

**POPULATION DISTRIBUTION AND CONSERVATION EFFORTS OF
COMMON DOLPHINS**

An Undergraduate Research Scholars Thesis

by

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ABSTRACT

Population Distribution and Conservation Efforts of Common Dolphins

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Short-beaked common dolphins (*Delphinus delphis*), which were previously considered Data Deficient on the IUCN Red List, are now considered Least Concern even though their population trends remain unknown. After the recent combination with the former species of long-beaked common dolphin (*D. capensis*), there are no recent population estimates or trends combining both subspecies. My research focuses on worldwide populations to determine if some populations are decreasing. Data were compiled to create worldwide population estimates and population trends. I will then address major factors placing the populations at risk and provide potential solutions as to what may help prevent the many populations of this species from decreasing further. As this research is completed, an improved understanding of the worldwide population estimates of this species will be reached which will aide future research regarding this species.

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NOMENCLATURE

ACCOBAMS Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and contiguous Atlantic Area

ASCOBANS Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas

CMS Convention on the Conservation of Migratory Species of Wild Animals

GIS Global Information Systems

NOAA National Oceanic and Atmospheric Administration

IUCN International Union for Conservation of Nature

IATTC Inter-American Tropical Tuna Commission

UNCLOS United Nations Convention on the Law of the Sea

CBD Convention on Biological Diversity

CHAPTER I

INTRODUCTION

Short-beaked common dolphins (*Delphinus delphis*) have a wide distribution, occurring in many temperate and tropical places. In the Atlantic Ocean, they occur in the west from Newfoundland to Miami, Florida, in the east, the Mediterranean and Black Seas; in the Pacific, they occur in the north from Washington to California, and in the south along Mexico to South America.¹ They often stay closer to shore throughout the spring and summer, and then migrate further offshore for the fall.² It is likely that they seek out prey abundance, therefore as prey availability near shore decreases; they move offshore to find another source.³

Background

Many cetaceans have been subject to declining numbers because of trawling, purse seining, and drift nets.⁴ The numbers of short-beaked common dolphins killed as bycatch may have a large effect on populations.⁵ A main factor to the decrease in populations is because they feed primarily on pelagic and epipelagic schooling fishes such as anchovy and squid, which are targeted by trawling fisheries in many areas.⁶ Before conservation efforts such as the ASCOBANS and ACCOBAMS agreements were signed, short-beaked common dolphins were

¹ NOAA 2012

² Thompson, F. N., Abraham, E. R., Berkenbusch, K. 2013

³ Neumann 2001

⁴ Hammond, P.S., Bearzi, G., Bjørge, A., Forney, K., Karczmarski, L., Kasuya, T., Perrin, W.F., Scott, M.D., Wang, J.Y., Wells, R.S. Wilson, B. 2008

⁵ Mannocci, L., Dabin, W., Augeraud-Véron, E., Dupuy, J., Barbraud, C., Ridoux, V. 2012

⁶ Thompson et al. 2013

harvested in Turkey in the Black Sea, with at least 840,000 killed from 1946 until the fishery was shut down in 1983; the population has not fully recovered.⁷

Steps have been taken to help cetacean populations; examples are signing agreements such as ACCOBAMS and ASCOBANS, banning certain types of fishing such as purse seining or drift nets, and requiring warning acoustics when using drift nets. However, there are still many steps that can be taken to help increase populations in shorter timespans. My bibliographic research will expand on outdated research with more current data as well as compare shipping routes with short beaked common dolphin inhabited areas. This research will help to determine current worldwide population estimates and trends of short beaked common dolphins, provide a list of factors that are putting populations at risk, comparing distribution with shipping routes to see if they have an effect and then offer ideas for reducing risks, and therefore increasing population numbers. Scientists could use my compilation and assessment because previous research is outdated and my research could help when determining if a marine protected area would be necessary or if a fishing ban needs to be placed in a certain area due to low population numbers.

Objectives

The goal of this thesis is to determine a worldwide population estimate and trend then look at the factors that put the population at risk. After taking all pertinent and accessible data into consideration, possible solutions will be offered that may help to prevent the many populations of this species from decreasing further.

⁷ Hammond et al. 2008

Null Hypothesis:

After reviewing the data collected, the overall estimate of numbers of the species inhabiting the eastern Atlantic in the Mediterranean and Black Sea, as well as the south Pacific from Mexico to South America is decreasing.

