



1515 CLAY STREET, 20TH FLOOR
P.O. BOX 70550
OAKLAND, CA 94612-0550

Public: (510) 622-2100
Telephone: (510) 622-2254
Facsimile: (510) 622-2270
E-Mail: jamie.jefferson@doj.ca.gov

June 12, 2007

Carlos M. Gutierrez
Secretary of Commerce
U.S. Department of Commerce
1401 Constitution Avenue, N.W., Room 5516
Washington, D.C. 20230

Dr. William Hogarth
Assistant Administrator for Fisheries
National Oceanographic and Atmospheric Administration
1315 East-West Highway
Silver Springs, MD 20910

RE: Comments on 90 Day Finding to Evaluate Listing the Black Abalone under the Endangered Species Act

TRANSMITTED VIA FACSIMILE, ELECTRONIC MAIL AND U.S. MAIL

Dear Mr. Gutierrez and Mr. Hogarth:

The Attorney General of the State of California (“Attorney General”) provides these comments in response to the National Marine Fisheries Service’s (“NMFS”) Finding for a Petition to List the black abalone (*Haliotis chacherodii*), a once abundant California marine mollusc, under the federal Endangered Species Act, 16 U.S.C. §1531 *et seq.* (“ESA”). See 72 Fed. Reg. 18616 (April 13, 2007). The Attorney General provides these comments pursuant to his independent power and duty to protect the natural resources of California from pollution, impairment, or destruction in furtherance of the public interest. (See Cal. Const., art. V, § 13; Cal. Gov. Code, §§ 12511, 12600-12; *D’Amico v. Board of Medical Examiners*, 11 Cal.3d 1, 14-15 (1974)). These comments are made on behalf of the Attorney General and not on behalf of any other California agency or office.

The black abalone serves as an indicator species for the health of California’s marine

ecosystems. Like other marine species, its survival is imperiled by a combination of overlapping factors, including decades of over-harvest, disease, and most recently, impacts from global climate change. While it is difficult to quantify exactly how much of the black abalone's demise is attributable to global warming related impacts, anthropogenic climate change is exacerbating the threat faced by black abalone and is therefore relevant to its future survival.

Global climate change is impacting the Earth's oceans by warming water temperatures, raising sea levels, submerging intertidal habitat and increasing ocean acidity. Given the rate of these changes, we believe that NMFS should consider global warming related impacts to the black abalone in its determination whether the species should be federally-listed under the ESA. Achieving a climate-based listing for the species as "endangered" is necessary to develop a successful recovery plan, protect other shell-forming species and reduce the deleterious effects of carbon dioxide emissions in the oceans.¹

The Earth's Changing Climate Threatens Ocean Ecosystems

The Intergovernmental Panel on Climate Change of the United Nations ("IPCCN") recently published a finding that overwhelming evidence establishes that global warming is occurring and is caused by human activity.² Greenhouse gases are increasing in concentration as a result of the combustion of fossil fuels, causing a warming of the climate that is already profoundly changing our planet. Greenhouse gases accumulate in the atmosphere and decrease the amount of solar radiation that is reflected back into space, warming the earth's climate much like a greenhouse. The impacts of climate change from greenhouse gas emissions have been extensively studied and documented.³ All climate models predict significant warming in this century, varying only as to the rate and magnitude of the projected temperature increases.

For many years, scientists viewed the ocean's absorption of carbon dioxide as mitigating the detrimental impacts of global warming on land. More recent studies show that the

1. The Attorney General submitted comments to the U.S. Fish and Wildlife Service in March, 2005, requesting that the agency consider global warming impacts in its evaluation of whether to list the polar bear as threatened or endangered. This petition is still pending; however, in December, 2006, the Fish and Wildlife Service indicated that it is inclined to list the polar bear as "threatened" and to consider melting polar ice as one factor contributing to the bear's demise.

2. "Climate Change 2007: The physical Science Basis, Summary for Policymakers" (Fourth Assessment Report of the IPCC, February 2007).

