

Species of Concern within the Puget Sound Georgia Basin Marine Ecosystem: changes from 2002 to 2004

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Abstract

Species of concern are native species, sub-species or ecologically significant units that warrant special attention to ensure their conservation. Within the Puget Sound Georgia Basin marine ecosystem, the Province of British Columbia, the State of Washington, the Canadian Federal Government, and the United States Federal Government each assess which species require special initiatives to ensure protection and survival of the population. Since 2002 when we first compiled an ecosystem-based list of species of concern for the Puget Sound Georgia Basin marine ecosystem, two ecologically significant units of sockeye salmon (*Oncorhynchus nerka*; Cultus Lake and Sakinaw Lake) have been listed as endangered by the Canadian Federal Government and status changes were made on an additional 14 species by one or more jurisdiction. As of September 1, 2004, 63 species of concern were listed by one or more jurisdiction in the Puget Sound Georgia Basin marine ecosystem. Of the 26 species listed as threatened or endangered, over-harvest, habitat loss, and contaminants were the most frequent causes cited for species declines. The identification of 63 species of concern in these marine waters is suggestive of ecosystem decay and reflects poorly on the single-species management approach, at least in the case of the species listed.

Introduction

Species of concern are native species, sub-species or ecologically significant units that warrant special attention to ensure their conservation. Within the Puget Sound Georgia Basin marine ecosystem, the Province of British Columbia, the State of Washington, the Canadian Federal Government, and the United States Federal Government all have different processes for assessing which species require special initiatives to ensure protection and survival of the population. The four state/provincial and federal entities have different mandates and processes for assessing which species require special initiatives to ensure protection and survival of the population. Within ecosystems spanning international boundaries and multiple jurisdictions, an ecosystem-based list of species of concern serves many functions. It acts as a crude indicator of ecosystem health, permits cross checking of species of concern between jurisdictions, suggests where more research is needed, and highlights where transboundary approaches could benefit species recovery (Gaydos and Gilardi, 2003). This work updates the list of species of concern for the Puget Sound Georgia Basin marine ecosystem developed in 2002, which highlighted 60 species of concern (Gaydos and Gilardi, 2003).

Methods

Using lists produced by each of the four jurisdictions, we identified species that utilize marine habitat within Puget Sound, the Northwest Straits, and Georgia Basin and compared listings between jurisdictions. Causes for declines were taken from status reviews, species summaries, stock assessments or other documents written for species listed as threatened or endangered. Data presented is current as of September 1, 2004. The processes for listing within each jurisdiction are as follows:

British Columbia

In the Province of British Columbia, species are assigned a risk of extinction. Species are placed on Red, Blue or Yellow lists. Red-listed species are those that have been legally designated as Endangered or Threatened under the provincial Wildlife Act, are extirpated, or are candidates for such designation. Blue-listed species are those not immediately threatened, but are of concern because of characteristics that make them particularly sensitive to human activities or natural events. Yellow-listed species are all species not included on the Red or Blue lists. For the purpose of this paper, Red and Blue-listed species are considered species of concern. When British Columbia ranks species, each species is assigned a global rank (applies across its range), a national rank (for each nation within its range, such as Canada), and a sub-national rank (for each province). In British Columbia, the Conservation Data Centre within the Ministry of Sustainable Resource Management assigns the provincial rank. These provincial

ranks are updated annually. Within the marine ecosystem, British Columbia currently only assesses mammals, birds, reptiles and freshwater fishes that also utilize marine habitat. Important to this study, conspicuously absent are marine fishes and marine invertebrates. All credible sources of information concerning species distribution, abundance, trends, and threats are considered in provincially ranking species in British Columbia.

