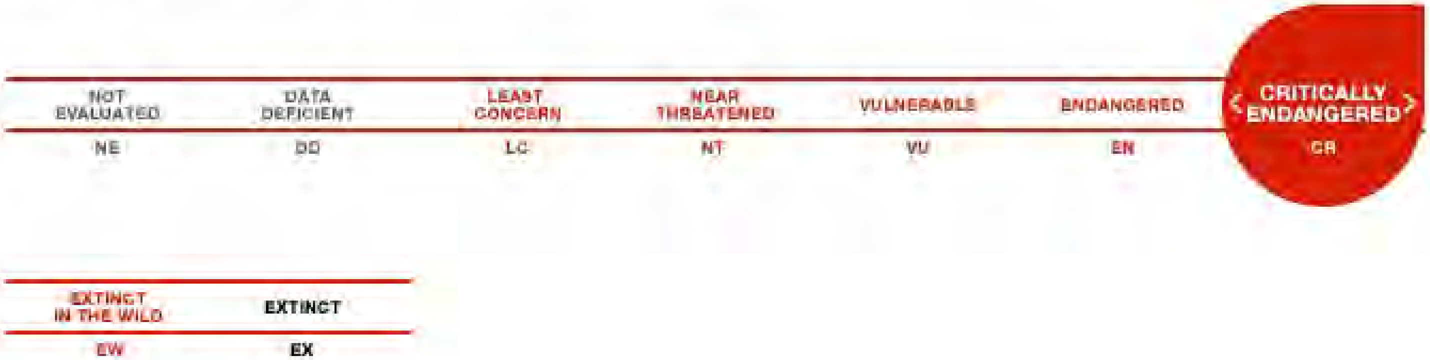
Exhibit R-025

IUCN, 2014 Red List of Threatened Species, "Dermochelys coriacea (East Pacific Ocean subpopulation)," *available at* http://www.iucnredlist.org/details/46967807/0

July 9, 2014

Dermochelys coriacea (East Pacific Ocean subpopulation)



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Taxonomy [top]

Kingdom	Phylum	Class	Order	Family
ANIMALIA	CHORDATA	REPTILIA	TESTUDINES	DERMOCHELYIDAE

Scientific Name: Dermochelys coriacea (East Pacific Ocean subpopulation)
Species Authority: (Vandelli, 1761)
Parent Species: See Dermochelys coriacea
Common Name(s):
English – Leatherback

Assessment Information [top]

Red List Category & Criteria: Critically Endangered A2bd+4bd ver 3.1
Year Published: 2013
Date Assessed: 2013-06-24
Assessor(s): Wallace, B.P., Tiwari, M. & Girondot, M.
Reviewer(s): Dutton, P.H., Bolten, A.B., Chaloupka, M.Y., van Dijk, P.P., Mortimer, J.A., Casale, P., Eckert, K.L., Nel, R., Musick, J.A., Pritchard, P.C.H., Dobbs, K., Miller, J. & Limpus, C.
Contributor(s): Reina, R., Sarti, L., Urteaga, J., Santidrian Tomillo, P. & Barragan, A.
Justification:

Rationale

The East Pacific (EP) Leatherback subpopulation nests along the Pacific coast of the Americas from Mexico to Ecuador, and marine habitats extend from the coastline westward to approximately 130°W and south to approximately 40°S (Figure 1 in attached PDF). Despite some areas of overlap in distribution with the West Pacific subpopulation, the East Pacific subpopulation is genetically distinct from all other Leatherback subpopulations (Dutton *et al.* 1999), and it occupies unique core feeding and migratory habitats (Bailey *et al.* 2012).

