eel seeds into the wild.

19.2.2.2 Eel Aquaculture

The national government regulates eel aquaculture in Japan. Eel aquaculture was specified as "designated aquaculture" under the Act on the Promotion of Inland Fisheries in June 2015, which requires those seeking to engage in eel aquaculture to obtain permission from the Ministry of Agriculture, Forestry, and Fisheries (MAFF). Under this Act, the total input of eel seeds for the entire country (upper limit: 21.7 tons) is allocated across aquaculture farms. The quantity of eel seeds allowed in each aquaculture farm is specified by the aquaculture permit. Farmers who receive an allocation are required to report the amount of eel seeds they input and their eel production to the national government every month. This process enables Japan to quantitatively manage domestic eel aquaculture. Thus, the international agreement on conservation and management measures for the upper limit of eel seeds to be input into aquaculture ponds is effectively implemented.

19.2.2.3 International Trade

To ensure the effectiveness of domestic management measures to protect Japanese eel resources, the Japanese national government specifies conditions for issuing approval for the export of eel seeds up to 13 g in weight: (1) the jurisdiction where eel seeds are exported must take conservation and management measures based on the outcomes of the Informal Consultation (see Sect. 19.3), which must be appropriately implemented; (2) the eel seeds must be caught in accordance with domestic laws and regulations; and (3) for the export of glass eels that have never been farmed in aquaculture ponds, their origin and trade must be traceable, and the overall input of glass eels into aquaculture ponds in Japan must exceed 50% of the Japanese upper limit (Fisheries Agency of Japan, https://www.jfa.maff.go.jp/j/saibai/unagi/export_unagi.html, accessed on June 11, 2022).

19.2.3 International Arrangements for Conservation and Management of Japanese Eels

Japan, China, Korea, and Chinese Taipei (hereafter referred to as "Members") take collaborative actions at the Informal Consultation on International Cooperation for Conservation and Management of Japanese Eel Stock and Other Relevant Eel Species (Informal Consultation) under the framework of the APEC Ocean and Fishery Working Group (OFWG) to advance the regional management of Japanese eel resources, and ensure that the conservation and management efforts of each member have positive effect on the entire resource in the region. In 2014 at the seventh meeting, members issued the joint statement on international cooperation for conservation and management of Japanese eel stock and other relevant eel species

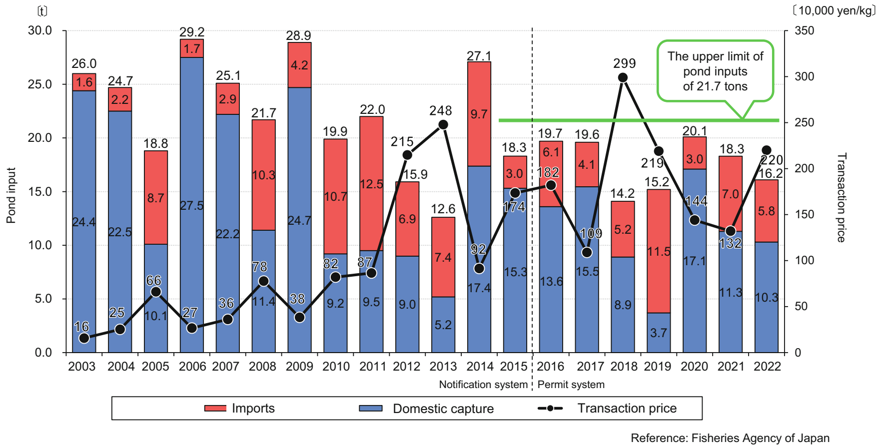

Fig. 19.4 Inputs of Japanese eel seeds into aquaculture ponds in Japan and transaction prices in each catch season from 2003–2022. The annual pond input represents the total volume from November in the previous year to May. The data for 2003–2013 and for 2014–2022 are originated from the industry research and the research by the Fisheries Agency, respectively. Transaction prices are originated from industry data. Imports are calculated from Trade Statistics of Japan

(Joint Statement 2014, http://www.jfa.maff.go.jp/j/saibai/pdf/140917jointstatement.pdf, accessed on June 11, 2022) as a compilation of their commitments. In the Joint Statement, it was articulated that for Japanese eel stock, the initial input of eel seeds for the 2014–2015 catch season would be no more than 80% of that of the 2013–2014 input season (from November 1, 2013 to October 31, 2014), and for other relevant eel species, each Member would take every possible measure to maintain the initial input levels of eel seeds from the previous 3 years. The upper limits of the input of eel seeds into aquaculture ponds were maintained as a result of the annual review of conservation and management measures and eel statistics by Members at the Informal Consultation (Fig. 19.4).

