This document is scheduled to be published in the
Federal Register on 03/03/2015 and available online at
http://federalregister.gov/a/2015-04405, and on FDsys.gov

Billing Code 3510-22-P

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Parts 223

[Docket No. 141219999-5133-01**]**

RIN 0648-XD681

Endangered and Threatened Wildlife and Plants; Proposed Rule to List the Tanzanian DPS of African Coelacanth as Threatened Under the Endangered Species Act

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; 12-month petition finding; request for comments.

SUMMARY: We, NMFS, have completed a comprehensive status review under the Endangered Species Act (ESA) for the African coelacanth (Latimeria chalumnae) in response to a petition to list that species. We have determined that, based on the best scientific and commercial data available, and after taking into account efforts being made to protect the species, L. chalumnae does not meet the definition of a threatened or endangered species when evaluated throughout all of its range. However, we determined that the Tanzanian population of the taxon represents a significant portion of the taxon's range, is threatened across that portion, and is a valid distinct population segment (DPS). Therefore, we propose to list the Tanzanian DPS of L. chalumnae as a threatened species under the ESA. We are not proposing to designate critical habitat for this DPS because the geographical areas occupied by the population are entirely outside U.S. jurisdiction, and we have not identified any unoccupied areas that are

essential to the conservation of the DPS. We are soliciting comments on our proposal to list the Tanzanian DPS of the coelacanth as threatened under the ESA.

DATES: Comments on our proposed rule to list the coelacanth must be received by [*insert date 60 days after date of publication in the FEDERAL REGISTER*]. Public hearing requests must be made by [*insert date 45 days after publication in the FEDERAL REGISTER*].

ADDRESSES: You may submit comments on this document, identified by NOAA-NMFS-2015-0024, by either of the following methods:

- Electronic Submissions: Submit all electronic public comments via the Federal eRulemaking Portal. Go to www.regulations.gov/#!docketDetail;D=NOAA-NMFS-2015-0024. Click the “Comment Now” icon, complete the required fields, and enter or attach your comments.
- Mail: Submit written comments to Chelsey Young, NMFS Office of Protected Resources (F/PR3), 1315 East West Highway, Silver Spring, MD 20910, USA.

Instructions: You must submit comments by one of the above methods to ensure that we receive, document, and consider them. Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered. All comments received are a part of the public record and will generally be posted for public viewing on http://www.regulations.gov without change. All personal identifying information (e.g., name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. We will accept anonymous comments (enter ‘‘N/A’’ in the required fields if you wish to remain anonymous).

You can obtain the petition, status review report, the proposed rule, and the list of references electronically on our NMFS website at http://www.nmfs.noaa.gov/pr/species/petition81.htm.

FOR FURTHER INFORMATION CONTACT: Chelsey Young, NMFS, Office of Protected Resources (OPR), (301) 427-8491 or Marta Nammack, NMFS, OPR, (301) 427-8469.

SUPPLEMENTARY INFORMATION:

Background

On July 15, 2013, we received a petition from WildEarth Guardians to list 81 marine species as threatened or endangered under the Endangered Species Act (ESA). This petition included species from many different taxonomic groups, and we prepared our 90-day findings in batches by taxonomic group. We found that the petitioned actions may be warranted for 27 of the 81 species and announced the initiation of status reviews for each of the 27 species (78 FR 63941, October 25, 2013; 78 FR 66675, November 6, 2013; 78 FR 69376, November 19, 2013; 79 FR 9880, February 21, 2014; and 79 FR 10104, February 24, 2014). This document addresses the findings for one of those 27 species: the African coelacanth L. chalumnae. Findings for seven additional species can be found at 79 FR 74853 (December 16, 2014). The remaining 19 species will be addressed in subsequent findings.

We are responsible for determining whether species are threatened or endangered under the ESA (16 U.S.C. 1531 et seq.). To make this determination, we consider first whether a group of organisms constitutes a "species" under the ESA, then whether the status of the species qualifies it for listing as either threatened or endangered. Section 3 of the ESA defines a "species" to include "any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature." On

February 7, 1996, NMFS and the U.S. Fish and Wildlife Service (USFWS; together, the Services) adopted a policy describing what constitutes a distinct population segment (DPS) of a taxonomic species (the DPS Policy; 61 FR 4722). The DPS Policy identified two elements that must be considered when identifying a DPS: (1) the discreteness of the population segment in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the significance of the population segment to the remainder of the species (or subspecies) to which it belongs. As stated in the DPS Policy, Congress expressed its expectation that the Services would exercise authority with regard to DPSs sparingly and only when the biological evidence indicates such action is warranted.

Section 3 of the ESA defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range" and a threatened species as one "which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." We interpret an "endangered species" to be one that is presently in danger of extinction. A "threatened species," on the other hand, is not presently in danger of extinction, but is likely to become so in the foreseeable future (that is, at a later time). In other words, the primary statutory difference between a threatened and endangered species is the timing of when a species may be in danger of extinction, either presently (endangered) or in the foreseeable future (threatened).

When we consider whether species might qualify as threatened under the ESA, we must consider the meaning of the term "foreseeable future." It is appropriate to interpret "foreseeable future" as the horizon over which predictions about the conservation status of the species can be reasonably relied upon. The foreseeable future considers the life history of the species, habitat characteristics, availability of data, particular threats, ability to predict threats, and the reliability to forecast the effects of these threats and future events on the status of the species under consideration. Because a species may be susceptible to a variety of threats for which different data are available, or which operate across different time scales, the foreseeable future is not necessarily reducible to a particular number of years. Thus, in our determinations, we may describe the foreseeable future in general or qualitative terms.

NMFS and the USFWS recently published a policy to clarify the interpretation of the phrase "significant portion of the range" (SPR) in the ESA definitions of "threatened" and "endangered" (76 FR 37577; July 01, 2014). The policy consists of the following four components:

(1) If a species is found to be endangered or threatened in only an SPR, the entire species is listed as endangered or threatened, respectively, and the ESA's protections apply across the species' entire range.

(2) A portion of the range of a species is ''significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction or likely to become so in the foreseeable future.

(3) The range of a species is considered to be the general geographical area within which that species can be found at the time USFWS or NMFS makes any particular status determination. This range includes those areas used throughout all or part of the species' life cycle, even if they are not used regularly (e.g., seasonal habitats). Lost historical range is relevant to the analysis of the status of the species, but it cannot constitute an SPR.

(4) If a species is not endangered or threatened throughout all of its range but is

endangered or threatened within an SPR, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

We considered this policy in evaluating whether to list the coelacanth as endangered or threatened under the ESA.

Section 4(a)(1) of the ESA requires us to determine whether any species is endangered or threatened due to any one or a combination of the following five threat factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence (16 U.S.C. 1533(a)(1)). We are also required to make listing determinations based solely on the best scientific and commercial data available, after conducting a review of the species' status and after taking into account efforts being made by any state or foreign nation to protect the species (16 U.S.C. 1533(a)(1)).

In making a listing determination, we first determine whether a petitioned species meets the ESA definition of a "species." Next, using the best available information gathered during the status review for the species, we complete a status and extinction risk assessment across the range of the species. In assessing extinction risk, we consider the demographic viability factors developed by McElhany et al. (2000) and the risk matrix approach developed by Wainwright and Kope (1999) to organize and summarize extinction risk considerations. The approach of considering demographic risk factors to help frame the consideration of extinction risk has been used in many of our status reviews, including for Pacific salmonids, Pacific hake, walleye pollock, Pacific cod, Puget Sound rockfishes, Pacific herring, scalloped hammerhead sharks, and black abalone (see http://www.nmfs.noaa.gov/pr/species/ for links to these reviews). In this approach, the collective condition of individual populations is considered at the species level according to four demographic viability factors: abundance, growth rate/productivity, spatial structure/connectivity, and diversity. These viability factors reflect concepts that are well-founded in conservation biology and that individually and collectively provide strong indicators of extinction risk.

We then assess efforts being made to protect the species, to determine if these conservation efforts are adequate to mitigate the existing threats. Section 4(b)(1)(A) of the ESA requires the Secretary, when making a listing determination for a species, to take into consideration those efforts, if any, being made by any State or foreign nation to protect the species. We also evaluate conservation efforts that have not yet been fully implemented or shown to be effective using the criteria outlined in the joint NMFS/USFWS Policy for Evaluating Conservation Efforts (PECE; 68 FR 15100, March 28, 2003), to determine their certainty of implementation and effectiveness. The PECE is designed to ensure consistent and adequate evaluation of whether any conservation efforts that have been recently adopted or implemented, but not yet demonstrated to be effective, will result in improving the status of the species to the point at which listing is not warranted or contribute to forming the basis for listing a species as threatened rather than endangered. The two basic criteria established by the PECE are: 1) the certainty that the conservation efforts will be implemented; and 2) the certainty that the efforts will be effective. We consider these criteria, as applicable, below. We re-assess the extinction risk of the species in light of the existing conservation efforts.

If we determine that a species warrants listing as threatened or endangered, we publish a proposed rule in the Federal Register and seek public comment on the proposed listing.

Status Review

We conducted a status review for the petitioned species addressed in this finding (Whittaker, 2014), which compiled information on the species' biology, ecology, life history, threats, and conservation status from information contained in the petition, our files, a comprehensive literature search, and consultation with experts. We also considered information submitted by the public in response to our petition finding. The draft status review report was also submitted to independent peer reviewers; comments and information received from peer reviewers were addressed and incorporated as appropriate before finalizing the draft report.

The status review report provides a thorough discussion of demographic risks and threats to the particular species. We considered all identified threats, both individually and cumulatively, to determine whether the species should reasonably be expected to respond to the threats in a way that causes actual impacts at the species level. The collective condition of individual populations was also considered at the species level, according to the four demographic viability factors discussed above.

The status review report is available on our website (see **ADDRESSES** section). The following section describes our analysis of the status of the African coelacanth, L. chalumnae.

Species Description

Latimeria chalumnae, a fish commonly known as the African coelacanth, belongs to a very old lineage of bony fish, the class Sarcopterygii or lobe-finned fishes, which includes the coelacanths, the lungfish, and very early tetrapods. Most species of lobe-finned fish are extinct. Among the lobe-finned fishes, L. chalumnae is one of only two living species belonging to the order Coelacanthiformes. The belief that the coelacanth had gone extinct over 65 million years ago made the discovery of a living specimen off the coast of South Africa in 1938 particularly sensational (McAllister, 1971). Latimeria chalumnae inhabits coasts along the western Indian Ocean, while Latimeria menadoensis, commonly known as the Indonesian coelacanth, observed for the first time in 1997, appears to be restricted to Indonesian waters, but might also occur along the coastal islands in the eastern Indian Ocean (Erdmann et al., 1998; Erdmann, 1999; Springer, 1999; Fricke et al., 2000b, Hissman pers. com.). Latimeria chalumnae and L. menadoensis are genetically and geographically distinct (Pouyaud et al., 1999; Holder et al., 1999; Inoue, 2005). While genetically distinct, the Indonesian and African coelacanth species exhibit overlapping morphological traits, which makes it difficult to differentiate between them based on morphology alone.