Based on analysis of long-term time series datasets of abundance—i.e. annual counts of nesting females and nests—this East Pacific Leatherback subpopulation has declined 97.4% during the past three generations (Table 1 in attached PDF), which corroborates earlier studies (Spotila *et al.* 1996, 2000; Santidrián Tomillo *et al.* 2007; Sarti Martínez *et al.* 2007; Wallace and Saba *et al.* 2009). Because the threats to this subpopulation (e.g. egg harvest, fisheries bycatch) have not ceased and are not reversible, the East Pacific Leatherback subpopulation is considered *Critically Endangered according to IUCN Red List Criterion A2, subcriteria (b) and (d)*. Likewise, applying Criterion A4 reveals a population decline of 99.9% by the year 2040, or one generation from now (Table 2 in attached PDF), which meets the requirements of *Critically Endangered under A4, subcriteria (b) and (d).*

Justification

Application of Criterion A2 is appropriate, as population reduction has been observed in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible. Furthermore, applicable subcriteria under Criterion A2 include (b) an index of abundance appropriate to the taxon (i.e. annual counts of nesting females, nests), and (d) actual or potential levels of exploitation. Based on Criterion A4, this subpopulation will be nearly extinct—population decline of 99.9%—in another generation (i.e., by 2040), with a remaining abundance of approximately 52 nests (~7 females) per year, or fewer than 30 adult females total.

We also applied Criterion B, C, and D to the East Pacific subpopulation. The extent of occurrence and area of occupancy exceeded the thresholds of Criterion B. Although the small number of mature individuals and single location (i.e. one genetic stock; Dutton *et al.* 1999) of this subpopulation met thresholds that triggered a threatened category of Endangered for Criteria C and Vulnerable for Criterion D, Criteria A2bd+4bd are used for this assessment because they triggered a higher threatened category.

Our analyses of long-term abundance trends at EP Leatherback index nesting beaches corroborated previous reports from long-term monitoring projects on primary nesting beaches in Mexico (Sarti Martínez *et al.* 2007) and Costa Rica (Santidrián Tomillo *et al.* 2007), which demonstrated that nesting abundance has declined more than 90% since the 1980s (Spotila *et al.* 2000; Figure 2 and Table 1 in attached PDF). The drivers of this decline—both anthropogenic (e.g. bycatch, egg harvest) as well as environmental (e.g. resource limitation)—have been described in detail (for review see Wallace and Saba 2009). Furthermore, long-term monitoring and conservation programs at the index nesting beaches in Mexico and Costa Rica have essentially eliminated threats from human consumption of eggs and nesting females, and ongoing efforts at important beaches in Nicaragua are increasing in effectiveness (Urteaga *et al.* 2012). Nonetheless, the abundance of this subpopulation remains perilously low, and continues to decrease slowly toward extinction. Fisheries bycatch is still considered the major obstacle to population recovery (Wallace and Saba 2009, Wallace *et al.* 2013).

Assessment Procedure

We assessed the status of the East Pacific Leatherback subpopulation by Criteria A-D; because no population viability analysis has been performed, Criterion E could not be evaluated.

Criterion A: We compiled time series datasets of abundance of nesting females or their nesting activities from all index beaches for the East Pacific subpopulation, including five beaches in México, one site (comprised of three beaches) in Costa Rica, and three beaches in Nicaragua, which together account for the vast majority of abundance for this population (Table 1 in attached PDF). Time series used were <10 years (Nicaragua) and between 15->20 years (Mexico and Costa Rica), and included counts of monitored nesting activities (e.g. tracks or nests) or individual nesting females. For marine turtles, annual counts of nesting females and their nesting activities (more often the latter) are the most frequently recorded and reported abundance metric across index monitoring sites, species, and geographic regions (NRC 2010). We presented and analysed all abundance data in numbers of nests yr^{-1}, as this metric was the most commonly available (Table 1 in attached PDF).

We calculated annual and overall population trends for each rookery within the subpopulation, and then calculated the average subpopulation trend by weighting rookery population trends by historical rookery abundance relative to historical subpopulation abundance. We only included time series datasets of ≥10 yr in trend estimations, although we included all rookeries for which we were obtained abundance values in the overall summary tables (Table 1 in attached PDF).

