BEFORE THE UNITED STATES DEPARTMENT
OF COMMERCE AND THE NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION, FISHERIES

In the Matter of the Petition to
Delist the Southern Resident killer whale
distinct population segment
(*Orcinus orcinus orca*)
under the Endangered Species Act

PETITION OF THE CENTER FOR ENVIRONMENTAL SCIENCE, ACCURACY & RELIABILITY, EMPRESAS DEL BOSQUE, AND COBURN RANCH TO DELIST THE SOUTHERN RESIDENT KILLER WHALE DISTINCT POPULATION SEGMENT UNDER THE ENDANGERED SPECIES ACT

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INTRODUCTION

Petitioners Center for Environmental Science, Accuracy & Reliability (CESAR), Empresas Del Bosque, and Coburn Ranch, hereby petition the United States Department of Commerce and the National Oceanic and Atmospheric Administration, Fisheries, pursuant to Section 4(b)(3), 16 U.S.C. § 1533(b)(3), of the Endangered Species Act (ESA), *id*. §§ 1531-1544, to delist the Southern Resident killer whale distinct population segment (DPS) (*Orcinus orcinus orca*). *See* 70 Fed. Reg. 69,903 (Nov. 18, 2005); 72 Fed. Reg. 16,284 (Apr. 4, 2007). Petitioners contend that the killer whale DPS does not constitute a listable unit under the ESA. The ESA authorizes the listing of species, subspecies, and DPSs of *species*. *See* 16 U.S.C. § 1532(16). The ESA does not permit the listing of DPSs of *subspecies*. Further, the killer whale DPS is based on faulty taxonomy—namely, a nonexistent and scientifically unjustifiable subspecies of North Pacific resident whales. *See* 70 Fed. Reg. at 69,904, 69,907. Accordingly, the listing of the Southern Resident killer whale DPS is illegal and, for that reason, the Secretary and the Director should delist the DPS.[1] *Cf*. 50 C.F.R. § 17.11(h).

[1] To the extent that the Department and the Service determine that any portion of this petition is not cognizable as an ESA Section 4 petition, Petitioners request that such portion be deemed a petition for the repeal of a rule under the Administrative Procedure Act, 5 U.S.C. § 553(e).

PETITIONERS

1. CESAR is a California nonprofit corporation the primary purpose of which is to bring scientific rigor to regulatory decisions undertaken pursuant to environmental statutes, and to ensure consistent application of these statutes throughout all industries and sectors. CESAR believes that these activities will generate additional support for environmental statutes, because the results of and bases for regulatory actions will be transparent and supported by science. CESAR believes that these goals will be furthered by delisting the Southern Resident killer whale DPS, for three related reasons. First, the delisting will ensure that the National Marine Fisheries Service abide by Congress's limitation of the Service's listing power to species, subspecies, and DPSs of species. Second, the delisting will ensure that the Service not be allowed to cherrypick populations for listing within subspecies that show no danger of extinction. Third, the delisting will ensure that the Service truly follow the commands of best available scientific data by protecting only those populations the taxonomy of which is legitimate rather than a product of politicized science. Realization of these goals is all the more important now, given that the water cutbacks in California's San Joaquin Valley have been due in part to ESA protections afforded the Southern Resident killer whale DPS.

2. Empresas Del Bosque, located in California's San Joaquin Valley, farms about 2,200 acres of cantaloupes, organic cantaloupes, almonds, asparagus, cherries, wheat, and processing tomatoes. It has 18 full-time

employees, and hires up to 300 more persons on a seasonal basis. Water from the San Luis Water District is vital for Empresas Del Bosque, as all its crops grown are irrigated.

Since 1992, irrigation water reductions have occurred in all but two years. The worst water reduction occurred in 2009 when the District only received a 10% allocation. That low allocation was in part due to the protections afforded the killer whale under the ESA. Empresas Del Bosque idled about 900 acres, including 600 acres of melons, and 120 acres of asparagus were removed. The revenue lost by the farm was about $1.5 million, most of that in wages. Just the best melons would have fed 2.5 million people for their annual consumption. But the severest impacts were to Empresas Del Bosque's farm workers. Instead of laying off people, Empresas Del Bosque cut back the workers' hours per week from 60 to 40, which created a severe hardship.

Swings in water allocation also strain financing. Bankers become more skeptical and require assurances of water supply. Empresas Del Bosque makes plans and field preparations in the fall, procures financing in the winter, and begins planting in the spring. It often does not know how much water it will receive until after planting. If it overestimates the water supply, it must abandon crops. If it underestimates, it suffers opportunity costs. Surviving lean water years is a difficult process. If substantial water losses were to occur for two years consecutively, it would mean financial disaster for Empresas

Del Bosque. Thus, delisting of the killer whale is one necessary step in preventing further catastrophic water cutbacks.

3. Coburn Ranch is a family farm that raises almonds, wine grapes, and various row crops. The Ranch currently has 4,000 acres in production. It has 21 full-time employees, and a handful of seasonal employees. The Ranch farms in several water districts, including the Chowchilla and Westlands Water Districts.

Coburn Ranch has ceased all development of land in the San Joaquin Valley federal water districts, in part because of water cutbacks attributable to ESA protections for the killer whale. Banks will not lend money due to uncertainty of future court decisions. Since the water cutbacks of 2009, a $6 million expansion planned for the Ranch's almond processing plant has been put on indefinite hold. Until the pumping regulations, including the delisting of the killer whale, are reformed, Coburn Ranch will be at a stand-still in development and job creation. If the current policies remain in place, Coburn Ranch will continue to downsize and lay-off employees that work in the federal water districts.

LEGAL BACKGROUND

The ESA requires the Service to determine whether any species qualifies as endangered or threatened, thus entitling it to the protections of the Act. 16 U.S.C. § 1533(a)(1). The ESA defines "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." *Id*. § 1532(16). The Service, with the United States Fish and Wildlife Service, has published a DPS Policy defining what types of populations qualify as DPSs under the ESA. 61 Fed. Reg. 4722 (Feb. 7, 1996). Pursuant to that policy, a population is listable as a DPS if it is discrete from other populations within its species, and if it is significant to the species as a whole. *Id*. at 4725. If the population meets both of these criteria, the Service then determines whether the population qualifies for threatened or endangered status. *Id*.

The ESA directs the Service to list species based on "the best scientific and commercial data available," 16 U.S.C. § 1533(b)(1)(A), and with reference to the following factors:

> (A) the present or threatened destruction, modification, or curtailment of the species's habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; [and] (E) other natural or manmade factors affecting the species's continued existence.

Id. § 1533(a)(1). The Service's regulations direct that a determination whether to delist a species must use these same factors. *See* 50 C.F.R. § 424.11(d). The regulations further explain that a determination to delist must be based on one of the following reasons: the species has become extinct; the species has recovered; or the original listing was erroneous. *See id*. § 424.11(d)(1)-(3).

FACTUAL BACKGROUND

A. The Killer Whale's Natural History

1. Identifying Characteristics

a. Coloration

The killer whale is easily identified by its black body and distinctive white markings. The region extending from the tip of the lower jaw towards the flippers is white where it narrows medially, and then widens slightly as it ends at the caudal of the urogenital region. A white flank patch running side to side connects to the ventral white patch on each side of the whale and gives the ventral patch a trident-like design. The ventral side of the fluke can be white or a light gray, and may be bordered in black. There is a white patch slightly above and behind each eye. The dorsal fin generally has a variable gray or white saddle behind it. The saddle shape varies among individuals (Baird & Stacey 1988). The saddle patch becomes more obvious with maturity.

b. Size and Shape

Killer whales are very large and exhibit sexual dimorphism in body size, flipper size, and height of the dorsal fin. Males may be up to 10 meters while females are generally less than nine meters. The few animals that have been weighed were 3,810 kilograms for a 6.7-meter female and 5,568 kilograms for a 6.75-meter male.