3. See Oreskes, Naomi, *The Scientific consensus on Climate Change*, 306 *Science* 1686 (Dec. 3, 2004) [review of 928 peer-reviewed scientific papers concerning climate change published between 1993 and 2003, noting the scientific consensus on the reality of anthropogenic climate change]; J. Hansen, *et al.*, *Earth's Energy Imbalance: Confirmation and Implications*, *Scienceexpress* (April 28, 2004) (available at <http://pubs.giss.nasa.gov/abstracts/2005/hansenNazarenkoR.html>) [NASA and Department of Energy scientists state that emission of CO₂ and other heat-trapping gases have warmed the oceans and are leading to energy imbalance that is causing, and will continue to cause, significant warming, increasing the urgency of reducing CO₂ emissions].)

accumulation of excess carbon dioxide in the Earth's atmosphere is impacting the oceans in disturbing ways: increasing water temperatures; increasing the severity of El Niño oscillations; raising sea levels; and lowering pH levels in the oceans, increasing acidity. These rapid changes require marine species to adapt or perish -- higher water temperatures are correlated with increased frequency and mortality from disease; rising sea levels threaten to submerge intertidal habitat; plummeting pH levels increase ocean acidity, which impairs the ability of shell-forming (calcifying) organisms (including shellfish, plankton, and corals) to construct their shells.⁴

The Decline of the Black Abalone in California

The black abalone has historically played a significant role in California's Native American, immigrant, and fishing communities. Abalone shells obtained from ancient Native American burial sites provide evidence of substantial fishing activity in California as early as 7000 BC.⁵ Abalone was a common source of food for California Native American tribes, and abalone shells were used as currency in trading with the Spanish. The modern California abalone fishery began in the 1850's by Chinese immigrants, who hand-gathered black abalone from California intertidal ecosystems.⁶ Early in the 1900's, however, abalone numbers were already decreasing, and new prohibitions on shore-gathering led to the near disappearance of Chinese fishing.⁷ The California Department of Fish and Game officially began recording abalone catch landings in 1916, at approximately the same time that Japanese immigrants virtually monopolized California abalone fishing operations. In just thirteen years (1916-1929), the "entire catch of about 2 million pounds per year was taken by Japanese fishermen and landed at Monterey."⁸ When Japanese immigrants were displaced to World War II internment camps in 1941, Caucasian fisherman took over the abalone fishery. Black abalone populations began to decrease dramatically over the next few decades due to disease; in 1993, harvesting of the species was prohibited in California.⁹

4. Kleypas, J.A., R.A. Feely, V.J. Fabry, C. Langdon, C.L. Sabine, & L.L. Robbins, 2006, *Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers: A Guide for Future Research*, Report of a workshop held 18-20 April, 20, St. Petersburg, Florida, sponsored by NSF, NOAA and U.S.G.S, 88 pgs.

5. K.D. Lafferty & A.M. Kuris, *Mass Mortality of Abalone *Haliotis cracherodii* on the California Channel Islands: Tests of Epidemiological Hypotheses*, Marine Ecology Progress Series 96, 239 (1993); Alistair J. Hobday & Mia J. Tegner, *Status Review of White Abalone (*Haliotis sorenseni*) Throughout its Range in California and Mexico*, NOAA Tech. Memorandum NMFS, May 2000 at 14.

6. Alistair J. Hobday & Mia J. Tegner, *Status Review of White Abalone (*Haliotis sorenseni*) Throughout its Range in California and Mexico*, NOAA Tech. Memorandum NMFS, May 2000 at 15.

7. *Id.* (citing P. Bonnet, *Abalone in California*, Cal. Fish & Game Bull. 16, 15-23 (1930)).

8. *Id.* (citing K.W. Cox, *Review of the Abalone of California*, Cal. Fish & Game Bull 46, 381-406 (1960)).

9. *Id.* at 16 (citing J.M. Alstatt et al., *Recent Declines of Black Abalone *Haliotis cracherodii* on the Mainland Coast of Central California*. marine Ecology Progress Series 142, 185-192. (1996)).

Commercial fishing, coastal development, pollution, and the emergence of a virulent disease called “withering syndrome” have decimated the black abalone.¹⁰ Today, the black abalone has “virtually disappeared from the Southern California mainland and in many areas of the Channel Islands.”¹¹ In less than twenty years, black abalone that once had densities of more than 100 per square meter vanished from most of their former range south of Point Conception.¹²

Despite the 1993 California moratorium on commercial fishing of black abalone, the species continues its decline. Many scientists contend that without active human intervention, the species will soon become extinct. On June 23, 1999, NMFS listed the black abalone as a candidate species (64 Fed. Reg. 33466); on April 15, 2004, the black abalone was upgraded to a species of concern (69 Fed. Reg. 19975) and is now being considered for listing as threatened or endangered under the ESA.