Alternative Hypothesis:

After reviewing the data collected, there is no discernable decrease in the overall estimate of numbers of the species inhabiting the western Atlantic from Newfoundland to Miami, Florida as well as the northern Pacific from Washington to California.

Methodology

The Jack K. Williams library in Galveston, Texas will be the location in which most of the research will be conducted. I will be obtaining population data via manuscripts accessible by Google Scholar and other scientific search engines, as well as the IUCN Red List of Species and other resources. After compiling the data, a worldwide estimate of all populations will be created. Dr. Bernd Würsig has decades of experience with cetaceans and I will be conducting my research in correspondence with him.

CHAPTER II

WORLDWIDE POPULATION

Population Estimates

While apparently abundant, this species has a population that is spread out around the globe. In the Northwestern Atlantic Ocean along Newfoundland to Miami, Florida there is an estimated population of 120,743 common dolphins in the area⁸. In the Eastern Atlantic Ocean, there was an estimated 75,450 common dolphins in the Celtic Sea,⁹ and 3,055 common dolphins in the English Channel in a study conducted during a winter pelagic trawl of fishing grounds¹⁰. The Mediterranean Sea has a population that has seen a dramatic decrease in the recent years, with the local population in the western part of Mediterranean Sea decreasing from 150 to only 15 in a ten-year span¹¹. After the collapse of the population due to overexploitation up until the 1960s, the population in the Black Sea has been rejuvenated and is now at an estimated 96,000 common dolphins¹², however shortly after this study was completed there was a visible decline in the population, therefore more studies need to be conducted for a more accurate estimate.

In the North Pacific Ocean from Washington to California there is an estimate of 489,515 common dolphins in the area¹³. In the Southern Pacific off the coast of Australia there is an estimated 1,957 common dolphins, with the highest density occurring during the peak months between December and April although studies completed in “off-peak” months suggest there are

⁸ Waring, G. T., Josephson, E., Fairfield-Walsh, C., Maze-Foley, K. 2009

⁹ Hammond, P. S., Berggren, P., Benke, H., Borchers, D. L., Collet, A., Heide-Jørgensen, M. P., Øien, N. 2002

¹⁰ De Boer, M., Leaper, R., Keith, S., & Simmonds, M. 2008

¹¹ Bearzi, G. 2011

¹² Sokolov, V., Yaskin, V., & Yukhov, V. 1997

¹³ Carretta, J. V., Forney, K. A., Lowry, M. S., Barlow, J., Baker, J., Hanson, B., & Muto, M. M. 2007

year round resident populations, and that the populations currently inhabiting the area prefer the southern gulf due to the deeper water depths available and increased prey availability¹⁴. While some studies have estimated population size in the waters surrounding New Zealand, the total area covered in each of the studies was too small to create a total population estimate for the area, further studies need to be done with a larger range in order to achieve a more accurate estimate. Along the total habitat range in the Eastern Tropical Pacific Ocean, it appears that the population has rebounded from a dip where there was an estimated 2,466,000 in 2000 and 1,197,000 in 2003 and now is an estimated at 3,127,000 in the area as of 2006¹⁵.

Inherent Risks

Population numbers are driven by factors such as gill nets, trawlers, prey of choice, and ships. With millions of pounds of marine life caught every year via trawling and gillnets among other methods that is thrown back into the sea (dead or alive) as bycatch, commercial fishing has a major affect on this species¹⁶. Anywhere between 1,000 and 25,000 common dolphins are unintentionally caught every year¹⁷. Besides the bycatch that is associated with commercial fishing, this field also has a slightly more indirect affect on common dolphins, and that is by what the trawlers target species is, which could end up being the common dolphins prey of choice. As a prey of choice becomes less available the predator species either moves to where there is a higher abundance, effectively changing the habitat range, or they switch their prey of choice to adapt to the decrease in availability.

¹⁴ Filby, N. E., Bossley, M., Sanderson, K. J., Martinez, E., & Stockin, K. A. 2010

¹⁵ Gerrodette, T., Watters, G., Perryman, W., & Ballance, L. 2008

¹⁶ Read, A.J. 2006

¹⁷ Mannocci et al. 2012

Boats in general can have an affect on cetaceans as the interest in eco-tourism increases which increases the number of boats getting close to cetaceans. However, global shipping routes, due to the boating traffic moving internationally everyday, is creating a lot of “noise” which could potentially affect migration patterns, interfere with ecolocation, and cause beachings.

