COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Offshore Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two morphologically and genetically distinct forms of common bottlenose dolphin (Duffield et al. 1983; Mead and Potter 1995; Rosel et al. 2009) described as the coastal and offshore forms in the western North Atlantic (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997; Rosel et al. 2009). The two morphotypes are genetically distinct based upon both mitochondrial and nuclear markers (Hoelzel et al. 1998; Rosel et al. 2009). The genetic and morphological differences recently led to the coastal form being described as a new species, *Tursiops erebennus* (Costa et al. 2022).

The offshore form is distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean from Georges Bank to the Florida Keys (Figure 1; CETAP 1982; Kenney 1990), where dolphins with characteristics of the offshore type have stranded. However, common bottlenose dolphins have occasionally been sighted in Canadian waters, on the Scotian Shelf (e.g., Baird et al. 1993; Gowans and Whitehead 1995), and these animals are thought to be of the offshore form. Because there are confirmed sightings within waters of Canada and the Bahamas, this is likely a transboundary stock (e.g., Halpin et al. 2009; Lawson and Gosselin 2009; Dunn 2013; DFO 2017; Emery 2020; Figure 1).

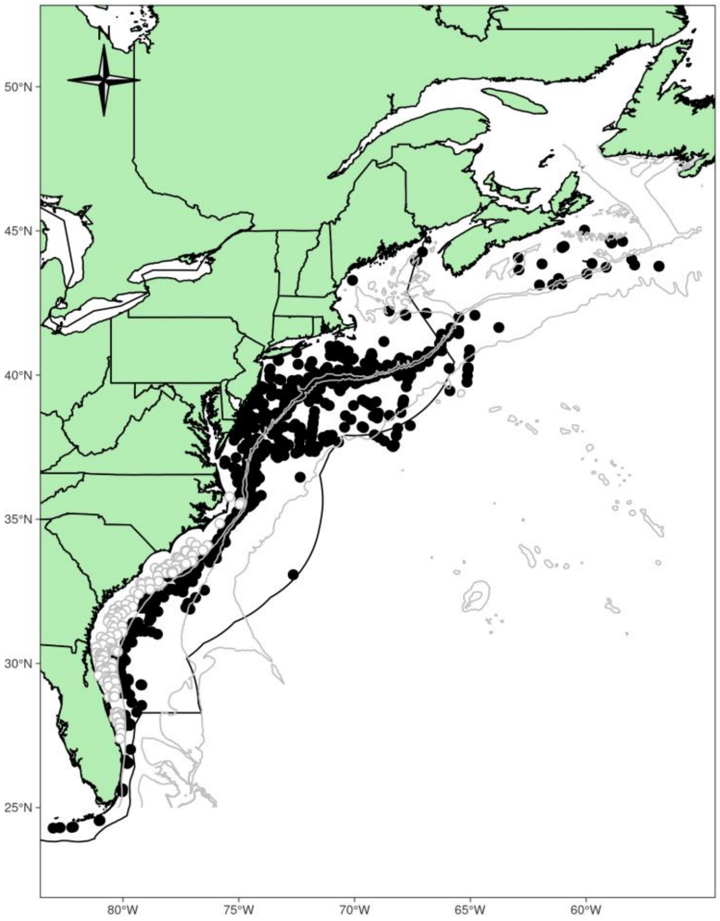

Figure 1. Distribution of offshore common bottlenose dolphin sightings from NEFSC and SEFSC shipboard (circles) and aerial (squares) surveys during 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, 2011, 2016 and 2021. Isobaths are the 200-m, 1,000-m, and 4,000-m depth contours. The darker line indicates the U.S. EEZ. Filled circles represent sightings of the offshore stock. Open circles represent sightings of either the offshore stock or a coastal stock.

North of Cape Hatteras, there is separation of the two morphotypes across bathymetry during summer months. Aerial surveys flown during 1979–1981 indicated a concentration of common bottlenose dolphins in waters < 25 m deep corresponding to the coastal morphotype, and an area of high abundance along the shelf break corresponding to the offshore stock (CETAP 1982; Kenney 1990). Biopsy tissue sampling and genetic analysis demonstrated that common bottlenose dolphins concentrated close to shore were of the coastal morphotype, while those in waters > 25 m depth were from the offshore morphotype (Garrison et al. 2003). However, south of Cape Hatteras, North Carolina, the ranges of the coastal and offshore morphotypes overlap to some degree. Torres et al. (2003) found a statistically significant break in the distribution of the morphotypes at 34 km from shore based upon the genetic analysis of tissue samples collected in nearshore and offshore waters from New York to central Florida. The offshore morphotype was found exclusively seaward of 34 km and in waters deeper than 34 m.

