Does a harbour seal 'orphan' in rehabilitation need a companion pup?

Susan C. Wilson[1]

[1]Tara Seal Research, Downpatrick, UK

Correspondence

Sue Wilson, Tara Seal Research, 141 Victoria Road, Mablethorpe, Lincolnshire, LN12 2AL, Lincolnshire, UK.

Email: suewilson@sealresearch.org

KEYWORDS

demand tests, harbor seal, orphan pups, *Phoca vitulina*, rehabilitation, social bonding, primary socialization, welfare

Stranded harbor seal (*Phoca vitulina*) pups of nursing age (termed "orphans") in rehabilitation (rehab) have been much studied in respect of their physiology and pathology (e.g., Cole and Fraser, 2021; Dailey et al., 2020; Dierauf et al., 1983; Fonfara et al., 2014; Gulland et al., 1999; Thomas and Ono, 2015; Trumble et al., 2013) but less so in respect of their behavior and welfare, although concerns have been expressed (Wilson & Jones, 2018) over the practice in some rehab centers of housing newly admitted pups in social isolation and without water access. Our recent study (Alger and Wilson, submitted) examined the behavior of orphan harbor seal pups maintained in pairs during the early rehabilitation weeks compared, qualitatively and quantitatively, with the behavior of free-living pups with their mothers. The results indicated that the pup pairs maintained with free water access displayed the same behaviors as previously recorded with free-living pups with their mothers (Wilson & Jones, 2018), although they engaged in relatively more body contact, nosing contacts, and aquatic play, i.e., more frequent overt affiliative behaviors believed to strengthen their social bond. Since the pups therefore had the *freedom to express a range of normal behaviors* (Mellor, 2016), and each pup behaved as if its partner pup was a mother-substitute, this social and physical rehab environment should be considered to provide good welfare.

However, Veasey et al. (1996) suggested that the expression of normal behaviors may not be necessary for "adequate welfare", provided the seal pup is – as in most present-day seal rehab centers – protected as much as possible from negative experiences (hunger, pain, ill-health, fear). These authors suggested that the animals' need should be *demonstrated*, e.g., through "demand" studies, where an animal is required to exert energy or effort to obtain a resource (Dawkins, 1990). The amount of effort the animal will expend to gain access may be measured, for example by increasing the weight of an access door (e.g., Broom, 2008). If the animal appears to be content in the company of another animal but makes no great effort to attain a companion when deprived of it, the demand is considered *elastic*, i.e., a 'luxury' or

not strictly necessary. If the animal works to overcome a resistance to obtain the reward of the presence of a companion, then the demand is considered to be *inelastic*, or essential to the animal's welfare (e.g., Dawkins, 2009; Broom, 2008). In this note, I am reporting on preliminary observations of the strenuous effort displayed by orphan pups of cohabiting pairs to overcome a barrier placed between them and their usual companion pup.

Dedicated observations of pups separated by a barrier were carried out with two pairs of pups (Table 1). The behavior of the pups was recorded by overhead CCTV cameras

Table 1. Pups used in 'demand' tests

Rehab Center	Pup name	sex	Date on entry to rehab	Mass on entry (kg)	Rehab condition to tests start	Rehab days of tests	Mass (kg) at start of tests
A (2012) Lincolnshire, UK	Salt	M	July 08	11.5	Cohabiting in pen with pool	13–18	11.7
	Pepper	M	July 08	10.8			12.3
B (2013) Co. Down, UK	Maxi	M	July 19	11.1	Cohabiting in pen with paddling pools	29–32	18.0
	Mini	F	July 19	9.0			16.0

We carried out general behavior observations and two sets of demand tests with two cohabiting pairs of orphan pups in centers A and B (Table 1). These four pups were found stranded on the shore as two pairs, apparently already socially bonded. The development of social bonding between such orphan pups while stranded nearby on the shore is described by Wilson and Jones (2021). Additionally, we have further records[1] of fourteen orphan pups stranding separately, taken into rehab in center B, introduced to a 2nd pup within the first 14 days of admittance to rehab, and subsequently forming seven socially bonded pairs.