The coelacanth has a number of unique morphological features. Most obvious are its stalked dorsal, pelvic, anal, and caudal fins. In the water, under camera observation, the body of the fish appears iridescent dark blue, but its natural color is brown (Hissman pers. com.); individuals have white blotches on their bodies that have been used for identification in the field. When individuals die, their color shifts from blue to brown. The name "coelacanth" comes from the Greek words for 'hollow 'and 'spine,' referring to the fish's hollow oil-filled notochord, which supports the dorsal and ventral caudal fin rays (Balon et al., 1988). This notochord is composed of collagen which is stiffened under fluid pressure (Balon et al., 1988). Coelacanth species have a unique intracranial joint allowing them to simultaneously open the lower and upper jaws, possibly an adaptation for feeding (Balon et al., 1988). Coelacanths undergo osmoregulation via retention of urea (Griffith, 1991). Their swim bladder is filled with waxesters used to passively regulate buoyancy, allowing the fish to reach depths of 700 meters during nightly feeding excursions (Hissmann et al., 2000). Males and females exhibit sexual dimorphism in size, with females larger than males (Bruton et al., 1991b).

The natural range of the African coelacanth L. chalumnae was once thought to be restricted to the Comoro Island Archipelago, located in the Western Indian Ocean between Madagascar and Mozambique. For many years, specimens caught off South Africa, Mozambique, and Madagascar were thought to be strays from the Comoro population (Schliewen et al., 1993; Hissmann et al., 1998). However, between 1995 and 2001, catches and observations of coelacanths from the coasts of Kenya (De Vos et al., 2002), Tanzania (Benno et al., 2006), South Africa (Hissmann et al., 2006), and Madagascar (Heemstra et al., 1996) suggested that the species was more widespread than previously thought, occupying deep water coastal habitat in several locations throughout the Western Indian Ocean. The range extent of the coelacanth remains unclear, as direct observations of established populations rely on dedicated deep water canyon surveys, or bycatch observations from gillnets and artisanal handlines (Hissmann et al., 2006). Today, three established coelacanth populations have been confirmed by survey efforts, inhabiting deep-water caves off the coast of the Comoros, South Africa, and the coast of Tanzania.

The coelacanth is known to inhabit waters deeper than 100m, making surveys difficult and reliant upon sophisticated technology including submersibles and remotely operated vehicles (ROVs), or highly-trained divers using special gas mixtures. To date, the best data addressing coelacanth habitat use come from in situ observations of the fish off the steep volcanic coasts of Grand Comoro Island; two decades of coelacanth observation there demonstrate that the coelacanth inhabits deep submarine caves and canyons which are thought to provide shelter from predation and ocean currents (Fricke et al., 2011). The fish aggregate in these caves in groups of up to 10 individuals. Retreat into these caves after nightly feeding activity is most likely a key factor for coelacanth survival, allowing the fish to rest and conserve energy in a deep-water, low-prey environment (Fricke et al., 1991a). At night, coelacanths occupy deeper waters to actively feed, spending the majority of their time between 200 and 300m (Fricke et al., 1994; Hissmann et al., 2000). Larger individuals are known to venture below 400m, with the deepest observation at 698m (Hissmann et al., 2000).

South African coelacanth habitat has also been studied, although to a lesser extent than in the Comoro Islands (Venter et al., 2000; Hissmann et al., 2006; Roberts et al., 2006). In the deep canyons off the coast of South Africa, suitable coelacanth caves have been found at depths of 100–130 m, whereas at Grand Comoro Island, most caves are in depths of 180–230 m (Heemstra et al., 2006). In general, it is thought that the deep overhangs and caves found off the shelf of South Africa provide suitable shelter and refuge for coelacanths.

Habitat off of Tanzania consists of rocky terraces occurring between 70-140m depth; the water temperature at coelacanth catch depths is around 20°C (Nyandwi, 2009). A large number (n=19) of Tanzanian coelacanths have been caught in the outer reefs near the village of Tanga. In this region, some coelacanth catches have been reported to occur at 50-60m; however, the validity of these reports is questionable (Benno et al., 2006; Nyandwi, 2009, Hissman pers. com.). These incidents may indicate a shallower depth preference for Tanzanian coelacanths than that exhibited by Comoran coelacanths; however, more surveys are needed to better understand coelacanth habitat use in this region (Benno et al., 2006). The benthic substrate off the coast of Tanzania is sedimentary limestone rather than the volcanic rock of the Comoros. In this habitat, coelacanths are thought to use submarine cavities and shelves that have eroded out of the limestone composite for shelter.

Coelacanths demonstrate strong site fidelity with relatively large overlapping home ranges, greater than 8km, as demonstrated at Comoro and South African sites where expeditions have tracked individual movements using ultrasonic transmitters (Fricke et al., 1994; Heemstra et al., 2006). Surveys off Grand Comoro over 21 years demonstrate that individual coelacanths may inhabit the same network of caves for decades; for example, 17 individuals originally identified in 1989 were re-sighted in 2008 in the same survey area (Fricke et al., 2011).

Temperature use for the Comoran coelacanth, based on survey observations, was found to be between 16.5 and 22.8°C (Fricke et al., 1991b). Surveys of South African coelacanth habitat off of Sodwana Bay confirm this temperature use across a broad portion of its range (Hissmann et al., 2006). This corresponds to estimates of thermal requirements based on the temperature-dependent oxygen saturation of their blood, with an optimum at 15 °C and an upper threshold at 22-23°C (Hughes et al., 1972). Thus, the coelacanth depends on cooler waters to help maintain its oxygen demands. Most likely, the depth distribution of coelacanth depends partly on this temperature requirement. The coelacanth's ecological niche is likely shaped by this narrow temperature requirement, prey abundance, and the need for shelter and oxygen.

It is thought that sedimentation and siltation act as a negative influence on coelacanth distribution. This is supported by a hypothesis surrounding the split between the two living coelacanth species estimated to have occurred 40-30 million years ago (Mya), corresponding with the collision between India and Eurasia (50 Mya), which created high levels of siltation and isolated individuals to the east and west of India (Inoue et al., 2005). This hypothesis has been supported by some surveys off Sodwana Bay where it was observed that some canyons, despite offering suitable habitat requirements, were not occupied by coelacanths; it was concluded that the turbidity of the water in these caves discouraged coelacanth habitation, as nearby canyons not affected by turbidity were occupied by coelacanths (Hissmann et al., 2006; Roberts et al., 2006).

Coelacanths are considered ovoviviparous, meaning the embryos are provided a yolk sac and develop inside the adult female until they are delivered as live births; coelacanth embryos are not surrounded by a solid shell. Embryos remain in gestation for 3 years; this period of embryogenesis has been determined by scale rings of embryo and newborn coelacanth specimens (Froese et al., 2000). The coelacanth gestation period is considered the longest of any vertebrate (Froese et al., 2000). It has been hypothesized that the coelacanth may live upwards of 40 or 50 years, and even up to 100 years (Bruton et al., 1991a, Fricke et al., 2011, Hissman per. com.). Coelacanth generation times are long. In fact, they are expected to reach reproductive maturity between 16 and 19 years of age (Froese et al., 2000). Coelacanth fecundity is not well known; 26 embryos were found within one female caught in 2001 from off of Mozambique, and other known fecundities are 5, 19, and 23 pups (Fricke et al., 1992).

Coelacanths are extremely slow drift-hunters. They descend at least 50 to 100m below their daytime habitat to feed at night on the bottom or near-bottom, and are thought to consume deep-water prey, or prey found at the bottom of the ocean (Uyeno et al., 1991; Fricke et al., 1994). Stomach content analysis has revealed a variety of prey items including deepwater fishes ranging from cephalopods (including cuttlefish) to eels such as conger eels (Uyeno et al., 1991). The fish exhibits low-energy drift feeding behavior, which is thought to conserve energy and oxygen for the fish. Metabolic demands have been studied in the coelacanth, and demonstrate that they have one of the lowest resting metabolisms of all vertebrates (Hughes et al., 1972; Fricke et al., 2000a). The coelacanth's gill surface area is much smaller than other fishes of similar size; this morphological feature is a factor thought to heavily limit their growth rate and productivity due to its control over oxygen utilization (Froese et al., 2000). Studies of the fish's blood physiology have demonstrated that the oxygen dissociation curve is temperature dependent, and shows an affinity for oxygen at lower temperatures (15°C). Small gill surface area and blood physiology are thought to influence the coelacanth's restriction to cold deep water habitat, and may correlate with their low metabolic rates, meager food consumption and generally slow growth and maturation (Froese et al., 2000).

Population Abundance, Distribution, and Structure

It was once thought that coelacanths were restricted to the Comoro Island Archipelago, and that individuals caught in other locations in the Western Indian Ocean were strays. However, growing evidence suggests that L. chalumnae consists of several established populations throughout the Western Indian Ocean (Schartl et al., 2005). Two resident and scientifically surveyed coelacanth populations exist in waters off South Africa and the Comoro Islands (Hissmann et al., 2006; Fricke et al., 2011). Increases in coelacanth catch off the coast of Tanzania during the last decade and genetic analysis of individuals caught there demonstrated that an established population exists there as well, as confirmed by the observance of 9 coelacanth individuals during a 2007 survey off the Tanzanian coast (Nikaido et al., 2011). Additional coelacanth catches have been recorded off Madagascar, Mozambique, and Kenya, but these regions have not yet been surveyed (Nulens et al., 2011) so their status is unclear. What is known of the coelacanth's distribution is largely based on bycatch data. Thus, the true number of established coelacanth populations, and the extent of the species' range across the Western Indian Ocean remain uncertain.

Insufficient data exist to quantitatively estimate coelacanth population abundance or trends over time for the majority of its range. Population abundance estimates are greatly challenged by sampling and survey conditions wherein deep technical scuba or submersibles are necessary to reach and document the coelacanth in its natural habitat.

Quantitative estimates of coelacanth abundance have been made only for the Comoro Islands. Coelacanth population abundance estimates for the western coastline of Grand Comoro were initially made in the late 1980s by Fricke et al. (1991a) and updated to include survey data from 1991 (Fricke et al., 1994). The survey area during this time covered 9 percent of the projected coelacanth habitat along the western coast of Grand Comoro (Hissmann et al., 1998). These estimates showed a relatively stable population ranging between 230-650 individuals (Fricke et al., 1994). Surveys conducted in 1994 across the southwestern coast of Grand Comoro (the same sample area as in earlier surveys) revealed a 68 percent decrease in cave inhabitants and a 32 percent decrease in the total number of coelacanths encountered as compared to a 1991 survey that covered the same area at the same time of year (Hissmann et al., 1998). Three additional surveys of the western coast of Grand Comoro occurred in the 2000s, and are summarized in Fricke et al. (2011). These survey methods and area were consistent with earlier surveys occurring in the late 1980s and 1990s. During surveys between 2000 and 2009, several marked individuals not sighted in 1994 re-appeared, and cave occupancy rates in these later surveys were similar to surveys of the early 1990s (Fricke et al., 2011). In total, nine dedicated coelacanth surveys have occurred in this area since 1986 (Fricke et al., 2011). Estimates of population abundance along the western coast of Grand Comoro, based on repeated surveys over almost 2 decades, are between 300 and 400 individuals, with 145 individuals identifiable via unique markings (Fricke et al., 2011). The 1994 survey showing population declines is thought to be an anomaly driven by higher water temperature, as later surveys demonstrate that the local population of western Grand Comoro has remained stable since the 1980s (Fricke et al., 2011). Some local Comoran fishermen have suggested that seasonal abundance patterns may exist for the coelacanth as they do for the locally-targeted oilfish, but there are insufficient data to address this phenomenon (Stobbs et al., 1991).

