

## Scientific Advances in Killer Whale Research – Understanding the Benefits of Managed Care



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Mainstream and social media are data deficient with respect to factual content about killer whales (*Orcinus orca*) in captivity (i.e., managed care). Much misinformation regarding the behavior, health, and welfare of killer whales in managed care is regularly posted that often spreads like wildfire across varied, multi-national platforms. To date, no scientific data exist that prove poor health and welfare for killer whales in facilities with recognized high standards for animal welfare (i.e., accredited certifications for animal welfare from established organizations like American Humane). Additionally, no direct comparison has been made between killer whales in the wild with those in managed care, principally because data for wild killer whales are missing, apart from some anecdotal observations made during studies on other topics (for a full review on killer whale peer-reviewed scientific literature per topics and settings, see [Hill et al. 2016](#)). There simply are no data to support that managed care is bad for these animals, refuting mainstream media and emotional rhetoric that suggest killer whales in managed care suffer.

In this white paper, we provide evidence from the scientific literature that address the concerns about captivity raised in the media. The topics we include talk about general life history traits of killer whales, general and social behaviors of killer whales, a review of what we have learned from killer whales in managed care and why managed care is important.

### ***Introduction to Killer Whales & Life History Traits***

We urge caution when reading about killer whales (or any species) in non-scientific papers. Stories or anecdotal observations with emotional attributions to humans are widely reported in media (with anthropomorphic emphases), but these stories misrepresent research results available to the general public (i.e., “orca that carried dead calf for weeks appears to be in mourning again”, “orcas start wearing dead salmon hats again”, “orca attacks on boats may be fueled by revenge”). Moreover, these results tend to apply to limited killer whales from specific populations, yet the media perpetuates the misconception that all wild killer whale populations behave in the same way and share the same ecology.

Killer whales are a cosmopolitan species found in all open seas and oceans of the world. At least 10 ecotypes have been described based on habitat and foraging strategies (for a full review see [de Bruyn et al., 2013](#)). While the literature is expanding on killer whale populations from other geographic regions (e.g., North Atlantic: [Baumgartner et al., 2025](#); Australia, [Donnelly et al., 2021](#); Antarctic and subantarctic region: [Durban et al., 2017](#); [Pitman et al., 2011](#); [Pitman & Ensor, 2003](#); Indian ocean: [Poncelet et al., 2010](#); Eastern Tropical Pacific: [Vargas-Bravo et al., 2021](#)), the most-studied and well-known groups are found off Vancouver, British Columbia (e.g., [Barrett-Lennard et al., 1996](#); [Bigg, 1982](#); [Burnham et al., 2023](#); [Ford, 1989](#); [Hanson et al., 2021](#)).

Knowledge about the life history traits of wild killer whales, i.e., reproduction and reproductive expectancy, survival and mortality rates, life expectancy, and calving interval, mostly come from populations in British Columbia and Alaska (Matkin et al., 2014; Olesiuk et al., 1990, 2005). It is unknown if these parameters apply to other populations worldwide as long-term longitudinal studies are difficult to put in place for some cryptic populations (i.e., Antarctic and Subantarctic, Indian Ocean, Marion Island, etc.). Thus, caution must be taken when comparing killer whale populations, as one set of information might not be true for all killer whales.

### ***Average vs. Maximum Lifespans***

Lifespan, or life expectancy, refers to how long an individual can live. Caution must be taken when talking about average or maximum lifespan of a species. In wild species, these numbers are estimated based on sightings of known individuals over years. Yet, newborns that live only a few weeks or are stillborn are events rarely observed and not counted in sighting data. Also, it is rarely possible to confirm the death of a wild killer whale as generally they simply disappear (i.e., they are not seen again), which is why most research groups classify individuals as 'missing' for 5 to 10 years before removing them from a population catalog.