Within 7.5 km of shore, all animals were of the coastal morphotype. More recently, offshore morphotype animals have been sampled as close as 7.3 km from shore in water depths of 13 m (Garrison et al. 2003). Systematic biopsy collection surveys were conducted coast-wide during the summer and winter between 2001 and 2005 to evaluate the degree of spatial overlap between the two morphotypes. Over the continental shelf south of Cape Hatteras, North Carolina, the two morphotypes overlap spatially, and the probability of a sampled group being from the offshore morphotype increased with increasing depth based upon a logistic regression analysis (Garrison et al. 2003). Hersh and Duffield (1990) examined common bottlenose dolphins that stranded along the southeast coast of Florida and found four that had hemoglobin profiles matching that of the offshore morphotype. These strandings suggest the offshore form occurs as far south as southern Florida. The range of the offshore common bottlenose dolphin includes waters beyond the continental slope (Kenney 1990), and also waters beyond the U.S. EEZ, and therefore the offshore stock is a transboundary stock (Figure 1). Offshore common bottlenose dolphins may move between the Gulf of Mexico and the Atlantic (Wells et al. 1999).

The western North Atlantic Offshore Stock of common bottlenose dolphins is managed separately from the Gulf of Mexico Oceanic Stock of common bottlenose dolphins. One line of evidence to support this separation comes from Baron et al. (2008), who found that Gulf of Mexico common bottlenose dolphin whistles (collected from oceanic waters) were significantly different from those in the western North Atlantic Ocean (collected from continental shelf and oceanic waters) in duration, number of inflection points and number of steps. In addition, the western North Atlantic and Gulf of Mexico belong to distinct marine ecoregions (Spalding et al. 2007). Restricted genetic exchange has been documented among offshore populations in the Gulf of Mexico (Vollmer and Rosel 2016) but analyses to determine whether multiple demographically independent populations exist within the western North Atlantic have not been performed to date.

POPULATION SIZE

The best available estimate for the offshore stock of common bottlenose dolphins in the western North Atlantic is 64,587 (CV=0.24; Table 1; Garrison and Dias 2023; Palka 2023). This estimate is from summer 2021 surveys covering waters from central Florida to the lower Bay of Fundy.

Earlier Abundance Estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent Surveys and Abundance Estimates

Abundance estimates of 17,958 (CV=0.33; combined northeast vessel and aerial surveys) and 44,893 (CV=0.29; southeast vessel survey) offshore common bottlenose dolphins were generated from surveys conducted in U.S. waters of the western North Atlantic during the summer of 2016 (Table 1; Garrison 2020; Palka 2020). One vessel survey was conducted from 27 June to 25 August in waters north of 38ºN latitude and included 5,354 km of on-effort trackline along the shelf break and offshore to the U.S. EEZ (NEFSC and SEFSC 2018). A concomitant aerial portion was conducted from 14 August to 28 September and included 11,782 km of trackline that were over waters north of New Jersey from the coastline to the 100-m depth contour, throughout the U.S. waters (NEFSC and SEFSC 2018). Estimates from these two surveys were combined to provide an abundance estimate for the area north of 38ºN. The second vessel survey covered waters from central Florida to approximately 38ºN latitude between the 100-m isobaths and the U.S. EEZ during 30 June–19 August. A total of 4,399 km of trackline was covered on effort (NEFSC and SEFSC 2018). All surveys utilized two visual teams and an independent observer approach to estimate detection probability on the trackline (Laake and Borchers 2004). Mark-recapture distance sampling was used to estimate abundance. Estimates from the two surveys were combined and CVs pooled to produce a species abundance estimate for the stock area.

More recent abundance estimates of 37,721 (CV=0.34) and 26,866 (CV=0.34) offshore common bottlenose dolphins were generated from vessel surveys conducted in U.S. waters of the western North Atlantic during the summer of 2021 (Table 1; Garrison and Dias 2023; Palka 2023). One survey was conducted from 16 June to 23 August in waters north of 36ºN latitude and consisted of 5,871 km of on-effort trackline along the shelf break and offshore to the outer edge of the U.S. EEZ (NEFSC and SEFSC 2022). The second vessel survey covered waters from central Florida (25ºN latitude) to approximately 38ºN latitude between the 200-m isobaths and the outer edge of the U.S. EEZ during 12 June–31 August. A total of 5,659 km of trackline was covered on effort (NEFSC and SEFSC 2022). Both surveys utilized two visual teams and an independent observer approach to estimate detection probability on the trackline (Laake and Borchers 2004). Mark-recapture distance sampling was used to estimate abundance. Estimates from the two surveys were combined and CVs pooled to produce an abundance estimate for the stock area.