Across the coelacanth's range, juveniles (<100cm) are largely absent from survey and catch data, suggesting that earlier life stages may exhibit differences in distribution and habitat use (Fricke et al., 2011). Length at birth is assumed to be 40 cm (Bruton et al., 1991a). Size classes between 40 and 100 cm are largely absent from surveys of the Comoros, South Africa, and Tanzania; these smaller sizes are also absent from shallower water, suggesting that they inhabit deeper water than older individuals (Fricke et al., 2011). In general, the distribution and relative abundance of juveniles across the coelacanth's range remains unknown.

Population estimates have not been conducted in other parts of the coelacanth's range, and it is possible that undiscovered populations exist across the Western Indian Ocean because coelacanths have been caught (in low numbers) off the coast of Madagascar, Kenya and Mozambique. Based on current understanding, coelacanth habitat and distribution is determined by the species' need for cool water and structurally complex caves and shelf overhangs for refuge. Using these requirements, Green et al. (2009) conducted a bathymetric survey using data coverage of the Western Indian Ocean in order to identify potential habitat for coelacanth populations, beyond occupied habitat already identified. The authors identified several locations off Mozambique and South Africa that met characteristics of coelacanth habitat. Lack of adequate data coverage for Tanzania and Madagascar precluded thorough analyses of these regions, so the authors did not rule out these locations as suitable coelacanth habitat. Although this bathymetric study did not lead to any additional surveys to confirm its findings, the analysis demonstrates the presence of suitable habitat throughout the Western Indian Ocean, and thus the potential for yet-undiscovered coelacanth populations. Based on the data presented, populations that have been surveyed appear to be stable with unknown abundance and trends elsewhere.

Genetic data on coelacanth population structure are limited and known distribution of coelacanth populations is potentially biased by targeted survey efforts and fishery catch data. However, recent whole-genome sequencing and genetic data available for multiple coelacanth specimens can be used to cautiously infer some patterns of population structure and connectivity across the coelacanth's known range (Nikaido et al., 2011; Lampert et al., 2012; Nikaido et al., 2013). Currently, whole-genome sequences exist for multiple individuals from Tanzania, the Comoros, and from the Indonesian coelacanth L. menadoensis.

Significant genetic divergence at the species level has been demonstrated to exist between L. chalumnae and L. menadoensis (Inoue et al. 2005) as described above.

Intraspecific population structure has been examined using L. chalumnae specimens from Tanzania, the Comoros, and southern Africa (Nikaido et al., 2011; Lampert et al., 2012; Nikaido et al., 2013). These studies suggest that L. chalumnae comprises multiple independent populations distributed across the Western Indian Ocean. However, based on limited samples, the geographic patterns and relatedness among coelacanth populations are not well understood. Using mitochondrial DNA analyses, Nikaido et al. (2011) demonstrated that individuals from northern Tanzania differ from those from southern Tanzania and the Comoros. In fact, this study estimated that a northern Tanzanian population diverged from the rest of the species an estimated 200,000 years ago. Nikaido et al. (2011) hypothesized that differentiation of individuals from northern Tanzania may relate to divergence of currents in this region, where hydrography limits gene flow and reduces the potential for drifting migrants. More recent data reflecting a greater number of samples and higher-resolution population analyses do not support a genetic break between individuals from north and south Tanzania. Instead, this more robust population-genetics approach reveals significant divergence among individuals from South Africa, Tanzania, and two populations which diverged but are co-existing within the Comoros; the mechanism of divergence between the two co-existing populations of the Comoros remains unclear (Lampert et al., 2012). All studies are consistent in that they demonstrate low absolute divergence among populations, which either relates to extremely low evolutionary rates in L. chalumnae, or recent divergence of populations after going through a bottleneck (such as a founding effect) (Lampert et al., 2012). Information derived from unique sequences of mitochondrial DNA support the Comoros as an ancestral population to other populations distributed throughout the Western Indian Ocean, because this population appears to have a greater number of ancestral haplotypes (Nikaido et al., 2011).

All coelacanth populations demonstrate the common characteristic of low diversity, but the Comoros population is the least diverse (Nikaido et al., 2011, Nikaido et al., 2013). Genetic evidence for inbreeding has been observed in investigations of coelacanth mitochondrial DNA and DNA fingerprinting, where high band-sharing coefficients showed significant inbreeding effects (Schartl et al., 2005). The species L. chalumnae exhibits significantly lower levels of genetic divergence than its sister species L. menadoensis (Nikaido et al., 2013). Because rates of molecular substitution and evolution are thought to be similar for these two species, the significantly lower diversity measures for L. chalumnae points to smaller populations (as compared to L. menadoensis) or the occurrence of repeated genetic bottlenecks, rather than slow evolution rate alone (Inoue et al., 2005, Nikaido et al., 2013). Low diversity within populations and evidence for inbreeding suggest that populations are independent and small.

While population structure is not clearly resolved across the region, available genetic data suggest the following: 1) Oceanographic and environmental conditions may cause uneven gene flow among coelacanth populations across the region; 2) populations across the Western Indian Ocean are independent, and do not represent strays from the Comoros, or a panmictic population (or a population in which all individuals are potential mates); 3) Evolutionary rates of coelacanths are extremely slow, and lower diversity in L. chalumnae as compared with L. menadoensis points to smaller population sizes and/or genetic bottleneck effects.

Summary of Factors Affecting the African Coelacanth

Available information regarding current, historical, and potential threats to the coelacanth was thoroughly reviewed (Whittaker, 2014). Across the species' range, we found the threats to the species to be generally low, with isolated threats of overutilization through bycatch and habitat loss in portions of its range. Other possible threats include climate change, overutilization via the curio trade, and habitat degradation in the form of pollution; however, across the species' full range we classify these threats as low. We summarize information regarding each of these threats below according to the factors specified in section 4(a)(1) of the ESA. Available information does not indicate that neither disease nor predation is operative threats on this species; therefore, we do not discuss those further here. See Whittaker (2014) for additional discussion of all ESA section 4(a)(1) threat categories.

The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

There is no evidence curtailment of the historical range of L. chalumnae has occurred throughout its evolutionary history, either due to human interactions or natural forces. Genetic data and geological history suggest that the split between L. chalumnae and its Indonesian sister species L. menadoensis occurred 40-30 Mya, and that the genus was previously distributed throughout the coasts of Africa and Eurasia (Springer, 1999; Inoue et al., 2005). However, no data are available to inform an understanding of historical changes in the range of the species L. chalumnae. Although the order Coelacanthiformes was deemed to have become extinct 65 million years before the 1938 discovery in South Africa, this surprising encounter cannot be used as evidence for a curtailment of the species' range from historical levels given lack of any historical data on the species prior to its discovery. The species is naturally hidden from human observation, and therefore, highly technical diving, deep water survey equipment, or unique fishing techniques (such as hand lines) are required to reach the fish's cavernous, structurally complex, and deep habitat; thus, the contemporary and historical extent of its range remains unclear.

Due to its occurrence in deep water (>100 meters), the coelacanth may be particularly buffered from human disturbance (Heemstra et al., 2006). Nonetheless, increases in human population and development along the coastline of the Western Indian Ocean could impart long-term effects on the fish throughout its range. World human population forecasts predict that the largest percentage increase by 2050 will be in Africa, where the population is expected to at least double to 2.1 billion (Kincaid, 2010). The result of increased population density on coastal ecosystems of East Africa may include increased pollution and siltation, which may impact the coelacanth despite its use of a deep and relatively stable environment.

Human population growth will likely lead to increases in agricultural production, industrial development, and water use along the coast of the Western Indian Ocean; these land use changes may increase near shore sedimentation, possibly affecting coelacanth habitat. As described earlier, sedimentation is theorized to negatively impact coelacanth distribution (Springer, 1999). The coelacanth has been shown to avoid caves with turbid water, even if other preferred conditions of shelter and food are present (Hissmann et al., 2006). Many East African countries are still developing, and the population is growing. Increased food demand may lead to changes in land and water use, and an increase in agriculture and thus run-off and siltation to the coast. It is possible that, if increases in siltation occur, coelacanth habitat may be affected, and range reduced. However, the nature of these economic and land use changes, as well as their direct effect on sedimentation and subsequent impact on coelacanth habitat, remain highly uncertain.

Pollution of coastal African waters does not currently pose a direct threat to the coelacanth. A review of heavy metals in aquatic ecosystems of Africa showed generally low concentrations, close to background levels, and much lower than more industrial regions of the world (Biney et al., 1994). Yet, surprisingly, a toxicological study of two coelacanth specimens detected lipophilic organochlorine pollutants such as polychlorinated biphenyl (PCBs) and dichlorodiphenyltrichloroethane (DDT) (Hale et al., 1991). Levels ranged from 89 to 510 pg kg^{-1} for PCB and 210 to 840 pg kg^{-1} for DDT concentration, and were highest in lipid-rich tissues such as the swim bladder and liver (Hale et al., 1991). The coelacanth has high lipid content, and its trophic position may increase the probability of toxic bioaccumulation. Insufficient data are available to determine the impact of these toxins on coelacanth health and productivity.

Direct habitat destruction is likely to impact coelacanths off the coast of Tanga, Tanzania. Plans are in place to build a new deep-sea port in Mwambani Bay, 8km south of the original Tanga Port. The construction of the Mwambani port is part of a large project to develop an alternative sea route for Uganda and other land-locked countries that have been depending on the port of Mombasa. Development of the port would include submarine blasting and channel dredging and destruction of known coelacanth habitat in the vicinity of Yambe and Karange islands - the site of several of the Tanzanian coelacanth catches (Hamlin, 2014). The new port is scheduled to be built in the middle of a newly-implemented Tanga Coelacanth Marine Park. The plans for Mwambani Bay's deep-sea port construction appear to be ongoing, despite conservation concerns. If built, the port would likely disrupt coelacanth habitat by direct elimination of deep-water shelters, or by a large influx of siltation that would likely result in coelacanth displacement.

Habitat destruction in the form of nearshore dynamite fishing on coral reefs may indirectly impact the coelacanth due to a reduction in prey availability, but these impacts are highly uncertain. As a restricted shallow-water activity, this destructive fishing would not impact the coelacanth's deep (+100 m) habitat directly. However, coral reefs in this region provide essential fish nursery habitat and are hot spots for biodiversity (Salm, 1983). Loss of nearshore coral habitat may negatively impact pelagic fish species due to loss of nursery habitat; it is highly uncertain how these impacts may affect the prey availability for the coelacanth. Dynamite fishing in the Comoros was observed recently by researchers (Fricke et al., 2011). While this method is not widespread throughout the Comoros, reduction in the sustainability of nearshore or pelagic fish populations may encourage fishermen to increase use of these new methods. Dynamite fishing in Tanzania is widespread, and has led to destruction of nearshore coral reefs and disruption of essential fish habitat (Wells, 2009). Destructive fishing practices occur throughout coral reefs along the coast of the Western Indian Ocean (Salm, 1983). The true extent to which the destruction of near shore coral habitat may affect the coelacanth remains uncertain, especially as the fish is thought to consume primarily deep-water prey (Uyeno, 1991; Uyeno et al., 1991).