Washington State

In Washington State species of concern are listed by the Washington Fish and Wildlife Commission (Commission) under the provisions of Washington Administrative Code (WAC) 232-12-297 (Endangered, Threatened, and Sensitive Wildlife Species Classification). Listing occurs in much the same stepwise procedure as occurs at the U.S. federal level. A species could be listed as either endangered (seriously threatened with extinction throughout all or a significant portion of its range within the state), threatened (likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state) or sensitive (vulnerable or declining and likely to become endangered or threatened in a significant portion of its range within the state). Listing can be initiated in one of three ways: (1) the Washington Department of Fish and Wildlife (WDFW) initiates a species status review; (2) the WDFW receives a petition from a citizen (at which point the agency has 60 days to either initiate the classification process or deny the petition, based on the best available scientific data); or (3) the Commission requests the WDFW to review a species of concern. Listings are based solely on the biological status of the species in the wild, as indicated by the preponderance of scientific data available. When the listing process is initiated, the WDFW publishes a public notice in the Washington State Register and calls for scientific information relevant to the species' status. The WDFW prepares a draft species status report, which reviews relevant information on the status of the species in Washington, addresses factors affecting its status, and makes a preliminary listing recommendation. The public and the scientific community is given 90 days to review and comment on the draft status report and listing recommendation, and the WDFW can hold one or more public meetings during the public review period. At the close of the public comment period, the WDFW addresses comments, completes the final status report and listing recommendation and submits them to the Commission. The final species status report, agency classification recommendation, and State Environmental Policy Act (SEPA) documents are made available to the public at least 30 days prior to the Commission meeting. Once a species is listed, the WDFW writes and implements a recovery plan for threatened or endangered species, or a management plan for sensitive species. A review of the species' status is conducted by the WDFW at least once every five years. The WDFW maintains a list of Candidate species by Department Policy, which are those species that will be reviewed for possible listing as endangered, threatened, or sensitive.

Canada

In Canada, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) creates a federal listing of species at risk using an international ranking system adapted from the World Conservation Union in Switzerland. COSEWIC is composed of government and non-government members, members from academic institutions, and one member with expertise in Aboriginal traditional knowledge. Species designations are made using formal status report review process. Experts are commissioned to write status reports on the biology, population status, range, and possible threats facing the species or subspecies in question using the best available scientific, community, and Aboriginal traditional knowledge. COSEWIC meets at least once annually to consider new and updated status reports and to make status determinations. If deemed necessary and appropriate, emergency listing can be made ahead of COSEWIC's regular general meeting and decisions made are later ratified based upon a full report. As listed by COSEWIC, risk categories for species include extinct (a species that no longer exists), extirpated (no longer exists in the wild in Canada, but exists elsewhere), endangered (facing imminent extinction or extirpation), threatened (likely to become endangered if limiting factors are not reversed), special concern (characteristics make species particularly sensitive to human activities or natural events), not at risk, or data deficient (insufficient information to support status designation). Species that are suspected of being at some risk of extinction or extirpation, but have not yet been reviewed by COSEWIC are placed on a Candidate List and as time and resources permit, COSEWIC commission's status reports for these species so that an assessment can be undertaken. Currently, species listed by COSEWIC as "endangered," "threatened," or "special concern" do not receive legal recognition from the federal government. Under the new federal Species at Risk Act, COSEWIC acts as an advisory body to the federal government, who ultimately is responsible for turning the list into law.

United States

In the United States, the U.S. Fish and Wildlife Service (USFWS, Department of the Interior) and the National Oceanic and Atmospheric Administration (NOAA-Fisheries, Department of Commerce) (hereinafter referred to as "the Agencies") share responsibility for identifying species of concern under the provisions of the Federal