Table 1. Summary of recent abundance estimates for western North Atlantic offshore stock of common bottlenose dolphins* (Tursiops truncatus truncatus) *by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV). The estimate considered best is in bold font.

Month/Year	Area	N_{best}	CV
Jun–Aug 2016	New Jersey to lower Bay of Fundy	17,958	0.33
Jun–Aug 2016	Central Florida to New Jersey	44,893	0.29
Jun–Aug 2016	Central Florida to lower Bay of Fundy (COMBINED)	62,851	0.23
Jun–Aug 2021	New Jersey to lower Bay of Fundy	37,721	0.34
Jun–Aug 2021	Central Florida to New Jersey	26,866	0.34
Jun–Aug 2021	**Central Florida to lower Bay of Fundy (COMBINED)**	**64,587**	**0.24**

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best abundance estimate is 64,587 (CV=0.24). The minimum population estimate for western North Atlantic offshore common bottlenose dolphin stock is 52,801 (Table 2).

Current Population Trend

There are four available coastwide abundance estimates for offshore common bottlenose dolphins from the summers of 2004, 2011, 2016, and 2021. Each of these is derived from surveys with similar survey designs and all four used the two-team independent observer approach to estimate abundance. The resulting estimates were 54,739 (CV=0.24) in 2004, 77,532 (CV=0.40) in 2011, 62,851 (CV=0.23) in 2016, and 64,587 (CV=0.24) in 2021 (Garrison 2020; Garrison and Dias 2023; Palka 2020; Palka 2023). A generalized linear model did not indicate a statistically significant (p=0.546) trend in these estimates. The high level of uncertainty in these estimates limits the ability to detect a statistically significant trend. A key uncertainty in this assessment of trend is that interannual variation in abundance may be caused by either changes in spatial distribution associated with environmental variability or changes in the population size of the stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4%, given the constraints of their reproductive life history (Barlow et al. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for offshore common bottlenose dolphins is 52,801. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor is 0.48 because the CV of the average mortality estimate is greater than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic offshore common bottlenose dolphin is therefore 507 (Table 2).

Table 2. Best and minimum abundance estimates for the western North Atlantic offshore stock of common bottlenose dolphins with Maximum Productivity Rate (R_{max}), Recovery Factor (F_r) and PBR.

N_{est}	CV N_{est}	N_{min}	F_r	R_{max}	PBR
64,587	0.24	52,801	0.48	0.04	507

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury of offshore common bottlenose dolphins during 2017–2021 was 28 (CV=0.43; Table 3) incidental to the large pelagics longline, northeast sink gillnet, northeast bottom trawl, and mid-Atlantic bottom trawl commercial fisheries. Additional mean annual mortality and serious injury for offshore common bottlenose dolphins 2017–2021 due to other human-caused sources was presumed to be zero. The minimum total mean annual human-caused mortality and serious injury for offshore common bottlenose dolphins during 2017–2021 was therefore 28. This is considered a minimum because 1) the estimate of fishery-related mortality and serious injury does not include the mid-Atlantic gillnet fishery, and 2) the likelihood is low that a dolphin killed at sea due to a fishery interaction or vessel-strike will be recovered (Williams et al. 2011).

Fisheries Information

There are seven commercial fisheries that interact, or that potentially could interact, with this stock in the Atlantic Ocean. These include four Category I fisheries (Atlantic Highly Migratory Species longline; Atlantic Ocean, Caribbean, Gulf of Mexico large pelagics longline; mid-Atlantic gillnet; and northeast sink gillnet), two Category II fisheries (northeast bottom trawl and mid-Atlantic bottom trawl), and the Category III Gulf of Maine, U.S. mid-Atlantic tuna, shark, swordfish hook and line/harpoon fishery. Detailed fishery information is reported in Appendix III.

No interactions have been documented in recent years for the U.S. mid-Atlantic tuna, shark, swordfish hook and line/harpoon fishery. See Appendix V for information on historical takes.

Longline

The Atlantic Highly Migratory Species longline fishery operates outside the U.S. EEZ. No takes of common bottlenose dolphins within high seas waters of the Atlantic Ocean have been observed or reported thus far.

