

REHABILITATION OF HARBOR SEAL PUPS BY A 'FAST-TRACK' METHOD

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Introduction

Harbor seal pups (*Phoca vitulina*) are sometimes found alone on the shore in a distressed condition, i.e. stranded. Reasons for a neonatal pup being stranded include failure to bond with and follow its mother, inadequate maternal care, low birth weight and disturbance. Some separated pups may have survived for a few days without maternal care before finally succumbing to primary and secondary effects of starvation, minor cuts and opportunistic bacterial infections. Pups may also strand in the immediate post-weaning period, most often either because of a low weaning weight or because they failed to make a successful transition from nursing from the mother to independent feeding. Older pups may strand either due to misadventure or debilitation, often with parasitic bacterial infections.

Many stranded pups of the harbor seal and also grey seal (*Halichoerus grypus*) pups throughout North America, the UK and western Europe are taken into seal 'sanctuary' facilities and released back into the wild after a period of rehabilitation usually lasting about sixteen weeks (e.g. Anon, 1997; Wilson, Corpe and Johnston, 1999). The length of this period has been queried (Wilson, 1999), since it means pups are being held in captive conditions for about three months longer than the natural weaning period in the wild, with likely adverse consequences for the development of natural social and foraging behaviour. Studies have suggested that seals held long-term in captivity may not adapt well to the wild (e.g. Harvey et al., 1983; Harvey, 1991; Reijnders, 1991). A study of healthy elephant seal pups (*Mirounga angustirostris*), captured and taken into captivity at the post-weaning stage, found that post-release survivorship decreased with time held in captivity and was significantly lower for pups held for more than 12 days (LeBoeuf, 1991).

The present study was initiated to establish a shorter period of rehabilitation for harbor seal pups and track these pups after release.

Methods

Fifteen harbor seal pups (*Phoca vitulina vitulina*) were rehabilitated and released in these trials (Table 1). All pups were from Co. Down population on the north-east coast of Ireland in the western Irish Sea. Thirteen were found abandoned in the neonatal period and two were found in a debilitated condition in the post-weaning period. The pups were maintained in an outdoor pen, which included a bath or pool and a covered sleeping area (Wilson, 1999). There were five occasions (1997, 2000, 2001, 2002, 2005) where two pups were being cared for simultaneously, and these were kept together in pairs except while one pup (pup 11) was seriously ill. Pups were always given free access to the pool, though care was taken to ensure that they were able to get out unaided. The human carers spent some time in the pen with the pups after feeding them, allowing the pup to make contact if it was so inclined.

All pups were fed via a feeding tube entirely on a liquid diet based on ‘multi-milk’ formula (Pet-Ag, Illinois), which included about 10% fish oil (lactase-treated cream for the pups up to nos 16 and 17) and a small amount of tinned or fresh mackerel or herring (Wilson, 1999; Wilson, Corpe & Kennedy, 1999). Digestive enzymes containing 60% protease and 25% lipase (‘Essential’ enzymes, obtainable at www.vitalhealthstore.com) were added to the milk formula for all pups after pup 9, since they seemed to enhance weight gain (Wilson, 1999). The volume of milk formula fed to small newborn pups totaled approximately 800–1000 ml per 24 hours,

fed in five meals and for older pups up to about 2000 ml fed in either four or five meals. If a pup attempted to suck, every effort was made to feed the pup with a baby's bottle instead of via a feeding tube, but this was only successful for pup 19. Any necessary medication was given via the feeding tube).

