COMMENTS ON THE PROPOSED CRITICAL HABITAT DESIGNATION FOR SOUTHERN RESIDENT KILLER WHALES

Designation of Critical Habitat has two functions. First, it puts in place legal protections integral to the function of the Endangered Species Act. Species which have Critical Habitat designated have a far better chance of increasing in number than species for which Critical Habitat has never been designated (Taylor *et al.* 2005, Stockstad 2005). Second, it serves an educational purpose by highlighting locations and habitat characteristics that need to be protected. By prohibiting both takes and adverse habitat modification, the Endangered Species Act offers federal agencies alternative approaches for protection. Where NMFS has various approaches available, it would be helpful to maximize the educational value of the Critical Habitat designation process. That is, in addition to designating Critical Habitat, NMFS should take this opportunity to highlight unoccupied habitat, such as salmon spawning streams, where federal actions may adversely modify distant marine Critical Habitat. If noise is not included as a PCE in its own right, NMFS should highlight the role it could play in impeding safe passage and reducing prey availability, as well as the potential for noise to result in takes at great distances.

Hood Canal Should Be Included in Critical Habitat

Background

Hood Canal is a channel in the western portion of Puget Sound that provides approximately 100 sq. miles of marine habitat. It is less developed than the central portion of Puget Sound. Published reports indicate Southern Resident Killer Whales were first identified in Hood Canal in 1958 (Ford 1991) and were identified again in Hood Canal as recently as 1995 (Unger 1997). Nearshore waters of Hood Canal have already been designated Critical Habitat for endangered salmonids (Good *et al.* 2005).

"Critical habitat is defined in section 3 of the ESA (16 U.S.C. 1532(3)) as: (1) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the ESA, in which are found those physical or biological features (a) essential to the conservation of the species and (b) which may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by the species at the time it is listed upon a determination that such areas are essential for the conservation of the species. The ESA defines "conservation" as the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary" (NMFS 2006).

In these comments, I will provide information to be considered when determining whether Hood Canal was occupied at the time of listing, evidence that Hood Canal currently possesses the physical and biological features necessary to support Southern Resident Killer Whales, management considerations needed to protect these features, present evidence that historically Hood Canal was more important to Southern Resident

Killer Whales historically than it was at the time of listing, and that conservation of Hood Canal is essential to the conservation of Southern Resident Killer Whales.

Was Hood Canal "occupied at the time of listing?"

The definition of this term is unclear. Clearly, it is not limited to the instant of listing. Otherwise, critical habitat would be limited to the few points in space where individuals were present at that moment. It seems more likely this term was intended to at least include the home ranges of the individuals composing the population at the time of listing. While some species are sedentary and occupy their entire habitat on a daily basis (i.e., the day range is the same as the home range), many species are migratory and only occupy their entire range over the course of a year. Killer whales are perhaps best described as nomadic. That is, they have large home ranges, occupy some portions of their home range more than others, and may go years between visits to portions of their range. For example, Johnstone Strait is core habitat for Northern Resident Killer Whales that is regularly occupied. Although one pod was sighted there on 90 of 94 days in one year, that same pod went almost two years without being observed there at all, and other Northern Resident pods have gone four years or more without being sighted there. Occupancy patterns may shift based on the experiences of elder whales that set movement patterns, as well as contemporary habitat quality. Thus killer whale habitat should still be considered occupied even if whales have not been documented there for many years.

A minimal timeline for occupancy of Hood Canal by Southern Residents is attached (Bain unpublished ms). Additional effort is likely to uncover additional usage. Further, due to conservative assumptions to ensure data quality, observations of Southern Residents may have been excluded from that analysis. This report showed extensive use of Hood Canal (comparable to or greater than use of all other parts of the range with the exception of the core area along the West Side of San Juan Island) from at least the late 1920's through the 1970's. Use declined during the early 1980's, and became only intermittent by the late 1980's.

Another consideration is that listing can be a lengthy process. It seems reasonable to interpret the time of listing as including the process leading up to the final listing, as well as the instant of Federal Register publication.