Center A. Male pups named "Salt" and "Pepper" were found stranded together on a public beach on the Lincolnshire coast (UK), and were taken for rehab to Center A. The

[1] www.sealresearch.org/rehab-pups/rehab-diary

pups' rehab enclosure consisted of the main enclosure with haul-out area and pool (Side 1) and a smaller area (Side 2) to the side of the main area, into which an inflatable paddling pool was placed for the tests. A double gate between the two sides could be opened from side 1 or closed. The pups' normal behavior and demand test behavior was recorded on CCTV cameras for 6 consecutive days. At night, the pups typically slept side-by-side in Side 1. The first pup to wake in the early morning usually woke the other by nosing and nuzzling him on the nose, face, and neck, and sometimes suckling on his "nipple" region. They then usually followed each other into the pool (out of shot in Figure 1), where they engaged in "rolling" (c.f. Venables & Venables, 1955; Wilson 1974), consisting of leaning over, clasping or nosing the partner's body, while twisting round one another, constantly changing position. One pup occasionally rode on the other's back, clasping him while nosing the back of the head in the manner of a pup riding on its mother's back (c.f. Venables & Venables, 1955; Wilson & Jones, 2018).

The demand tests were carried in the evenings, immediately after the center staff had left for the night. On the first evening, the pups' behavior with no demand test was recorded, and demand tests were then carried out on the next five days. Just before leaving for the night, the keeper separated the pups and closed the partitioning gate, placing the 'test' pup (Salt) into the main enclosure with the built-in pool (Side 1) and the 'receiving' pup (Pepper) into the smaller compartment (Side 2) with the inflatable pool. The first 30m after the gates were closed were used as the demand test. The gates were arranged so that one side would potentially open only if pushed by the 'test' pup in Side 1. For test 1 the movable gate was wedged at its base, for test 2 the gate was not wedged and a 2kg weight (in a telescope bag) attached. For tests 3–5 the gate was wedged with 3, 4 & 6 kg weights added respectively (Table 2).

In test 1, when they were first separated by the gate, Salt went to the gate and nuzzled it, while Pepper tried unsuccessfully to push it open from the 'wrong' side. Later in the evening both pups slept on either side of the gate, and Salt eventually opened it, initially by accident. Once the gate was open, they both slept side by side in Side 1 for the rest of the night.

In all subsequent tests Salt started trying to open the gate less than 2 min after it was closed (Table 2). He experienced increasing levels of difficulty in opening the gate as the weights were heavier, but each time he persisted, using one or both fore-flippers to push the gate, and his nose pushing into the gap between the gates (Figure 1), with the time to succeed increasing from 3–11 min from tests 2 to 5. In tests 2 and 4, Pepper also tried to open the gate. In all tests the pups made nosing and body contact with each other after reuniting and spent the rest of the night resting together. It was evident that the effort to open the door by the test pup was to reach its partner pup rather than Side 2 of the enclosure, since once the gate was opened, both pups always returned to their usual home base in Side 1.

FIGURE 1. Center A demand tests, showing test pup "Salt" opening gate to receiving pup "Pepper". CCTV frames from tests 3, 4 and 5. Bag containing weights hanging from gate. *Top row*: Salt attempting to open gate with nose and fore-flipper, *Middle row*: Salt goes through gate and pups interact, *Bottom row*: Salt enters pool with Pepper; both pups have returned to main enclosure, Salt suckling on Pepper.

Table 2. Demand test results at Center A. Pup "Salt" is test pup in Side 1, pup "Pepper" is "receiving" pup in Side 2.