Using information accessed from the International Union for Conservation of Nature (IUCN), as well as NOAA and other sources, I have compiled a few maps using GIS to compare the influence of trawling¹⁸, shipping¹⁹, and commercial fishing²⁰ with the general habitat range of common dolphins. By doing this, the goal is to show how much of the habitat range is touched, with the assumption that the amount of the habitat range that corresponded with the trawling, commercial fishing, and shipping routes was indicative to the amount of common dolphins affected.

¹⁸ See Figure 1

¹⁹ See Figure 1

²⁰ See Figures 2, 3

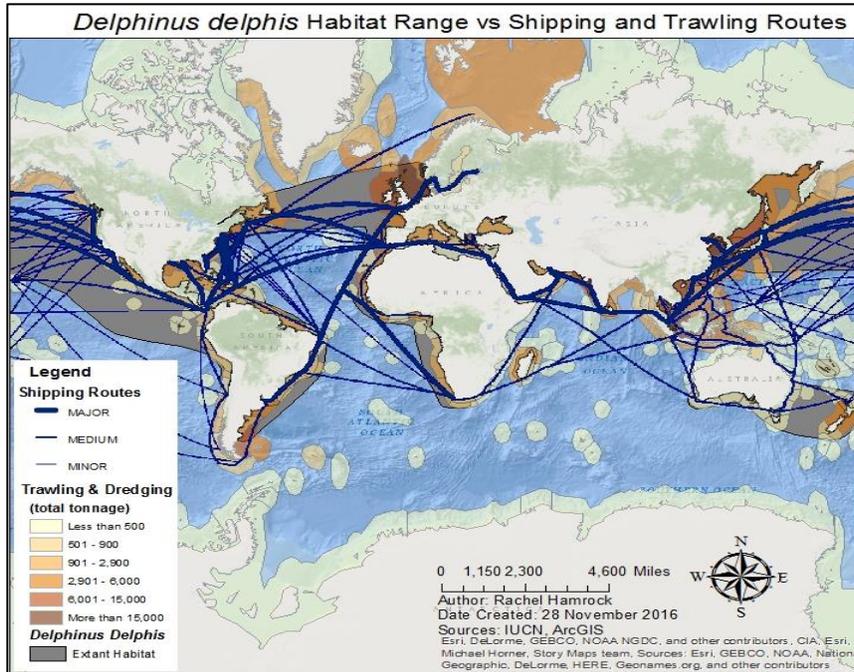


Figure 1: Map Comparing Habitat Range with Shipping and Trawling Routes

There is a visible overlapping between the extant habitat range and the majority of major shipping routes, while trawling and dredging is not as impactful²¹. Major shipping routes include those that see near constant ship traffic, such as tankers and container ships. When there is more constant ship traffic in an area the amount of “noise” entering the water increases and potentially disrupts habitats and disorients species.

²¹ See Figure 1

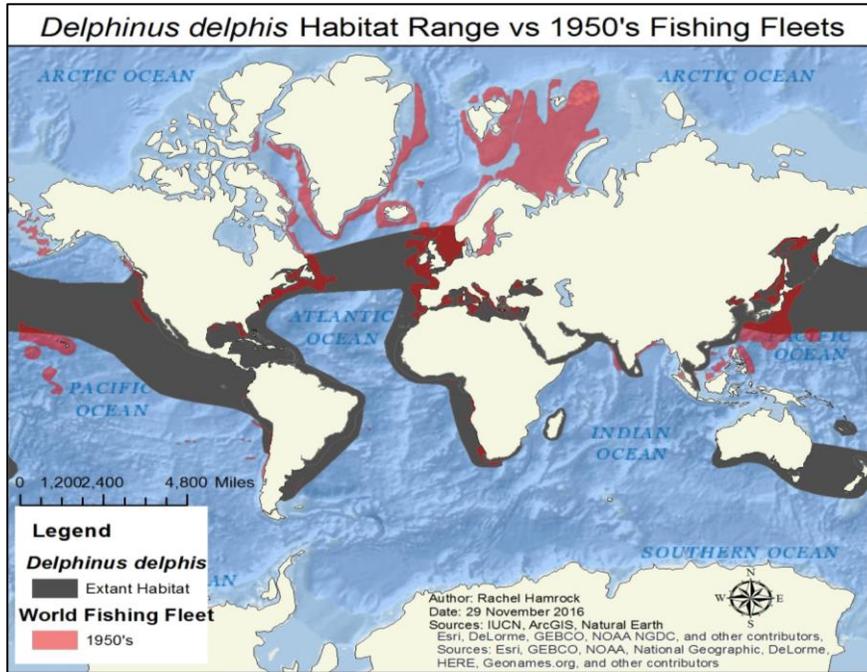


Figure 2: Map Comparing Habitat Range to the areas impacted by the 1950's Commercial Fishing Fleet