When the Endangered Species Act passed in 1973, Southern Residents were in greater danger of extinction than when they were listed in 2006. Their numbers had been rapidly reduced about 30% to fewer than 75 individuals. Had NMFS known then what it knows now, Southern Residents would have been listed then. At that time, Southern Residents occupied Hood Canal on a regular basis.

Subsequently, Southern Resident numbers remained low (<100), suggesting they remained in danger of extinction. The apparent imminence of extinction varied as the population increased or decreased for years at a time.

Although Cope (Scammon 1869 and 1874) proposed a taxonomy in the 1860's and 1870's that would have allowed recognition of Southern Residents as a listable population, more recent data were required to justify the listing to NMFS.

Bigg (1979) first proposed the currently recognized distinctions among Northern Residents, Southern Residents, and Transients. At the time, he was aware of a fourth population in the region that later became known as Offshores. Southern Residents were still using Hood Canal at this time.

The possibility that multiple taxa existed within *Orcinus* received further support with the description of a dwarf form in the Antarctic (*O. glacialis* of Mikhalev et al. 1982 and *O. nanus* of Berzin and Vladimirov 1983).

At around the same time, Dahlheim and Awbrey (1982) and Ford and Fisher (1983) added acoustic behavior to the characteristics that made Southern Residents distinct from other killer whales. Duffield and Cornell (1979) had already recognized genetic differences between populations.

In 1990, a collection of papers were published by the IWC describing differences between residents and transients (Bigg et al.1990, Olesiuk et al. 1990, Morton 1990). Southern Residents still used Hood Canal at that time, although apparently with declining regularity.

The last confirmed use of Hood Canal by Southern Residents occurred in December of 1995. Less than four years later the formal listing process began. Bain and Balcomb (1999) were asked to address the Status Review Group to present to NMFS data on the decline of Southern Residents that ultimately resulted in a 20% reduction in population size. In 2001, the Center for Biological Diversity and others petitioned NMFS to list Southern Residents under the Endangered Species Act. In 2003, NMFS rejected the petition (although it listed the stock as depleted under the MMPA), but later in 2003 a federal judge found the decision making process was flawed. In 2004, after further review of the previously available data, and reviewing additional genetic data acquired in the intervening years, NMFS proposed to list Southern Residents as threatened. Following consideration of public comment, in 2005 a final rule was issued listing Southern Residents as endangered effective in 2006. Due to the length of the review process, ten years passed between the last confirmed sighting of Southern Residents in Hood Canal and the issuance of the final rule. Nonetheless, most of the individuals in J Pod today were in Hood Canal in 1995, and hence Hood Canal is part of their home range. Further, a set of sightings of about 14 individuals (extraordinarily large for a school of transients, but still within the range of possibility) was reported in September, 2005, but it is uncertain whether these sightings would have been of residents or transients.

Was Hood Canal part of the historical distribution of Southern Residents?

Bain (see attached unpublished ms.) found Hood Canal was used by Southern Residents on a regular basis from at least the 1920's until the early 1980's, so in addition to being part of the current home range of most members of J Pod, it was used more extensively historically.

Does Hood Canal have the physical or biological features essential to conservation?

Hood Canal retains the physical features needed to support Southern Resident Killer Whales, as evidenced by extensive use of the canal by Transient Killer Whales in recent years. These two populations have similar physical needs, but differ in their biological needs.

It is likely that Hood Canal lost the biological features needed to support more than occasional occupancy by Southern Residents by the mid-1980's. Wild early run chinook salmon were extinct, although hatchery and late run fish remained extant. Summer-run chum population size ranged from about 10,000-75,000 in the late 1970's when there still was regular usage of Hood Canal by Southern Residents. By 1993, however, run size had dropped below 1,000. Following restoration efforts, the run size had increased 100 fold to 87,000 in 2005 (T. Johnson, WDFW, pers. comm..), which is above the level that supported regular occupancy. This illustrates success in restoring Hood Canal habitat, and its potential to once again support regular occupancy by Southern Resident Killer whales at the time of listing.

The record of usage of Hood Canal confirms it provides: (1) space for individual and population growth, and for normal behavior; (2) food, water, air, light, minerals, or other nutritional or physiological requirements; (3) cover or shelter; (4) sites for rearing of offspring; (5) habitat that is protected from disturbance and is representative of the historic geographical and ecological distributions of the species.