Test	**Gate status**	**Latency to touch partition**	**Latency to go through gate**	**Time spent by both pups in Side 2 during 30-min test**
Dummy	Open	N/A	N/A	30m
1	Closed, lightly wedged	19m 28s	Does not open and go through gate during test period	None
2	Closed, not wedged, 2kg wt	0m 39s	3m 48s Salt opens gate easily with nose	4m 49s
3	Closed, wedged, 3kg wt	1m 7s	6m 17s Salt pushes gate ajar in 11s of effort, inserting fore-flippers into gap between the gates	18m 04s
4	Closed, wedged, 4kg wt	1m 53s	9m 52s – after trying to get gate open for 7m 59s, pushing and putting fore-flipper and nose through gap between the gates	20m 08s Whole time after gate opening)
5	Closed, wedged, 6kg wt	1m 7s	11m 9s – after trying to open gate for 4m 15s then again for 13s, using fore-flipper and then nose)	18m 51s Whole time after gate opening)

Center B. Two pups, "Maxi" (male) and "Mini" (female), were found stranded together in Dundrum Bay, N. Ireland (UK), and taken into rehab at Center B. The rehab enclosure was a paved yard approx. 6m long, with a plastic paddling pool and small trampoline at each end.

These two pups behaved as if socially bonded, sleeping together, following one another, and playing in close body contact in the pools, as described by Alger and Wilson (submitted). For the demand tests, a barrier was created with water-filled plastic buckets with lids, total height 39.5cm (Figure 2). For several days before the tests, the pups were accustomed to the presence of the buckets, sometimes arranged into a temporary barrier across the yard, although the pups were never separated and made no attempt to breach the barrier.

Two demand tests were carried out on consecutive days, just after the pups had been fed at one end of the yard. One each occasion, the first pup to be fed went (of its own volition) to the far end of the yard while the other was being fed, immediately after which the buckets were placed across the middle of the yard to create a barrier, thereby separating the

pups, one at each end of the yard. For test 1, Maxi was the test pup, i.e., the 2nd pup to be fed; for test 2, Mini was the test pup.

In both tests the pups reunited by means of the test pup surmounting the barrier, less than 7 min after it was put in place (Table 3).

Table 3. Center B demand tests – times from start of test to surmount barrier

	Test pup	Time from start to touch barrier	Time attempting to get through/over barrier	Time from start to 1st contact with partner pup	Time from start to land on other side of barrier
17/08/13	**Test 1 ('Maxi')**	04:08	00:49	05:42	06:33
20/08/13	**Test 2 ('Mini')**	00:36	00:45 + (after interval) 01:08	02:53	05:24

Both test pups initially tried to push the buckets aside while trying to follow their partner pup. When this failed (the buckets were too heavy), they each quickly resorted to climbing over the top of the barrier. Once each test pup had achieved a position on top of the buckets, it stretched towards the receiving pup, established nosing contact, and then joined it on the ground (Figure 2). Further tests were not carried out since it was felt the barrier should not be made any higher in order to avoid causing excessive stress to the pups.

FIGURE 2. Center B demand tests, showing the test pups surmounting the barrier and the positive response of receiving pup. *Left*: test 1-test pup "Maxi"; *Right*: test 2 – test pup "Mini".

The preliminary demand tests described here indicated the strength of the test pups' following response to its socially bonded partner pup. For free-living harbor seal pups, the pup's ability to follow and keep up with its mother in the water is essential to its survival (e.g., Renouf & Diemand, 1984; Wilson & Jones, 2018); if a pup is unable to follow its mother for any reason (such as physical weakness, hypothermia, or poor behavioral following response), it will eventually strand and die (e.g., Wilson, 2001); the pup is therefore "programed" to make every effort to maintain or re-establish contact with its mother, and it is therefore not surprising that this behavior appears to transfer to a socially bonded partner pup in rehab. The strenuous effort displayed by the two pairs of pups to overcome the barriers that separated them, confirmed their need for re-establish physical proximity. which may therefore be considered to have been *inelastic*, i.e., essential to their welfare.

It has been suggested that the behavior to recover physical proximity after separation of a bonded animal pair, such as a harbor seal mother-pup pair or rehab pup pair, is an allostatic regulatory system akin to a thermoregulatory system (Morrison, 2016). According to this view, proximity regulation is like a rubber band, *yanking conspecifics back together if they become separated* (Morrison, 2016); this rubber band is clearly essential to the survival of a free-living dependent harbor seal pup. Morrison (2016) has also suggested (citing e.g., Panksepp et al., 1978) that the rubber band mechanism may be mediated by opioid withdrawal during involuntary separation and a surge of endorphins upon reunion. In harbor seals a pre-existing bond may not be a pre-requisite in already socialized individuals for an inelastic demand for a conspecific companion, as demonstrated by the celebrated case of an adult female harbor seal, who had been living alone in an aquarium for 18 months following

the disappearance (during a storm surge) of her life-long male companion: she scaled, with difficulty, the horizontal metal bars of a barrier ~1.2m high to reach a newly arrived yearling in an adjoining pool[2].