Killer whales have rounded heads with a slight demarcation at the mouth. Flippers are relatively large, ovate, and found about one-fourth of the distance from the snout to the flukes. The flipper shape varies significantly from the sickle-shaped flippers of most delphinids. Flipper length varies between males and females with male flippers as much as 20% of the body length and female flippers only 11% to 13% of the body length. The spread of the flukes may be over one-fifth of the body length for both sexes. The dorsal fins of mature males are erect and are 1.0 meters to 1.8 meters in height; female dorsal fins are less than 0.7 meters and curve to a point.

c. Internal Anatomy

Skulls of adult killer whales are large in size, and have a recognizable dental formula and large teeth. When killer whales close their jaws, the teeth interlock. Killer whales have a total of 50 to 54 vertebrae, with the number of ribs varying from 11 to 13 per side, and with the anterior six or seven ribs attached to the vertebrae by both the capitulum and tuberculum. The remaining ribs are attached by the tuberculum. Ribs 1 through 6 attach to the sternum. The phalanges are wider than they are long with the ends of the phalanges and most carpal elements composed of cartilage. It has been hypothesized that the accelerated secondary growth of flippers in maturing males is related to the continued growth of these cartilages.

The general plan of the digestive system in killer whales is similar to that of other delphinids. The fore-stomach is large and extremely distensible in order to accommodate large prey items. The diet of killer whales is geographic and sometimes population-specific. In the North Pacific, whales feed primarily on salmonids. Populations known as "transient" in the eastern Pacific feed primarily upon pinnipeds and other cetaceans. Off the coast of Norway, herring and other schooling fish are their primary prey. Killer whales near New Zealand feed on stingrays and sharks. Antarctic killer whales eat minke whales, seals, Antarctic toothfish, and other fish species.

2. Range

Killer whales are distributed throughout the world's oceans. They are the most widely distributed of the cetaceans (which include whales, dolphins, and porpoises). They are the second-most widely distributed mammal species in the world. There is only one recognized species of killer whale in the world. Although there is much discussion and consideration as to whether this should be reduced to species and subspecies, to date no such distinction has been made.

Killer whales are found in all parts of the oceans and in most seas from the Arctic to the Antarctic (NMFS 2005).

- In the North Pacific Ocean: Bering Sea; Aleutian Islands; Sea of Okhotsk; Sea of Japan; Prince William Sound; southeastern Alaska;

nearshore and intercoastal waterways of British Columbia, Canada, and Washington State; along the U.S. Pacific coast in Washington, Oregon, and California; along the Russian coast (Bering Sea and the Sea of Okhotsk); on the eastern side of Sakhalin and the Kuril Islands.

- In the North Atlantic Ocean: up to the pack ice edge in Norwegian waters and around Iceland.
- In the South Atlantic and Pacific Oceans: along the pack ice of Antarctica; both coasts of Baja California; off the coasts of Patagonia, southern Argentina; New Zealand; Gulf of Panama; Galapagos Islands.

The killer whale is also found off the coasts of China, Japan, and Hawaii, and in the tropical Pacific.

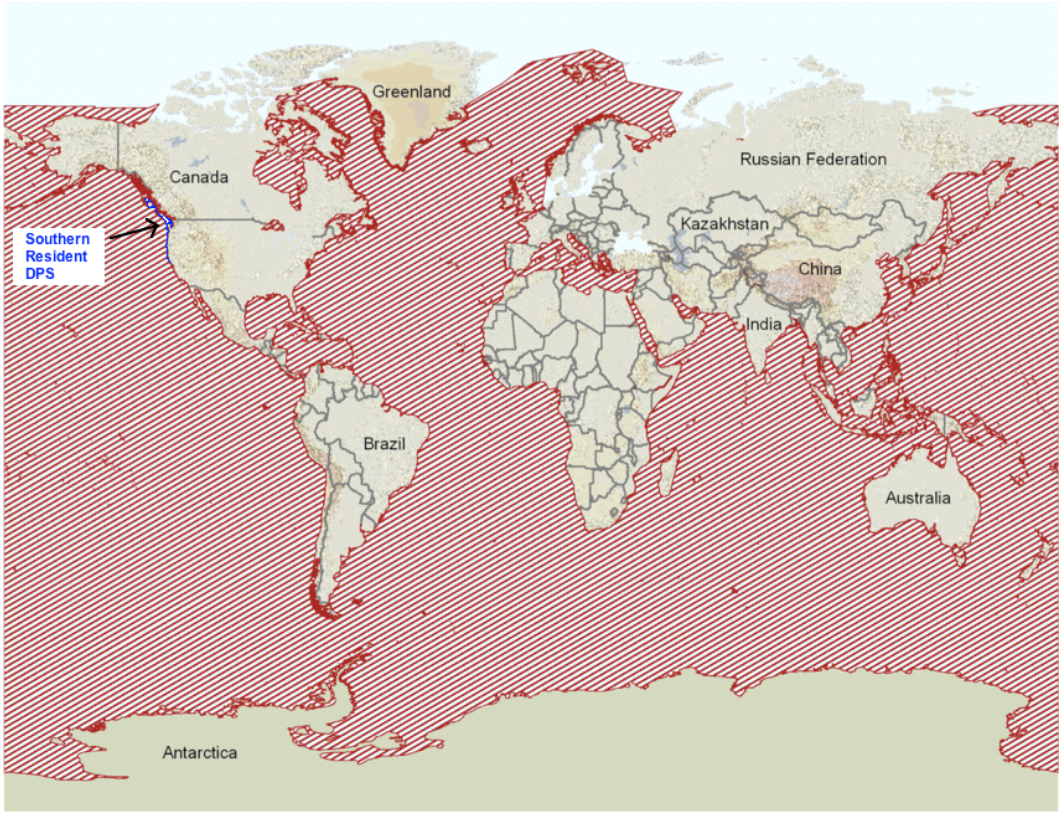

Figure 1. Map of the distribution of O. orca (in diagonal red hatches) from the International Union for the Conservation of Nature (IUCN), and modified to show the range of the NMFS-designated Southern Resident killer whale DPS (in blue). The purported North Pacific resident subspecies (recognized only by the Service) includes the southern Coast of Alaska and Aleutian Islands (range not shown because there is no scientifically accepted taxonomic description).

3. Taxonomy

a. The Problem of Taxonomic Inflation

The definition of "species" has been a subject of debate by philosophers and biologists since the time of Aristotle, with no firm resolution. "Subspecies" are on shakier epistemological grounds, especially as the description is based upon a selective, post-hoc interpretation of the data and is used to justify conservation actions such as a threatened or endangered listing under the ESA (Cronin 1997, 2006, 2007; Ramey 2005, 2007; Ramey *et al*. 2005, 2006, 2007). Regulators mistakenly assume that erring on the side of caution requires erring on the side of species or subspecies status (Chaitra *et al*. 2004; Isaac *et al*. 2004; Meiri and Mace 2007). Such an "ends justify the means" approach shortchanges the protection of the many legitimate species worldwide that are both highly unusual and highly endangered. Erroneous subspecies classifications, and their consequent listing under the ESA, can also impose great costs to society. This occurs when the balance of harms shifts disproportionately in favor of "preservation" and takes no account of the level of human suffering that regulation imposes. *Consol. Delta Smelt Cases*, 717 F. Supp. 2d 1021, 1069-71 (E.D. Cal. 2010).

The elevation of "subspecies" to the level of species, and populations to the level of subspecies or DPSs, is "taxonomic inflation." This phenomenon has the effect of increasing the perception of endangerment, as each population

of a given taxon is subdivided into smaller ranges with a smaller number of individuals in each grouping (Agapow *et al*. 2004).