Figures 2 and 3 show a change in the worldwide fishing fleet, which is important as the amount of commercial fishing boats on the water is usually synonymous with the amount of fishing that is being done, and how much world stocks are being depleted. When looking at Figure 2, the commercial fishing fleet in the 1950's was not large enough to have an impact on the common dolphins population range, which could be why they thrived in the millions at this time.

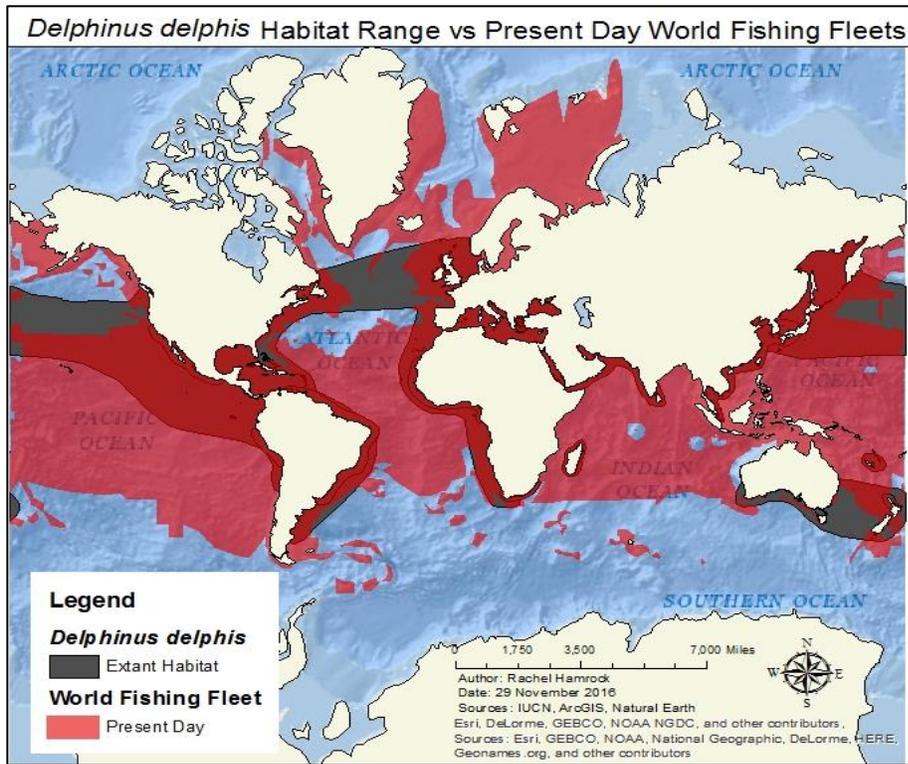


Figure 3: Map Comparing the Habitat Range to the Areas Impacted by the 21st Century Commercial Fishing Fleet

In comparison to Figure 3, the 21st Century fishing fleet has encroached on nearly all of the known habitat range. This could explain why there have been dips in various populations over the past two decades and shows the need for a plan of action before the increasing fishing fleet spirals out of control and depletes the world stocks and increases bycatch as well as fouls the habitat range for common dolphins.

“Noise” has become an increasing problem with the increased boating and military exercises creating disturbances. This is a problem because marine mammals use echolocation and the extra vibrations in the water can cause acoustic trauma and damage. Dolphins have found ways around these disturbances, either diving and staying below surface for longer periods of time or leaving the area temporarily. However, studies have shown if the problem becomes a

larger issue the reproductive success decreases and eventually leads to long-term abandonment of the habitat.²² This could lead to a reduction in habitat this species finds suitable or push them to other locations previously uninhabited by them, as well as create a possible risk to the population by disrupting reproduction among the disturbed populations.

