

## Editorial

# Climate Change and Human Impacts On Our Oceans and Seas- It's a Sad Time to be a Marine Species.



The earth's global climate is under going dramatic changes and these changes are happening at an exceptional rate

mostly due to human influences (5,10). Research indicates that few animal species seem to be free from the potentially disastrous effects of climate change when looking at individual species or the latitude of their habitat (9). As a result, numerous species are now facing extinction. In fact it has been recently published that the extinction rate from climate change is accelerating at an alarming rate (11). The present risk of extinction is at 2.8% which rises to 5.2% with the present international policy of a targeted 2<sup>o</sup> C rise in global temperatures.

However, as most experts do not believe that this 2<sup>o</sup> C is achievable, a 3<sup>o</sup> C rise in global temperatures would raise the extinction risk to 8.5% (11). Some scientists, researchers, individuals, and environmental groups are calling this the 6<sup>th</sup> great extinction as 5 previous times our planet has seen the extinction of up to 90 % of its species (12). In a recent issue of Science (2014), it was reported that in the past 500 years huge numbers of animal species have gone extinct or are now threatened, mostly due to "human biodiversity loss" (or losses due to human impacts) which has resulted in the loss of approximately 11,000 to 58,000 species per year (4).

When looking at the marine ecosystems and the species living within them, it would seem that they will also be dramatically affected by climate change. Increasing thermal stratification, or the temperature differences that separate layers of water, would reduce nutrient upwellings, melt sea ice, or decrease pH. These changes would alter the blooming of phytoplankton which would affect the food chain, thereby having an impact on numerous

species from krill, seabirds, and marine mammals (10). Moffitt *et al* recently published a study examining the decreased amount of oceanic oxygen concentrations through climate change (6). They found that this oxygen loss in the oceans would dramatically change the distribution of marine life living on the margins of the continents, causing the ocean ecosystems to change and require several millennia to recover (6). However, climate change is not the only threat to marine species as other human impacts may further increase their rate of extinction.

Elasmobranchs (sharks, rays, skates) are one of the top apex predators of the marine environment and having a healthy elasmobranch population is critical for a well balanced ecology (7,13). However, it has been recently shown that numerous species of elasmobranchs are seriously endangered by over fishing or from habitat degradation, both of which are man made stressors (13). Multi- stressor research must now be instigated to uncover what impact a combination of climate change and other man made stressors such as over fishing or habitat loss may have on these important species that are already threatened. Logically it can be assumed that the combination of climate change and other stressors will further push these species to the brink of extinction and some preliminary research bears this out. A recent publication from Di Santo (2015) reveals that climate change in combination with ocean acidification has multiple effects on elasmobranch embryos such as increased metabolic costs with decreasing pH, lowered body condition, and decreased survival (3). It is therefore obvious that more than ever, research is required to study and evaluate the effects of climate change in combination with other environmental stressors on the marine ecology and the various species found within it.

With the need for further climate change research, it is critical that government agencies, who have legislative control over these areas of concern



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and that offer research opportunities/funding, take a leading role in furthering research into climate change to protect the marine environment. Instead it seems they continue to withdraw research support in an area that is quickly becoming critical and also has implications for human health. A leading Canadian scientist in the area of elasmobranch research has recently retired and claimed that government scientists were “muzzled”: “We have very strict directives of what we can say and the approval steps we have to go through, and very often that approval seems to be withheld for totally arbitrary reasons.” He also said that “...government scientists often have to find their own funding, travel is often turned down and they are rarely allowed to talk to the media, even about their own groundbreaking research.” (1). As well, critical government programs that were looking into “research and stock assessment of shark species...” have been “temporarily closed” (2).

Climate change, human made stressors, and the threatened existence of top apex predators can only lead to the marine ecology and our environment being pushed further into a state of ever growing instability. In 2006, the Chinese river dolphin went extinct and within 4 more years the vaquita (a small porpoise) will also disappear from the earth's waters. NOAA Fisheries has reported that there are 125 endangered or threatened marine species under their jurisdiction with another 2 shark species presently being petitioned for protection (8). Despite the efforts of many non-governmental groups, scientists/researchers, and private citizens, and regardless of any amount of public outcry, government agencies seem to ignore the scientific data, all pointing to the gravity of climate change. They continue to procrastinate having international meetings to discuss what needs to be done and issue reports. Meanwhile our environment continues to degrade further and more species are being threatened with extinction. It is truly a sad time to be a marine animal.

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