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Bycatch

Since its discovery in 1938, all known coelacanth catches are considered to have been the result of bycatch. Particularly in the Comoro Islands, where the highest number of coelacanth catches has occurred, researchers have found no evidence of a targeted coelacanth fishery given that methods do not exist to directly catch the deep-dwelling fish (Bruton et al., 1991c). The coelacanth meat is undesirable, and thus the fish is not consumed by humans (Fricke, 1998).

Out of 294 coelacanth catches since its 1939 discovery, the majority of catches (n =215 as of 2011) have been a result of bycatch in the oilfish, or Revettus, artisanal fishery occurring only in the Comoro Island archipelago (Stobbs et al. 1991; Nulens et al. 2011). The Comoros oilfish fishery uses unmotorized outrigger canoes (locally called galawas). The fish are caught using handlines and hooks close to shore at depths as great as 800m (Stobbs et al., 1991). This traditional fishery is known locally as mazé fishing, and coelacanth catches have only occurred on Grand Comoro and Anjouan Islands (Stobbs et al., 1991). Oilfish are traditionally caught at night, an act considered locally to be very dangerous (Stobbs et al., 1991). Often, this artisanal fishing is performed only on dark moonless calm nights. In general, subsistence fishing in the region is limited by weather conditions, and often disrupted by monsoon or tropical storms. This fishery is also limited by a tradition of social pressure which restricts fishing to offshore waters adjacent to each fisherman's village (Stobbs et al., 1991).

Since its discovery in the Comoros (in 1938), coelacanth catch rate has been very low, between 2-4 individuals per year. Coelacanth catch rate in the Comoros shows no significant trend over time; however, it has fluctuated historically with changes in fishing technology and shifts in the ratio between artisanal and more modern pelagic fishing methods (Stobbs et al., 1991; Plante et al., 1998). From a broader temporal perspective, there was an increasing but insignificant change in coelacanth catch from the Comoros from 1954 to 1995 (Plante et al., 1998). However, between 1995 and 2008, the number of *galawas* in the Comoros has declined steadily, corresponding with a steady increase in motorized boats (Fricke et al., 2011). The most recent update of coelacanth catch inventory indicates that catch rates in the Comoro archipelago have declined and stabilized over the past decade (Nulens et al., 2011). In fact, between 2000 and 2008, catch rates were the lowest ever observed, likely due to the increase in motorized boats and decreased artisanal handline fishing over the past decade (Fricke et al., 2011). Today, mazé fishing is going out of favor in the Comoros (Plante et al., 1998; Fricke et al., 2011); this trend is expected to continue into the future, and reduces fishing pressure on the coelacanth in this region, most likely explaining the reduction in coelacanth catch over the past decade (Stobbs et al., 1991; Plante et al., 1998; Fricke et al., 2011; Nulens et al., 2011). Fishing mortality has been determined to be negligible in the Comoros population, likely relating to its population stability over time (Bruton et al., 1991a; Fricke et al., 2011).

Outside of the Comoros, coelacanths have been caught in Tanzania, Madagascar, Mozambique, Kenya, and South Africa (Nulens et al., 2011). Historically, far fewer coelacanth catches have occurred outside of the Comoros Islands. However, over the past decade, the trend in coelacanth catches shows a drastic increase in catch rate off Tanzania via shark gillnets (Fricke et al., 2011; Nulens et al., 2011). Hand line mazé fisheries are absent outside of the Comoros, thus catches across the rest of the Western Indian Ocean have occurred using different gear - deep-set shark gillnets and trawls. Trawls have been the mechanism for only 3 total coelacanth catches; minimal catch through trawling is thought to relate to the coelacanth's preferred rocky steep cavernous habitat, substrate not suitable for trawling activity (Benno et al., 2006). The first confirmed coelacanth catches using shark gillnets occurred in Madagascar in 1995 and in Tanzania in 2003, although a few earlier unconfirmed catches in these locations may have occurred as early as 1953 (Benno et al., 2006). The first Tanzanian catch in 2003 followed the introduction of shark gillnets in the region in 2001 (Benno et al., 2006). As of September 2003, the capture of coelacanths has been dominated by those caught in Tanzania (Nulens et al., 2011). Since the first 2003 catch in Tanzania, over 60 catches via deep water gillnets have been reported, with over 12 fish caught/year between 2003 and 2008 (Benno et al., 2006; Nulens et al., 2011). These shark gillnets are set at depths between 50 and 150m, and it is thought that accidental coelacanth catches in Tanzania occur when coelacanths leave their caves for nighttime hunting (Nyandwi, 2009).

Expansion of the shark gillnet fishery across the Western Indian Ocean may result in increased bycatch of the coelacanth, as has been observed off the coast of Tanzania, but the potential for such an increase is uncertain. Available information suggests that shark fishing effort has been increasing off the coast of east Africa, including the coelacanth range countries of Mozambique, Madagascar, Kenya, and South Africa (Smale, 2008). Techniques for catching sharks in this region include deep-set shark gillnets, such as those responsible for the commencement of coelacanth bycatch in Tanzania in 2003 (Nulins et al., 2011). Shark gillnet fishing is used in other East African countries, such as Mozambique, where these fisheries are highly profitable, and are driven by the demand for fin exports, with evidence for frequent illegal export occurring (Pierce et al., 2008). Despite the use of gillnet fishing practices elsewhere in East Africa, other areas have not shown a similar spike in coelacanth bycatch as has been observed in Tanzania. Quantification of effort from the shark gill net fishery in South Africa has been challenging due to high levels of illegal or unreported fishing occurring; for example, as little as 21 percent of the actual catch for shark gillnet and seine fisheries may be reported in South Africa (Hutchings et al., 2002). Nonetheless, shark fisheries in this region are thought to be overexploited, which may lead to an increase in future effort due to sustained global demand (Hutchings et al., 2002). It is reasonable to conclude that the use of shark gillnets will continue or increase in Tanzania and will continue to expand throughout the Western Indian Ocean; however, whether this trend will result in an increased threat of coelacanth bycatch is uncertain, especially given the uncertainty over the fish's range and habitat use throughout the coast of East Africa.

Commercial Interest

The coelacanth is not desirable commercially as a traditional food source or for artisanal handicrafts. Targeted methods of fishing the coelacanth have never been developed, and local cultures do not value the coelacanth commercially or for subsistence purposes (Fricke, 1998).

In the Comoros, the coelacanth has become a source of pride and national heritage (Fricke, 1998). However, cultural interest in the coelacanth does not put the fish at risk, and on the contrary, may encourage its conservation. Commercial interest through tourism to the coelacanth's habitat is not a realistic threat either, as the deepwater habitat is largely inaccessible. In the 1980s there was a rumor that Japanese scientists were attempting to develop a new anti-aging serum using the coelacanth notochord oil. Although these claims made international headlines, the rumor has since been rejected. As Fricke pointed out (Fricke, 1998), the unsubstantiated rumor of the 'fountain of youth' serum had an unexpected result of stirring publicity and conservation interest in the fish. Interest in the coelacanth notochord oil for medicinal purposes does not pose a threat to the species, as claims of its life extending properties are unsubstantiated.

Interest in coelacanth specimens on the black market is a possible threat to the species. The concern mostly surrounds a curio trade rather than a potential aquarium trade. Because the fish is deep-water dependent, it survives for only a short period of time at the surface, and thus far, is not maintained in aquariums. Several attempts have been made to keep the coelacanth alive in captivity, but these attempts have demonstrated that the deep water fish is fragile and that it has been shown to survive at the surface for less than 10 hours (Hughes et al., 1972); the cause of death is thought to be a combination of capture stress and overheating resulting in asphyxiation. Comment threads found on the popular website Monster Fish Keepers, a forum for private aquarium and fish hobbyists, reveal widespread knowledge of the coelacanth's fragility; these hobbyists express general understanding that the coelacanth's life can be sustained at surface depth no longer than a few hours (Hamlin, 1992; Monsterfish, 2007). Thus, black market trade of the coelacanth for private aquaria is not a realistic threat. However, the black-market curio trade may be a source of exploitation. The same fish hobbyist forums reveal general interest in the fish as a curio specimen, and willingness to pay large sums relative to the typical Comoran income for a dead specimen (Monsterfish, 2009). Thus, black market curio trade may provide an economic incentive for capture of the fish. However, we did not find data suggesting that a black market curio trade is currently active.

Scientific Interest

Since discovery of the species in 1938, international scientists and researchers have cherished the coelacanth as the only representative of an important evolutionary branch in the tree of life. This has led to a long history of surveys to better understand the fish's ecology, habitat, distribution, and evolution. A tissue library from bycaught specimens is maintained at the Max Planck Institute in Germany, which provides the opportunity for scientific use of samples derived from these accidental coelacanth catches (Fricke, 1998). Coelacanth specimens have been used by more than 30 laboratories. In earlier years of coelacanth research, a reward of US$300-400 was offered to fishermen for each coelacanth caught (Fricke, 1998). However, those rewards have not been offered for decades. Prior to strict regulations on coelacanth trade, the global museum trade offered between US$400 and US$2000 for each specimen caught. Today, trade of the coelacanth is prohibited by the Convention on International Trade in

Endangered Species (CITES) because the coelacanth is listed as an Appendix I species; however, some transfer of specimens for scientific study is permitted. We did not find any evidence that targeted coelacanth catch for scientific purposes is occurring. Thus, the demand for specimens for scientific research is not considered a threat.

In the future, scientific interest and study may be used as a basis for the public display of the coelacanth. The public display of the fish would be of high commercial value, and efforts to keep the coelacanth in captivity have already been made. In the late 1980s and early 1990s, American and Japanese aquariums attempted to directly capture and bring the coelacanth into captivity (Suzuki et al., 1985; Hamlin, 1992). These attempts were not successful; it was determined that coelacanth cannot be directly caught, and that they only survive for a few hours outside of their deep water environments (Hamlin, 1992). In the future, larger aquariums may pursue the use of pressurized tanks to keep the coelacanth alive in captivity, but their success is uncertain given the challenge of transporting a fish from its native habitat, and then maintaining it in an aquarium environment.

Other Natural or Manmade Factors Affecting Their Continued Existence

Climate Change

Coelacanth habitat preference and distribution is dictated by specialized requirements for appropriate shelter (caves, caverns, and shelves), prey availability, and a combination of depth and temperature that meets the fish's need for oxygen (relating to optimal blood saturation at 15°C) (Hughes, 1972). Evidence from coelacanth habitation in South Africa is particularly useful in demonstrating the trade-offs among these important characteristics: there, coelacanths occupy depths of 100-140m. The optimal temperature for the uptake of oxygen (15°C) occurs at lower depths of 200m, where fewer caves exist. It is thought that the occupation of shallower depths is a trade-off between the need for shelter and optimal oxygen uptake; increases in oceanic temperature as is expected in connection with climate change may disrupt the tight balance between coelacanths' metabolic needs and the need for refuge (Roberts et al., 2006).