Endangered Species Act (ESA), enacted in 1973. A species is listed either as endangered (a species that is in danger of extinction throughout all or a significant portion of its range) or threatened (one that is likely to become endangered in the foreseeable future) when it is determined to be negatively impacted by any or all of the following factors: 1) current or imminent destruction or degradation of its habitat or range; 2) over-extraction for any purpose or by any means; 3) population-level impacts of disease or predation; 4) existing regulatory mechanisms that are inadequate to protect the species; or 5) other natural or anthropogenic factors significantly impeding the species' survival. The process for listing as species can be initiated by the Agencies or by a petition from the public. The Agencies initiate the process by publishing a "notice of review" that identifies a "candidate for listing" any species in the United States that it believes meets the definition of threatened or endangered, or for which its status in the wild warrants review and consideration under the ESA. If the Agencies receive a petition for listing a species from the public they have 90-days to review the petition and determine whether or not there is substantial information indicating that the listing may be warranted. At this point, the species is called a "Candidate for Listing", and the Agencies then have one year to determine whether or not to propose listing for the species. During this review period, the Agencies seek biological information to help complete the status review. If the Agencies decide that a species warrants listing under the ESA, a proposed rule is published in the Federal Register for a 60-day public comment period. Information received is analyzed and considered, and within one year of a listing proposal, one of three possible actions is taken: 1) a species is listed as threatened or endangered because the best available scientific data supports the listing; 2) the proposal is withdrawn because the best available scientific data does not support the listing; or 3) the proposal review period is extended for an additional 6 months if there is substantial disagreement within the scientific community concerning the listing. Once a species is listed under the ESA, all protective measures authorized under the Act are applicable to the species, e.g. restrictions on take, transport and sale; authority to draft and implement recovery plans, and/or authority to designate critical habitat. The status of a listed species is reviewed at least every five years to determine if federal protection is still warranted.

Results

We identified 63 species in the Puget Sound Georgia Basin marine ecosystem that were listed by one or more jurisdiction as species of concern (Table 1). These included three invertebrates (Table 2), 27 fishes (Table 3), one reptile (Table 4), 23 birds (Table 5), and 9 mammals (Table 6). Twenty-six species were listed as threatened or endangered by one or more jurisdiction (Table 7). Of the 26 species listed as threatened or endangered by one or more jurisdiction, over-harvest, habitat loss, and contaminants were the most frequent causes listed in status reviews for species declines. When compared to the 2002 list (Gaydos and Gilardi, 2003), two species were removed from the list, five species, sub-species or ecologically significant units were added and status changes were made for 14 species listed by one or more jurisdiction.

Species removed from the Puget Sound Georgia Basin marine ecosystem list since 2002:

- Harlequin duck (*Histrionicus Histrionicus*): The U.S. Federal Government removed this bird from its list of Candidate species in 1996. Anachronous information prompted the inaccurate listing of the Harlequin duck in the 2002 list (Gaydos and Gilardi, 2002).
- Golden Eagle (*Aquila chrysaetos*): A review of this raptor's life history revealed that although the golden eagle is present within our focus area, it does not sufficiently utilize the marine ecosystem to warrant consideration as a marine species.

Species added to the Puget Sound Georgia Basin marine ecosystem list between 2002 and 2004:

- Bull trout (*Salvelinus confluentus*): During the creation of the 2002 Puget Sound Georgia Basin marine ecosystem list, it was not known that bull trout utilized the nearshore marine ecosystem. A better understanding of this species, listed by British Columbia (blue-list), Washington state (candidate), the Canadian Federal government (candidate) and the US Federal Government (threatened), has revealed that it utilizes marine habitat in the Puget Sound Georgia Basin (US Fish and Wildlife Service, 2004).
- Killer whale, offshore population (*Orcinus orca*) – This sub-population of killer whales occasionally uses the inland waters of Washington state and British Columbia and was over-looked in the 2002 Puget Sound Georgia Basin marine ecosystem list when British Columbia had this population listed as a species of special concern and Washington state had them listed as candidates. In March 2004, Washington state determined that all sub-populations of killer whales in Washington state (including the offshore population) are at risk of extinction and recommended them listed as endangered in the state (Wiles, 2004). British Columbia still has them listed as a species of concern.