Veasey et al (1996) have argued that if an animal in human care has its essential needs (such as nutrition, freedom from fear, pain, and disease) met without having to perform the behaviors of its free-living counterparts to fulfil those needs, it may not necessarily suffer by not being able to perform those behaviors – filial social behaviors in the case of harbor seal pups. Even if it is demonstrated that socially bonded pups need to be together, it may not necessarily follow that cohabiting with a companion pup and social bonding *per se* is essential to orphan harbor seal pup welfare. However, these authors also state that the suffering caused by the non-performance of behaviors cannot yet be adequately measured, and that the absence of a behavior should be considered for its consequences. This caveat could apply to orphan harbor seal pups kept in isolation for their first month, since they are subject to sensory deprivation and primary socialization during what is likely a sensitive period in development. The consequences could be alterations in the brain, which may in turn have ramifications for later behavior and cognition (e.g., Robbins et al., 1996). Cohabiting with a partner pup, and with water access to facilitate social interaction (Wilson & Jones, 2018; Alger & Wilson, submitted), should not therefore be considered a "luxury" option, but necessary for orphan harbor seal pups to develop as normally as possible in the constrained circumstances of rehab.

These tests described here are preliminary, with an attempt at quantification of demand being shown so far for only one pup pair (in Center A). Nevertheless, the immediacy and strength of the response of both pup pairs to separation are consistent with predictions

[2] https://www.bbc.co.uk/news/uk-scotland-edinburgh-east-fife-14324444

from observations of numerous orphan pup pairs in rehab, and could suggest further and more refined demand tests, testing both access to a companion pup and access to water. Such studies could lead to a re-evaluation of the rehab environment of clinically healthy orphan harbor seal pups (Wilson & Jones, 2018; Alger & Wilson, submitted). The results of this study are species specific to *Phoca vitulina*; separate assessments would be necessary for the pups of other phocid species.

I would like to thank Paul King, Dennis and Chloe Drew at Mablethorpe seal sanctuary, Lincolnshire, UK (Center A) for their support in carrying out the study, and Will Matthews for his technical assistance. Thanks also to Dominic and Carrie Ijichi for their support at Tara Seal Research, Co. Down, N. Ireland, UK (Center B) throughout the study, and Lisa Collins for her suggestion of the demand studies. Consultation with the English Home Office confirmed that no licence was needed for the demand study at Center A. The study at Center B was carried out under licence TSA-14-13 from the Northern Ireland Environment Agency. The study received no external funding.

REFERENCES

Alger, R. and Wilson, S. (submitted). Welfare assessment of "orphan" harbor seal pup pairs during rehabilitation through behavior monitoring.

Broom, D.M. (2008). Welfare assessment and relevant ethical decisions: key concepts. *ABRS Annual review of biomedical sciences, 10*, T79–T90. http://arbs.biblioteca.unesp.br

Cole, J., & Fraser, D. (2021). Sink or swim: risk stratification of preweaning mortality in harbor seal pups (*Phoca vitulina richardii*) admitted for rehabilitation. *Marine Mammal Science*, *37*(3), 807–825. https://doi.org/10.1111/mms.12777

Dailey, R.E., Smith, K., Fontaine, C., Jia, Y., & Avery, J.P. (2020). Response of metabolic hormones and blood metabolites to realimentation in rehabilitated harbor seal (*Phoca vitulina*) pups. *Journal of Comparative Physiology B, 190*, 629–640. https://doi.org/10.1007/s00360-020-01290-5

Dierauf, L.A., & Dougherty, S.A. (1983). Early evaluation of neonatal harbor seal (*Phoca vitulina richardsi*) health status 1. Preliminary report. *Journal of Zoo Animal Medicine, 14*, 138–144.