Across the globe, ocean temperature is increasing at an accelerated rate (IPCC, 2013). The extent of this warming is reaching deeper and deeper waters (Abraham et al. 2013). Increase of global mean surface temperatures for 2081–2100 relative to 1986–2005 is projected to likely be in the ranges derived from the concentration-driven CMIP5 model simulations by the Intergovernmental Panel on Climate Change (IPCC), that is, 0.3°C to 1.7°C (RCP2.6), 1.1°C to 2.6°C (RCP4.5), 1.4°C to 3.1°C (RCP6.0), or 2.6°C to 4.8°C (RCP8.5) (IPCC, 2013). While these predictions relate to surface ocean temperatures, evidence from deep-water ocean measurements and models suggest that heat flux to the deep ocean has accelerated over the last decade (Abraham et al., 2013). If deep-water warming continues to keep pace with (or exceed the pace of) surface warming, even the most conservative IPCC scenarios may mean a warming of current coelacanth habitat.

The coelacanth is typically observed at 15-20°C, with upper thermal preferences of 22-23°C (Hughes et al., 1972). The effect of these thermal boundaries on the coelacanth's distribution has been demonstrated by a 1994 survey of the Comoro Islands, which revealed a 68 percent decrease in cave inhabitants and a 32 percent decrease in the total number of coelacanths encountered as compared to a 1991 survey (Hissmann et al., 1998). Temperature is thought to have directly led to this decline in coelacanth observations; in 1994, temperature of the survey region was 25.1°C, the warmest ever recorded by researchers there (Hissmann et al., 1998).

However, it is important to note that individually-identifiable coelacanths had returned to their previous habitat in subsequent surveys (Fricke et al., 2011); this suggests that the warm conditions in 1994 led to a displacement of coelacanth habitat, but did not lead to extirpation of that population, or a reduction in the population abundance. This information suggests that warming may impact coelacanth distribution, but there may be suitable habitat to accommodate a displacement of populations, where warming may not lead to decreases in population sizes or extirpation of populations. Despite deep water warming that has occurred over the last decade, the surveyed coelacanth population in the Comoros is described as stable, and not declining (Fricke et al., 2011).

Based on the majority of climate model predictions, it is likely that current coelacanth habitat will reach temperatures exceeding the fish's thermal preferences by 2100 (IPCC, 2013). It is unlikely that the low-diversity fish with long generation times will physiologically adapt to withstand the metabolic stress of a warming ocean. However, the fish may be able to move to suitable habitat outside of its current range, thus adapting its range to avoid the warming deep water conditions. If the fish is displaced based on its need for cooler waters, but complex cave shelters are not available, local extirpation or range restriction may occur. However, currently, these impacts and responses are highly uncertain. Thus, it is reasonable to conclude that a warming ocean may impact the fish's distribution, but the impact of warming on the future viability of the species is uncertain. Due to the coelacanth's temperature-dependent oxygen demand, coupled with a highly specific need for deep structurally complex cave shelter, warming oceanic waters may pose a threat to the coelacanth and displacement of populations, but the impact of this threat on the future viability of the species is highly uncertain, and climate change threats have not been clearly or mechanistically linked to any decline in coelacanth populations.

Inadequacy of Existing Regulatory Mechanisms

CITES Appendix I regulates trade in species in order to reduce the threat international trade poses to those species. The coelacanth is included in CITES-Appendix I. Appendix I addresses those species deemed threatened with extinction by international trade. CITES prohibits international trade in specimens of these species except when the purpose of the import is not commercial, meets criteria for other types of permits, and can otherwise be legally done without affecting the sustainability of the population, for instance, for scientific research. In these exceptional cases, trade may take place provided it is authorized by the granting of both an import permit and an export permit (or re-export certificate). We found no evidence of illegal trade of the coelacanth. Trade is limited to the transfer of specimens for scientific purposes. There is no evidence that CITES regulations are inadequate to address known threats such that they are contributing to the extinction risk of the species.

The coelacanth is also listed as Critically Endangered on the International Union for the Conservation of Nature's (IUCN) Red List. The IUCN is not a regulatory body, and thus the critically endangered listing does not impart any regulatory authority to conserve the species.

The threat to the coelacanth stemming from anthropogenic climate change includes elevated ocean temperature reaching its deep-water habitat and resulting in decreased fitness or relocation of populations based on elimination of suitable habitat, which may become restricted due to the tight interaction between the coelacanth's thermal requirements and need for highly complex cave shelter and prey. Impacts of climate change on the marine environment are already being observed in the Indian Ocean and elsewhere (Hoerling et al., 2004; Melillo et al.,

2014) and the most recent IPCC assessment provides a high degree of certainty that human sources of greenhouse gases are contributing to global climate change (IPCC, 2013). Countries have responded to climate change through various international and national mechanisms, including the Kyoto Protocol of 2007. Because climate change-related threats have not been clearly or mechanistically linked to decline of coelacanths, the adequacy of existing or developing measures to control climate change threats is not possible to fully assess, nor are sufficient data available to determine what regulatory measures would be needed to adequately protect this species from the effects of climate change. While it is not possible to conclude that the current efforts have been inadequate such that they have contributed to the decline of this species, we consider it likely that coelacanth will be negatively impacted by climate change given the predictions of widespread ocean warming (IPCC, 2013).

Extinction Risk

In general, demographic characteristics of the coelacanth make it particularly vulnerable to exploitation. While coelacanth abundance across its entire range is not well understood, it is likely that population sizes across the Western Indian Ocean are small, as described in Whittaker (2014). The likelihood of low abundance makes coelacanth populations more vulnerable to extinction by elevating the impact of stochastic events or chronic threats resulting in coelacanth mortality. Their growth rate and productivity is extremely limited. The coelacanth has one of the slowest metabolisms of any vertebrate, and this relates to their meager demand for food, slow swim speed and passive foraging, need for refuge to rest, and small gill surface area which limits their absorption of oxygen. In addition, their gestation period is longer than any vertebrate (3 years), although their fecundity is moderate. They are long-lived species, with long generation times. The extremely long gestation period and late maturity makes the coelacanth particularly vulnerable to external threats such as bycatch, possibly impeding recovery from mortality events (Froese et al., 2000). Genetic data suggest that the coelacanth comprises independent and isolated populations, originating in the Comoros, but fully established around the Western Indian Ocean. The small and isolated nature of coelacanth populations, only three of which are confirmed to exist, increases vulnerability by preventing their replacement and recovery from external threats and mortality events, and increases the potential for local extirpations. Finally, the species exhibits extremely low levels of diversity (Schartl et al., 2005). Low levels of diversity reflect low adaptive and evolutionary potential, making the coelacanth particularly vulnerable to environmental change and episodic events. These events may reduce diversity further, and result in a significant change or loss of variation in life history characteristics (such as reproductive fitness and fecundity), morphology, behavior, or other adaptive characteristics. Due to their low diversity, coelacanth populations may be at an increased risk of random genetic drift and could experience the fixing of recessive detrimental genes that could further contribute to the species' extinction risk (Musick, 2011).

While demographic factors increase the coelacanth's vulnerability, the status review classified the risk of threats across its range as low or very low (Whittaker, 2014). We found that, in general, the coelacanth is largely buffered from habitat impacts due to its occurrence in deep water. Thus, the threats of dynamite fishing, pollution, land-use changes, and sedimentation are considered low-risk. The direct loss of coelacanth habitat may occur if the deep port of Mwambami Bay is developed off the coast of Tanzania. However, whether plans to build this port will come to fruition remains uncertain, and the effects will impact a small portion of the coelacanth's range. The threat of port development does not represent a widespread threat to the species, and the port of Mwambami Bay is the only large coastal development project (that we found) that would directly impact the fish.

As for impacts from overutilization, bycatch has historically been thought to pose the greatest threat to the coelacanth, but survey data show there is no observed link between coelacanth bycatch and population decline. A decade ago, the Comoros oilfish fishery was responsible for the highest rate of coelacanth bycatch. Historically, the Comoran fishery was responsible for catch rates of about 3 fish per year, and is not thought to have contributed to declines in population abundance. While the Comoran oilfish fishery has seen recent declines in effort and has never contributed to population decline of the coelacanth, a greater threat of bycatch has emerged in Tanzania over the last decade. As evidenced by high rates of coelacanth bycatch via the shark gillnet fishery, which began in 2001 in Tanzania, this fishing method has the potential to impact the coelacanth. Since 2003 in Tanzania, coelacanth catch rates have been more than 3 times greater than ever observed in the Comoros, at over 10 fish per year. It is unclear whether this catch rate is unsustainable due to limited information on trends and abundance of the Tanzanian population. While traditional Comoran handline fishing is no longer the most pressing bycatch threat to the fish, data suggest that the expansion of a shark gill net fishery throughout the Western Indian Ocean could result in additional coelacanth bycatch. The reduction of sustainable fisheries throughout the east African and South African coastline may encourage shifts to alternative fishing methods, such as gillnets, or trawling closer to shore, both of which could increase the probability of coelacanth bycatch. Bycatch in Tanzania is an ongoing threat, and potential for additional coelacanth bycatch across the fish's range poses a potential but uncertain threat to the fish's persistence into the foreseeable future. Coelacanth population abundance in Tanzania, and whether current bycatch rates are sustainable, is unknown. Thus, the risk of bycatch across the species' entire range is generally low. There is no real indication that overutilization for scientific purposes, public display, or the curio trade is occurring; thus we do not consider these factors as contributing a risk to the future persistence of the species across its range.

Because threats are low across the species' range, we have no reason to consider regulatory measures inadequate in protecting the species.

Regarding other natural or manmade factors, the threat of climate change via ocean warming may work synergistically to enhance all other threats to the coelacanth across its range, but the nature of these impacts is highly uncertain as described in Whittaker (2014). The extent of this impact on the coelacanth remains uncertain, and there has been no clear or mechanistic link between climate change or temperature warming and coelacanth population declines. Thus, the threat of climate change poses a low risk to the coelacanth.

Overall, the fish's demographic factors make it particularly vulnerable to ongoing and future threats, but existing threats pose a generally low risk. Thus, we find that the coelacanth is at a low risk of extinction due to current and projected threats to the species.

Protective Efforts

Since its discovery, much debate has surrounded the need to conserve the coelacanth, as an evolutionary relic and for its value to science. The long history of this debate was summarized by Bruton (1991). The international organization the Coelacanth Conservation Council (CCC) has been the primary body advocating for coelacanth conservation over the years since 1987.

The CCC has its headquarters in Moroni, Comoros, and the Secretariat is currently in Grahamstown, South Africa with branches in Canada, the United Kingdom, the United States, Germany and Japan. The CCC has set forth general objectives of promoting coelacanth research and conservation, along with establishing an international registry of coelacanth researchers and the compilation of a coelacanth inventory and bibliography, which were published for the first time in 1991 and recently updated in 2011 (Bruton et al., 1991b; Nulens et al., 2011).

Several conservation initiatives were implemented in the Comoros in the 1990s to reduce coelacanth bycatch. For instance, fishing aggregation devices were installed to encourage pelagic fishing and reduce pressure on the coelacanth from nearshore handline fishing. During this time, the use of motorized boats was encouraged for the same purpose, in order to direct fishing off-shore and reduce the use of artisanal handlines. Initially, there were some challenges, including lack of infrastructure preventing the repair of motors. However, the fishing trend today in the Comoros shows a clear shift to motorized pelagic fishing, and reduced interest in traditional handline fishing; this trend is occurring due to a natural shift in social perspectives and local economic trends.