The large pelagics longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ, and pelagic swordfish, tunas and billfish are the target species. During 2017–2021, there was one observed mortality and three observed serious injuries of common bottlenose dolphins of the offshore stock by this fishery (Garrison and Stokes 2020a; 2020b; 2021; 2023a; 2023b). See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical estimates of annual mortality and serious injury.

Table 3. Summary of the incidental mortality and serious injury of western North Atlantic offshore common bottlenose dolphins* (Tursiops truncatus truncatus) *by commercial fishery including the years sampled (Years), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries using on-board observer data, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Large Pelagics Longline	2017	Obs. Data Logbook	.11	0	0	0	0	0	NA	8.7 (0.50)
	2018		.10	2	0	17.3	0	17.3	0.73	
	2019		.10	0	0	0	0	0	NA	
	2020		.09	1	0	10.2	0	10.2	0.73	
	2021		.08	0	1	0	15.8	15.8	1.00	
Northeast Sink Gillnet[c]	2017	Obs. Data Logbook	.12	0	1	0	8	8	.92	2.3 (3.21)
	2018		.11	0	0	0	0	0	0	
	2019		.12	0	0	0	0	0	0	
	2020		.02	0	0	0	1.9	1.9	0.99	
	2021		.11	0	0	0	1.4	1.4	0.99	
Northeast Bottom Trawl[d]	2017	Obs. Data Logbook	.12	0	0	0	0	0	NA	2.2 (0.56)
	2018		.12	0	0	0	0	0	NA	
	2019		.16	0	1	0	5.6	5.6	0.92	
	2020		.08	0	0	0	1.9	1.9	0.92	
	2021		.19	0	1	0	3.7	3.7	0.86	

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Mid-Atlantic Bottom Trawl[d]	2017 2018 2019 2020 2021	Obs. Data Logbook	.14 .12 .12 .02 .04	0 0 0 0 0	3 1 0 1 2	0 0 0 0 0	22.1 6.3 0 9.5 37.9	22.1 6.3 0 9.5 37.9	0.66 0.91 NA 0.55 1.03	15.2 (0.56)
TOTAL	2017–2021	-	-	-	-	-	-	-	-	28 (0.43)

[a] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

[b] Proportion of sets observed (for Pelagic Longline, in the Atlantic portion of the fishery).

c Observer data in the Northeast sink gillnet fishery in 2020 and 2021 was not used in the bycatch estimation process, because observer coverage was impacted by the COVID-19 pandemic and was not believed to be representative of the fishery in 2020 and 2021. The numbers of observed mortalities and serious injuries are included in the usual columns for the sake of documentation only. Bycatch estimates for 2020 and 2021 were developed using the observed bycatch rate in 2017-2019 and fishing effort in 2020 and 2021 respectively. The CV for the annual mortality over 2017-2021 was calculated using the estimated CVs from 2017-2019 only.

[d] Due to the impact of the COVID-19 pandemic on Northeast and Mid-Atlantic bottom trawl observer coverage, a 3-year average (2017–2019) was used to estimate mortality and serious injury for calendar year 2020. The observed numbers are included in the usual columns for the sake of documentation only. Fishery related bycatch rates for 2017–2019 and 2021 were estimated using an annual stratified ratio-estimator following the methodology described in Chavez-Rosales et al. (2018).

Northeast Sink Gillnet

During 2017–2021, one mortality was observed (in 2017) in the northeast sink gillnet fishery (Orphanides 2020, 2021; Precoda and Orphanides 2022; Precoda 2023). There were no observed injuries of common bottlenose dolphins in the Northeast region during 2017–2021 to assess using new serious injury criteria. See Table 3 for bycatch estimates and observed mortality and serious injury for the current five-year period, and Appendix V for historical estimates of annual mortality and serious injury.

Through the Marine Mammal Authorization Program (MMAP) during 2017–2021, there were four self-reported incidental takes (mortalities) of common bottlenose dolphins off New York (during 2017).

Northeast Bottom Trawl

During 2017–2021, two mortalities were observed in the northeast bottom trawl fishery (Lyssikatos et al. 2020, 2021; Lyssikatos and Chavez-Rosales 2022). There were no observed injuries of common bottlenose dolphins in the northeast region during 2017–2021 to assess using new serious injury criteria. See Table 3 for bycatch estimates and observed mortality and serious injury for the current five-year period, and Appendix V for historical estimates of annual mortality and serious injury.

Through the Marine Mammal Authorization Program (MMAP) during 2017–2021, there was one self-reported incidental take (mortality) of a common bottlenose dolphin off Massachusetts while trawling for *Illex* squid.

