Bottlenose Dolphins and Fisheries: How Much Fish Do They Really Take?
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INTRODUCTION

The ecological roles of cetaceans in the trophic dynamics of marine ecosystems have been relatively poorly known until recently. Their diets include a wide variety of prey species, including pelagic, demersal and benthic fishes, euphausiids ("krill"), copepods and other crustacean zooplankton, shrimp, crabs, squid, octopods. Many of the species consumed by cetaceans are likely to be either important target species of commercial fisheries, or linked to such species through the food web. Thus, predation by cetaceans is one factor which should be considered in multi-species fishery management models. In this paper an attempt is made to estimate seasonal and total prey consumption by cetaceans within the major regions of the eastern Adriatic Sea. The objective is to compare the fisheries catches from the early 1990s to the amount of food consumed by marine mammals, and to estimate the primary production required to sustain the only resident marine mammal species in the Adriatic Sea.

MATERIALS AND METHODS

We used available estimates of current bottlenose dolphin abundance and population structure in the Croatian Adriatic, based on aerial surveys and photo-identification, and estimated the average body weight by sex. Dolphin density was estimated for the entire area, and inshore waters. Biomass of dolphins in investigated area was calculated by multiplying the abundance and average weight. Moreover, we analysed the diet of dolphins from the stomachs of the animals stranded along Croatian coast in the past 15 years, and calculated the annual prey consumption in each prey category (% of wet weight). Based on calculated metabolic rates for the bottlenose dolphins, which were adjusted for activity/inactivity periods known from behaviour studies, we calculated the total annual consumption of main prey categories and individually for commercially important species. Due to the high density of bottlenose dolphins in the Cres-Losinj reserve, we made a separate calculation for that population.

RESULTS

Over 90% of estimated 218 bottlenose dolphins in eastern Adriatic are found in inshore waters, with high density in Northern and Central Adriatic. Diet analysis from all areas shows that it is comprised of 64% fish and 31.8% cephalopods (wet weight), with demersal fish (Sparidae, Merluccidae) and benthic octopods dominating these two prey categories.

The annual food consumption by bottlenose dolphins in Croatian offshore waters was estimated to be 16 t of fish and 8 t squid in the offshore area and 250 t fish and 124 t squid in inshore area. Using a five-level trophic model, the approximate primary production needed to support this apex predation rate was estimated to 32.9 x 10^9 g C/year, which equals to only ~3 g C/m²/year.

DISCUSSION

The quantity of fish needed to support bottlenose dolphins in eastern Adriatic sea is small in comparison with fisheries total catch in Croatian Adriatic, and even regular fluctuations of annual fisheries catches. The area with the highest density of dolphins, Northern Adriatic, is important in fishing small pelagic fish, with catches of only 40-50% of MSY, therefore dolphin prey uptake is not significant for this fishery. Demersal fish eaten by dolphins is comparable to 5-10% of the fishing catches, but almost 50% of the catch is hake, which is of different size class than hakes eaten by dolphins, which minimizes the direct competition. The total primary production required to sustain the dolphin population is low (as PP is 200-400 gC/m²/year) compared to other regions and could reflect the reductions in numbers of apex predators, and the possibility of the region to sustain a larger number of cetaceans and other top predators.