This Joint Statement has also promoted collaboration among stakeholders in the private sector. Based on the Joint Statement, the "Alliance for Sustainable Eel Aquaculture" (ASEA) was founded as an international non-governmental group of eel management organizations for each Member to discuss eel resource management. The ASEA plays an important role as a platform for discussing the regional management of eel resources in the private sector.

19.2.4 Recent Situation Surrounding Management of Japanese Eel Resources

19.2.4.1 Domestic Efforts

Glass eels cannot be caught without special catch permits issued in accordance with prefectural fisheries adjustment rules. In 2020, under the new Fishery Act, eels ≤13 cm in total length were designated as "specified aquatic animals and plants" (Article 41, Regulation for Enforcement of the Fishery Act; Fisheries Agency of Japan), which refers to aquatic animals and plants that are likely to be gathered or caught for the purpose of acquiring unlawful economic benefits. Any person is prohibited from gathering or catching specified aquatic animals and plants without specific permits from the relevant authorities. The designation for eels of ≤13 cm in total length will come into effect in December 2023. As a result of this improvement in the Fishery Act, catching eels ≤13 cm in total length will be regulated as a fishery permitted by the governor, and there will be a strict penalty for noncompliance (imprisonment for ≤3 years or a fine of ≤30 million yen) (Article 189, Fishery Act; Fisheries Agency of Japan). Furthermore, under the Act on Ensuring the Proper Domestic Distribution and Importation of Specified Aquatic Animals and Plants, eels ≤13 cm in total length are recognized as aquatic animals and plants that are in particular need of conservation and management because of their significant risk of illegal and excessive catching or gathering in Japan (excluding catching or gathering by foreign fishing vessels). After December 2025, business operators who catch/gather or distribute such eels will be required to (1) notify the administrative authorities in advance, (2) inform other business operators of catch numbers and other information when transferring the eels, and (3) prepare and keep transaction records for the transfers (Article 1, Regulation for Enforcement of the Act on Ensuring the Proper Domestic Distribution and Importation of Specified Aquatic Animals and Plants; Fisheries Agency of Japan).

In addition to fisheries management, continuous efforts have been made towards the creation and conservation of favorable riverine environments for the Japanese eel (see Chap. 22). The concept of "nature-oriented river works" has been adopted in river management to conserve and create intrinsic river habitats. One example is *ishikura*, an artificial stone-filled cage (see Chap. 18) that is placed instream to provide structural habitat and refuge for Japanese eels. Approximately 440 cages have been placed in rivers and lakes across Japan, and their design and placement are under continuous evaluation and improvement (Mochioka N, personal communication). In addition, a study from Lake Shinji, Shimane, suggested that the use of neonicotinoid pesticides since 1993 has caused declines in Japanese eel and Japanese smelt *Hypomesus nipponensis* populations by altering food web structure and dynamics (Yamamuro et al. 2019). Thus, the management of pesticides and other chemicals is also an important issue in inland habitats of Japanese eel.

19.2.4.2 International Efforts

Following the 14th annual Informal Consultation (Fisheries Agency of Japan, ttps://www.jfa.maff.go.jp/j/press/sigen/210727.html, accessed on June 11, 2022), it was agreed that a scientific meeting on the Japanese eel would be held to promote regional communication and research collaboration. Therefore, as a regional initiative, the first scientific meeting on Japanese eel and other relevant eels, under the framework of the Informal Consultation, was held online in April 2022 (Fisheries Agency of Japan, https://www.jfa.maff.go.jp/j/press/sigen/220415.html, accessed on June 11, 2022). The meeting was attended by representatives from China, Japan, the Republic of Korea, and Chinese Taipei, as well as invited experts on European eels. Members shared and exchanged scientific knowledge of eels, particularly the Japanese eel, and discussed ways to enhance scientific activities and collaboration. They agreed on a "Roadmap for Scientific Activities and Collaborative Research on Japanese Eel" which focuses on: (1) developing close relationships among scientists in the Northeast Asia region and collecting and organizing long-term time-series data on Japanese eel to understand and forecast the stock trend of Japanese eel in that region, and (2) exchanging information on tracking techniques to track migration paths of Japanese eels, and the other relevant eels, from rivers to spawning grounds in Northeast Asia and other regions, and subsequently analyzing/evaluating tracking data. Members also exchanged views on establishing standard working formats for the statistics of the glass eel, elver, and adult eel (catch, input into aquaculture ponds, and aquaculture and trade). Input from each Member was considered to ensure efficient collection and collaborative use of the statistics at the Informal Consultation.