The most recent year for available abundance data across all rookeries and subpopulations was 2010. Where time series ended prior to 2010, we estimated population sizes for each rookery through 2010 based on the population trend for existing years. Furthermore, if a longer time series for a rookery within a subpopulation was available that reflects a trend not captured by shorter time series, we estimated historical abundance to calculate overall declines for that subpopulation. For example, abundance data for three of five index sites in the Mexican Pacific—the East Pacific subpopulation—begin in the early 1980s, while the remaining sites (i.e., Barra de la Cruz and Cahuitán, Oaxaca) begin in the early 1990s (Table 1 in attached PDF). All other sites in Mexico, as well as other sites within the same subpopulation (i.e., those in Costa Rica), showed a decline of >97% beginning in the 1980s, whereas the Barra de la Cruz and Cahuitán showed much less dramatic declines, because those time series began after the broader population decline had already begun to occur. Given the synchrony in inter-annual abundance fluctuations and historical reports of high abundance among these rookeries (Eckert 1993), we assumed that the abundance at Barra de la Cruz and Cahuitán was similar to that of other Mexican rookeries at the beginning of those time series, i.e., 1982 (L. Sarti Martínez pers. comm.). This allowed us to standardize trend and abundance estimates within the Mexican rookeries.

To evaluate Criterion A, three generations (or a minimum of ten years, whichever is longer) of abundance data are required (IUCN 2011). For A2, data from three generations ago (~100 yr) are necessary to estimate population declines beginning three generations ago through the present (i.e. assessment) year. The challenges of this requirement on long-lived species like marine turtles—with generation lengths of 30 yr or more—are obvious (see Seminoff and Shanker 2008 for review). Abundance data from ~100 yr ago are not available for Leatherbacks anywhere in the world. We considered extrapolating backward using population trends based on current datasets inappropriate because estimates produced would be biologically unrealistic and unsubstantiated, given what is currently known about sea turtle nesting densities on beaches and other factors (Mrosovsky 2003). In the absence of better information, we assumed that population abundance three generations (~100 years, one generation estimated 30 yr; see below) ago was similar to the first observed abundance than to assume that the population has always been in a decline (or increase) of the same magnitude as in the current generation (Table 1 in attached PDF). A similar approach was used in the Red List assessment of another long-lived, geographically widespread taxon, the African Elephant (Blanc 2008). Thus, to apply Criterion A to this subpopulation, we assumed that the abundance at the beginning of an available time series dataset had not changed significantly in three generations, and therefore used the same abundance value in trend calculations (Tables 1 and 2 in attached PDF).

We also applied Criterion A4 to the East Pacific subpopulation, using the same overall scheme as described above. Criterion A4 permits for analysis of population trend during a "moving window" of time, i.e. over three generations, but where the time window must include the past, present, and future. Therefore, we made the same assumption about earliest available historical abundance being equivalent to the subpopulation abundance for generations past, and estimated future population abundance in 2020, 2030, and 2040, i.e. within one generation. This future projection assumes that the derived population trend will continue without deviation during the next generation. Implicit in this assumption is that no changes to degree of threats impacting rookeries or the subpopulation will occur during that time. We deemed this to be a reasonable assumption, based on available information, because threats to Leatherbacks in this region that have caused observed declines have not ceased and are not reversible (for review, see Eckert *et al.* 2012; Wallace and Saba 2009; Wallace *et al.* 2011, 2013), and new threats are emerging (e.g., coastal development (Wallace and Piedra 2012). Based on application of Criterion A4 to the available data, this subpopulation will have declined by 99.9% by the year 2040, or within one generation (Table 2 in attached PDF). This would correspond to a total subpopulation abundance of approximately 52 nests per year—roughly seven females per year—at the index sites, or fewer than 30 adult females total, which could represent functional extinction, as is currently reported for the formerly large Leatherback rookery at Terengganu, Malaysia (Chan and Liew 1996, Tapilatu *et al.* 2013).

<u>Criterion B:</u> We defined extent of occurrence (EOO) as the total area included within the georeferenced boundaries of the East Pacific Leatherback subpopulation (Figure 1 in attached PDF), which we calculated to be >46 million km^2. We defined area of occupancy (AOO) as the linear distribution of nesting sites within the EOO, multiplied by 2 km to account for the IUCN Guidelines for calculating linear AOOs using minimum grid cell size of 2 km x 2 km. The AOO for this subpopulation was calculated in excess of 2,000 km^2. Due to the broad distribution of the EP Leatherback subpopulation, Criterion B did not meet thresholds for any threatened category.