The average weight gains were 0.20 kg/d for the first pup in the trials (for which digestive enzymes were not used) and ranged from 0.26 to 0.55 kg/d for the pups for which enzymes were added to the formula. (Table 1). This compares with an estimated average of about 0.54 kg/d of wild pups during lactation (estimated from birth weight of 11 kg, 24 d lactation and a weaning weight of 24 kg; Muelbert and Bowen, 1993; Bowen *et al.*, 1994). The average release weight for the eight pups taken in as neonates was 20.9 kg (SD 1.6). This is slightly less than the estimated average weaning weight for harbor seal (*P. v. concolor*) pups on Sable Island of 24 kg (Muelbert and Bowen, 1993) but within the range of observed and estimated weaning weights for a tagged cohort of wild pups in Co. Down in 1995 (Corpe and Wilson, 1996). The average time for the pups taken in as neonates to reach their release weights was 38 days, which is about 14 days longer than the average natural suckling period of about 24 days (Bowen, 1991; Muelbert and Bowen, 1993; Wilson, 1974).

Table 2. Weight gain by pups in the trial

Pup ID	Date arrived	Arrival weight (kg)	No. days in rehab.	Weight gain (kg)	Av. gain (kg/day)
09 ♀ Cecilia	13.08.96	11.5	20	3.8	0.19
10 ♀ Tara	03.07.97	8.0	34	11.0	0.32
11 ♂ Caelan	15.07.97	7.5	30	11.0	0.37
14 ♂ Finn	28.06.00	12.5	41	10.5	0.26
15 ♀ Tinkerbelle	04.07.00	9.0	35	11.0	0.31

16 ♀ Rona	02.07.01	7.25	43	13.75	0.32
17 ♀ Star	03.07.01	7.25	42	13.75	0.33
18 ♂ Leo	14.08.01	10.0	20	11.0	0.55
19 ♀ Evie	28.06.02	8.0	47	14.0	0.30
20 ♂ Olly	11.07.02	10.0	34	13.0	0.38
21 ♀ Maris	24.06.04	6.5	47	13.5	0.29
22 ♂ Emil	02.07.05	11.0	45	14.0	0.31
23 ♂ Silver	13.07.05	10.0	34	11.0	0.32
24 ♀ Lora	24.06.06	11.0	36	10.5	0.29
25 ♀ Dana	03.07.07	9.75	34	10.0	0.29

The pups kept together in pairs (9/10, 14/15; 16/17; 19/20) tended to follow one another, sleep together in the covered kennel or beside the pool, or play together in the water. Although they always had free access to water in the pool or bath, small pups initially spent only short periods in the water and no problems of hypothermia were noted. The opportunity to swim appeared to contribute to the young pup's well-being and did not seem to inhibit initial weight gain.

In the wild, olfactory and tactile contact between mother and pup is extremely intensive in the neonatal and nursing period, and is therefore undoubtedly essential for normal social development. (Wilson, 1974; 1978). In rehabilitation, however, it appeared that a second pup was able to substitute at least some of the stimuli normally provided by the mother, and pups therefore appeared to act in some respects as a mother substitute for each other. At the time of their release, all of the four pup pairs orientated closely to each other, following each other along the shore and into the sea. Contact between pups from the earliest age in rehabilitation was considered to be beneficial to the pups' short-term well-being and long-term social development. This

procedure was in contrast to the usual procedure in seal sanctuaries of keeping pups in individual pens, often for some weeks.

All of the pups taken in as neonates quickly became entirely tame to handle, feed and hold for weighing. The pups kept alone until the second pup was introduced typically sought contact with the human carer and sometimes attempted to suck on her although only one pup (19) nursed from a baby's bottle (This pup was partly bottle fed from day 5 to day 24, after which time she refused to suck and had to be tube fed until her release). Both the advantages and potential disadvantages of contact between the pups and human carers need to be considered. On the one hand, physical contact with the human carers may provide the pups with at least some aspects of the contact and care it would normally receive from its mother, and may thus benefit the pup's well-being and social development. On the other hand, human carers might cause the pups to be 'imprinted' socially on human beings. However, observations of previous released pups have suggested that human contact during rehabilitation appears not to cause harbour seal pups to approach people after release (Picken, 1978; Reijnders *et al.* (1991). Although Morgan *et al.* (1993) suggested that the deaths of two released pups as a result of interactions with fisheries might have been due to their habituation to humans, this might equally have been a result of their habituation to dead fish. Only one of the ten pups in the present study showed any inclination to approach humans after release, and even in this single case (Tara – pup 10), this did not operate to her detriment (Wilson, 1999).