Impacts of Global Warming on the Black Abalone

Numerous scientific studies demonstrate the impacts of warming water temperatures, rising sea levels and intertidal habitat loss, and increased carbon uptake and acidification on marine calcifying organisms, such as the black abalone.

Water Temperature and El Niño Events

For black abalone, warmer water temperatures are linked with increased frequency and mortality from disease. In the last sixty (60) years, ocean temperatures between 0-300 meters in depth have risen by 0.31 degrees Celsius (.56 degrees Fahrenheit).¹³ Since the late 1980's, California's populations of black abalone have been ravaged by a virulent disease known as withering syndrome.

Withering syndrome is a chronic disease which ultimately impedes the ability of abalone to attach to their substrate and causes death.¹⁴ Although temperature increases are not responsible for introducing withering syndrome to the abalone, elevated sea temperature is correlated with increased frequency and mortality from the disease both in the wild and in

10. *See generally supra* note 3 at 240.

11. Petition at 1.

12. *Id.*

13. Field, et al, *U.S. National Assessment of Potential Consequences of Climate Variability and Change: Potential Consequences of Variability and Change on Coastal Areas and Marine Resources* 461 (2000).

14. Moore, et al., *The Role of Rickettsia Type Prokaryote in Withering Syndrome in California red Abalone*, *Journal of Shellfish Research*, Vol 19, No. 1, pp. 525-26 (2000).

laboratory replications.¹⁵ As global warming increases water temperatures, it is likely for withering syndrome to spread northward throughout all of its range.

In addition, global warming is anticipated to produce more severe El Niño events in California, which negatively impact the black abalone. El Niño oscillations produce changes in near shore and offshore marine communities, including a reduction in upwelling of cool, nutrient rich waters, which causes an overall decline in the black abalone's productivity.¹⁶ In central California massive die-offs of black abalone have occurred during El Niño and non-El Niño years, but the rate of mortality was found to be significantly faster during El Niño events (~24 months) compared to non-El Niño years (~41 months).¹⁷ While El Niño events are natural phenomena, most climate change models predict that global warming will lead to an increased frequency of strong El Niño events.¹⁸

Sea Level Rise

Rising sea levels threaten to eliminate the intertidal habitat of the black abalone. In 2001, the IPCC concluded that global sea levels will rise between 10-90 cm this century, thereby threatening to submerge the intertidal habitat of the black abalone as well as other tide-dependent species. This assessment, however, seems in hindsight to be underestimated. According to recent studies by two independent teams of university and government climatologists published in the journal, *Science*,¹⁹ sea-level rise from the melting of polar ice sheets is one of the largest potential threats associated with the present trends of climate change.²⁰ For instance, polar warming by the year 2100 may reach levels that will cause a sea level rise of between 13 and 20 feet by the end of this century if current greenhouse gas emission trends continue unabated. Reviewing the conclusions of these studies, the San Francisco Chronicle reported that these possible scenarios would cause the certain destruction of

15. Petition at 23 (citing Alstatt et al., 1996).

16. Petition at 23 (citing Richards and Davis, 1993).

17. Raimondi PT, Wilson CM, Ambrose RF, Engle JM, Minchinton TE (2002). *Continued declines of black abalone along the coast of California: are mass mortalities related to El Niño events?* Marine Ecology Progress Series 242: 143-152.

18. Petition at 23 (citing Hansen, et al., 2006)

19. Johnathan T. Overpeck et al., *Paleoclimatic Evidence for Future Ice-Sheet Instability and Rapid Sea-Level Rise*, 311 Sci. 1747, 1747-1750 (2006).

20. For these reasons, the Attorney General submitted comments to the U.S. Fish and Wildlife Service in March, 2005, requesting that the agency consider global warming impacts in its evaluation of whether to list the polar bear as threatened or endangered. This petition is still pending, however, in December, 2006, the Fish and Wildlife Service indicated that it is inclined to list the polar bear as "threatened" and to consider melting polar ice as one factor contributing to the bear's demise.

significant parts of San Francisco and the Bay Delta, and “would threaten coastal cities and harbors on every continent.”²¹ Such a significant increase in sea level has profound implications on the black abalone species and the ecosystems on which it depends.