Special management considerations are similar to those in other portions of the Southern Resident Killer Whale range. In addition to ongoing activities, future actions that may adversely modify habitat include fish farms, energy farms, increases in shipping traffic, construction of bridges, and major shoreline development projects.

Federal involvement is required due to the need to co-manage killer whales with tribal governments, the Canadian government and state governments. The MMPA pre-empts states from directly managing marine mammals. Further, Southern Resident Killer Whales occupy state waters used for interstate and international commerce, federal waters, and waters used for national security purposes.

Hood Canal is essential to the conservation of Southern Resident Killer Whales

In August, 2005, NMFS held a meeting to discuss what a recovered population might look like. The historical population size was reviewed to determine whether the estimate in the 2003 depleted listing decision was realistic. Several points suggested historical population sizes were higher. Further, population viability analysis indicated that maximum population size was a key component in the long-term survival of the population (Krahn *et al*. 2004).

Resident killer whales are divided into two groups. Southern Residents appear to be a single population of 89 individuals which is genetically isolated from other residents. The Northern Residents consist of roughly 2,000 individuals which are divided into a series of matrilocal populations, with limited genetic interchange between them (Carrera *et al*. 2004). The genetic diversity within the two groups is similar, indicating that until recently, Southern Residents probably had similar numbers to Northern Residents. A population chronically less than 200 individuals would not be able to maintain the level of genetic variation observed in Southern Residents. Historical estimates of prey abundance are roughly 10-20 times higher than current levels. If the Southern Resident population size was proportional to available prey, that would fit the genetic data. Finally, all other known populations consist of more than one acoustic clan, while Southern Residents consist of a single clan. This suggests that historically, there were additional clans, which are now extinct.

The carrying capacity was found to be a very important factor in long-term survival of the population in viability analyses conducted by the Biological Review Team (Krahn *et al.* 2004). The BRT considered a variety of scenarios, and survival of the population for 300 years was up to 8 times more likely if the carrying capacity was 400 rather than 100 in some of these scenarios. Qualitatively, this can be understood as the population remaining near its carrying capacity until a catastrophe occurs. Normal stochastic fluctuation may then drive the reduced population to extinction. A larger pre-catastrophe population would mean a larger post-catastrophe population, and the larger population would be less likely to be driven to extinction by normal events.

Finally, an important factor in long-term survival is that the population should be sub-divided into geographically distant subunits (IUCN 2001). For example, at its current population size, all Southern Residents are in the same place at the same time many days each year. Thus a single event could devastate the entire population. For example, during a 1970 collection for public display, every Southern Resident was probably captured (Hoyt 1990). If all rather than selected individuals had been taken into captivity, the population would have become extinct. An oil spill has the potential to devastate the entire population (see Loughlin 1994).

These considerations identify immediate population growth as essential to the recovery of the species. Immediate growth will help maintain genetic diversity in a population that has been in a severe bottleneck for at least two generations. Second, it is important for

the population to reach a size where not all individuals are in the same place at the same time before a localized catastrophe occurs.

Expanded use of Hood Canal is essential to achieving this growth. Due to its proximity to the core area in the San Juan Islands, prey resources there could be utilized with minimal travel costs. Hood Canal could provide a safe refuge in the event of an oil spill farther north in the range. It would also significantly expand the winter range, especially for J Pod, which uses inland waters year-round. That is, Hood Canal is essential to the conservation of the species, and will be central to achieving a population size where listing is no longer necessary.

The 20' depth exclusion is not supported by data

In contrast to Transients, which are known to feed on land, and Northern Residents which use the intertidal for feeding, grooming, and socializing, Southern Residents are only observed in at least several feet of water. Thus, NMFS was inclined to argue that very shallow water is not occupied habitat, and asked for public comment on whether 20' is the appropriate cut-off. However, I believe "active space" (the space around an individual that is perceived visually or auditorily, and hence constitutes the space in which its social and predator-prey interactions occur, Miller 2002) should be included in occupied habitat.

