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TITLE: Anthropogenic causes of jellyfish blooms and their direct consequences for humans: a review

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ABSTRACT:

Although recent articles state that jellyfish populations are increasing, most available evidence shows that jellyfish abundances fluctuate with climatic cycles.Reports of increasing problems with jellyfish, especially in East Asia, are too recent to exclude decadal climate cycles.Jellyfish are infamous for their direct negative effects on human enterprise; specifically, they interfere with tourism by stinging swimmers, fishing by clogging nets, aquaculture by killing fish in net-pens and power plants by clogging cooling-water intake screens.They also have indirect effects on fisheries by feeding on zooplankton and ichthyoplankton, and, therefore, are predators and potential competitors of fish.Ironically, many human activities may contribute to increases in jellyfish populations in coastal waters.Increased jellyfish and ctenophore populations often are associated with warming caused by climate changes and possibly power plant thermal effluents.Jellyfish may benefit from eutrophication, which can increase small-zooplankton abundance, turbidity and hypoxia, all conditions that may favor jellyfish over fish.Fishing activities can remove predators of jellyfish and zooplanktivorous fish competitors as well as cause large-scale ecosystem changes that improve conditions for jellyfish.Aquaculture releases millions of jellyfish into Asian coastal waters yearly to enhance the jellyfish fishery.Aquaculture and other marine structures provide favorable habitat for the benthic stages of jellyfish.Changes in the hydrological regime due to dams and other construction can change the salinity to favor jellyfish.Accidental introductions of non-native gelatinous species into disturbed ecosystems have led to blooms with serious consequences.In many coastal areas, most of these environmental changes occur simultaneously.We summarize cases of problem jellyfish blooms and the evidence for anthropogenic habitat disruptions that may have caused them.Rapid development in East Asia makes that region especially vulnerable to escalating problems.We conclude that human effects on coastal environments are certain to increase, and jellyfish blooms may increase as a consequence.

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