A supporter of coelacanth conservation and member of the US Explorer Club, Jerome Hamlin, author and curator of the website DINOFISH.com, has encouraged the use of a 'Deep Release Kit' for coelacanth conservation when bycaught. The Deep Release Kit was created in response to the 'Save the Coelacanth Contest' sponsored by DINOFISH.com (Hamlin, 2014). The kit consists of a barbless hook attached to a sack. The fisherman puts some of his sinker stones in the sack, places the hook in the lower jaw of the fish he has just caught with the shank pointing down to the sack, and releases the fish to the bottom where it frees itself. The purpose of the Deep Release procedure is to get the fish quickly to the cold bottom water with no further exertion on its part. A surface release (in theory) leaves the fish without the strength to get back down to depth. Hundreds of these devices have been distributed in the Comoros and Tanzania. These kits are some of the only direct coelacanth conservation measures in the Comoros or Tanzania. Yet, it is unclear whether these have been used at sea, their success is unproven, and it is unknown whether the method has been adopted by local fishermen.

Ongoing scientific research on the coelacanth may play a role in coelacanth conservation, as management of the species can improve with a more complete understanding of its biology and natural history. In 2002, South Africa instituted its African Coelacanth Ecosystem Programme, which has coordinated an extensive array of research including bathymetric surveys, taxonomic studies, and observational expeditions. This program is funded by the Global Environment Facility of the World Bank and it is in its third phase, taking an ecosystem-based approach to understanding coelacanth distribution and habitat utilization across the Western Indian Ocean, and providing deep-water research tools and resources for this research.

Local efforts for marine conservation exist in the Comoros. For example, the Mohéli Marine Park takes a co-management approach to stop some destructive fishing and conserve marine habitat using a series of no-take reserves. The park encompasses 212 km^2, and was set up during a 5- year biodiversity conservation project which began in 1998, funded by the World Bank's Global Environment Facility; the goals of the project were to address the loss of biodiversity in Comoros and develop local capacity for natural resource management (Granek et al., 2005). However, no alternative revenue-generating activities have been provided, making life difficult for some fishermen. The World Bank's Global Environment Facility biodiversity management project in the Park ended in 2003, and there has been no source of additional financing to continue the resource co-management. The Moheli Park has brought together some key institutions to encourage sustainable management and monitoring of marine habitat of the Comoros; however, specific laws have not been enacted, and existing legislation has not been enforced (Ahamada et al., 2002). No coelacanths have ever been caught off the island of Moheli, so the park's impact on bycatch of the species is not applicable.

Other conservation efforts in the form of marine parks distributed throughout the Western Indian Ocean may benefit the coelacanth by reducing habitat destruction and improving prey availability; however, the direct impacts of these conservation efforts on the species is difficult to evaluate. Efforts to improve marine resource management and conservation in developing nations of east Africa have increased in the past decade. Today, 8.7 percent of the continental shelf in Kenya, 8.1 percent in Tanzania, and 4.0 percent in Mozambique have been designated as marine protected areas (Wells et al., 2007). Many of these parks intersect with known coelacanth habitat, or are in range countries where coelacanths have been caught and potential populations exist. However, in many areas, ongoing socioeconomic challenges have precluded effective management of these regions (Francis et al., 2002). Analysis of east African Marine Protected Area (MPA) management has demonstrated that socio-economic barriers make it more difficult to reach conservation goals (Tobey et al., 2006). Because of this, much effort has gone into creating community-based conservation planning in recent years (e.g., Harrison (2010)). Management constraints still remain. First, there are large gaps in ecosystem knowledge surrounding these marine parks; for instance, many vital habitats and species are not yet fully represented by MPAs in place today (Wells et al., 2007). Next, monitoring is not widely implemented and data are not available to determine whether biodiversity or socio-economic goals are being met (Wells et al., 2007).

A new marine park in Tanga, Tanzania has been put in place, and was prompted by increases in coelacanth catch in the region. The Tanga Coelacanth Marine Park is located on the northern coastline of Tanzania, extending north of the Pangani River estuary 100 km along the coastline towards Mafuriko village just north of Tanga city. The park covers an area of 552 km^2, of which 85 km^2 are terrestrial and 467 km^2 are marine. The plans for the park were announced in 2009, and a general management plan published in 2011 (Parks; MPRU, 2011). The goal of the Tanga Coelacanth Marine Park is to conserve marine biodiversity, resource abundance, and ecosystem functions of the Park, including the coelacanth and its habitat; and enable sustainable livelihoods and full participation of local community users and other key stakeholders. The plans for the park, specific to the coelacanth, are to restrict fishing within its boundaries, including fishing with deep-set shark gillnets, the primary source of coelacanth bycatch in the area. Additional restrictions against destructive fishing and development practices have been set forth in the park's 2011 general management plan (MPRU, 2011). Partnership and guidance from the IUCN has encouraged plans for community-based and adaptive park management (Harrison, 2010).

Applying the considerations mandated by our PECE policy, we determine that the implementation and enforcement of the park's regulations and goals are unclear and untested; further, there are several reasons to believe that infrastructure, funding, and park management may not be adequate to fully prevent coelacanth bycatch within the park's boundaries: For one, illegal fishing off the coast of Tanzania is high (Tobey et al., 2006; Hempson, 2008; Wells, 2009). Widespread poverty and other regional socio-economic challenges in the region have reduced the effectiveness and implementation of other east African marine parks, and it is likely that the Tanga Coelacanth Marine Park will face similar challenges (Toby, 2006; Wells, 2012). Although recommendations and goals are set in place to increase tourism to the Park as an economic offset for stricter fishing regulations, the economic infrastructure and incentives needed for this shift are not in place or have not yet been proven to be effective. Next, there are plans to build a new deep-sea port in Mwambani Bay, just 8 km south of the original old Tanga Port, which would include submarine blasting and channel dredging and destruction of known coelacanth habitat in the vicinity of Yambe and Karange islands - the site of several of the Tanzanian coelacanth catches. The new port is scheduled to be built in the middle of the Tanga Coelacanth Marine Park. The construction of Mwambani port is part of a large project to develop an alternative sea route for Uganda and other land-locked countries which have been depending on the port of Mombasa. The plans for Mwambani Bay's deep-sea port construction appear to be ongoing, despite conservation concerns. It is unclear whether this port will be built, but its presence would negate many of the benefits (even now, unproven) of the Park. The general management plan for the park will be fully evaluated every 10 years, with a mid-term review every 5 years. The effectiveness of Tanga Coelacanth Marine Park is not yet known, and for reasons described above, we do not consider this park to provide certain conservation measures that would alleviate extinction risk to the species.

Significant Portion of its Range Analysis

As noted above, we find that the species is at a low risk of extinction throughout its range. In other words, our range-wide analysis for the species does not lead us to conclude that the species meets the definition for either an endangered species or a threatened species based on the rangewide analysis. Thus, under the final Significant Portion of Its Range (SPR) policy announced in July 2014, we must go on to consider whether the species may have a higher risk of extinction in a significant portion of its range (79 FR 37577; July 1, 2014).

The final policy explains that it is necessary to fully evaluate a portion for potential listing under the "significant portion of its range" authority only if information indicates that the members of the species in a particular area are likely both to meet the test for biological significance and to be currently endangered or threatened in that area. Making this preliminary determination triggers a need for further review, but does not prejudge whether the portion actually meets these standards such that the species should be listed:

> To identify only those portions that warrant further consideration, we will determine whether there is substantial information indicating that (1) the portions may be significant and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. We emphasize that answering these questions in the affirmative is not a determination that the species is endangered or threatened throughout a significant portion of its range—rather, it is a step in determining whether a more detailed analysis of the issue is required.

79 FR 37586.

Thus, the preliminary determination that a portion may be both significant and endangered or threatened merely requires NMFS to engage in a more detailed analysis to determine whether the standards are actually met (Id. at 37587). Unless both are met, listing is not warranted. The policy further explains that, depending on the particular facts of each situation, NMFS may find it is more efficient to address the significance issue first, but in other cases it will make more sense to examine the status of the species in the potentially significant portions first. Whichever question is asked first, an affirmative answer is required to proceed to the second question. Id. ("[I]f we determine that a portion of the range is not ''significant,'' we will not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we will not need to determine if that portion was ''significant.''). Thus, if the answer to the first question is negative – whether that regards the significance question or the status question – then the analysis concludes and listing is not warranted.

After a review of the best available information, we identified the Tanzanian population of the African coelacanth as a population facing concentrated threats because of increased catch rates in this region since 2003, and the threat of a deep-water port directly impacting coelacanth habitat in this region. Due to these concentrated threats, we found that the species may be at risk of extinction in this area. Under the policy, if we believe this population also may constitute a "significant" portion of the range of the African coelacanth, then we must go on to a more definitive analysis. We may either evaluate the extinction risk of this population first to determine whether it is threatened or endangered in that portion or first determine if it is in fact "significant." Ultimately, of course, both tests have to be met to qualify the species for listing.

We proceeded to evaluate whether this population represents a significant portion of the range of the African coelacanth. The Tanzanian population is one of only three confirmed populations of the African coelacanth, all considered to be small and isolated. Because all three populations are isolated, the loss of one would not directly impact the other remaining populations. However, loss of any one of the three known coelacanth populations would significantly increase the extinction risk of the species as a whole, as only two small populations would remain, making them more vulnerable to catastrophic events such as storms, disease, or temperature anomalies. Tanzanian and Comoran populations are approximately 1,000 km apart, ocean currents are thought to have led to their divergence over 200,000 years ago, and connectivity between them is not thought to be maintained (Nikiado *et al.*, 2011). The South African population is separated from the Comoran and Tanzanian populations by hundreds of miles. The Tanzanian population exhibits the greatest genetic divergence from the other populations, suggesting that it may be the most reproductively isolated among them (Lampert *et al.*, 2012). Potential catastrophic events such as storms or significant temperature changes may affect the Comoran and Tanzanian populations simultaneously, due to their closer geographic proximity. The South African population, while not as genetically isolated, may experience isolated catastrophic events due to its geographic isolation. This reasoning supports our conclusion that the Tanzanian population comprises a significant portion of the range of the species because this portion's contribution to the viability of the African coelacanth is so important that, without the members in this portion, the African coelacanth would be likely to become in danger of extinction within the foreseeable future, throughout all of its range.

Because the Tanzanian population of the coelacanth was determined to represent a significant portion of the range of the species, we performed an extinction risk assessment on the Tanzanian population by evaluating how the demographic factors (abundance, productivity/growth rate, spatial structure/connectivity, and diversity) of the species would be impacted by the ESA section 4(a)(1) factors, considering only those factors affecting the Tanzanian population.

Coelacanth abundance across its entire range is not well understood, and no abundance estimates exist for the Tanzanian population. Based on general knowledge of the African coelacanth, the Tanzanian population is likely associated with very restricted and specific habitat requirements and low growth rates. We conclude that it is likely that the population size of the Tanzanian population is small for the same reasons described above for the species as a whole: it exhibits low levels of diversity (Nikaido et al., 2013), long generation times, and restricted habitat (Hissmann et al., 2006; Fricke et al., 2011). The likelihood of low abundance makes the Tanzanian population more vulnerable to extinction by elevating the impact of stochastic events or chronic threats resulting in coelacanth mortality.