Even if NMFS wants to exclude shallow water, Southern Residents use shallower water than the 20' cut-off proposed by NMFS. I collected data on Southern Resident travel routes as a contractor for NMFS in the summers of 2003-2005 (Bain et al. 2006). This work was performed from shore rather than from a boat. In contrast to boat-based work which is biased toward whales in deep water, our work put us in a position to observe whales near shore. While not a focus of the study, I would estimate that roughly 20% of the whales passing our "North Site" (located just south of Lime Kiln State Park on San Juan Island) used water less than 20' deep (charted depth, which is referred to mean lower low water—actual depths varied depending on the tide). Shallow water was used for pursuit of prey, socializing, grooming (rubbing against kelp), and play as well as travel across the study area. Use of shallow water was less common at our "South Site," (the Salmon Bank area) but in some passes 100% of the whales used water less than 20' deep when transiting the area, and foraging and socializing were also observed in shallow water.

It is difficult to imagine an activity that would adversely modify shallow water habitat without adversely modifying slightly deeper water (e.g., whales would be able to see to shore and hear echoes from the shoreline from the shallowest water they actually physically occupy). Further, shallow water has been identified as critical habitat for salmon, and activities that adversely affect salmon in shallow water need to be at least highlighted as activities likely to adversely modify deep water habitat. For clarity, it would make sense to include the whales' active space in critical habitat, rather than

creating the illusion that an activity in 6' of water would not have an impact on a whale swimming in 7' of water.

Military Exclusions Are Excessive

NMFS is tasked with balancing national security needs with the needs of the endangered Southern Resident Killer Whales. It appears that the Navy requested areas to be excluded, and NMFS evaluated these on an all-or-none basis. While these areas may provide sufficiently important national security functions to justify exclusion, NMFS should consider whether the national security function could be achieved by only excluding a subset of the exclusion requests.

The Admiralty Inlet Naval Restricted Area is of particular concern. The large size of this proposed exclusion constitutes a significant portion of critical habitat. There is potential for creation of a barrier to safe passage to a still larger portion of the range. Although NMFS points out there is alternative access to Southern Puget Sound, the alternate route is rarely used, so is presumably of lower habitat quality than the more frequently used Admiralty Inlet approach. While operating in this area in May of 2003, the GMD Shoup prevented J Pod from entering a key feeding area off San Juan Island. The size of this exclusion should be reduced to the point where the diminishing returns to national security no longer outweigh the benefits of protection to killer whales.

A second area of concern, due to its proximity to the most heavily used portion of the Southern Resident Killer Whale range, is the Strait of Juan de Fuca Naval Air-to-Surface Weapon Range Restricted Area. NMFS should ask whether this function could be co-located with another exclusion zone (e.g., a portion of the Admiralty Inlet Naval Restricted Area). Similarly, the Strait of Juan de Fuca and Whidbey Island Naval Restricted Area should be considered for co-location, although I suspect it is less likely that this can be moved.

Another option NMFS should consider is not allowing exclusions. Exclusions would apply to both national security and non-national security applications. NMFS could consider allowing adverse modification in these areas provided there is mitigation elsewhere in the range (analogous to Habitat Conservation Plans negotiated with private land-owners). While balancing habitat modifications will require administrative actions, administrative actions would be required anyway under jeopardy provisions. Further, the military may want to take administrative action regarding proposed civilian activities in these areas that would be unnecessary if the areas remain in the critical habitat designation. The application of national security resources to expedite identification of critical habitat in the Pacific should provide a means for offsetting adverse habitat modification within the proposed exclusion areas.

Critical Habitat in the Pacific

In recent years it has become apparent that Southern Resident Killer Whales use the Pacific Ocean extensively. While data are too sparse to determine the relative importance of different areas, this should be a high priority research question in the immediate future. Data at this point may be sufficient to justify including the Washington coast and Oregon waters near the mouth of the Columbia River, as usage is at least comparable to the lesser used portions of Puget Sound and Juan de Fuca Strait included in proposed Critical Habitat.