A contributing factor to the excessive splitting of taxa and the phenomenon of taxonomic inflation is the assumption of reproductive isolation supported by weak or unsubstantiated data, heavy reliance on a single genetic marker (such as mitochondrial DNA), or flawed sampling design (*e.g*., the sampling protocol does not draw equally across the species's geographic range). Under this scenario, even slight but statistically significant differences in allele frequencies (or minor behavioral or morphological variation or both) are considered "evidence" of reproductive isolation, thereby elevating many "subspecies" to the level of species and many populations to the level of subspecies. This practice improperly equates "statistical significance" with "biological significance." (Isaac *et al*. 2004; Agapow *et al*. 2004; Meiri & Mace 2007).

The listing of taxa or populations under the ESA brings power and funding to those associated with the description of the subspecies, and to regulatory agencies charged with their "preservation." When an agency proposes a new subspecies, which it will then regulate under the ESA, the agency falls into a conflict of interest. And, once the subspecies is listed as threatened or endangered, it is rare for the subspecies ever to be delisted. Politically powerful environmental litigants, as well as similarly motivated academics and agency staff have vigorously opposed taxonomic revisions that

would potentially "lump" subspecies into larger groups and deny ESA-listing authority, even in cases of gross taxonomic inflation (*e.g.*, Allard 2007; Crandall 2006; Martin 2006; Ramey 2007; Ramey *et al*. 2006, 2007; Skalski *et al*. 2008).

Despite the best of intentions, peer review provides only a coarse and highly variable filter on the quality of information used in science. Peer reviews, even those conducted by federal agencies, suffer from conflicts of interest and do not always provide an impartial assessment. The absence of any unified bright-line or clear-cut criteria for what constitutes a subspecies, or requirement that there be multiple lines of evidence considered, effectively puts the basis of many subspecies classifications and listings into the realm of subjective opinion (Baker & Bradley 2006: Sites & Marshall 2003; Ramey *et al*. 2005, 2006, 2007).

b. The Killer Whale's Taxonomy

The killer whale is the only extant member of the genus *Orcinus*. Although some researchers have suggested that there may be more than one species of killer whale, to date modern taxonomists have not accepted that hypothesis and instead classify all killer whales as *Orcinus orca*. The distinct genetic and morphologic variations observed among populations of killer whales are generally considered to be variations within a single species (Perrin 1982; Heyning & Dahlheim 1988).

4. The Service's 2004 Workshop on Cetacean Taxonomy

The cetacean taxonomy workshop was convened in response to the district court's order in *Center for Biological Diversity v. Lohn*, 296 F. Supp. 2d 1223 (W.D. Wash. 2003), directing that the Service reanalyze earlier taxonomic studies to determine whether the killer whale should be listed. Membership in the workshop comprised 18 experts from the fields of morphological, behavioral, and molecular systematics, among others. No experts in the field of cetacean taxonomy were included to inform the workshop participants. Of the 18 members, 10 were Service employees and the remainder were from various institutions. It is unknown to what extent the remaining scientists received funding from the Service for their work.

The group came to several conclusions with respect to killer whales:

- An overall conclusion was that, globally, killer whales exhibit relatively shallow divergence at mtDNA loci, and the fossil record has been interpreted to signify a 5 million year history of a monotypic lineage.

- Killer whales worldwide do not appear to be distinguishable along ecotype differences defined from research in the eastern North Pacific (ENP) (i.e., 'residents,' 'transients,' and 'offshores,' with their respective foraging specializations). It therefore seems that at least some of their typical traits have evolved multiple times.

- A straw poll within the working group indicated little support for the premise that one or more new species could be described on present evidence.

- There was extensive discussion as to whether the North Pacific evidence from mitochondrial and nuclear markers was discordant, and no agreement could be reached in the time available.

- Genetic analysis of mitochondrial DNA shows low diversity, no consistent worldwide geographical pattern, and no consistent correlation between mtDNA lineage and ecotype.

- Whether the different ecotypes of killer whales constitute a single species, multiple species or subspecies is not yet resolved.

- While there are clearly different ecotypes, it is not clear whether these represent a plastic and ephemeral response to changing habitat conditions, or the beginning of an irreversible process of speciation.

- The majority view among workshop participants was that multiple species probably exist at least in Antarctica, and that this might well be confirmed in the future, but that current data are limited (absent or insufficiently quantified) and therefore that separation at the species level is at this point premature.

- The working group agreed that it was not possible at this point to comment meaningfully on the relationship between Antarctic and [Eastern North Pacific (ENP)] ENP killer whales on the basis of existing data, except to note convergent similarities in summer feeding preferences between Antarctic Type B and ENP Transients, and Antarctic Type C and ENP Residents.

Reeves *et al.* 2004 at 4-6, 62-63.

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Further, the workshop group made several statements with respect to subspecies:

- The subspecies has been and remains a difficult concept. Scientific opinion varies concerning the utility of designating subspecies).

- Some scientists insist that no compelling justification has been offered as to why subspecies are important, while others regard subspecies as meaningful in terms of both biology and conservation.

- Several participants stressed that taxonomic practice should not be changed simply to accommodate perceived political needs.

- Thus far, cetacean subspecies have been geographical forms that are noticeably different. Therefore, designations have been based on a combination of morphology and distribution.

- [F]or most cetaceans, we do not have enough morphological data to meet an evidentiary standard for establishing (or rejecting) additional species.

- In developing its species guidelines, the working group had effectively rejected all formal species concepts that do not require at least two independent lines of evidence.

Reeves *et al.* 2004 at 4, 7, 29.

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The workshop group generally accepted the following guidelines for designation of species- and subspecies-level taxonomy:

- In addition to the use of morphology to define subspecies, the subspecies concept should be understood to embrace groups of organisms that appear to have been on independent evolutionary trajectories (with minor continuing gene flow), as demonstrated by morphological evidence or at least one line of appropriate genetic evidence.

- Geographical or behavioral differences can complement morphological and genetic evidence for establishing subspecies. As such, subspecies could be geographical forms or incipient species.

- The agreed guidelines were noncommittal in regard to specific types of evidence required for species delimitation.

- No type of evidence was seen as essential, nor were any completely dismissed as irrelevant. However, some kinds of evidence were considered secondary and not suitable as primary support for species-level decisions, e.g., behavioral and distributional data.

Reeves *et al.* 2004 at 4, 7.

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Most importantly, the workshop report contained the following:

> [C]onsideration of whether to add the 'southern resident' killer whales of the eastern North Pacific to the U.S. Endangered Species List hinged on poorly understood evolutionary relationships between this population and killer whales globally (LJ/04/KW10). In the absence of a fundamental understanding and agreement on the number of species and subspecies of killer whales, consensus could not be reached on whether this whale population was significant to the taxon to which it belongs.

Reeves *et al.* 2004 at 3.

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In summary, the 2004 workshop participants were unwilling and unable to identify data to support species designations within the killer whale taxonomy as a whole.

5. The Service's Classification of Killer Whales in the Pacific Northwest in Its 2006 Listing Determination

The 2006 listing determination begins by dividing the killer whale species into even smaller groups (hypothetical species, subspecies, and DPS). These divisions are not discussed in the context of any taxonomic system (species, subspecies) accepted by the scientific community.

The listing determination first identifies killer whales of the Eastern North Pacific Region (ENP), but does not identify them as a species, subspecies or DPS. Further, it fails to put this group into context with the larger species grouping either by identifying two lines of evidence accepted in the 2004 working group, or by providing other data supporting their distinctness.

The Service then parses the undefined ENP whales into three smaller "ecotypes"—resident, transient, and offshore—but again fails to identify the ENP as a species, subspecies, or distinct population segment and fails to identify data or lines of evidence supporting identification of the ENP as distinct.

Finally, the listing determination further parses the ENP ecotype into yet smaller groups: Southern, Northern, Southern Alaska, western Alaska, and western North Pacific. No data or research substantiating their distinctness is provided in the Federal Register determination.

