Jellyfish blooms in coastal waters nearby thermal discharges of nuclear power plant

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1 Introduction

There is one Nuclear Power Station, which was constructed in 2007 and began to operate in 2013, is located in Liaodong Bay of Bohai Sea, China. In order to study the long-term effects of the thermal discharges on marine organisms, community structure and ocean ecosystem in coastal waters, long-term monitoring of marine organisms in the area with water outlet as the center and the radius of 4.0 km was carried out. In 2010, before the discharge of thermal waste water by the nuclear power plant, the maximum abundance of *Aurelia aurita* in this area, a common jellyfish species in the Bohai Sea, was recorded as 533 ind. /(net h). Thereafter the frequency of jellyfish bloom in this area has been increased. In 2014, jellyfish bloom of *Aurelia aurita* clogged the sea water intake and reduced the production efficiency of nuclear power plant.

2 Discussion

We collected the jellyfish data surveyed in the thermal discharge area (Figure 1). With anchor network (Figure 2),which belongs to fixed network, is 8 meter height 60meter length of net clothing, and the mesh size is 10 centimeter. The mesh is vertically down the network with the direction of tidal current, and up with flow when sampling operation. Since the large biomass of large jellyfish in the thermal discharge sea area, the monitoring sampling time is 30min.

Fig. 1 Jellyfish sampling stations

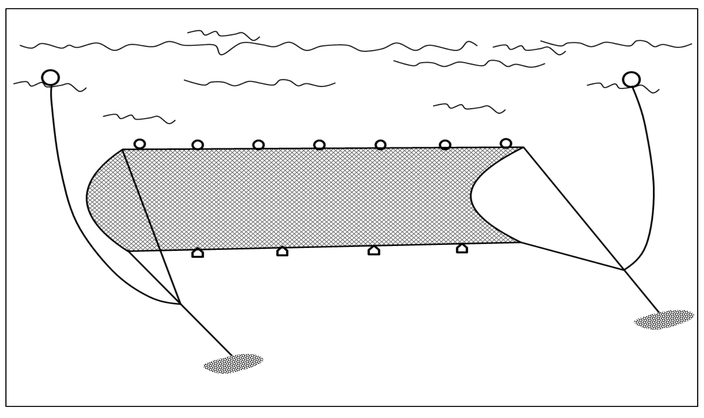

Fig. 2 Anchor network operation schematic

The number of *Aurelia aurita* decreased year by year(Fig3, Table1), but the number of Stomolophus meleagris increased during the year of 2015 to 2018(Fig4).

Year	Peak period time	Maximum abundance ind/(net h)	Average umbrella diameter (cm)	Average wet weight (g)
2015	late June~Mid August	12353	14.7	170
2016	July~Mid August	16667	17.9	360
2017	August	380	17.7	262.7
2018	late June~Mid August	9188	19.7	370

Table1 The *Aurelia aurita* surveyed data from 2015 to 2018

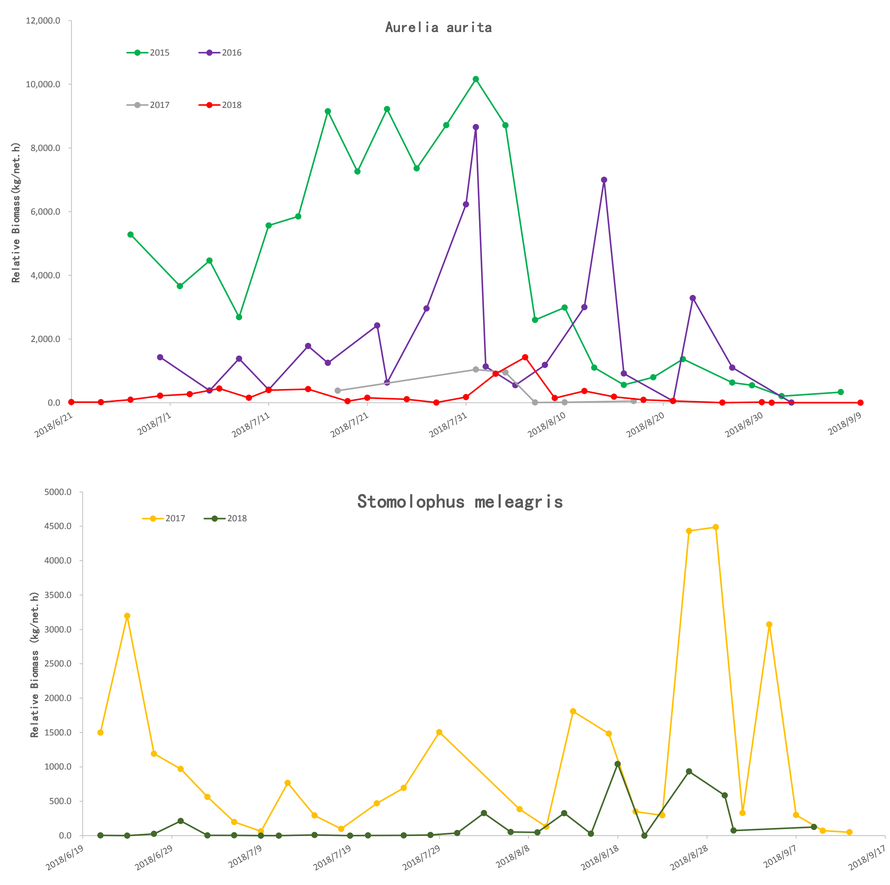

Fig.3 The number of Aurelia aurita and Stomolophus meleagris relative biomass(2015-2018)

In 2010, before the nuclear power operation, the maximum abundance of Aurelia aurita was 533 ind./(net•h).

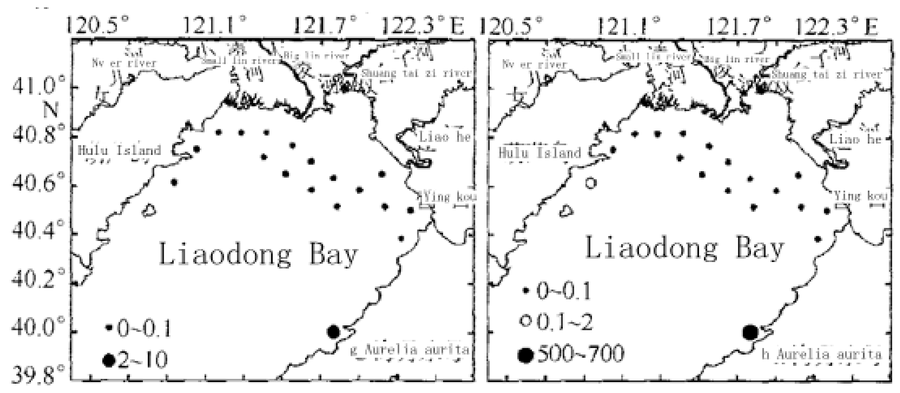

Fig.4 The number of Aurelia aurita biomass(g,2009/6/25-7/2 h,2010/6/24-30）

3 Conclusion

The average results in the past four years showed that maximum abundance of *Aurelia aurita* was about 18 times of that in 2010. Long-term monitoring and comparatively analysis of the structure and function of marine organisms, biological communities and ecosystems, before and after the operation of nuclear power plants, are crucial for rectangle the relationship between the marine ecosystem and the thermal water discharge. And it may be an ideal ‘stress-tests’ system for studying the impacts of climate change on marine ecosystems.