Sound as a Primary Constituent Element

While NMFS considered including sound as a PCE, it was dropped in the proposed Critical Habitat designation. Noise is an example of a physical habitat characteristic that could be addressed in many ways. Since noise can impair echolocation ability, it can be addressed through the prey availability PCE. Noise can also displace fish such as herring, and adversely modify prey availability. High levels of noise can also injure fish (McCaughley et al. 2003).

Since noise can impede movement (Morton and Symonds 2002), and high levels can cause immediate injury or death (U.S. Department of Commerce and Secretary of the Navy 2001), it could be addressed through the safe passage PCE.

The recent RIMPAC settlement included recognition that takes by mid-frequency sonar could occur at distances on the order of 25 nm, although the Navy reserved the right to adopt a different position in the future. That is, loud noise sources, such as explosives, airguns, and mid-frequency sonar can adversely modify large areas of habitat. However, since noise can cause behavioral changes, injury, or death, it could be addressed through the take prohibition rather than as an element of habitat.

However, for clarity, sound should be a PCE in its own right. NMFS considered noise to be ephemeral, so if a whale were not there to hear it, it would not have any effect. However, a similar comment could be made about toxic chemicals, and perhaps even prey. If a whale never consumes the toxin, it may not be affected by its presence.

I believe including noise as a PCE would make enforcement easier. It would be easier to prove that noise was put into critical habitat than that noise resulted in a take of a specific whale.

Disturbance, typically mediated by noise, may have played an important role in killer whale population dynamics. Ford et al. (2005) identified prey availability, specifically chinook salmon abundance, as being important to resident killer whale population dynamics. Olesiuk et al. (2005) calculated how carrying capacity (determined by prey availability under natural conditions) influences population growth. As a result, observed population growth can be used to estimate carrying capacity. Figure 1 shows estimated

carrying capacity, actual Southern Resident Killer Whale abundance, and the best fit chinook abundance trend curve from Ford *et al.* (2005). As can be seen, this curve fits well in the early years, and the recent increase in chinook abundance corresponds to the recent increase in killer whale abundance. However, the decline in chinook abundance preceded an increase in chinook abundance, and in fact the minimum chinook abundance more or less coincides with the maximum in the killer whale population.

This discrepancy might be explained by noise from vessel traffic reducing effective prey availability. Bain (2002) suggested that the increased energetic cost of moving around whale watching vessels (Williams *et al.* 2002ab) and reduced foraging efficiency due to noise would influence population dynamics, and data supporting extrapolation of these concerns from Northern Residents to Southern Residents were subsequently obtained (Bain *et al.* 2006). Osborne (1990) reported trends in recreational fishing vessels, commercial vessels, and gill net openings. These activities would place vessels near killer whale prey, where they would potentially have an impact. As can be seen in figure 1, the reduction in fishing activities corresponds to an increase in carrying capacity relative to fish abundance. Subsequent to the decline in fishing, there was an increase in commercial whale watching traffic, which again increased noise where whales were trying to find prey. This corresponds to a decline in carrying capacity relative to prey availability. In contrast, the large and rapid increase in prey abundance in recent years may have resulted in a temporary respite from the population effects of noise as the population slowly approaches its new carrying capacity.

Critical Habitat Designation May Have Positive Economic Benefits, Not Just Costs

The economic analysis assumes fishing will be reduced as a result of the critical habitat designation. However, it is possible that actions taken to protect critical habitat will enhance fish availability, both to whales and sport and commercial fisheries. In particular, actions taken to protect water quality and nearshore habitat could enhance fish stocks.

From time to time, NMFS revises its regulations for wildlife viewing. Such decisions may have consequences for habitat quality, and economic consequences for the commercial whale watching industry. Properly implemented, critical habitat protection and killer whale recovery would enhance the economic value of this industry.

Enhancement of fishing and whale watching would have trickle-down benefits to other business in the region, such as food and lodging, retail sales, etc. Such benefits to this class of businesses has been used to justify large expenditures of public funds on sports arenas in Washington.