Criterion C: To apply Criterion C, we first calculated the number of mature individuals in the subpopulation, i.e., the total number of adult females and males. First, we divided the current average annual number of nests (n=926, Table 1 in attached PDF) by the estimated clutch frequency (i.e. average number of clutches per female; n=7.2, Reina *et al.* 2002) to obtain an average annual number of nesting females. Next, we multiplied this value by the average remigration interval (i.e. years between consecutive nesting seasons; n=3.7 yr, Reina *et al.* 2002, Santidrián Tomillo *et al.* 2007) to obtain a total number of adult females that included nesting as well as non-nesting turtles. Finally, to account for adult males, we assumed that the sex ratio of hatchlings produced on nesting beaches in the East Pacific (approximately 75% female, or 3:1 female:male ratio) reflected the natural adult sex ratio. This calculation provided an estimated mature adult population of 633 individuals, which triggered a threat category under Criterion C (Endangered). In addition, this subpopulation is exhibiting an estimated continuing decline of at least 25% in one generation (CR). Taken together, the East Pacific subpopulation meets the thresholds for the *Endangered under Criterion C (EN C1)*.

Criterion D: The East Pacific subpopulation has 633 mature individuals, and we defined "locations" as biological rookeries, i.e. genetic stocks, within the EOO (n=1; Dutton *et al.* 1999). These values meet thresholds for *Vulnerable under Criterion D1 and D2* (VU D1+2).

Estimating Generation Length:

Leatherback age at maturity is uncertain, and estimates range widely (see Jones *et al.* 2011 for review). Reported estimates fall between 9-15 yr, based on skeletochronology (Zug and Parham 1996), and inferences from mark-recapture studies (Dutton *et al.* 2005). Furthermore, updated skeletochronological analyses estimated Leatherback age at maturity to be between 26-32 yr (mean 29 yr) (Avens *et al.* 2009). Extrapolations of captive growth curves under controlled thermal and trophic conditions suggested that size at maturity could be reached in 7-16 yr (Jones *et al.* 2011). Thus, a high degree of variance and uncertainty remains about Leatherback age at maturity in the wild. Likewise, Leatherback lifespan is unknown. Long-term monitoring studies of Leatherback nesting populations have tracked individual adult females over multiple decades (e.g. Santidrián Tomillo *et al.* unpublished data, Nel and Hughes unpublished data), but precise estimates of reproductive lifespan and longevity for Leatherbacks are currently unavailable.

The IUCN Red List Criteria define generation length to be the average age of parents in a population; older than the age at maturity and younger than the oldest mature individual (IUCN 2011). Thus, for the purposes of this assessment, we estimated generation length to be 30 yr, or equal to the age at maturity (estimated to be 20 yr on average), plus a conservative estimate of reproductive half-life of 10 yr, as assumed by Spotila *et al.* (1996).

Sources of Uncertainty

Although monitoring of nesting activities by adult female sea turtles is the most common metric recorded and reported across sites and species, globally, there are several disadvantages to using it as a proxy for overall population dynamics, some methodological, some interpretive (NRC 2010). First, because nesting females are a very small proportion of a sea turtle population, using abundance of nesting females and their activities as proxies for overall population abundance and trends requires knowledge of other key demographic parameters (several mentioned below) to allow proper interpretation of cryptic trends in nesting abundance (NRC 2010). However, there remains great uncertainty about most of these fundamental demographic parameters for Leatherbacks, including age at maturity (see Jones *et al.* 2011 for review), generation length, survivorship across life stages, adult and hatchling sex ratios, and conversion factors among reproductive parameters (e.g., clutch frequency, nesting success, re-migration intervals, etc.). These values can vary among subpopulations, further complicating the process of combining subpopulation abundance and trend estimates to obtain global population abundance and trend estimates, and contributing to the uncertainty in these estimates. Second, despite the prevalence of nesting abundance data for marine turtles, monitoring effort and methodologies can vary widely within and across study sites, complicating comparison of nesting count data across years within sites and across different sites as well as robust estimation of population size and trends (SWOT Scientific Advisory Board 2011). For example, monitoring effort on Matura beach, Trinidad, has changed multiple times since the early 1990s, which necessitated a modelling exercise to estimate a complete time series for years with reliable monitoring levels (Table 2 in attached PDF). Furthermore, there was a general lack of measures of variance around annual counts provided for the assessment, which could be erroneously interpreted as equally high confidence in all estimates. Measures of variance around annual counts would provide information about relative levels of monitoring effort within and among rookeries, and thus reliability of resulting estimates. For all of these reasons, results of this assessment of global population decline should be considered with caution. For further reading on sources of uncertainty in marine turtle Red List assessments, see Seminoff and Shanker (2008).