Growth rate and productivity for the Tanzanian population is thought to exhibit similar characteristics to other populations of the species. The species as a whole has one of the slowest metabolisms of any vertebrate. The extremely long gestation period and late maturity makes the Tanzanian population particularly vulnerable to external threats such as bycatch, possibly impeding recovery from mortality events (Froese et al., 2000).

The Tanzanian population is thought to represent a single isolated population of the species. It has been estimated that this population diverged from the rest of the species 200,000 years ago (Nikaido et al., 2011). Differentiation of individuals from the Tanzanian population may relate to divergence of currents in this region, where hydrography limits gene flow and reduces the potential for drifting migrants. The isolated nature of the Tanzanian population lowers the potential for its recovery from external threats; the population is not thought to maintain connectivity with other populations, and thus has no source for replacement of individuals lost outside of its own reproductive processes. Fast-moving currents along the

Eastern coast of Africa are thought to prevent connectivity among populations in the region (Nikaido et al., 2011). This may be particularly true for Tanzania. We consider current evidence for the Tanzanian population's high isolation from the rest of the species to contribute to a moderate risk of extinction, as these are natural factors (relevant under section 4(a)(1)(E)) that may increase vulnerability of this population by preventing its replacement and recovery from external threats and mortality events, and increase the potential for extinction.

Genomic analyses of individuals from the Tanzanian population and other representatives of the species reveal that divergence and diversity within and among populations is very low (Nikaido et al., 2013). Low levels of diversity reflect low adaptive and evolutionary potential, making the Tanzanian population particularly vulnerable to environmental change and episodic events. These events may reduce diversity further, and result in a significant change or loss of variation in life history characteristics (such as reproductive fitness and fecundity), morphology, behavior, or other adaptive characteristics. Due to the Tanzanian population's low diversity, this population may be at an increased risk of random genetic drift and could experience the fixing of recessive detrimental genes that could further contribute to the species' extinction risk (Musick, 2011).

Regarding habitat threats to the Tanzanian population, loss and degradation of coelacanth habitat can take the form of pollution, dynamite fishing, sedimentation, and direct loss through development. Future human population growth and land use changes off the coast of Tanzania increase these threats to the Tanzanian population, but their trends and impacts are highly uncertain. In general, the coelacanth is largely buffered from habitat impacts due to its occurrence in deep water, and general effects of pollution and development are similar to those described for the rest of the species. However, specifically related to the Tanzanian population, direct loss of habitat is likely to occur if the deep port of Mwambami Bay is developed. The port is planned to be built just 8 km south of the original old Tanga Port, and this would include submarine blasting and channel dredging and destruction of known coelacanth habitat in the vicinity of Yambe and Karange islands - the site of several of the Tanzanian coelacanth catches. The new port is scheduled to be built in the middle of the Tanga Coelacanth Marine Park. The construction of Mwambani port is part of a large project to develop an alternative sea route for Uganda and other land-locked countries that have been depending on the port of Mombasa. The plans for Mwambani Bay's deep-sea port construction appear to be ongoing, despite conservation concerns, and thus it is reasonable to conclude that it poses a likely threat to the species. Whether plans to build this port will come to fruition remains uncertain, but if built, the deep port could significantly impact the Tanzanian population of coelacanths by destroying habitat directly. For the Tanzanian population, the construction of this deep-water port could be catastrophic, and it is clear that the boundaries of the new Tanga Marine Park are insufficient in halting plans for the port's development.

As for impacts from overutilization, bycatch has historically been thought to pose the greatest threat to the coelacanth. While survey data from the Comoros show there is no observed link between coelacanth bycatch and population decline, since 2003 in Tanzania, coelacanth catch rates have been more than 3 times greater than ever observed in the Comoros, at over 10 fish per year. It is unclear whether this catch rate is sustainable due to limited information on trends and abundance of the Tanzanian population. The further expansion of a shark gill net fishery in Tanzania, as has been observed over the last decade, could result in additional coelacanth bycatch. Bycatch in Tanzania is an ongoing threat. While direct data assessing Tanzanian coelacanth population decline are not available, the relatively high and persistent catch rate in this region has the potential to deplete this small and isolated population, which has life history characteristics that greatly impede its recovery and resiliency to mortality.

We consider the threat of overutilization for scientific purposes, public display, or for the curio trade as low for reasons described above, as they apply to the rest of the species.

We consider the threat of inadequate regulatory mechanisms as low for the Tanzanian population for the same reasons described above for the rest of the species. Additionally, we classify the risk of climate change as low for the Tanzanian population for the same reasons described above for the rest of the species.

Overall, the Tanzanian population's demographic factors make it particularly vulnerable to ongoing and future threats, which pose a moderate risk to the species. Based on the best available information, threats of bycatch to the Tanzanian population appear to be persistent, and the potential development of a deep port within this population's habitat could be catastrophic to the population in the foreseeable future. Thus, we find that the Tanzanian population is at a moderate risk of extinction due to current and projected threats.

Therefore, we conclude that the Tanzanian population is at moderate risk of extinction in a significant portion of the African coelacanth's range of the species.

Distinct Population Segment Analysis

In accordance with the SPR policy, if a species is determined to be threatened or endangered in a significant portion of its range, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies. Because the Tanzanian population represents a significant portion of the range of the species, and this population is at a moderate risk of extinction, we performed a DPS analysis on that population.

As defined in the ESA (Sec. 3(15)), a "species" includes any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature. The joint NMFS-U.S. Fish and Wildlife Service (USFWS) policy on identifying distinct population segments (DPS) (61 FR 4722; February 7, 1996) identifies two criteria for DPS designations: (1) the population must be discrete in relation to the remainder of the taxon (species or subspecies) to which it belongs; and (2) the population must be "significant" (as that term is used in the context of the DPS policy, which is different from its usage under the SPR policy) to the remainder of the taxon to which it belongs.

Discreteness: A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) "it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation"; or (2) "it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D)" of the ESA (61 FR 4722; February 7, 1996).

Significance: If a population segment is found to be discrete under one or both of the above conditions, then its biological and ecological significance to the taxon to which it belongs is evaluated. This consideration may include, but is not limited to: (1) "persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that the loss of the discrete population segment would result in a significant gap in the range of a taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; and (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics" (61 FR 4722; February 7, 1996).

Discreteness

The Tanzanian population cannot be differentiated from other populations based on its morphology. In fact, no coelacanth population exhibits significant distinguishing morphological characteristics, and morphological differences within the Latimeria genus as a whole have been debated (Pouyad et al., 1999, Holder et al., 1999; Erdmann et al., 1999). No unique behavioral, physical, or ecological characteristics have been identified for the Tanzanian population to set it apart from the rest of the taxon. Only a single dedicated survey of the Tanzanian population is available; thus, future surveys may reveal distinguishing ecological features of the population.

As stated above, genetic data on coelacanth population structure are limited and known distribution of coelacanth populations is potentially biased by targeted survey efforts and fishery catch data. However, recent whole-genome sequencing and genetic data available for multiple coelacanth specimens can be used to cautiously infer some patterns of population structure and connectivity across the coelacanth's known range (Nikaido *et al.*, 2011; Lampert *et al.*, 2012; Nikaido *et al.*, 2013). Intraspecific population structure has been examined using L. chalumnae specimens from Tanzania, the Comoros, and southern Africa (Nikaido *et al.*, 2011; Lampert *et al.*, 2012; Nikaido *et al.*, 2013). These studies suggest that L. chalumnae comprises multiple isolated and reproductively independent populations distributed across the Western Indian

Ocean, only three which have been confirmed (inhabiting waters off of Tanzania, the Comoros, and South Africa).

While population structure of the taxon, described earlier, is not fully resolved, all genetic data available suggest that the Tanzanian population represents a single isolated population of the species. Multiple genetic studies corroborate a significant divergence between Tanzanian individuals, and individuals from the South African and Comoros populations (Nikaido et al.; 2011, Lampert et al., 2012). This includes evidence from both nuclear and mitochondrial DNA (Nikaido et al., 2011, Lampert et al., 2012, Nikaido et al., 2013). The Tanzanian population is the most diverged of all coelacanth populations (Lampert et al., 2012). Differentiation of individuals from the Tanzanian population may relate to divergence of currents in this region, where hydrography limits gene flow and reduces the potential for drifting migrants (Nikaido et al., 2011). All available data suggest that the Tanzanian population does not likely maintain connectivity with other populations, and likely has no source for replacement of individuals outside of its own reproductive processes.

The Tanzanian population is geographically isolated from the Comoran and South African populations. The Tanzanian population is approximately 1,000 km away from the Comoran population and over 4,000 km away from the South African population, with oceanic currents further reducing their potential for connectivity. While it is thought that the Comoran population is the source of other populations along the Western Indian Ocean, the Tanzanian and South African populations may have been established as many as 200,000 years ago, as genetic data suggest (Nikaido et al., 2011).

Based on genetic evidence, and the clear geographic isolation of the Tanzanian population, we determined that the Tanzanian population of L. chalumnae is discrete from other populations within the species.

Significance

The Tanzanian population does not persist in an ecological setting unusual or unique for the taxon. Although the Tanzanian individuals are thought to inhabit limestone ledges rather than volcanic caves where Comoran and South African individuals are found, the depth, prey, temperature, and shelter requirements are remarkably similar among the known coelacanth populations (Hissman et al., 2006). We found no evidence to suggest that differences in the ecological setting of the Tanzanian population have led to any adaptive or behavioral characteristics that set the population apart from the rest of the taxon, or contribute significant adaptive diversity to the species.

The Tanzanian population is one of only three known populations within the species. Although it is not the only surviving natural occurrence of the taxon, we determined that loss of this population segment would result in a significant gap in the taxon's range for the following reasons: Although coelacanth populations are not thought to maintain reproductive connectivity, loss of one population would make the other two populations more vulnerable to catastrophic events, as explained earlier. The extent of the Tanzanian population's range is not known, but given the existence of only three known coelacanth populations considered to be small and isolated, loss of the Tanzanian population would constitute a significant gap in the range of the taxon, and thus we consider this population to be significant to the taxon as a whole.

We determined that the Tanzanian population is discrete based on evidence for its genetic and geographic isolation from the rest of the taxon. The population also meets the significance criterion set forth by the DPS policy, as its loss would constitute a significant gap in the taxon's range. Because it is both discrete and significant to the taxon as a whole, we identify the Tanzanian population as a valid DPS.

