East Asia Eel Resource Consortium

Head Office: Atmosphere and Ocean Research Institute, The University of Tokyo
277-8564 Kashiwa, Chiba, JAPAN. Tel: +81-4-7136-6416, Fax: +81-4-7136-6227

Statement of the East Asia Eel Resource Consortium for the protection and conservation of the Japanese eel

Emergency EASEC Symposium, 19 March 2012

Glass eel recruitment and standing stock of Japanese eels have continued to decrease since the 1970's and appear to have reached a historically critical situation in recent years. Very low levels of glass eel catches throughout East Asia since 2009 suggested a possible collapse of the Japanese eel stock, or even endangerment of the species. The industry depends on wild caught glass eels for seed for aquaculture along with imported glass eels of other species, mainly European eels. Declines in recruitment of the Japanese eel and the export ban on glass eels in Europe due the regulation of wildlife trade for conservation purposes by CITES have caused a crisis in this industry. Artificial seed production of the Japanese eel has been experimentally completed in 2010, but many technical problems still remain to be solved before it can be realized at a commercial scale. Therefore, we need to solely depend on the natural Japanese eel stock, at least, until the artificial production technique is finally established. The Japanese eel is an internationally very important aquaculture species in the East Asian region such as Japan, Korea, Taiwan and mainland China. The East Asia Eel Resource Consortium (EASEC), established in 1998, has been holding an annual meeting to share the latest information for the conservation and sustainable use of the Japanese eel. This year, however, due to the crisis of the Japanese eel stock in the last 3 years, the EASEC had an international emergency symposium on 19 March 2012 in Tokyo to discuss a possible strategy for the conservation of the Japanese eel as summarized below.

1. Present status of the Japanese eel

The fishery statistics of the Japanese eel, including glass eels, in East Asia are fragmental and are not sufficient in duration or accuracy to enable scientifically based management of the species. However, drastic declines of total amount of glass eels stocked in eel culture ponds in East Asia (from more than 100 tons until 2004 to 41 tons in 2010 and 35 tons in 2011, data from The Nihon Yoshoku Shimbun, Japan) strongly show a negative trend of the stock. Further, rapid decline in recent years suggests that the Japanese eel will follow the case of the European eel listed in the CITES in 2007.

2. Possible causes of the population decline

Our knowledge on the spawning ecology of the Japanese eel has been advanced recently, however, many uncertainties still remain for clearly understanding the causes of the decline of the Japanese eel, due to its spawning area being located far offshore in the ocean and recruitment success being determined by complex interaction between biological and environmental factors. Based on the scientific information presently available, the following factors that occur at different time scales are proposed as possible reasons for the decline of glass eel recruitment:

A. Short-term time scales (within several years)

- Increased larval mortality due to alterations of the offshore environment, a shift in the spawning season, and changes in the larval migration period.

- An increased proportion of larvae being transported out of the species range each year, due to southward shifts of spawning sites or shifts of the bifurcation latitude in the westward flowing North Equatorial Current region.

B. Middle-term time scales (within decades)

- Overexploitations of both glass eels in the estuary and yellow or silver eels in inland and coastal waters.
- Decline of the population due to degradation and losses of growth habitat such as rivers and coastal areas.

C. Long-term time scales (within hundreds of years)

- Gradual changes in climate as well as oceanic environments may have changed some characteristics of the species life history and/or species range.

3. Conservation Measures

The management plan for European eels through EU regulation that was initiated in 2009 (Report of the 2011 session of the joint EIFAC / ICES working group on eels), explains that implementation of protection and conservation efforts for catadromous fish that spawn and migrate in the vast open ocean, like anguillid eels, is quite difficult. The oceanic migration process of the adult Japanese eels is still not understood because it is certainly influenced by environmental factors that act at the global scale. This means that if some factors globally affecting the ocean-ecosystem caused the recent sharp declines of the Japanese eel stock, it is out of our direct control and there are no feasible measures at the moment to stop the main cause of the declines. We also have no way to compensate for factors with geological time scales, and the only possible management strategy is to cope with factors with limited temporal and spatial scales. Furthermore, there are still many uncertainties about the ecology of the Japanese eel even in freshwater. Population traits such as habitat selection and sex ratio of the Japanese eels in their freshwater growth habitats are characterized by the environment in which they occur, but the mechanisms of this are not well known. Artificial interventions for the purpose of conservation may disrupt the ecological balance of the natural population. The East Asia Eel Resource Consortium has considered these factors and has proposed the following precautionary directives as conservation measures for the Japanese eel.

3-1. Regulation of the eel fishery

After glass eels recruit to their growth habitats, they spend 4-15 years until they grow and metamorphose into the silver eel stage and begin their downstream migration for reproduction. To ensure that a certain amount of eels can become spawning eels each year, regulations on capture of yellow or silver eels in their growth habitats must be urgently controlled to allow escapement of spawners. So we propose, at first, temporal restriction of eel fisheries in growth habitats as well as recreational fishing that probably capture a considerable amount of eels. Capture of silver eels during their fall migration would be of the highest priority. Glass eel fishing should also be strongly restricted, however, considering the situation in which we solely depend on natural Japanese eel seedlings for aquaculture until the artificial production technique is completely established,

glass eel collection needs to be allowed for a while under strict regulatory observation in relation to scientific monitoring. Geographic and seasonal patterns of glass eel recruitment are known to drastically vary. This suggests that glass eel fishing regulations should be flexibly modified and applied based on the real-time scientific monitoring. To facilitate such fishery management as well as to have accurate statistics, an official system throughout the East Asian countries is required, instead of local governments that presently regulate these fishing activities independently. Scientific monitoring of glass eel recruitment throughout the East Asia, such as the EASEC has been conducting through the Eel River Project, should also be expanded and utilized for the stock management.

3-2. Growth habitat conservation and restoration

Habitat conservation and restoration in coastal and inland water is strongly needed to conserve the Japanese eel populations and it must be implemented according to a master plan suitable for ecosystems and human societies in and around the target area. Fish pass must be constructed at all artificial structures, which prevent movements of eels and other aquatic animals. In the EU management plan, "eel ladders" were used to make it possible for glass eels or young eels to ascend a dam that has no fish pass. This should be recommended for dams that are located close to the estuary that prevent many eels from their upstream migration. The eel ladders are not preferably recommended though, particularly in upper parts of rivers with very limited habitats available for young eels beyond obstacles. Further, the setting of the eel ladder must always be accompanied with a way for the returning silver eels to descend past the dam for their downstream migration to reproduce.

3-3. Improvement of restocking techniques and encouragement of other measures

The release of eels from aquaculture production facilities into natural river systems for the purpose of stock enhancement, or sometimes for fisheries, have been frequently conducted for more than 40 years. However, its efficiency for stock enhancement has never been comprehensively evaluated. Recent ecological studies showed that demographic characters of eel populations such as size composition, sex ratio and distribution pattern are different depending on the environment in which the eels occur. Restocking needs to be carefully conducted under the official and scientific plans to check its effect on stock enhancement and impacts on the natural eel population and the local ecosystems. Transplants of newly recruited glass eels are likely acceptable because of less artificial influence on the fish. On the other hand, increasing effort on aquaculture of eel species other than Japanese eel *A. japonica*, artificial invasion of exotic species must be completely prevented. We therefore strongly recommend to make standard protocols for both restocking and identifying exotic eel species and also to encourage relatively secure and effective management measures such as regulations on eel fisheries, anti-poaching patrol, ecological monitoring of eel populations, and conservation and restoration of their growth habitat.