To put this analysis into context, the estimated minimum killer whale population is 50,000. The population of killer whales in the Northeast Pacific is approximately 2,250 to 2,700. Thus, the entire Northeast Pacific population makes up about 4% of the total killer whale population. The Service states that the Southern Pacific population consisted of 88 individuals in 2003, which means that the population represents less than 4% of the Northeast Pacific population. In the context of the entire killer whale species, the Southern Pacific population represents less than 0.2% of the species.

ANALYSIS

I

BECAUSE THE SERVICE IS WITHOUT AUTHORITY TO LIST A DPS OF A SUBSPECIES, THE KILLER WHALE DPS MUST BE DELISTED

A. The ESA's Plain Meaning Forbids the Listing of DPSs of Subspecies

The protections of the ESA apply only to "species," with that critical term defined as follows:

> The term "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.

16 U.S.C. § 1532(16) (emphasis added). As the plain language of the foregoing provision demonstrates, only DPSs *of a species* are considered and may be recognized and listed for ESA protection. *See Alsea Valley Alliance v. Evans*, 161 F. Supp. 2d 1154, 1162 (D. Or. 2001) ("Listing distinctions below that of subspecies or a DPS of a species are not allowed under the ESA."). A species includes (1) a subspecies or (2) a DPS of a species. 16 U.S.C. § 1532(16). If the Service wishes to include DPSs of a subspecies in ESA regulation, it must resort to Congress.

Principles of statutory construction prohibit defining "DPS of a species" to include DPSs of a subspecies. For instance, it would be impermissible to determine that, because the term "species" includes subspecies, the Service

may then list a DPS of a subspecies. Doing so would violate the maxim *expressio unius est exclusio alterius*, *i.e.*, "the mention of some implies the exclusion of others not mentioned." *United Dominion Indus. v. United States*, 532 U.S. 822, 836 (2001). By explicitly limiting listing authority to DPSs of a species, Congress specifically excluded listing authority for DPSs of subspecies. *See Alsea Valley Alliance*, 161 F. Supp. 2d at 1162 ("The ESA 'specifically states in the definition of "species" that a "species" may include any subspecies . . . and any distinct population segment (DPS) of any species . . . .' ") (citing 16 U.S.C. § 1532(16) and *Southwest Center for Biological Diversity v. Babbitt*, 980 F. Supp. 1080, 1085 (D. Ariz. 1997))).

Moreover, to read the statutory definition to allow for the listing of DPSs of species *and* subspecies would render the phrase "of any species" (which follows "distinct population segments") redundant and superfluous. After all, if a DPS could be listed for both of the other entities the Service may list—species and subspecies—then there would be no need to include the phrase "of any species" after "distinct population segments." But the phrase "of any species" *is* included, indicating a congressional intent that DPSs are to be limited to "species." Ignoring this statutory qualification is not permissible. *Cf. Jarecki v. G.D. Searle & Co.*, 367 U.S. 303, 307-08 (1961) ("[W]e will not adopt a strained reading which renders one part a mere redundancy."); *Weinberger v. Hynson, Westcott & Dunning, Inc.*, 412 U.S.

609, 633 (1973) (noting "the well-settled rule of statutory construction that all parts of a statute, if at all possible, are to be given effect").

B. The Argument That, Because Subspecies Are by Definition Part of a Larger Taxonomic Class of Species, Any Population That Is Part of a Subspecies Is of Necessity Part of a Species Classification, Is Unavailing

The Joint DPS policy rationalizes the listing of DPSs of subspecies on the grounds that such DPSs are always, by definition, part of a larger species classification. The argument is without merit.

First, and as preliminary matter: because the statute is plain on its face, the Service is not entitled, on this point, to deference under *Chevron U.S.A., Inc. v. Natural Resources Defense Council,* 467 U.S. 837, 842-43 (1984) ("If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress."). *Cf. Nw. Ecosystem Alliance v. U.S. Fish & Wildlife Serv.*, 475 F.3d 1136, 1143-44 (9th Cir. 2007) (holding that the policy's interpretation of what constitutes a "distinct population segment" was a reasonable construction meriting *Chevron* deference).

Second, the argument is entirely inapt here where the Service has determined that the Southern Resident killer whale DPS is both discrete and significant *to the Northern Pacific resident population, i.e.,* to the higher-level subspecies. The Service cannot have it both ways: the Service cannot determine that a population qualifies as a DPS by conducting the DPS analysis

with respect to a subspecies, but then justify the legality of the DPS with reference to the overarching species. If a DPS that is part of an existing subspecies *can* be listed as part of the overarching species, then consistency would require that the DPS analysis be conducted with respect to that overarching species. In fact, the Service did precisely that here but determined that the Southern Resident killer whale population would *not* qualify as a DPS of the overarching species. *See* 67 Fed. Reg. 44,133, 44,138 (July 1, 2002).

Third, the argument avoids a crucial component of the interpretive question presented—namely, can the Service list a DPS of a subspecies, whether or not that population may qualify as a DPS of the overarching species? To allow the Service to list a DPS of a species that consists entirely of members of a recognized subspecies of that overarching species would frustrate Congress's desire to limit the type of subpopulations that may be listed under the ESA. The 1973 version of the ESA defined "species" as including "any subspecies of fish or wildlife or plants and any other group of fish or wildlife of the same species or smaller taxa in common spatial arrangement that interbreed when mature." Endangered Species Act of 1973, Pub. L. No. 93-205, § 3(11), 87 Stat. 884 (Dec. 28, 1973). Accordingly, under the 1973 Act the Service could list sub-populations of species ("any other group . . . of the same species") *and subspecies* ("any other group . . . of . . . smaller taxa"). The 1978 amendment narrowed the Service's population-listing power by defining "species" to include "any distinct

population segment of any species of vertebrate fish or wildlife which interbreeds when mature." *See* Pub. L. No. 95-632, § 2(5), 92 Stat. 3751 (Nov. 10, 1978). The 1978 amendment's deletion of the phrase "or smaller taxa" as part of the Service's population listing power is strong inferential evidence that Congress has not authorized the Service to designate a population as a DPS where that population is comprised entirely of members of a recognized subspecies but where that population is not coextensive with that subspecies. Importantly, the Service's population listing power pre-1978 was not based upon the population's relationship to a larger taxonomic classification (as is the Service's post-1978 population listing power) but instead depended upon intra-population considerations: (1) common spatial arrangement and (2) interbreeding capability. Thus, the limitation of the Service's population-listing power evinces a Congressional objection to affording ESA protections to small subgroups of wildlife, *whatever* their relationship to a larger taxonomic classification.

C. The Listing of a DPS of a Subspecies Cannot Be Justified on the Grounds That, Because the ESA Defines "Species" to Include Subspecies, the Phrase "Distinct Population Segment of a Species," Contained Within the Definition of "Species," May Be Read as "Distinct Population Segment of a Subspecies"

A canon of statutory interpretation provides that, where a statute defines a word or phrase, the word or phrase must be given that meaning in other parts of the statute. *United States v. Migi*, 329 F.3d 1085, 1087 (9th Cir. 2003). But reliance on that canon is this context would be misplaced. The issue presented by the Southern Resident killer whale DPS listing is not the meaning of "species" as used in ESA sections other than 16 U.S.C. § 1532(16), but rather the meaning of "species" as used in the very section that defines the statutory term.

There is no indication that Congress intended one part of the defined meaning of "species" to apply to the terms comprising the other parts of that defined meaning. Section 1532(16) provides:

> The term "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.[2]

Had Congress intended the defined meaning of species to apply throughout the definition itself, Congress would have written thus:

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[2] The enrolled bill contains the entire phrase in double quotation marks and retains single quotation marks around the first "species." *See* Pub. L. No. 95-632, §2(5), 92 Stat. 3751 (Nov. 10, 1978).

> The term "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 placement of quotation marks around the second "species" would have indicated that the defined meaning of species, which includes subspecies, is to be applied throughout the definition itself. That Congress did not so provide is further evidence that the ESA does not authorize the listing of DPSs of subspecies.