Pollution has become a problem in the world's oceans today with all the global shipping and industrializing and the subsequent waste disposal associated. Increasing levels of contaminants are dumped into various oceans and seas and have been taking a toll on the marine life. Bioaccumulation of harmful substances like cadmium and polychlorinated biphenyls (PCBs) have entered common dolphins systems, found in blubber and kidneys via necropsies causing alarm in many areas. Some scientists have advocated using cetaceans as an indicator species of water quality²³. This suggestion could come from the belief that cetaceans are in most areas easy to locate due to size and their need to surface to breathe. As they tend to follow their main prey of choice, if water quality decreases, the prey abundance is going to diminish, which would cause the number of cetaceans to decrease as they follow their prey to new habitats. This would be an easier method, simply by visual identification instead of trawling an area or setting up gill nets to determine species richness and abundance of an area.

²² Lusseau, D., Bejder, L. 2007

²³ Viale, D. 1994

CHAPTER III

CONSERVATION

Natural Activity

Human stressors have affected wild common dolphin populations, causing them to adapt by switching preferred prey of choice, creating mixed species pods, and hybridizing. Prey of choice varies geographically, for example in the Mediterranean Sea the prey of choice is anchovy but because of a decrease in anchovy due to increased trawling in the area, the number of common dolphins has decreased. In result to this, there are no longer conspecific pods; instead, they have mixed into striped dolphin (*Stenella coeruleoalba*) pods and have started preying on deepwater squid. Mixed species pods suggest communication between species is possible.

Human Activity

Many deaths occur related to fishing gear, whether they are near fisheries or from gill nets, trawls, and purse seines. To help reduce the number of deaths from entanglement, acoustic deterrents have been tested and proven successful in short-term studies²⁴ and the reduction was statistically significant among common dolphins²⁵. There has also been many laws and legislation passed to protect cetaceans; these include UNCLOS, CBD, CMS, ACCOBAMS, and ASCOBANS. UNCLOS primarily protects any body of water close to a country that is a member of the United Nations. CBD essentially protects all bodies of water. The Mediterranean, Western Mediterranean, and Black Sea populations are protected specifically under ACCOBAMS and CMS. The Baltic and North Sea populations are protected specifically under

²⁴ Berrow, S. 2008

²⁵ Barlow, J. 2003

ASCOBANS and CMS, and the Eastern Pacific population is only protected under the CMS. These legislations are various treaties and agreements regarding certain cetaceans in specific regions of the world where multiple countries are in signed agreement to protect species listed. Marine sanctuaries have been set up in different parts of the ocean to create relatively “safe” spaces for marine life. These marine sanctuaries can range from being rather small at less than one square mile to very large exceeding one hundred thousand square miles. Italy, France, and Monaco coordinated and created a marine sanctuary in the Corso-Ligurian Basin primarily for cetaceans, which was needed, especially because the Mediterranean population has been listed as endangered. While marine sanctuaries are a great creation in theory, the reality is common dolphins don’t know the border of these areas, entering and exiting as they please, and the sanctuaries have to remain fixed. Unlike the limitations of the marine sanctuaries, the IATTC has aided in conserving cetaceans, placing a limit on stock mortality, placing regulations on the safety and release of dolphins, and the mandatory use of an acoustic deterrent to aide in the survival of a species by reduced bycatch. Currently research is being led with the conservation of common dolphins in mind; proposing new marine protected areas, reductions in fishing by season or specific fisheries, and a reduction of pollutant input into the oceans.

CHAPTER IV

CONCLUSION

Common dolphins are a species with populations seen worldwide. Due to the internationality of the species, many would assume this species is doing well. After compiling the data for the most part it was seen that the species populations were stable and increasing, or increasing at a slower rate than seen in past years. The Mediterranean population was the exception, with its numbers drastically decreasing over recent years. While this overall might seem like a stable species in terms of population size, the increase in populations could have been due to increased regulations along the pacific coast of the United States.

Keeping a species under observation is truly one of the only ways to notice differences among a population. Monitoring the species is still recommended to determine the populations' numbers are staying in a healthy range. Monitoring in the Mediterranean Sea is vital to saving this species, as well as continuing to present proposals to save this population to local governments. I recommend forming population estimates for future research to receive a more updated number and allow scientists to compare where the species has grown or declined over the last decade. Studying the Black Sea and open water of the Atlantic Ocean would be some of the more important areas to study as there is not much information on the populations in these places, and if there is regarding the Black Sea's population, it is severely outdated and hard to determine if it is an accurate number due to the lack of information. With this research scientists will have an idea as to where the numerous populations around the world stand with these population estimates being the most updated and include the former species *Delphinus capensis*.

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