For further information about this species, see
46967807_Dermochelys_coriacea_East_Pacific_Ocean_subpopulation.pdf.
A PDF viewer such as Adobe Reader is required.

Geographic Range [top]

Range Description:	Leatherbacks are distributed circumglobally, with nesting sites on tropical sandy beaches and foraging ranges that extend into temperate and sub-polar latitudes; see Eckert *et al.* (2012) for review. The East Pacific (EP) Leatherback subpopulation nests along the Pacific coast of Mexico, Central, and South America, and its area of occupancy extends from Baja California Sur, Mexico, to central Chile, and westward to 130°W (Bailey *et al.* 2012) (Figure 1 in attached PDF). See Eckert *et al.* (2012) for review of Leatherback geographic range. For further information about this species, see 46967807_Dermochelys_coriacea_East_Pacific_Ocean_subpopulation.pdf. A PDF viewer such as Adobe Reader is required.
Countries:	Native: Chile; Colombia; Costa Rica; Ecuador; El Salvador; France (Clipperton I.); Guatemala; Honduras; Mexico; Nicaragua; Panama; Peru; United States (Hawaiian Is.)
FAO Marine Fishing Areas:	Native: Pacific – eastern central; Pacific – southeast; Pacific – southwest; Pacific – western central
Range	

Map: Click here to open the map viewer and explore range.

Population [top]

Population: Leatherbacks are a single species globally comprising seven regional management units (RMUs; Wallace *et al.* 2010), which describe biologically and geographically explicit population segments by integrating information from nesting sites, mitochondrial and nuclear DNA studies, movements and habitat use by all life stages. RMUs are functionally equivalent to IUCN subpopulations, thus providing the appropriate demographic unit for Red List assessments. There are seven Leatherback subpopulations, including the East Pacific Ocean, West Pacific Ocean, Northwest Atlantic Ocean, Southeast Atlantic Ocean, Southwest Atlantic Ocean, Northeast Indian Ocean, and Southwest Indian Ocean. Multiple genetic stocks have been defined according to geographically disparate nesting areas around the world (Dutton *et al.* 1999), and are included within RMU delineations (Wallace *et al.* 2010; shapefiles can be viewed and downloaded at: http://seamap.env.duke.edu/swot).

For further information about this species, see 46967807_Dermochelys_coriacea_East_Pacific_Ocean_subpopulation.pdf.
A PDF viewer such as Adobe Reader is required.

Population Trend: Decreasing

Habitat and Ecology [top]

Habitat and Ecology: See species account for details. For a thorough review of Leatherback biology, please see Eckert *et al.* (2012).

Systems: Terrestrial; Marine

Use and Trade [top]

Use and Trade: Egg consumption by humans and domestic animals (e.g., dogs) persists on nesting beaches where protection is incomplete (Urteaga *et al.* 2012).

Threats [top]

Threats to Leatherbacks (and other marine turtle species) vary in time and space, and in relative impact to populations. Threat categories were defined by Wallace *et al.* (2011) as the following:

1) Fisheries bycatch: incidental capture of marine turtles in fishing gear targeting other species;

2) Take: direct utilization of turtles or eggs for human use (i.e. consumption, commercial products);

3) Coastal Development: human-induced alteration of coastal environments due to construction, dredging, beach modification, etc.;

4) Pollution and Pathogens: marine pollution and debris that affect marine turtles (i.e. through ingestion or entanglement, disorientation caused by artificial lights), as well as impacts of pervasive pathogens (e.g. fibropapilloma virus) on turtle health;

5) Climate change: current and future impacts from climate change on marine turtles and their habitats (e.g. increasing sand temperatures on nesting beaches affecting hatchling sex ratios, sea level rise, storm frequency and intensity affecting nesting habitats, etc.).