- Leatherback turtle (*Dermochelys coriacea*) – This species was previously listed by British Columbia (red-list), Washington state (endangered), the Canadian Federal government (endangered) and the US Federal Government (endangered), but was not included on the 2002 Puget Sound Georgia Basin marine ecosystem list because we were not aware that it utilized the Puget Sound Georgia Basin marine ecosystem. The National Oceanic and Atmospheric Administration (NOAA Fisheries) Northwest Regional Office considers the Puget Sound as habitat for this endangered sea turtle so it was added to the 2004 list (NMFS, 2004).
- Sockeye Salmon, Cultus Lake and Sakinaw Lake (*Oncorhynchus nerka*) – The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Cultus Lake and Sakinaw Lake populations of Sockeye Salmon endangered effective October of 2002 (COSEWIC, 2004). These designations were based on evidence supporting that these are genetically distinct populations that could not be replaced by transplanted stock.

As in 2002, each jurisdiction underestimated the total number of species of concern within the entire marine ecosystem (Gaydos and Gilardi, 2003). This was not surprising due to differences in species abundance and distribution within the ecosystem as well as differences in listing criteria by jurisdiction. This supports the need for an ecosystem-based list of species of concern for the Puget Sound Georgia Basin marine ecosystem. Of the 63 species listed by one or more jurisdiction, Washington State listed 73% of them, the Province of British Columbia listed 50%, the Canadian Federal Government identified 36%, and the U.S. Federal Government identified 31%.

Discussion

As previously recognized, there is merit to developing and updating an ecosystem-based list of species of concern that encompasses all jurisdictional listings (Gaydos and Gilardi, 2003). As an indicator of ecosystem health, the current list of 63 species of concern within the Puget Sound Georgia Basin marine ecosystem is suggestive of ecosystem decay (Bierregard et al., 2001). As suggested in table 7, the causes for declines in most species are complex and multi-factorial. Efforts need to be greatly expanded to reverse fish and wildlife population declines.

This list also permits cross checking of species of concern between jurisdictions. Currently, there are 12 birds that utilize the marine ecosystem that are red or blue listed by British Columbia and are not listed by the State of Washington (Table 5). Data on population trends in Washington state should be evaluated to see if status reviews are warranted for any of these species. This list also suggests where more research is needed. Within the Puget Sound Georgia Basin marine ecosystem the diversity of invertebrate species greatly outnumbers the number of vertebrate species, yet the representation of only 3 invertebrates out of 63 species of concern seems disproportionate. While it is possible that there are only 3 invertebrate species of concern, it would appear there is a need for all jurisdictions to evaluate the status of non-harvested marine invertebrate populations. Finally, this list highlights that where populations of species freely range between or are continuously distributed between the United States and Canada there is need for transboundary cooperation on species recovery.

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Table 1: Marine ecosystem species identified as species of concern by jurisdiction

	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.	TOTAL
INVERTEBRATES	0	3	2	2	3
FISHES	2	22	5	6	27
REPTILES	1	1	1	1	1
BIRDS	21	11	6	7	23
MAMMALS	8	9	9	4	9
TOTAL	32	46	23	20	63

Table 2: Invertebrate Species of Concern in the Georgia Basin / Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Newcomb's littorine snail (<i>Algamorda subrotundata</i>)		Candidate		Species of Concern
Olympia oyster (<i>Ostrea lurida</i>)		Candidate	Special Concern	
Pinto (Northern) Abalone (<i>Haliotis kamtschatkana</i>)		Candidate	Threatened	Not listed to Species of Concern

*Items in bold represent legal status changes made between September 2002 and September 2004.