Dawkins, M.S. (1990). From an animal's point of view: motivation, fitness, and animal welfare. *Behavioral and brain sciences, 13*, 1–61.

Gulland, F.M.D., Haulena, M., Lowenstine, L.J., Munro, C., Graham, P.A., Bauman, J., & Harvey, J. (1999). Adrenal function in wild and rehabilitated Pacific harbor seals (*Phoca vitulina richardii*) and in seals with phocine herpesvirus-associated adrenal necrosis. *Marine Mammal Science, 15*(3), 810–827.

Mellor, D.J. (2016). Moving beyond the "Five Freedoms" by updating the "Five Provisions" and introducing aligned "animal welfare aims". *Animals, 6*(1), 59. https://doi:10.3390/ani6100059

Morrison, I. (2016). Keep calm and cuddle on: social touch as a stress buffer. *Adaptive human behavior and physiology, 2*, 344–362.

Panksepp, J., Herman, B., Conner, R., Bishop, P., & Scott, J. P. (1978). The biology of social attachments: Opiates alleviate separation distress. *Biological Psychiatry, 13*(5), 607–618.

Renouf, D. and Diemand, D. (1984). Behavioral interactions between harbour seal mothers and pups during weaning (Pinnipeds: Phocidae). *Mammalia, 48*(1), 53–58.

238 Robbins, T.W., Jones, G.H., & Wilkinson, L.S. (1996). Behavioural and neurochemical
239 effects of early social deprivation in the rat. *Journal of Psychopharmacology, 10*(1), 39–47.

240 Thomas. A., & Ono, K. (2015). Diving related changes in the blood oxygen stores of
241 rehabilitating harbor seal pups (*Phoca vitulina*). *PLoS ONE 10*(6): e0128930.
242 https://doi:10.1371/journal

243 Trumble, S.J., O'Neill, D.O., Cornick, L.A., Gulland, F.M.D., Castellini, M.A., & Atkinson,
244 S. (2013). Endocrine changes in harbour seal (*Phoca vitulina*) pups undergoing rehabilitation.
245 *Zoo Biology, 32*(2), 134–141. https://doi:10.1002/zoo.21036

246 Veasey, J.S., Waran, N.K., & Young, R.J. (1996). On comparing the behaviour of zoo-
247 housed animals with wild conspecifics as a welfare indicator. *Animal Welfare, 5*, 13–24.

248 Venables, U.M., & Venables, L.S.V., 1955. Observations on a breeding colony of the seal
249 *Phoca vitulina* in Shetland. Venables, U. M., L. S. V. Venables, and L. Harrison Matthews.
250 "Observations on a breeding colony of the seal *Phoca vitulina* in Shetland." *Proceedings of*
251 *the Zoological Society of London, 125*(3–4), 521–532. https://doi:10.1111/j.1096-
252 642.1955.tb00614.x

253 Wilson, S.C. (1974). Juvenile play of the common seal, *Phoca vitulina vitulina*, with
254 comparative notes on the grey seal, *Halichoerus grypus*. *Behaviour, 48*:37–60.

255 Wilson, S.C. (2001). Population growth, reproductive rate and neonatal morbidity in a re-
256 establishing harbour seal colony. *Mammalia 65*(3), 319–334.

257 Wilson, S.C., & Jones KA. (2018). Behaviour of harbour seal (*Phoca vitulina vitulina*)
258 mother-pup pairs in Irish Sea intertidal habitats. *Biology and Environment: Proceedings of*
259 *the Royal Irish Academy, 118*(1), 1–15. https://doi:10.3318/BIOE.2018.02

Wilson, S.C. & Jones, K.A. (2021). Body mass and behaviour of stranded harbour seal (*Phoca vitulina vitulina*) pups during the peak pupping season in Co. Down, north-east Ireland. *Biology and Environment: Proceedings of the Royal Irish Academy*, *121*(1), 9–20. https://doi.org/10.3318/BIOE.2021.03