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 recentlyTheir 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 arelikely 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 attemptis made to estimate seasonal and total preyconsumption by cetaceans within the major regionsof 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 Adriatuc 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-Lošinj reserve, we made a separate calculation for that population.

Figure 1. Some of the prey items found inbottlenose dophins stomachs

We compared the annual consumption with the amount of catch by commercial and artisanal fisheries, given by the Croatian Nature protection Department. We also compared the spatial distribution of dolphins obtained from aerial surveys with distribution of fisheries catches in different fishing regions .

RESULTS

Over 90% of estimated 218 bottlenose dolphins in eastern Adriatic are found in inshore waters, with high denisty 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, Merluciidae*) and benthic octopods dominating these two prey categories. In Northern Adriatic small pelagic fish (e.g. *Sardina pilchardus*) also a significant part of the diet.

Figure 2. Cres-Losinj reserve with relatively high dolphin biomass

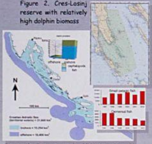

Figure 3. Inshore and offshore area of Croatian adriatic with yearly fisheries catches (red) and average annual dolphins predation (blue/green)

The annual food consumption by bottlenose dolphins in Croatian offshore waters was estimated to be 16t of fish and 8 t squid in the offshore area and 250t fish and 124t squid in inshore area. Using a simple five-level trophic model, the approximate primary production needed to support this apex predation rate was estimated to 32,9 x 10^9g C/year, which equals to only ~3g 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 haks 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.

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