Table 3: Fish Species of Concern in the Georgia Basin / Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Eulachon (<i>Thaleichthys pacificus</i>)	Blue List	Candidate		
Pacific cod, S. & C. Puget Sound (<i>Gadus macrocephalus</i>)		Candidate		
Pacific hake, C. Puget Sound (<i>Merluccius productus</i>)		Candidate		Candidate to Species of Concern
Pacific herring, Cherry Point (<i>Clupea pallasii</i>)		Candidate		Candidate
Pacific herring, Discovery Bay (<i>Clupea pallasii</i>)		Candidate		
Rockfish, Black (<i>Sebastes melanops</i>)		Candidate		
Rockfish, Bocaccio (<i>Sebastes paucispinis</i>)		Candidate	Not listed to Threatened	
Rockfish, Brown (<i>Sebastes auriculatus</i>)		Candidate		
Rockfish, Canary (<i>Sebastes pinniger</i>)		Candidate		
Rockfish, China (<i>Sebastes nebulosus</i>)		Candidate		
Rockfish, Copper (<i>Sebastes caurinus</i>)		Candidate		
Rockfish, Greenstriped (<i>Sebastes elongatus</i>)		Candidate		
Rockfish, Quillback (<i>Sebastes maliger</i>)		Candidate		
Rockfish, Redstripe (<i>Sebastes proriger</i>)		Candidate		
Rockfish, Tiger (<i>Sebastes nigrocinctus</i>)		Candidate		
Rockfish, Widow (<i>Sebastes entomelas</i>)		Candidate		
Rockfish, Yelloweye (<i>Sebastes ruberrimus</i>)		Candidate		
Rockfish, Yellowtail (<i>Sebastes flavidus</i>)		Candidate		
Salmon, Chinook (<i>Oncorhynchus tshawytscha</i>) (Puget Sound)		Candidate		Threatened
Salmon, Chum (<i>Oncorhynchus keta</i>) (summer-run Hood Canal)		Candidate		Threatened
Salmon, Coho (<i>Oncorhynchus kisutch</i>) Interior Frasier River			Endangered	

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Salmon, Coho (<i>Oncorhynchus kisutch</i>) Puget Sound and Strait of Georgia				Candidate to Species of Concern
Salmon, Sockeye (<i>Oncorhynchus nerka</i>) Sakinaw Lake			Not listed to Endangered	
Salmon, Sockeye (<i>Oncorhynchus nerka</i>) Cultus Lake			Not listed to Endangered	
Spinynose Sculpin (<i>Asemichthys taylori</i>)			Data Deficient	
Trout, Bull (<i>Salvelinus confluentus</i>)	Blue List	Candidate	Candidate	Threatened
Walleye Pollock, S. Puget Sound (<i>Theragra chalcogramma</i>)		Candidate		

***Items in bold represent legal status changes made between September 2002 and September 2004.**

Table 4: Reptile Species of Concern in the Georgia Basin / Puget Sound Marine Ecosystem

Species	British Columbia	Washington State	Canada	U.S.A.
Sea Turtle, Leatherback (<i>Dermochelys coriacea</i>)	Red List	Endangered	Endangered	Endangered

Table 5: Avian Species of Concern in the Georgia Basin / Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S. A.
American Golden Plover (<i>Pluvialis dominica</i>)	Blue List			
Ancient Murrelet (<i>Synthliboramphus antiquus</i>)	Blue List		Special Concern	
Bald Eagle (<i>Haliaeetus leucocephalus</i>)		Threatened		Threatened
Canada Goose, Aleutian (<i>Branta canadensis leucopareia</i>)	Not listed to Blue List	Threatened		Threatened to Species of Concern
Caspian Tern (<i>Sterna caspia</i>)	Blue List			
Cassin's Auklet (<i>Ptychoramphus aleuticus</i>)	Blue List	Candidate		Species of Concern
Common Loon (<i>Gavia immer</i>)		Sensitive		
Common Murre (<i>Uria aalge</i>)	Red List	Candidate		
Cormorant, Brandt's (<i>Phalacrocorax penicillatus</i>)	Red List	Candidate		
Cormorant, Double-crested (<i>Phalacrocorax auritus</i>)	Red List			
Cormorant, Pelagic (<i>Phalacrocorax pelagicus pelagicus</i>)	Red List			
Forster's Tern (<i>Sterna forsteri</i>)	Red List		Data Deficient	
Great Blue Heron, Pacific (<i>Ardea herodias famini</i>)	Blue List		Special Concern	
Long-billed Curlew (<i>Numenius americanus</i>)	Blue List			
Long-tailed duck / Oldsquaw (<i>Clangula hyemalis</i>)	Blue List		Special Concern	
Marbled Murrelet (<i>Brachyramphus marmoratus marmoratus</i>)	Red List	Threatened	Threatened	Threatened
Peregrine Falcon, American (<i>Falco peregrinus anatum</i>)	Red List	Sensitive	Threatened	Species of Concern
SPECIES	BRITISH	WASHINGTON	CANADA	U.S. A.