Congress's failure to include "species" in quotation marks throughout Section 1532(16) is all the more significant given the legislative history. The House Conference Report accompanying the 1978 ESA amendments, which added the DPS clause, explains:

> The existing definition of "species" in the act includes subspecies of animals and plants, taxonomic categories below subspecies in the case of animals, as well as distinct populations of vertebrate "species."

H.R. Conf. Rep. No. 95-1804, at 17 (1978). Thus, the drafters of the Conference Report recognized the need to place "species" within quotation marks to give the definition the gloss that the Service would wish to impose upon the statute, but obviously the intentions of the Conference Report's drafters—representing a tiny portion of the voting members of Congress—did not prevail in the amendment's approved form. And in any event, it would be unfairly selective to read the Conference Report as supporting Congressional approval for an expansive reading of the DPS power when other legislative

history expressly counsels against a broad use of that power. *See* S. Rep. No. 96-151, at 1397 (1979) ("[T]he committee is aware of the great potential for abuse of this [DPS] authority and expects the [Service] to use the ability to list populations sparingly . . . .").

* * * * *

In sum, textual analysis as well as statutory and legislative history support the conclusion that the Service may not list a DPS comprised wholly of members of a subspecies. Thus, the DPS should be delisted.

II

THERE IS NO SCIENTIFIC BASIS FOR THE DESIGNATION OF THE UNNAMED NORTH PACIFIC RESIDENT SUBSPECIES OF KILLER WHALE, OF WHICH THE SOUTHERN PACIFIC RESIDENT POPULATION IS A PURPORTED DPS, AND THUS THE KILLER WHALE DPS MUST BE DELISTED

Contradicting the scientific consensus in the cetacean's workshop, and without any support from the broader taxonomic community, the Service unilaterally created a killer whale subspecies—the North Pacific residents—based apparently on geographic distribution.

The North Pacific resident killer whale has no standing in taxonomic nomenclature because it was never formally described in the scientific

literature as a subspecies, or formally named under the International Code of Zoological Nomenclature. Thus, the Service has chosen to ignore 275 years of biological classification and taxonomic nomenclatural convention (Linneaus 1735). The Service has simply disregarded the International Code of Zoological Nomenclature, which established conventions for the naming of species in 1842 and is periodically revised (ICZN, London, 4th ed. 1999). These conventions provide the rules and standards by which the naming of animals occurs. The conventions also provide universality and continuity in the scientific naming of animals to the scientific community, the public, and the law. Without such standards, the naming of species and subspecies would be a chaotic and unscientific free-for-all. This is precisely the result the Service has created, notwithstanding the Service's own regulations which incorporate the standard classifications. *See* 50 C.F.R. § 424.11(a) ("In determining whether a particular taxon or population is a species for the purposes of the Act, the Secretary shall rely on standard taxonomic distinctions and the biological expertise of the Department and the scientific community concerning the relevant taxonomic group.").

In its desire to achieve the policy goal of recognizing additional species, subspecies, and DPSs of killer whales (NMFS 2011), the Service is supplanting a universal and logical scientific system for naming animals with one that is parochial and non-scientific. The Service is operating contrary to accepted scientific convention and the law by basing ESA listings and

regulatory decisions on a *nomen nudum* ("naked name," an entity that does not exist) not recognized by the rest of scientific community. The Service's listing directly contradicts the consensus reached in the cetacean workshop. For the foregoing reasons, the Service should rescind the DPS designation for the Southern Resident killer whale because the subspecies designation on which it is founded is without scientific basis.

A. Genetic Data Do Not Support Subspecies Status for the North Pacific Resident Killer Whale

The best scientific data available demonstrate that gene flow (the transfer of different forms of a gene from one population to another) occurs within and among resident, transient, and offshore killer whale ecotypes, or genetically distinct varieties within a species (Pilot *et al.* 2010). Pilot *et al.* (2010) used microsatellite genotyping data to test for current exchange of genetic material among populations by determining parentage and testing for F1 and F2 immigrants (F1: an immigrant, F2: offspring of a mating outside the population) using individual-based assignment tests. Individual-based assignment tests are more precise for detecting current gene flow than traditional genetic distance measures (*i.e.*, FST GST, G'ST) because they classify the origins of each individual rather than rely on population-level comparisons of the frequencies and dissimilarities of different forms of a gene. As a result, the individual-based assignment tests used by Pilot *et al.* (2010) do not mix recent with historic gene flow as did those used by Morin *et al.*

(2010) (Pearse & Crandall 2004; Palsbøll *et al.* 2010). Pilot *et al.* (2010) reported that comparative assessments of kinship, parentage, and dispersal reveal high levels of kinship and male-mediated gene flow within local populations, including among ecotypes that are highly divergent within the mtDNA phylogeny.[3] Dispersal from birth populations was rare, suggesting that gene flow occurs without dispersal as a result of reproduction during temporary interactions. Pilot *et al.* (2010) also show that the mating system of killer whales is highly promiscuous but still selective in terms of killer whales seeking mating opportunities outside of their natal pod or group. These interactions also appear to be on the increase. While assessments based on the genetic makeup of a cell are not always conclusive, multiple analyses at the individual and population level, which show high rates of mating between pods and between populations within the resident ecotype, suggest increased contact among pods possibly due to the range expansion of resident populations.

In contrast to the Service's insistence that its speculative unnamed North Pacific resident subspecies (and Southern Resident DPS) are genetically isolated, Pilot *et al.* (2010) show that they are not. Pilot *et al.* (2010) provide explanations of how gene flow among ecotypes and population can occur

[3] Phylogeny is the evolution of a species or group, especially in reference to lines of descent and relationships among broad groups of organisms.

without dispersal, based on genetic and observational data, and that are grounded in an understanding of evolutionary biology.

The significance of the findings of Pilot *et al.* (2010) is threefold.

First, they demonstrate with data that social interactions among killer whale pods do occur in the wild and they occur more frequently than has been reported (*i.e.*, many interactions are simply "missed" by human observers who cannot watch a vast area of ocean to take note of killer whale pod interactions, 24 hours a day, 7 days a week, year round). The genetic data provide evidence that these inter-pod social interactions occur, and that they can and do result in mating among individuals in different pods, including mating among individuals of different ecotypes (*i.e.*, between resident and transient killer whales). This explains why killer whales can remain in socially cohesive pods without becoming highly inbred and suffering the deleterious consequences of inbreeding. This fact is also significant to the Service's purported but unrecognized subspecies (discussed below).

Second, Pilot *et al.* (2010) explain why inbreeding is not a problem even though killer whales rarely disperse outside of natal pods.

> The low rate of dispersal from a natal population in the killer whale may be explained by foraging specialization: given significant investment in learning strategies associated with the exploitation of local resources, individuals may risk a reduction in fitness when they move to a population that forages on a different type of prey using a different hunting strategy.

Pilot *et al.* (2010) at 23. Further, if mating typically occurs without permanent dispersal of individuals from their natal pods, and foraging behavior is learned during interactions between a parent and offspring (Hoelzel 1991; Guinet & Bouvier 1995, *cited in* Pilot *et al.* 2010), then there should be no "outcrossing" disadvantage to mating outside a given ecotype. In other words, foraging specialization found among different ecotypes is a learned behavior and there is a "cost" to individual killer whales if they disperse outside of their learned foraging specialization. There is also a potential "cost" to dispersing individuals in terms of kin selection: dispersing outside of one's natal group would result in an individual giving up the obvious benefits of sociality, including cooperative hunting and defense (Hamilton 1964).

As noted by Pilot *et al.* (2010):

> We detected only a few cases of possible dispersal of individuals between pods and between populations (using individual-based assignment tests), but many more cases of inter-pod and inter-population mating (using paternity tests). The assignment of maternal kinship was typically within a natal population and pod, while the assignment of a father was as often outside as within the population, and in most (83%) cases outside the natal pod. These results suggest male-mediated gene flow occurring without male dispersal.
>
> . . . .
>
> Eight putative F2 immigrants were detected among the sampled individuals [out of a sample of 213 individuals in the North Pacific and North Atlantic oceans], which may imply inter-population mating (consistent with the CERVUS results), and in three cases between-ecotype mating. One case implied mating between a transient male and an offshore female.