Average life expectancy is a useful tool to compare populations, though the sample size to calculate the average needs to be large enough to provide meaningful information. Maximum life expectancy must be taken with caution as age of wild animals is usually estimated based on size (and rarely known birth dates) and/or tooth layer examination (Amano et al., 2011; Read et al., 2018). Thus, these expectancies do not represent how long all individuals of a species should or could live. Indeed, wild killer whale average life expectancy seems to vary between populations. Resident killer whale males have been documented as ranging from 22-37 yo and females from 39-50 yo (Ford et al. 2000; Olesiuk et al., 2005; Robeck et al., 2015). Off Norway, males reach 34 yo, and females 43 yo (Kuningas et al. 2013; Robeck et al., 2015).

Comparing life expectancy parameters for wild killer whales with those in managed care would be like comparing apples to oranges because the available data for each setting is not the same nor equal. Particularly, different phases must be considered when looking at the life expectancy of managed care animals, as the level of care and quality of housing have improved over different phases in facilities with recognized high standards for animal welfare. Despite this, Robeck et al. (2015) did a comparison between managed care and different wild populations, and even though life expectancy was slightly lower for managed care individuals before 1985, there are now no differences with wild populations using data from the last two decades.

### ***Killer Whale Behavior***

The literature on wild killer whales has been focused mostly on population demographics (Matkin et al., 2014; Olesiuk et al., 2005; Poncet et al., 2010), foraging habits (Ford & Ellis, 2006; Hoelzel, 1991; Saulitis et al., 2000; Tennessen et al., 2023), habitat use (Esteban et al., 2014; Ford et al., 2017; Thornton et al., 2022), and anthropogenic impacts (e.g., boat traffic, noise, etc.) (Burnham et al., 2023; Lusseau et al., 2009; Williams et al., 2009). The goal of these studies is not specifically the study of killer whale behaviors but rather to extend our knowledge on key parameters that allow us to better protect wild killer whales facing anthropogenic threats. Although these studies usually use broad behavioral categories of group activity, such as rest, forage, travel, and social, instead of focusing on specific inter-individual behaviors, Noren & Hauser (2016) completed a full review of available literature comparing these four

activities from different published killer whale research. Definitions for these activities were broad and diverged between studies and also focused on killer whale groups rather than individuals. Still, the activity budgets [Noren & Hauser](#) summarized matched with the results of our recent study of managed care killer whale activity budgets ([Manitzas Hill et al., 2025](#)). With 261 hours of analyzed videos and observations conducted over full days across a year, our study provides the only point of comparison available in the literature between activity budgets of wild and managed care killer whales.

The behavioral repertoire and details of the inter-individual behavioral exchanges of wild killer whales are not represented in the literature. Individual-based association patterns are also unknown as most studies focus on the groups or the matriline, and not on individuals. Although some studies focus on “behavioral ecology” or “foraging behavior”, they do not specifically describe nor focus on social interactions among individuals, rather they examine foraging from coordinated to solitary techniques ([Baird & Dill, 1995](#); [Ford & Ellis, 2006](#); [Guinet, 1991](#); [Hoelzel, 1991](#); [Pitman & Durban, 2012](#)).

Only a handful of non-peer-reviewed papers from the 1980s tentatively described general and social behaviors of killer whales. Some behaviors seem conserved and expressed by animals in each setting, though no direct comparison between killer whales in managed care and in the wild has been completed nor is represented in the literature. [Martinez & Klinghammer \(1978\)](#) described a few behaviors for individual killer whales from both settings, suggesting there was not much difference. But, in the intervening four decades, there has been no peer-reviewed literature describing exchanges between wild individual killer whales or shared behaviors exchanged within dyads or small groups. This paucity of knowledge and data is not the foundation on which to place a critique of killer whales in managed care.

