Harbour Seals

in the Georgia Basin

- **What are harbour seals?**
- **What do harbour seals eat?**
- **What is the status of British Columbia's harbour seals?**
- **What pollutants are found in harbour seals and where do they come from?**

What are harbour seals?

Harbour seals belong to a group of marine mammals known as the Pinnipeds (from latin 'fin-footed'). They are also known for their latin name Phoca vitulina. The harbour seal is an example among the Pinnipeds of a 'true' (phocid) seal. In addition to other phocids, there are 'eared' seals (sea lions and fur seals) and the walrus. Harbour seals are the most widely distributed pinniped in the northern hemisphere, being found in Canada's Pacific, Atlantic and even Arctic Oceans.

Harbour seals are small and slightly sexually dimorphic marine mammals, with males weighing 80-130 kg, and females weighing 50-90 kg. In British Columbia, they have a small home range of 20-50 km2, with individuals staying close to home for most of their 30 year life expectancy. Exceptions include the first year of life, when young seals disperse to seek out a new home.

Harbour seal in Oak Bay, Vancouver Island

Photo courtesy of Chris Garrett

What do harbour seals eat?

Harbour seals eat a wide variety of fish and invertebrates. While they have a preference for small, fatty fishes, they readily adapt to local circumstances and availability. In BC's Strait of Georgia, studies reveal their 'top three' list as follows: Pacific hake (Merluccius productus, 42.6%), Pacific herring (Clupea pallasi, 32.4%), and assorted salmonids (Oncorhyncus spp., 4%). By contrast, harbour seals in Washington State's Puget Sound eat a different menu, likely a reflection in species abundance: Pacific tomcod (Microgadus proximus, 35.5%), Pacific herring (18.0%), and English sole (Parophrys vetulus, 8.9%). Very young harbour seals are thought to rely heavily on invertebrates including copepods.

What is the status of British Columbia's harbour seals?

British Columbia's harbour seals number approximately 110,000 individuals, a number that is thought to represent natural historical abundance for this species. This reflects a recovery from heavy hunting and culling pressures exerted until harbour seals in Canada were protected in 1973. At that point, it is thought that they numbered approximately 12,000. Approximately one quarter of BC's harbour seals live in the Strait of Georgia, highlighting the importance of this region as seal habitat. Protected waters, an abundance of rocky intertidal haul outs, and a rich diversity of prey, make the Strait of Georgia important habitat for harbour seals.

What pollutants are found in harbour seals and where do they come from?

As omnivorous mammals at the top of the food web, harbour seals are exposed to a myriad of pollutants, especially those considered to be persistent, bioaccumulative and toxic (PBT). PBT chemicals include the notorious polychlorinated biphenyls (PCBs), organochlorine pesticides and the current flame retardant chemical polybrominated diphenylethers (PBDEs). These chemicals tend to be found at high positions in aquatic food webs because they do not readily breakdown in the environment (persistent), they are not readily metabolized and are retained in the fatty tissues of animals during their lifetime (bioaccumulative), and are endocrine-disrupting and interfere with developmental and physiological processes (toxic). While BC's harbour seals are not as contaminated as those found in Washington State (Puget Sound) or those found in Europe's Baltic Sea, those inhabiting the Strait of Georgia do have moderate levels of PCBs associated with past industrial activities, and polychlorinated dibenzo-p-dioxins (PCDDs) and in certain areas elevated levels of polychlorinated dibenzofurans (PCDFs) associated with pulp and paper mills and the use of pentachlorophenol (PCP). In some cases, sublethal effects have been noted, although the threat of PBT contaminants to BC's harbour seal populations is unclear.

Key references:

1. Cottrell,P.E., Jeffries,S.J., Beck,B., and Ross,P.S. 2002. Growth and development in free-ranging harbour seal (Phoca vitulina) pups from southern British Columbia. Mar. Mamm. Sci. 18(3): 721-733.
2. Cullon,D.L., Jeffries,S.J., and Ross,P.S. 2005. Persistent Organic Pollutants (POPs) in the diet of harbour seals (Phoca vitulina) inhabiting Puget Sound, Washington (USA) and the Strait of Georgia, British Columbia (Canada): A food basket approach. Environ. Toxicol. Chem. 24: 2562-2572.
3. Olesiuk,P.F. 1999. An assessment of the status of harbour seals (Phoca vitulina) in British Columbia.
4. Ross,P.S., Jeffries,S.J., Yunker,M.B., Addison,R.F., Ikonomou,M.G., and Calambokidis,J. 2004. Harbour seals (Phoca vitulina) in British Columbia, Canada, and Washington, USA, reveal a combination of local and global polychlorinated biphenyl, dioxin, and furan signals. Environ. Toxicol. Chem. 23: 157-165.
5. Tabuchi,M., Veldhoen,N., Dangerfield,N., Jeffries,S.J., Helbing,C.C., and Ross,P.S. 2006. PCB-related alteration of thyroid hormones and thyroid hormone receptor gene expression in free-ranging harbor seals (Phoca vitulina). Environ. Health Perspect. 114: 1024-1031.

Useful websites:

- British Columbia State of the Environment Report chapter on 'Persistent Organic Pollutants in harbour seals': www.env.gov.bc.ca/soe/bcce/
- Washington State's "State of the Sound" report including chapter on 'Toxics in harbor seals': http://www.psat.wa.gov/Publications/state_sound07/sos.htm
- the multi-agency / binational Georgia Basin – Puget Sound transboundary Ecosystem Indicators chapter on 'Toxics in harbour seals': http://www.epa.gov/region10/psgb/indicators/