> Because of the sympatric/parapatric occurrence of all three ecotypes in the North Pacific, mating between ecotypes may take place without the need for mating individuals to leave their natal pods.

Pilot *et al.* (2010) at 27.

Third, Pilot *et al.* (2010) explain why mtDNA haplotypes (groups of genes that are inherited together by an organism from a single parent) can be highly divergent among ecotypes but not nuclear DNA markers. Nuclear DNA is composed of information inherited from two parents, one male, one female, rather than matrilineally (based on descent through the maternal line). Pilot *et al.* 2010 at 29 ("Mitochondrial and nuclear DNA variability indicate contrasting patterns with respect to the relationship between three North Pacific ecotypes of killer whales."). Mitochondrial DNA is maternally inherited, which means that it is inherited intact and only from one's mother, without recombination and without any contribution of the father's DNA. Consequently, population variation in this genetic marker is strongly affected by social organization. This often leads to the loss of mtDNA variation in populations that have a matrilineal social organization (all females in a group being maternally related, and rarely dispersing, as is the case with killer whales and African savannah elephants (Moss and Poole 1983; Moss 1988; Archie *et al.* 2006)). Pilot *et al.* (2010) clearly recognize this issue in killer whales:

> The contrasting patterns of mitochondrial and nuclear DNA variability between the ecotypes may result from the stochastic

> [non-deterministic] distribution of mtDNA haplotypes following a post-bottleneck expansion (Hoelzel *et al.*, 2002), and rare female-mediated gene flow. These inconsistent inferences based on markers with different modes of inheritance may be problematic for attempts to delimit subspecies of the killer whale. In such cases, using markers experiencing higher levels of gene flow is recommended. (Petit & Excoffier, 2009).

Pilot *et al.* (2010) at 29. Therefore, if only mtDNA is considered in an analysis, the loss of mtDNA variation in populations (also referred to as lineage sorting) can give an erroneous appearance of populations (and putative species) being genetically isolated because they are trying to maintain taxonomic differences (*i.e.*, Morin *et al.* 2010) while at the same time ecotypes and populations are not isolated for nuclear genetic variation. This is precisely the case with killer whales, a fact the Service did not acknowledge in its 2005 listing of the killer whale DPS, or in its 2011 status review of the population.

This problem with over-reliance on a single one-parent genetic marker (mtDNA) has long been known in taxonomy and conservation (Cronin 1993; Moritz 1994), and was noted recently by Petit and Excoffier (2009): "Clearly, the results presented here caution against the use of uniparentally inherited markers for species delimitation [*i.e.*, mtDNA] when they are inherited only from the least-dispersing sex." Petit and Excoffier (2009) at 391.

In killer whales, opportunities for mating outside of one's ecotype are constrained by the vast expanse of ocean that killer whale ecotypes occupy, rather than by an attempt of ecotypes to maintain taxonomic differences:

"[C]ontemporary associations of pods belonging to different ecotypes may be rare due to differential temporal and spatial habitat use [in the vast expanse of ocean], and this may limit between-ecotype mating (Hoelzel *et al.*, 2007)." Pilot *et al.* (2010) at 28. Thus, outbreeding occurs (particularly those in different ecotypes) but is limited by the frequency of interactions in the ocean, rather than by killer whales trying to maintain taxonomic or population isolation.

Hence, cultural differences among killer whales are likely a function of learned behaviors, not genetics. Being members of stable matrilineal societies, killer whales benefit from the knowledge and skills that are transferred from older to younger generations over time, such as the skills suited cooperatively to hunt a particular prey species. Such cultural differences occur throughout the range of the species; there is no evidence that they are the result of underlying genetic differences. Pods, clans, and local populations may exhibit these cultural differences not because they are isolated, but because such species-wide behavior is a function of the fact that killer whales are long-lived, highly intelligent mammals with an extensive range. These characteristics are conducive to an organism's ability to vary its behavior in response to environmental changes, which may lead to local cultural traits that have no known genetic basis.

The behavioral ecology of killer whales is driven by the environment in which they live; thus, their adaptations to ecotypes are learned rather than genetic. These behaviors are equivalent to those described by Sir Richard Dawkins for "memes," *i.e.*, learned behaviors that are passed among individuals by imitation rather than genetics (Dawkins 1976). Thus, the Service has erroneously attributed the patterns of genetic variation and behavior between ecotypes to genetic differences, when learned behaviors are responsible for these ecotypes.

Learned behaviors, such as greeting behaviors and dialects, are the result of social networks. These traits are fluid and evolve over time, like those of other cetaceans (Au & Lammers 2007; Green *et al.* 2011), because they are subject to the interaction of cultural drift (random changes in traits), imitation, homophily, and changing network interactions (Centola *et al.* 2007; Strigul 2009; Centola 2010). Such cultural traits are common to human and many animal societies, including other killer whale populations throughout their range. Local dialects—which the Service considers unique—are simply localized behaviors replicated throughout the range of all killer whales. The greeting calls in Southern Resident killer whales are like the vocalizations of humans and other whales—learned traits arising from social networks. Emphasizing the purportedly "distinct" vocalizations of Southern Residents obscures the fact that the Southern Residents share many traits with other killer

whales. Further, any alleged differences can change over time for the reasons described above. Pods, clans, and local populations of killer whales throughout the world exhibit unique vocalizations, interspersed with vocalizations that are universal in killer whales. The unique vocalizations are analogous to dialects or slang in human languages.

In sum, there is no competent genetic evidence to support the designation of the North Pacific resident whale population as a subspecies.

B. Morphological Data Do Not Support Subspecies Status for the North Pacific Resident Whale

The Service fails to distinguish the difference between variation that is primarily due to environmental influences on development, such as body size, and variation that has a genetic basis. The Service's use of morphological differences (differences in the form and structure of organisms) to differentiate ecotypes (and unnamed subspecies) is flawed for the following reasons: (a) these differences have an unknown genetic basis; (b) these differences do not reflect genetic differences (because they are influenced by environment rather than genetics); and (c) although these differences may have a genetic basis (color patterns), there is no evidence that they are uniquely adaptive to their ecotype. At bottom, the Service's purported morphological differences among whale ecotypes are subjective.

In the listing decision, references to morphological differences that distinguish ecotypes are based upon studies that are anecdotal, qualitative, or

pseudo-quantitative in nature (Baird & Stacey 1988; Baird 2000). There are no data to substantiate objectively actual distribution of these traits in the wild. There are no data to support the genetic basis for variation in these traits (*e.g.*, body size, which is primarily influenced by environment rather than genetics in most mammals). Further, there are no data to support the presumption that the morphological differences in question have any functional significance (*i.e.*, they confer a survival advantage to an ecotype). The Service's key morphological "evidence" to describe three ecotypes of killer whales in the 2005 listing rule is subjective, or involves incomplete qualitative comparisons, or both (Table 1).

Table 1. Morphological comparisons between killer whale ecotypes as presented in the 2005 killer whale listing decision (NMFS 2005). The dashes indicate that NMFS provided no description for that category.

	Resident	**Transient**	**Offshore**
Dorsal fin	*"is rounded at the tip and falcate (curved and tapering)"*	*"tends to be more erect (i.e., straighter at the tip) than those of resident and offshore whales"*	*"their fins appear to be more rounded at the tip with multiple nicks on the trailing edge"*
Saddle patch	*"variety of saddle patch pigmentations with five different patterns recognized (Baird and Stacey, 1988)"*	*"Saddle patch pigmentation of transient killer whales is restricted to three patterns (Baird and Stacey, 1988)"*	-
Body size	-	-	*"smaller overall size"*
Sexual dimorphism	-	-	*"less"*

These morphological "differences" are highly subjective, are not supported by data, and have substantial overlap among ecotypes, which is inimical to subspecies status.