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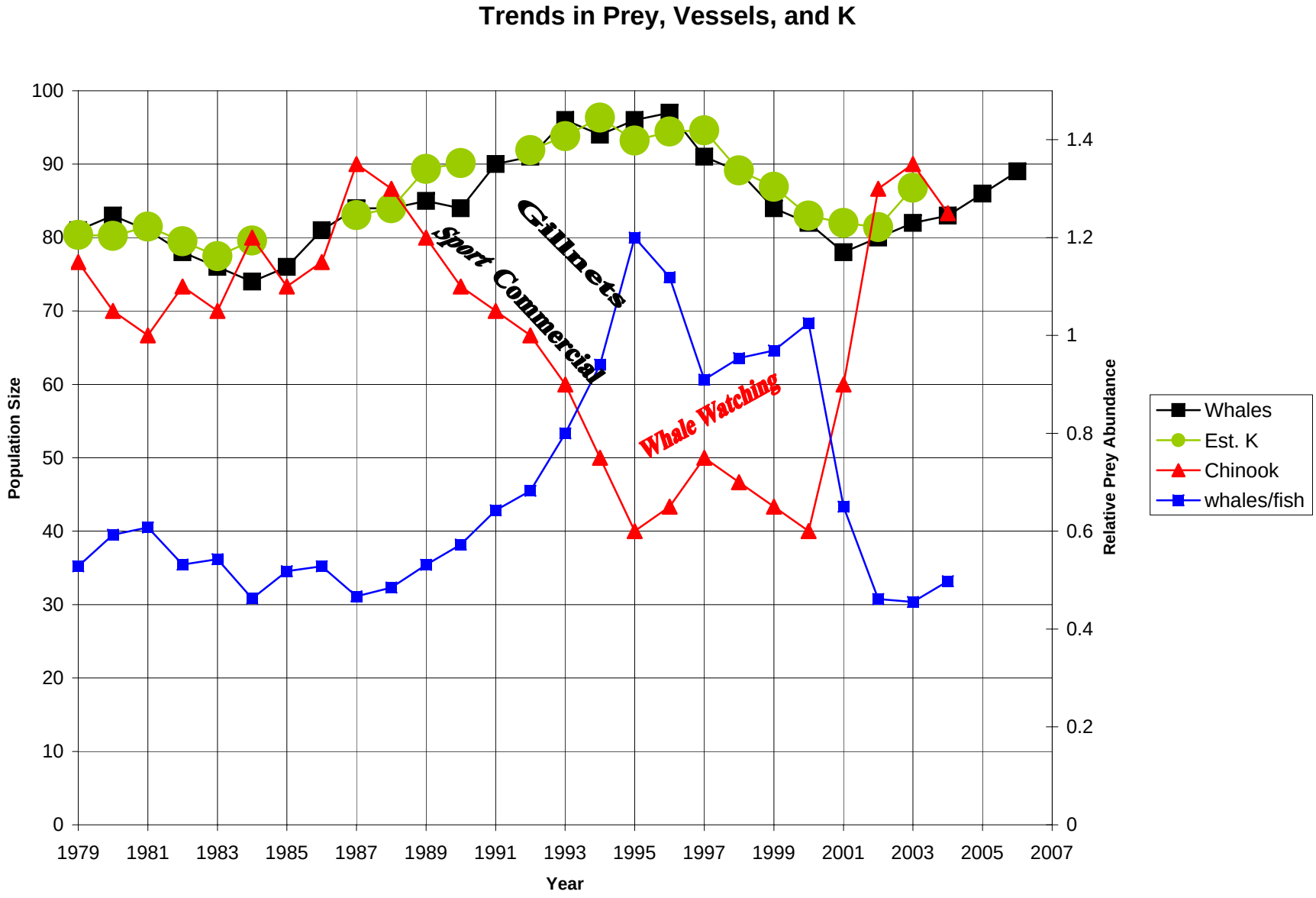
Figure 1. Trends in prey availability, Southern Resident Killer Whale abundance, estimated carrying capacity, and disturbance. Salmon data are after Ford *et al.* (2005), estimated carrying capacity is calculated after formulas in Olesiuk *et al.* (2005), the timing of decline in fishing is after Osborne (1999), and the timing of the increase in whale watching traffic is after Foote *et al.* (2004).


Trends in Prey, Vessels, and K
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