Proposed Determination

We assessed the ESA section 4(a)(1) factors and conclude that the species, viewed across its entire range, experiences a low risk of extinction. However, we determined that the Tanzanian population constitutes a significant portion of the range of the species, as defined by the SPR policy (79 FR 37577; July 1, 2014). The Tanzanian population faces ongoing or future threats from overutilization and habitat destruction, with the species' natural biological vulnerability to overexploitation exacerbating the severity of the threats. The Tanzanian population faces demographic risks, such as population isolation with low productivity, which make it likely to be influenced by stochastic or depensatory processes throughout its range, and place the population at an increased risk of extinction from the aforementioned threats within the foreseeable future. In our consideration of the foreseeable future, we evaluated how far into the future we could reliably predict the operation of the major threats to this population, as well as the population's response to those threats. We are confident in our ability to predict out several decades in assessing the threats of overutilization and habitat destruction, and their interaction with the life history of the coelacanth, with its lifespan of 40 or more years. With regard to habitat destruction, we evaluated the likelihood of the deep water port being constructed. If the port is to be developed, the results could significantly impact the Tanzanian coelacanth population. Evidence suggests that the plans for its construction are moving forward; its construction is not certain, but likely. If built, the construction of the port would likely occur within the next decade. With bycatch, and its interaction with the fish's demographic characteristics, we feel that defining the foreseeable future out to several decades is appropriate. Based on this information, we find that the Tanzanian population is at a moderate risk of extinction within the foreseeable future. Therefore, we consider the Tanzanian population to be threatened.

In accordance with the our SPR policy, if a species is determined to be threatened or endangered across a significant portion of its range, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies. Based on the best available scientific and commercial information as presented in the status report and this finding, we do not find that the African coelacanth L. chalumnae is currently in danger of extinction throughout all of its range, nor is it likely to become so in the foreseeable future. However, because the Tanzanian population represents a significant portion of the range of the species, and this population is threatened, we conclude that the African coelacanth is threatened in a significant portion of its range. Because the population in the significant portion of the range is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

Therefore, we propose to list the Tanzanian DPS of the African coelacanth as threatened under the ESA.

Similarity of Appearance

The petition requested that, if the African coelacanth were listed under the ESA, the Indonesian coelacanth also be listed due to its "similarity of appearance." The ESA provides for treating any species as an endangered species or a threatened species even if it is not listed as such under the ESA if: (1) such species so closely resembles in appearance, at the point in question, a species which has been listed pursuant to section 4 of the ESA that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species; (2) the effect of this substantial difficulty is an additional threat to the listed species; and (3) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of the ESA.

While the African and Indonesian species exhibit morphological similarities, they are clearly geographically and genetically separated. Enforcement personnel would have no difficulty in differentiating between the Tanzanian DPS of the African coelacanth and the Indonesian coelacanth because of similarity of appearance because their geographic separation (in the Western Indian Ocean and Indo-Pacific, respectively) should facilitate regulation of taking. The species experience no overlap in range and catch of both species is relatively low, and well-documented. We do not deem ESA protection for the Indonesian coelacanth to be advisable at this time, as the clear genetic and geographic differences between the two species set them apart in a way that allows for easy identification, regardless of their similar appearance.

Because we are proposing to list the Tanzanian DPS as a threatened species under the ESA, we also considered any potential similarity of appearance issues that may arise in differentiating between the proposed DPS and other populations of the species. No morphological characteristics separate the Tanzanian DPS from other populations of the species. However, we do not conclude that listing the South African or Comoran populations based on similarity of appearance is warranted. First, outside of Tanzania, coelacanth catches are infrequent, and well documented. Second, the three known coelacanth populations do not overlap geographically. Differentiation between the African and Indonesian coelacanth, and likewise between the Tanzanian DPS and other populations of the species, could potentially pose a problem for enforcement of section 9 prohibitions on trade, should any be applied. However, that issue is addressed, at least with respect to imports and exports, by the inclusion of coelacanth in CITES Appendix I.

Effects of Listing

Conservation measures provided for species listed as endangered or threatened under the ESA include recovery plans (16 U.S.C. 1533(f)); concurrent designation of critical habitat, if prudent and determinable (16 U.S.C. 1533(a)(3)(A)) and consistent with implementing regulations; Federal agency requirements to consult with NMFS under section 7 of the ESA to ensure their actions do not jeopardize the species or result in adverse modification or destruction of critical habitat should it be designated (16 U.S.C. 1536); and, for endangered species, prohibitions on taking (16 U.S.C. 1538). Recognition of the species' plight through listing promotes conservation actions by Federal and state agencies, foreign entities, private groups, and individuals.

Identifying Section 7 Conference and Consultation Requirements

Section 7(a)(2) (16 U.S.C. 1536(a)(2)) of the ESA and NMFS/USFWS regulations require Federal agencies to consult with us to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Section 7(a)(4) (16 U.S.C. 1536(a)(4)) of the ESA and NMFS/USFWS regulations also require Federal agencies to confer with us on actions likely to jeopardize the continued existence of species proposed for listing, or that result in the destruction or adverse modification of proposed critical habitat of those species. It is unlikely that the listing of this

DPS under the ESA will increase the number of section 7 consultations, because the DPS occurs outside of the United States and is unlikely to be affected by Federal actions.

Critical Habitat

Critical habitat is defined in section 3 of the ESA (16 U.S.C. 1532(5)) as: (1) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed upon a determination that such areas are essential for the conservation of the species. ‘‘Conservation’’ means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary. Section 4(a)(3)(A) of the ESA (16 U.S.C. 1533(a)(3)(A)) requires that, to the maximum extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. However, critical habitat shall not be designated in foreign countries or other areas outside U.S. jurisdiction (50 CFR 424.12 (h)).

The best available scientific data as discussed above identify the geographical area occupied by the species as being entirely outside U.S. jurisdiction, so we cannot designate critical habitat for this species. We can designate critical habitat in areas in the United States currently unoccupied by the species, if the area(s) are determined by the Secretary to be essential for the conservation of the species. Based on the best available information, we have not identified unoccupied area(s) in U.S. water that are currently essential to the species proposed for listing. Thus, as we discussed above, we will not propose critical habitat for this species.

<u>Identification of Those Activities That Would Constitute a Violation of Section 9 of the ESA</u>

On July 1, 1994, NMFS and FWS published a policy (59 FR 34272) that requires NMFS to identify, to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the ESA.

Because we are proposing to list the Tanzanian DPS of the African coelacanth as threatened, no prohibitions of Section 9(a)(1) of the ESA will apply to this species.

Protective Regulations Under Section 4(d) of the ESA

We are proposing to list Tanzanian DPS of the African coelacanth, L. chalumnae as threatened under the ESA. In the case of threatened species, ESA section 4(d) leaves it to the Secretary's discretion whether, and to what extent, to extend the section 9(a) ''take'' prohibitions to the species, and authorizes us to issue regulations necessary and advisable for the conservation of the species. Thus, we have flexibility under section 4(d) to tailor protective regulations, taking into account the effectiveness of available conservation measures. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. These 9(a) prohibitions apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. We will consider potential protective regulations pursuant to section 4(d) for the proposed threatened coelacanth DPS. We seek public comment on potential 4(d) protective regulations (see below).

Public Comments Solicited

To ensure that any final action resulting from this proposed rule to list the Tanzanian DPS of the African coelacanth will be as accurate and effective as possible, we are soliciting comments and information from the public, other concerned governmental agencies, the scientific community, industry, and any other interested parties on information in the status review and proposed rule. Comments are encouraged on this proposal (See **DATES** and **ADDRESSES**). We must base our final determination on the best available scientific and commercial information. We cannot, for example, consider the economic effects of a listing determination. Before finalizing this proposed rule, we will consider the comments and any additional information we receive, and such information may lead to a final regulation that differs from this proposal or result in a withdrawal of this listing proposal. We particularly seek:

(1) Information concerning the threats to the Tanzanian DPS of the African coelacanth proposed for listing;

(2) Taxonomic information on the species;

(3) Biological information (life history, genetics, population connectivity, etc.) on the species;

(4) Efforts being made to protect the species throughout its current range;

(5) Information on the commercial trade of the species;

(6) Historical and current distribution and abundance and trends for the species; and

(7) Information relevant to potential ESA section 4(d) protective regulations for the proposed threatened DPS, especially the application, if any, of the ESA section 9 prohibitions on import, take, possession, receipt, and sale of the African coelacanth.

We request that all information be accompanied by: 1) supporting documentation, such as maps, bibliographic references, or reprints of pertinent publications; and 2) the submitter's name, address, and any association, institution, or business that the person represents.

<u>Role of Peer Review</u>

In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing a minimum peer review standard. Similarly, a joint NMFS/FWS policy (59 FR 34270; July 1, 1994) requires us to solicit independent expert review from qualified specialists, in addition to a public comment period. The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. We solicited peer review comments on the African coelacanth status review report, including from: five scientists with expertise on the African coelacanth. We incorporated these comments into the status review report for the African coelacanth and this 12-month finding.

References

A complete list of the references used in this proposed rule is available upon request (see **ADDRESSES**).

Classification

National Environmental Policy Act

The 1982 amendments to the ESA, in section 4(b)(1)(A), restrict the information that may be considered when assessing species for listing. Based on this limitation of criteria for a listing decision and the opinion in Pacific Legal Foundation v. Andrus, 675 F. 2d 825 (6th Cir. 1981), NMFS has concluded that ESA listing actions are not subject to the environmental assessment requirements of the National Environmental Policy Act (NEPA) (See NOAA Administrative Order 216-6).

Executive Order 12866, Regulatory Flexibility Act, and Paperwork Reduction Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process. In addition, this proposed rule is exempt from review under Executive Order 12866. This proposed rule does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

Executive Order 13132, Federalism

In accordance with E.O. 13132, we determined that this proposed rule does not have significant Federalism effects and that a Federalism assessment is not required. In keeping with the intent of the Administration and Congress to provide continuing and meaningful dialogue on issues of mutual state and Federal interest, this proposed rule will be given to the relevant governmental agencies in the countries in which the species occurs, and they will be invited to comment. We will confer with the U.S. Department of State to ensure appropriate notice is given to foreign nations within the range the DPS (Tanzania). As the process continues, we intend to continue engaging in informal and formal contacts with the U.S. State Department, giving careful consideration to all written and oral comments received.

List of Subjects in 50 CFR Parts 223

Administrative practice and procedure, Endangered and threatened species, Exports, Imports, Reporting and record keeping requirements, Transportation.

Dated: February 25, 2015.

____

Samuel D. Rauch, III.

Deputy Assistant Administrator for Regulatory Programs,

National Marine Fisheries Service.

For the reasons set out in the preamble, we propose to amend 50 CFR part 223 as follows:

PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

1. The authority citation for part 223 continues to read as follows:

Authority: 16 U.S.C. 1531-1543; subpart B, § 223.201–202 also issued under 16 U.S.C. 1361 et seq.; 16 U.S.C. 5503(d) for § 223.206(d)(9).

2. In § 223.102, amend the table in paragraph (e) by adding a new entry for one species in alphabetical order under the "Fishes" table subheading to read as follows:

§ 223.102 Enumeration of threatened marine and anadromous species.

* * * * *

(e) * * *

Species[1]			Citation(s) for listing Determination(s)	Critical Habitat	ESA rules
Common name	Scientific name	Description of listed entity			
*******					
		Fishes			

Coelacanth, African (Tanzanian DPS)	Latimeria chalumnae	African coelacanth population inhabiting deep waters off the coast of Tanzania	[Insert FEDERAL REGISTER citation and date when published as a final rule]	NA	NA.
*******					

[1]Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722, February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, see 56 FR 58612, November 20, 1991).

* * * * *

[FR Doc. 2015-04405 Filed 03/02/2015 at 8:45 am; Publication Date: 03/03/2015]