1. Dorsal Fins and Coloration

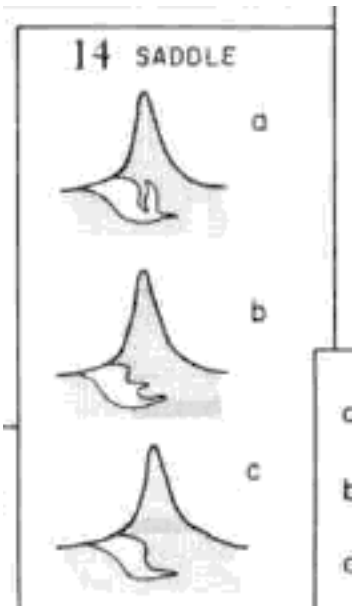
Diagnostic patterns like the nicks on the trailing edge of the dorsal fin are not found in all offshore killer whales. Although diagnostic patterns on dorsal fins have been found in "many" offshore killer whales (Dahlheim *et al.* 2008), such data cannot serve as endorsement for a trait used to substantiate discreteness. Further, dorsal fin shape categories are highly subjective, vary between the sexes, and are not quantified anywhere in the literature. For example, Dahlheim *et al.* (2008) simply presented three photographs of killer whale dorsal fins as typical of individuals from the three ecotypes; there are no measurements or quantitative analyses accompanying them. It is pure speculation that these are in fact distinctive patterns.

The shape of the dorsal fin is a trait for which the genetic basis is unknown. The nicks on the trailing edge of the dorsal fin are likely the result of strong environmental factors, particularly when their occurrence is not universal. For example, the nicks on the trailing edge of the dorsal fins could easily be produced by wear and tear in that environment, just as many "offshore" killer whales have been observed to have high levels of tooth wear. This is not a genetic difference. For either of these morphological traits there

is no known functional significance (*i.e.*, a genetically-based adaptation that confers a survival advantage in the environment for each ecotype).

Saddle patches are another morphological trait used to treat the North Pacific resident whale population as a separate subspecies. Yet again there is substantial overlap among ecotypes, and the categories of patterns have been described differently by different authors. Evans *et al.* (1984) described three patterns, while Baird and Stacey (1988) described five. As shown in the line drawings from each paper on the following page (Evans *et al.* 1984; Baird and Stacey 1988), there is no overlap in the patterns, yet the Service relied on this subjective classification in its listing decision even in the absence of supporting data such as field notes, photographs, or measurements.

Finally, the Service did not acknowledge another source of error in classifying saddle patch patterns: saddle patches are not always symmetrical. Therefore, different classifications can be obtained depending upon which side of the killer whale is photographed, leading to erroneous assignments. Killer whale color patterns (of which saddle patch is just one) have varying degrees of intra and inter-regional variation (Evans *et al.* 1984). Although these may provide some level of kin recognition within pods, the patterns described by the Service have no known functional significance among presumed ecotypes.



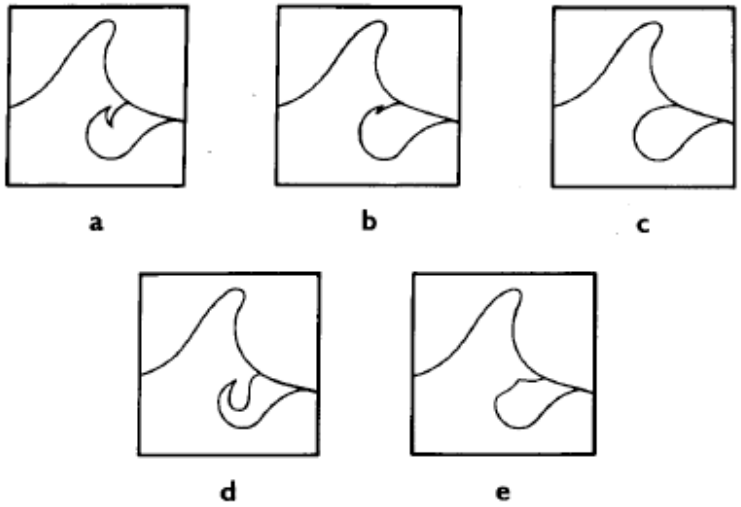


FIG. 1. Saddle patch types. Drawings by K. Uldall-Ekman (modified, with permission, from Sugarman 1984, ©1984 The Whale Museum, Friday Harbor, WA). (*a*) Vertical notch (residents only); (*b*) horizontal notch (residents only); (*c*) smooth (residents and transients); (*d*) hook (residents only); (*e*) bump (residents and transients).

2. Body Size

The Service cites body size and degree of sexual dimorphism as evidence of morphological differences among ecotypes, with offshore killer whales having smaller body size and less sexual dimorphism than other ecotypes. There are, however, no measurement data, photographs, or field notes in the literature cited by the Service to support this assertion. The research that the Service relies on provides no data, measurement forms, field notes, or photographs to substantiate the relative differences as to how much smaller offshore killer whales are, or how much less sexual dimorphism exists between resident and transient killer whales.

The supposed morphological differences in body size among ecotypes are not quantified, nor is it known whether environmental factors (*e.g.*, food intake) or genetic differences are the primary cause. Nutrition plays a key role in contributing to individual differences in body size in most species of mammals. Body size will also affect the degree of sexual dimorphism (differences between the sexes in behavior and ornamentation) due to allometry (the study of the relationship of body size to shape). As body size for a population increases, so will the degree of sexual dimorphism, with males becoming disproportionately larger.

3. Behavioral Variation, Including Social Organization, Food Preference, and Vocalizations

The Service fails to recognize the evolutionarily more parsimonious explanation that the behavioral traits it uses to distinguish among supposed subspecies or ecotypes are learned rather than the result of genetic differences. Specifically with respect to learned behaviors and vocalizations, including those that are culturally passed on, the Service impermissibly speculates on their importance in maintaining genetic separation among ecotypes and supposed species and subspecies.

a. Similarities in Vocalization

Cross-cultural studies, which are used to find evidence of biologically innate facial and vocal expressions of emotion in mammals, have identified a vocalisation (the V4 or "excitement" call) associated with high arousal behaviors in a population of killer whales in Canada. In a recent paper, Rehn *et al.* (2010) reported that a killer whale vocalization associated with high arousal behaviors is common to all killer whales and does not vary regardless of pod, ecotype, or location in the Pacific. Thus, this innate behavior is consistent with the killer whale's current classification as a single species:

> In this study, we compared recordings from three different socially and reproductively isolated [the authors were apparently unaware of Pilot, *et al.*, 2010, whose data refuted the hypothesis of reproductive isolation] ecotypes of killer whales, including five vocal clans of one ecotype, each clan having discrete culturally transmitted vocal traditions. The V4 call was found

> in recordings of each ecotype and each vocal clan. Nine independent observers reproduced our classification of the V4 call from each population with high inter-observer agreement. . . . Our results suggest the V4 call may be universal in Pacific killer whale populations and that transmission of this call is independent of cultural tradition or ecotype. We argue that such universality is more consistent with an innate vocalisation than one acquired through social learning and may be linked to its apparent function of motivational expression.

Rehn *et al.* (2010) at 1.

The finding is significant because whether or not this vocalization is innate (has a genetic basis), it has a universal function involving social interactions, and spans presumed species, ecotypes, and pods. While other vocalizations may vary among groups due to cultural learning and drift or environment (*i.e.*, Foote & Nystuen 2008), this socially significant vocalization is consistent with the traditional view that killer whales comprise a single species.

b. Prey Specialization

Cooperative hunting provides a selective advantage to both individual killer whales (via natural selection at the level of the individual (Williams 1966)) and to closely related kin groups that typically make up pods (via kin selection or inclusive fitness (Hamilton 1964)). Thus, cooperative hunting provides a selective advantage to all killer whales, and is the underlying basis for the evolution of their sociality.