Major Threat(s):

The relative impacts of individual threats to all Leatherback subpopulations were assessed by Wallace *et al.* (2011). Fisheries bycatch was classified as the highest threat to Leatherbacks globally, followed by human consumption of Leatherback eggs, meat, or other products and coastal development. Due to lack of information, pollution and pathogens was only scored in three subpopulations and climate change was only scored in two subpopulations. Enhanced efforts to assess the impacts of these threats on Leatherbacks—and other marine turtle species—should be a high priority for future research monitoring efforts.

For the East Pacific subpopulation, the emergence of new threats from coastal development on key Leatherback nesting areas in Costa Rica present a serious challenge to efforts to protect Leatherbacks in the East Pacific (Wallace and Piedra 2012). In addition, egg consumption by humans and domestic animals (e.g., dogs) persist on nesting beaches where protection is incomplete (Urteaga *et al.* 2012). However, fisheries bycatch is still considered the major obstacle to population recovery (Wallace and Saba 2009). The latent impacts of high mortality in swordfish driftnets off Chile in the 1990s are likely further hindering recovery, as possibly thousands of adult Leatherbacks were killed annually (Frazier and Montero1990, Eckert and Sarti 1997), which eliminated not only a significant portion of the breeding population, but their offspring as well. In addition, ongoing leatherback bycatch in small-scale fisheries in South America (Alfaro-Shigueto *et al.* 2007, 2011; Donoso and Dutton 2010) continues to impact adults and subadults, the two life stages with disproportionately high influence on marine turtle population dynamics (Wallace *et al.* 2008). A recent assessment of fisheries bycatch impacts on sea turtle populations globally found that bycatch in net gear—probably in small-scale fishing operations—appears to have the highest population-level impact on the East Pacific subpopulation, followed by longlines (Wallace *et al.* 2013). Rigorous estimates of Leatherback bycatch in fishing gear throughout the region are necessary to adequately quantify the relative impacts on this subpopulation. Most importantly, Leatherback bycatch in fishing gears throughout the region, especially those with the largest population-level impacts, must be reduced as soon as possible to avoid extinction of this subpopulation.

Conservation Actions [top]

Leatherbacks are protected under various national and international laws, treaties, agreements, and memoranda of understanding. A partial list of international conservation instruments that provide legislative protection for Leatherbacks are: Annex II of the SPAW Protocol to the Cartagena Convention (a protocol concerning specially protected areas and wildlife); Appendix I of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora); and Appendices I and II of the Convention on Migratory Species (CMS); the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC), the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the

Indian Ocean and South-East Asia (IOSEA), the Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection, and the Memorandum of Understanding Concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa.

Conservation Actions:

Long-term efforts to reduce or eliminate threats to Leatherbacks on nesting beaches have been successful (e.g. Dutton *et al.* 2005, Santidrián Tomillo *et al.* 2007, Sarti Martínez *et al.*, 2007). Reducing Leatherback bycatch has become a primary focus for many conservation projects around the world, and some mitigation efforts are showing promise (Watson *et al.* 2005; Gilman *et al.* 2006, 2011). However, threats to Leatherbacks—bycatch and egg consumption, in particular—persist, and in some places, continue to hinder population recovery (Alfaro-Shigueto *et al.* 2011, 2012; Urteaga *et al.* 2012; Wallace *et al.* 2013). For depleted Leatherback populations to recover, the most prevalent and impactful threats must be reduced wherever they occur, whether on nesting beaches or in feeding, migratory, or other habitats (Bellagio Report 2007; Wallace *et al.* 2011, 2013); a holistic approach that addresses threats at all life history stages needs to be implemented (Dutton and Squires 2011).

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