Discussions at the global level are ongoing. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) was designed to protect endangered wild species by controlling their capture and exploitation for international trade. European eels were listed in the CITES Appendix II at the 14th Conference of Parties (CoP). Currently, the EU does not issue export permits for the European eel, and European countries base conservation and management measures on management advice from the Advisory Committee of the International Council for the Exploration of the Sea (ICES). In August 2019, the CITES CoP18 decided to ensure sustainable trade of eels not listed in the CITES appendices, including the Japanese eel. In the decision, range states are encouraged to: (1) cooperate with other countries and regions that share resources to set common management objectives and improve understanding of biological information; (2) introduce a monitoring system for resource status; (3) improve traceability in international trade; and (4) report on the above efforts and measures to the CITES Secretariat (CITES Decision 18.198., 2019, https://cites.org/eng/dec/index.php/42080, accessed on June 11, 2022). Since 2012, regional efforts through the Informal Consultation, which are compiled in the Joint Statement in 2014, have been in line with this decision, and it is expected that Members will continue to enhance efforts through this framework.

19.2.5 Management of European Eel in Europe

The European eel *Anguilla anguilla* has a complex life cycle: the spawning grounds are in the Sargasso Sea in the Caribbean and from there the glass eels reach European shores by drifting on the Gulf Stream current. Eels spend 5–20 years in fresh and/or brackish waters and then return to the marine environment to spawn (European Commission, https://oceans-and-fisheries.ec.europa.eu/ocean/marine-biodiversity/eel_en, accessed on October 10, 2022). A drastic decline in the recruitment of European eels after the 1980s raised concerns over the status of eel stock, highlighting the need to improve scientific understanding of the stock. The European eel is listed as critically endangered by the IUCN; fishing is regulated, including 3-month fishing closures, and trade outside the EU is banned.

To manage European eel, the European Commission (EC) requested scientific advice from the ICES, and based on this advice, the EC established measures for the recovery of eel stocks. In 2007, the European Commission Council Regulation 1100/2007 "establishing measures for the recovery of the stock of European eel" was published, requiring EU Member states to establish and implement eel management plans (EMPs). These EMPs require EU countries to restrict fishing, undertake stocking activities, facilitate eel migration, and increase the escape of silver eels to 40% of the pristine escapement levels.

19.3 Future Perspectives

Eel resource management, including Japanese and European eels, is addressed through both domestic regulations and regional arrangements (for the Japanese eel, Fig. 19.5), while the management frameworks differ depending on regional contexts

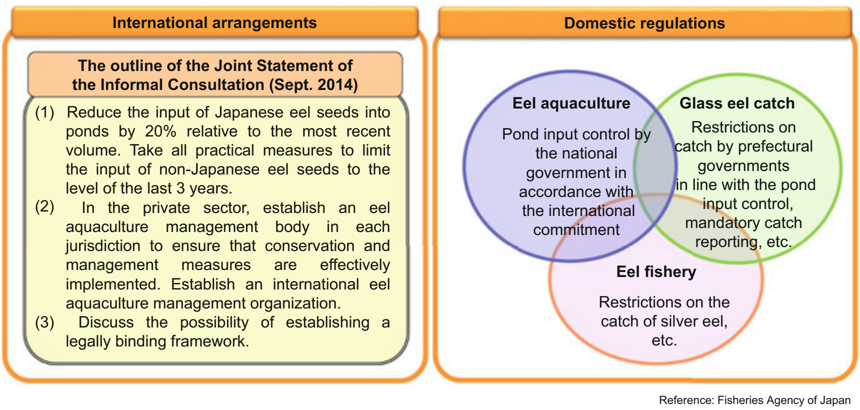

Fig. 19.5 Regional management of Japanese eel resources

and scientific knowledge of stocks. For the management of Japanese eel, the Informal Consultation under the framework of the APEC OFWG functions as a place for regionally coordinating conservation policies, including the regulation of glass eel inputs into aquaculture ponds. Under the consultation mechanism, a scientific body was established in 2022 to encourage scientists from range countries/regions to cooperate to bridge knowledge gaps and provide scientific advice for the conservation and management of the species. For the management of European eel, ICES provides scientific advice to the EC based on the knowledge synthesis by WGEEL, and the EC regulation specifies regulatory principles, such as the 40% of pristine escape levels of silver eel, for conservation of the species, taking into account the scientific recommendations.

In Japan, it is the responsibility of resource users to continue improving conservation and management measures for the Japanese eel, which is the reason why the national and prefectural governments manage eel fisheries, and the distribution and input of eel seeds into aquaculture ponds. The implementation of these measures could be more effective if scientific knowledge of Japanese eel is advanced. In addition to monitoring biomass levels and trends, future research should focus on producing additional scientific information and data from the Northeast Asia region and to advance the stock assessment of the Japanese eel.

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