Although local groups of killer whales (*e.g.*, "resident" killer whale pods) specialize on a particular type of prey that is abundant in their environment, this does not mean that this specialized prey-seeking behavior has a genetic basis. Rather, a far more parsimonious explanation, and one supported by abundant theoretical models and data from other species, is that prey specialization and cooperative hunting are learned behaviors that allow efficient exploitation of a particular food resource (Packer & Ruttan 1988; Creel & Creel 1995; Kitchen & Packer 1999; Gazda *et al.* 2005). Cooperative hunting and some degree of prey specialization are behaviors common across the range of killer whales, and are also found in other mammalian predators (*e.g.*, dolphins, African lions, wild dogs, chimpanzees), all of which use this strategy efficiently to exploit a food resource. Thus, prey specialization in killer whale populations is a consequence of learning and is passed on through cultural transmission. It is not a consequence of genetic isolation or genetic adaptation.

c. The Distribution of Killer Whale Ecotypes

Distribution of killer whales is strongly affected by the prey they specialize on (Felleman *et al.* 1998; Hanson *et al.* 2010). For example, Hanson *et al.* (2010) recently reported that the Southern Residents ate primarily chinook salmon from the Fraser River, a stock migration route which coincides with the killer whale's core summer habitat. Thus, the predictability of a prey

species gives rise to prey specialization behavior in predators. For prey specialization to be maximally efficient, the predator must tailor its range to overlap the distribution of its prey. These are environmental factors influencing behavior, not genetic factors.

d. The Interaction of Killer Whale Ecotypes and Local Killer Whale Populations

The interaction of killer whale ecotypes (including the Service's purported subspecies), as well as local killer whale populations (including the Southern Resident DPS) is primarily influenced by the distribution of their prey and is not due to avoidance for genetic factors (*i.e.*, to remain inbred which would be detrimental to their long-term fitness and survival). For example, the primary reason that Northern and Southern Resident killer whales rarely overlap in inland waters is because they reside in two different tidal regions: the Northern Residents in a northern-flowing tidal basin (Johnstone Strait) while the Southern Residents occupy the southern-flowing tidal basins (Georgia and Juan de Fuca Straits, as well as the connecting Puget Sound). These are the pathways along which chinook salmon migrate and to which the killer whales must adhere for efficient foraging and to avoid competition. In the open ocean, opportunities for observing interactions between these two groups are far less frequent, although genetic data show that mating does occur among ecotypes (Pilot *et al.* 2010).

e. Specialization of Killer Whale Ecotypes on a Particular Type of Prey

The Service has not acknowledged that researchers in Russia, who collected stomach contents from 785 killer whales (inshore and offshore), reported that the offshore killer whales contained 89.7% marine mammals, 7.1% squid, and 3.2% fishes, while the inshore killer whales contained 98.5% fishes, 1.1% squid, and 0.4% marine mammals (Berzin & Vladimirov 1983, *cited in* Felleman *et al.* 1988). Recently, Hanson *et al.* (2010) used DNA tests of prey remains and killer whale feces to determine which species were consumed and the stock from which they came. Those authors reported:

> Chinook salmon was the most prevalent salmonid species in all sample types [a total of 158 of the tissue and scale samples, including all 6 regurgitation samples, and 69 of the fecal samples could be used for species identification], and in each month in both sample areas. Of the non-salmonids, all of which were collected in the SJI area, the prey item was an unidentified flatfish, and the fecal samples included lingcod *Ophiodon elongatus*, halibut *Hippoglossus stenolepis*, rockfish *Sebastes* spp. and Dover sole *Microstomus pacificus*. The proportion of Chinook salmon in the samples was highest in midsummer (>90%) and lower in May (50%) in the SJI (no collections were made in JDFS in May and only 1 in September). Steelhead *Oncorhynchus mykiss* was nearly as common as Chinook salmon in May in the SJI, although the sample size was small. Three steelhead were also recovered in June and in September. One sockeye salmon *Oncorhynchus nerka* was taken in July and 3 in August. Two chum salmon *Oncorhynchus keta* were recovered in June and 1 in July. In the SJI, 1 coho salmon *Oncorhynchus kisutch* was recovered in June, 2 were recovered in August and 4 were recovered in September. Only 1 coho salmon was recovered in the JDFS (in September).

Hanson *et al.* (2010) at 73. Although Chinook salmon were reported as the preferred prey species with the remaining samples identified as "other fish species," the authors acknowledged the limitations of their research due to an absence of sampling in the ocean. The authors state: "However, it is also important to note that for both of these months some or all of the southern resident pods may spend significant time outside the inland waters and as such may be foraging on different prey than reported here." Hanson *et al.* (2010) at 76.

Sampling methods used by Hanson *et al.* (2010), cited in the Service's 2011 status review, are biased towards fish because they are not capable of detecting marine mammals in killer whale feces and prey remains

Although Hanson *et al.* (2010) provide a valuable contribution to the study of fish stock identification consumed by killer whales, their methods could not detect marine mammals' samples. That is because Hanson *et al.* (2010) used salmonoid-specific DNA primers to amplify DNA from samples for subsequent analysis. They determined species by PCR amplification and sequencing the COIII/ND3 region of the mitochondrial genome, using the primers and PCR reaction conditions described in Purcell *et al.* (2004). That paper used primers COIII/ ND3 Forward: tta caa tcg ctg acg gcg and Reverse: gaa aga gat agt ggc tag tac tg to produce a 368 base pair fragment (Domanico & Phillips 1995, *cited in* Purcell *et al.* 2003). However, Petitioners have been

unable to find a match between these primers and the complete harbor seal mitochondrial DNA sequence (NCBI Reference Sequence: NC_001325.1) using the Primer-Blast utility at the National Center for Biotechnology Information. Petitioners used the same PCR amplification conditions as Purcell *et al.* (2004), as well as relaxed conditions (*e.g.*, annealing temperature of 50°C) but were unable to find a match between these primers and the target COIII/ND3 sequence. In other words, those primers and the reaction conditions used by Hanson *et al.* (2010) are highly likely to fail to produce the harbor seal sequence even if it is present in the sample. They are also very unlikely to detect other mammals, birds, or squid.

An unbiased method would have used DNA amplification primers and reaction conditions capable of detecting types of potential prey other than just fish (*i.e.*, marine mammals, birds, and squid). Such a method would use a pair of conserved DNA amplification primers for animals (*i.e.*, 16sRNA), or combinations of primers that would amplify fish, marine mammals, birds, and squid, followed by application of culture independent methods (*e.g.*, PCR, cloning of PCR products, and sequencing of the clone library). That would provide DNA sequences from virtually all animal DNAs in a sample, even if they are at low frequency. This method is widely used in microbial genomics and forensics, and is needed to detect total diversity of the prey items in the sample (Hugenholtz *et al.* 1998).

f. Group Size

The Service states that ecotypes have different average group sizes that serve to distinguish them. In making the statement that these pod sizes distinguish ecotypes and the Southern Resident population, the Service is speculating, with no supporting data, that there are evolutionary adaptations underlying the pod size. Furthermore, the Service fails to acknowledge that group size in killer whales, like that of other mammals, is driven by environmental circumstances that influence feeding efficiency and does not reflect genetic differences (Packer & Ruttan 1988; Couzin & Krause 2003; Pilot *et al.* 2010).

CONCLUSION

The ESA is clear that the Service's listing power is limited to species, subspecies, and DPSs of species. The Service's listing of the Southern Resident killer whale DPS, as a DPS of subspecies, is therefore illegal. Moreover, the listing is illegal because it is based on an entirely unproved and unjustified subspecies classification for an unnamed population of Northern Pacific whales.

For these reasons, CESAR, Empresas del Bosque, and Coburn Ranch petition the Secretary and the Service to delist the Southern Resident killer whale DPS.

DATED: August 1, 2012.

Respectfully submitted,

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By _____
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