	COLUMBIA	STATE		
Peregrine Falcon, Peale's (<i>Falco peregrinus pealei</i>)	Blue List	Sensitive	Special Concern	Species of Concern
Phalarope, Northern / Red-necked (<i>Phalaropus lobatus</i>)	Blue List			
Short-billed Dowitcher (<i>Limnodromus griseus</i>)	Blue List			
Surf Scoter (<i>Melanitta perspicillata</i>)	Blue List			
Tufted Puffin (<i>Fratercula cirrhata</i>)	Blue List	Candidate		Species of Concern
Western Grebe (<i>Aechmophorus occidentalis</i>)	Red List	Candidate		

***Items in bold represent legal status changes made between September 2002 and September 2004.**

Table 6: Mammalian Species of Concern in the Georgia Basin / Puget Sound Marine Ecosystem

SPECIES	BRITISH COLUMBIA	WASHINGTON STATE	CANADA	U.S.A.
Gray Whale (<i>Eschrichtius robustus</i>)	Blue List	Sensitive	Not listed to Special Concern	
Harbor Porpoise (<i>Phocoena phocoena</i>)	Blue List	Candidate	Data deficient to Special Concern	
Humpback whale, N. Pacific (<i>Megaptera novaeangliae</i>)	Not listed to Blue List	Endangered	Threatened	Endangered
Killer Whales, Offshore (<i>Orcinus orca</i>)		Candidate to Endangered	Special Concern	
Killer Whales, S. Residents (<i>Orcinus orca</i>)	Red List	Candidate to Endangered	Endangered	Not listed to Candidate
Killer Whales, N. Residents (<i>Orcinus orca</i>)	Blue list to Red List	Candidate to Endangered	Threatened	
Killer Whales, Transients (<i>Orcinus orca</i>)	Red List	Candidate to Endangered	Threatened	
Sea Otter, northern (<i>Enhydra lutris</i>):	Red List	Endangered	Threatened	Not listed to Species of Concern
Steller Sea-lion (eastern population) (<i>Eumetopias jubatus</i>)	Red List	Threatened	Not listed to Special Concern	Threatened

*Items in bold represent legal status changes made between September 2002 and September 2004.

Table 7: Species listed as Threatened or Endangered by one or more jurisdiction; causes for decline were taken from status reviews, species summaries, stock assessments or other documents written for species listed as threatened or endangered.

SPECIES	LISTING	OVER-HARVEST	HABITAT LOSS	CONTAMINANTS	BY-CATCH	OTHER	UNKNOWN
Pinto (Northern) Abalone (<i>Haliotis kamtschatkana</i>)	Canada (Threatened)	X				Possible Allee effect and recruitment failure	
Rockfish, Bocaccio (<i>Sebastes paucispinis</i>)	Canada (Threatened)	X				Recruitment failure	
Salmon, Chinook (<i>Oncorhynchus tshawytscha</i>) (Puget Sound)	U.S.A. (Threatened)	X	X				
Salmon, Chum (<i>Oncorhynchus keta</i>) (summer-run Hood Canal)	U.S.A. (Threatened)	X	X				
Salmon, Coho (<i>Oncorhynchus kisutch</i>) Interior Frasier River	Canada (Endangered)	X	X				
Salmon, Sockeye (<i>Oncorhynchus nerka</i>) Sakinaw Lake	Canada (Endangered)	X	X				
Salmon, Sockeye (<i>Oncorhynchus nerka</i>) Cultus Lake	Canada (Endangered)	X	X			Early season return; Introduction of Eurasian watermilfoil (<i>Myriophyllum spicatum</i>)	