Mid-Atlantic Bottom Trawl

During 2017–2021, seven mortalities were observed in the mid-Atlantic bottom trawl fishery (Lyssikatos et al. 2020, 2021; Lyssikatos and Chavez-Rosales 2022). There were no observed injuries of common bottlenose dolphins in the mid-Atlantic region during 2017–2021 to assess using new serious injury criteria. See Table 3 for bycatch estimates and observed mortality and serious injury for the current five-year period, and Appendix V for historical estimates of annual mortality and serious injury.

Mid-Atlantic Gillnet

Through the Marine Mammal Authorization Program (MMAP) during 2017–2021, there was one self-reported incidental take (mortality) of a common bottlenose dolphin off Virginia (during 2019) by a fisherman targeting monkfish.

STATUS OF STOCK

The common bottlenose dolphin in the western North Atlantic is not listed as threatened or endangered under the Endangered Species Act, and the offshore stock is not considered strategic under the MMPA. Total U.S. fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching the zero mortality and serious injury rate. The status of this stock relative to optimum sustainable population in the U.S. Atlantic EEZ is unknown. There was no statistically significant trend in population size for this species; however, the high level of uncertainty in the estimates limits the ability to detect a statistically significant trend.

OTHER FACTORS THAT MAY BE AFFECTING THE STOCK

Strandings

A total of 1,764 common bottlenose dolphins were found stranded along the U.S. East Coast from 2017 through 2021 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 October 2022 (Southeast Region) and 18 September 2022 (Northeast Region)). Of these, 264 showed evidence of human interactions (e.g., gear entanglement, mutilation, vessel strike). However, none were identified as belonging to the offshore stock. The vast majority of stranded common bottlenose dolphins are assumed to belong to one of the coastal stocks or to bay, sound and estuary stocks. For example, only 19 of 185 *Tursiops* strandings in North Carolina that were genetically tested were assigned to the offshore form (Byrd et al. 2014). Nevertheless, it is possible that some of the stranded common bottlenose dolphins belonged to the offshore stock and that they were among those strandings with evidence of human interactions.

Habitat Issues

Anthropogenic sound in the world's oceans has been shown to affect marine mammals, with vessel traffic, seismic surveys, and active naval sonars being the main anthropogenic contributors to low- and mid-frequency noise in oceanic waters (e.g., Nowacek et al. 2015; Gomez et al. 2016; NMFS 2018). The long-term and population consequences of these impacts are less well-documented and likely vary by species and other factors. Impacts on marine mammal prey from sound are also possible (Carroll et al. 2017), but the duration and severity of any such prey effects on marine mammals are unknown.

Offshore wind development in the U.S. Atlantic may also pose a threat to this stock, particularly south of Cape Hatteras where it comes closer to shore. Activities associated with development include geophysical and geotechnical surveys, installation of foundations and cables, and operation, maintenance and decommissioning of facilities (BOEM 2018). The greatest threat from these activities is likely underwater noise, however other potential threats include vessel collision due to increased vessel traffic, benthic habitat loss, entanglement due to increased fishing around structures, marine debris, dredging, and contamination/degradation of habitat (BOEM 2018).

The chronic impacts of contaminants (polychlorinated biphenyls [PCBs] and chlorinated pesticides [DDT, DDE, dieldrin, etc.]) on marine mammal reproduction and health are of concern (e.g., Schwacke et al. 2002; Jepson et al. 2016; Hall et al. 2018), but research on contaminant levels for the offshore stock of bottlenose dolphins is lacking.

Climate-related changes in spatial distribution and abundance, including poleward and depth shifts, have been documented in or predicted for plankton species and commercially important fish stocks (Nye et al. 2009; Pinsky et al. 2013; Poloczanska et al. 2013; Grieve et al. 2017; Morley et al. 2018) and cetacean species (e.g., MacLeod 2009; Sousa et al. 2019). Chavez-Rosales et al. (2022) documented an overall 178 km northeastward spatial distribution shift of the seasonal core habitat of Northwest Atlantic cetaceans that was related to changing habitat/climatic factors. Results varied by season and species. This study used sightings data collected during seasonal aerial and shipboard line transect abundance surveys during 2010 to 2017. During this time frame, the weighted centroid of the offshore common bottlenose dolphin core habitat moved farthest during fall (753 km towards the northeast) and least during winter (211 km). There is uncertainty in how, if at all, the changes in distribution and population size of cetacean species may interact with changes in distribution of prey species and how the ecological shifts will affect human impacts to the species.

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