Carbon Uptake and Ocean Acidification

The problem of ocean acidification is one of the most pressing environmental threats facing the Earth. The Earth’s oceans act as a “sink” for carbon dioxide, absorbing large volumes of carbon dioxide approximately fifty (50) times more carbon dioxide than the atmosphere. Current estimates conclude that the ocean has thus far absorbed approximately 30% of the excess carbon dioxide emitted since the beginning of the Industrial Revolution. By taking up one-third of the atmosphere's carbon dioxide -- much of which stems from exhaust from automobiles, power plants and other industrial sources -- oceans are transforming their pH level which increases its acidity. Increased acidity reduces the abundance of the right chemical forms of a mineral called calcium carbonate, which corals and other sea animals need to build shells and skeletons. It also slows the growth of the animals within those shells and makes the shells brittle and prone to collapse.²²

Already, surface ocean pH has dropped by .1 units on the pH scale, from 8.16 in 1800 to 8.05 today - a rise in acidity of 30%. The pH scale is exponential, so a one-unit drop represents a 10-fold decrease. This change indicates that if carbon dioxide trends continue on a trajectory to ultimately stabilize at 1,000 parts per million, the pH of the ocean is expected to dip to 7.9 or lower by the end of the century — a 150% change.²³ The ocean has already lost 10% of its total carbonate compared to pre-industrial levels.²⁴

The ocean’s increasing acidity puts calcium carbonate dependent species --such as phytoplankton, corals, coralline macroalgae, urchins, starfish, clams, oysters, crustaceans and marine molluscs (including the black abalone)-- in serious jeopardy. If these impacts are not addressed, some scientists estimate that by the end of the century, this trend will decimate the organisms that form the basis of the food chain and upset the delicate balance of life in the oceans.

Although the fate of plankton and marine molluscs may not seem as compelling as vibrantly colored coral reefs, they are critical to sustaining all ocean life, including species such

21. David Perlman, *Oceans Rising Fast*, *New Studies find*, S.F. Chronicle, Mar. 24, 2006, at A1.

22. Petition at 25 (citing Ruttimann, 2006).

23. Lee MacFarling, Usha Lee, *A Chemical Imbalance, Growing Acidity Threatens to Wipe Out Sea Life*, LA Times, August 3, 2006.

24. WBGU. 2006. *The Future of Oceans: warming up, rising high, turning sour*. German Advisory Council on Global Change, *Special Report*, March 2006; available at www.wgbu.de.

as salmon, redfish, mackerel and baleen whales.

NMFS Must Consider Global Warming Impacts in its Listing of the Black Abalone

The ESA mandates the protection of a species as “threatened” if it “is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” 16 U.S.C. 1532(20). A species is considered “endangered” when it “is in danger of extinction throughout all or a significant portion of its range.” 16 U.S.C. § 1532(6). The best available scientific information reveals that the black abalone is in danger of extinction throughout *all* of its range and is therefore “endangered” within the meaning of the ESA.

NMFS is required to determine whether a species is “threatened” or “endangered” based on the presence of any of the following five factors: the presence or threatened destruction, modification or curtailment of its habitat or range; overutilization for commercial, educational, recreational, educational, or scientific 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) & 1533 (b). All five of these factors have played a role in the black abalone’s collapse.

Section 2(c) of the ESA mandates that “all Federal departments and agencies shall seek to conserve endangered species and threatened species.” 16 U.S.C. § 1531(c). “The Act specifically defines “conserve” as meaning “to use ... *all methods and procedures which are necessary* to bring *any endangered species or threatened species*” to a continued existence that no longer requires the protections afforded by the Act. 16 U.S.C. § 1532(3)(emphasis added.)”²⁵ NMFS will be required to formulate a recovery plan for the species that takes into account future threats from climate change and provides objective, meaningful criteria to evaluate the species’ recovery. This scrutiny will benefit all marine species facing a similar future.

///

Conclusion

Global climate change and ocean acidification in particular present the marine environment with an unprecedented challenge. Many complex factors, both natural and anthropogenic, have combined to decimate California’s populations of black abalone. The best available science indicates that the black abalone is in danger of extinction throughout all or most of its range and should receive federal protection. We request that NMFS evaluate the

25. *TVA v. Hill*, 437 U.S. 153, 180 (1978) (quoting 16 U.S.C. § 1532(3)).

William Hogarth
Carlos M. Gutierrez
June 12, 2007
Page 8

present and future global warming related impacts faced by the black abalone in order to facilitate the species' recovery and the health of the oceans. We appreciate the opportunity to provide these comments. Please direct any questions regarding this comment letter to the undersigned.

Sincerely,

JAMIE JEFFERSON
Deputy Attorney General

For EDMUND G. BROWN JR.
Attorney General