Ecology and conservation of the oceanic whitetip shark
(Carcharhinus longimanus)

Abstract
The oceanic whitetip shark (OCS) is a tropical predator commonly taken as bycatch in pelagic fisheries using longlines and purse seines. Concerns regarding the conservation of oceanic whitetips have risen substantially during the past decade due to increasing fishing pressure throughout the species range and inadequate monitoring of its catches. Despite being frequently caught on high-sea fisheries, there are wide knowledge gaps regarding the behavior and ecology of OCS. The ultimate goal of this thesis was to bridge these knowledge gaps and contribute for an ecosystem-based fishery management. Two main questions are addressed: interactions between OCS and tuna fisheries and the species habitat preferences. Data from the Brazilian longline fleet showed that the nominal catch per unit of effort (CPUE) gradually increased, varying from 0.04 sharks/1000 hooks in 2004 to 0.15 in 2010. A CPUE standardization was performed, but the standardized index of abundance did not differ significantly from the nominal CPUE. The models indicated that the catches of oceanic whitetip sharks are higher for the Spanish fishing strategy, which is characterized by the deployment of hooks at shallower depths. The interaction between OCS and the purse seine fishery was also analyzed using data from the French fleet and the Soviet Union. The combined time series spanned from 1986 to 2014. The occurrence index was very low for the Atlantic Ocean and no marked temporal trend was observed. For the Indian Ocean a well-marked change was observed, fluctuating around 20% from mid 80’s to mid 90’s and dropping to less than 10% as from 2005. The vulnerability of OCS to pelagic longline fisheries was assessed using fisheries dependent and independent data. Fisheries dependent data constituted logbooks from the Brazilian longline fleet. Fisheries independent data were obtained from 8 oceanic whitetip sharks tagged with pop-up satellite archival tags in the area where the longline fleet operated. Tagged OCS exhibited some degree of philopatry to the main fishing ground of the Brazilian longline fleet. All sharks exhibited a strong preference for the warm and shallow waters of the mixed layer, spending on average more than 70% of the time above the thermocline and 95% above 120 m. This result explains the higher catchability of the species on shallow longline gear. Despite its restricted vertical distribution, the data also revealed that OCS perform complex movement patterns, including distinct diel patterns and deep diving behavior. A correlation between vertical movements and sea surface temperature was also observed, suggesting the occurrence of thermoregulation for the species.

Key words
Bycatch, Tuna fisheries, Observer data, Catch rates, Abundance index, Electronic tagging, Movement patterns, Behavior, Mitigation measures