We are currently moving forward on studying the behavior of killer whales in both managed care and the wild. From our first study ([Manitzas Hill et al., 2025](#)), surface observations of killer whales in managed care did not show any concerns about the welfare of our study group. We are now recording the behaviors of this same group from underwater and adding the killer whales from Loro Parque to our study. Based on our preliminary observations (that will be presented at the EAAM 2025), the observed social behaviors of these killer whales include pectoral fin contacts and body-to-body rubbing, as well as various pair swimming positions. These behaviors are similar to those observed in wild and managed care bottlenose dolphins (*Tursiops truncatus*) that use them in their daily social interactions to build and strengthen their relationships ([Dudzinski et al., 2010, 2013](#); [Dudzinski & Ribic, 2017](#); [Themelin et al., 2020](#); [Yamamoto & Kashiwagi, 2023](#)). Since no data are available for wild killer whales, we will also be conducting observations on wild groups with which to compare our results.

### ***What We’ve Learned from Killer Whales in Managed Care & Why Managed Care is Important***

Based on the amount of negative publicity that managed care populations of killer whales have received and the lack of objectivity from diverse media in sharing scientific results, one could think nothing was learned from having these animals in our care – this conclusion could not be more incorrect.

A considerable amount of scientific knowledge about killer whales has been gained from individuals in managed care. As a non-exhaustive list of research that can be cited as leading to better understanding of killer whales, topics include their reproductive physiology ([Benirschke & Cornell, 1987](#); [Duffield et al. 1995](#); [Robeck et al. 1993, 2004, 2006](#); [Robeck & Nollens, 2013](#); [Walker et al. 1988](#)), their respiration and adaptation to diving ([Hedrick & Duffield, 1991](#);

Kriete, 1995; Spencer et al. 1967), the care and development of calves (Asper et al. 1988; Bowles et al. 1988; Clark & Odell, 1999a, 1999b; Clark et al. 2000), their auditory and vocalization specificities (Bowles et al. 1988; Branstetter et al. 2024; Branstetter et al. 2023; Branstetter et al. 2017; Crance et al. 2013; Dahlheim & Awbrey, 1982; Hall & Johnson, 1972; Szymanski et al. 1999), their immune system (Cornell, 1983; Funke et al. 2003; King, 1996), and their metabolism, development, and food intake requirements (Kastelein et al. 2000; Kastelein et al. 2003; Kastelein & Vaughan, 1989; Kasting et al. 1989; Williams et al. 2011; Worthy et al. 2013).

It is important to understand that some research cannot be done on wild killer whales (Hill et al. 2016). It is currently not possible to get blood from wild animals without invasive methods. It is also not possible to measure exact food intake or respiration rate and oxygen consumption of wild individuals. But these can easily be done in managed care with the voluntary cooperation of the animals. The evolution of husbandry training has opened a new world of possibilities for research (Brando, 2010), as we are now able to ask questions directly to the animals. Blood and other body samples can be collected in minutes with animal cooperation. Auditory and echolocation abilities can be evaluated by presenting simple, enriching behavioral tests to the animals. And cognitive studies, that are impossible to conduct in the wild, are now merged with the daily training activities of these animals, as these studies are highly stimulating for the animals as well as valuable for science.

The results from all this research have been used and combined with population dynamic and habitat use information gained from wild populations to better evaluate the health of some endangered groups, the threats they face and how to address them to better protect these populations. The details about metabolism and food intake requirements are now used to better evaluate the amount of prey that need to be available for endangered southern resident killer whales and to put in place conservation measures to protect both the killer whales and the endangered species of salmon on which they feed (Williams et al. 2011).

## **Conclusions**

The level of misinformation available to the general public in the media about killer whales in managed care is staggering. It is important to remember that there are *no scientific data* showing that living in managed care is detrimental to these animals for facilities with recognized high standards for animal welfare. Such facilities are important to continue scientific research on killer whales to gather data that can then be used to enhance our knowledge of wild populations and manage their conservation.

More generally, caution must be taken when using anthropomorphism in the media to attract the public's attention to a species. Although emotional attachment to a species can be beneficial to trigger efforts to protect it, attributing human characteristic to animals (i.e., anthropomorphism) or trying to compare species' abilities to human abilities is detrimental to an objective evaluation and understanding of animals' biology in general. Only rigorous and thorough scientific research can provide insight into the animals' lives, not pictures or video shared without context in the media.

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