SPECIES	LISTING	OVER-HARVEST	HABITAT LOSS	CONTAMINANTS	BY-CATCH	OTHER	UNKNOWN
Trout, Bull (<i>Salvelinus confluentus</i>)	U.S.A. (Threatened)		X			Poor water quality; Competition, hybridization, and possibly predation by non-native species (brook trout, <i>Salvelinus fontinalis</i>)	
Sea Turtle, Leatherback (<i>Dermochelys coriacea</i>)	BC (Red List); WA (Endangered); Canada (Endangered); U.S.A. (Endangered)		X		X	Potentially ingestion of marine debris	
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	WA (Threatened); U.S.A. (Threatened)		X	X			
Canada Goose, Aleutian (<i>Branta canadensis leucopareia</i>)	WA (Threatened)					Predation by introduced species on nesting ground (arctic fox, <i>Alopex lagopus</i> and red fox, <i>Vulpes vulpes</i>)	X

SPECIES	LISTING	OVER-HARVEST	HABITAT LOSS	CONTAMINANTS	BY-CATCH	OTHER	UNKNOWN
Common Murre (<i>Uria aalge</i>)	BC (Red List)				X		X
Cormorant, Brandt's (<i>Phalacrocorax penicillatus</i>)	BC (Red List)			Debated	X	Mortality from naturally occurring biotoxins documented	X
Cormorant, Double-crested (<i>Phalacrocorax auritus</i>)	BC (Red List)			Debated	X	Adult, juvenile, or egg depredation; possibly disease	X
Cormorant, Pelagic (<i>Phalacrocorax pelagicus pelagicus</i>)	BC (Red List)			Debated	X		X
Forster's Tern (<i>Sterna forsteri</i>)	BC (Red List)					Nesting sensitivity	X
Marbled Murrelet (<i>Brachyramphus marmoratus marmoratus</i>)	BC (Red List); WA (Threatened); Canada (Threatened); U.S.A. (Threatened)		X		X		
Peregrine Falcon, American (<i>Falco peregrinus anatum</i>)	BC (Red List); Canada (Threatened)		X	X			
Western Grebe (<i>Aechmophorus occidentalis</i>)	BC (Red List)	X	X	X			X

SPECIES	LISTING	OVER-HARVEST	HABITAT LOSS	CONTAMINANTS	BY-CATCH	OTHER	UNKNOWN
Humpback Whale, N. (<i>Megaptera novaeangliae</i>)	WA (Endangered); Canada (Threatened); U.S.A. (Endangered)	X		X	X	Mortality from naturally occurring biotoxins documented	X
Killer Whale, Offshore (<i>Orcinus orca</i>)	WA (Endangered)			Possibly			X
Killer Whale, S. Resident (<i>Orcinus orca</i>)	BC (Red List); WA (Endangered); Canada (Endangered)			Possibly		Possibly decrease in prey availability; possibly increased vessel traffic	X
Killer Whale, N. Residents (<i>Orcinus orca</i>)	BC (Red List); Canada (Threatened)			Possibly		Decrease in prey availability	X
Killer Whale, Transients (<i>Orcinus orca</i>)	BC (Red List); Canada (Threatened)			Possibly			X
Sea Otter, northern (<i>Enhydra lutris</i>)	BC (Red List); WA (Endangered); Canada (Threatened)	X					
Steller Sea-lion (eastern population) (<i>Eumetopias jubatus</i>)	BC (Red List); WA (Threatened); U.S.A. (Threatened)	X		X		Competition with fisheries; Sensitive to human disturbance	X

SPECIES	LISTING	OVER-HARVEST	HABITAT LOSS	CONTAMINANTS	BY-CATCH	OTHER	UNKNOWN
Percentage of species for which cause of decline is listed		42%	42%	46%	27%	50%	50%