Since this fast-track procedure has so far been tried only with a limited number of harbor seal pups from one population, it would be premature to recommend it as a

universal procedure without more extensive trials. We would therefore suggest that larger seal sanctuaries might try this ‘fast-track’ method with one group of pups taken in at estimated ages 0–6 weeks while treating another group according to their existing procedure. The results from post-release monitoring of both groups of pups could then be compared. It is also suggested that ‘fast-track’ trials might be extended to rehabilitating pups of grey seals (*Halichoerus grypus*) and other phocid species, making appropriate allowances for species differences in nutritional needs and developmental timetable for pups. The key points of the ‘fast-track’ procedure are summarised as follows:

1. Feed pups, by nursing bottle or stomach tube, on a liquid ‘milk’ consisting of a high fat milk formulation together with salmon oil. Add digestive enzymes rich in lipase and protease is considered (these are considered essential for rapid weight gain). Do not feed solid fish pieces or whole dead fish at all. Weigh pups daily to ensure steady growth averaging about 1 kg every 2–4 d.
2. Keep healthy pups (including newborns) together in pairs (or small groups), unless there is veterinary contra-indication. Give them access to a small pool or bath at all times, but monitor pups at first to ensure they can get out unaided. Allow pups of nursing age to contact and suckle the human carer if they are so inclined.
3. Release pups close to a seal colony at approximately 20+ kg, as close to the natural time of weaning in the wild as possible. This should be a maximum of about six weeks for pups admitted as neonates and a shorter time for pups admitted at the post-weaning stage. Mark pups for individual visual

identification and monitor after released using either VHF telemetry or newer technologies.

Husbandry of harbor seal pups while in sanctuary facilities may also cause the pups to experience a range of stimulus and response patterns which differ in important ways from those experienced by free-ranging harbor seal pups. Pups are usually kept singly in dry pens for the first weeks while they are initially tube-fed a liquid formula and before being force-fed on dead fish, usually mackerel or herring. By contrast, the wild harbor seal pup for the first three to four weeks of life is in almost continuous contact with its mother while at the same time being surrounded by the haul-out group of other seals. It spends much time in the water, swimming alongside its mother for several hours on each tidal cycle (Wilson, 1974; 1978; Renouf, 1984). During the nursing period it does not usually eat solid fish (Muelbert and Bowen, 1993).

Once pups in sanctuaries are voluntarily swallowing hand-fed fish, they are then given some access to water in individual pens and trained to self-feed on dead fish. Where the pup is reluctant, it may be starved until it accepts dead fish (Grindrod, 1996). By contrast, the harbor seal mother does not bring dead fish prey to her pup. The pup does not begin to forage until weaning at 3–4 weeks of age (Muelbert and Bowen, 1993), and then pups normally learn to forage within the first two weeks after weaning. They feed on live small prey such as shrimps and very small fish (Sergeant, 1951; Golitsev, 1972; Wilson *et al.*, 2002). During this period, which lasts until about 6–8 weeks in the wild, they also swim and dive around the haul-out site, haul-out in

the social group, associate with other pups and follow adults and juveniles (Corpe and Wilson, 1996; Wilson, 1996; Bekkby and Bjørge, 2001).

Once the pup in rehabilitation is self-feeding on dead fish (usually at around two months of age), it is usually introduced into a larger pool where it has the opportunity to associate with its peers. Fish are thrown into the pool and pups ‘compete’ with each other for food, which is considered ‘a valuable life skill’ (Grindrod, 1996). Free-ranging pups at this stage begin to travel from the nursery haul-out site to foraging areas, probably following other seals (Corpe and Wilson, 1996; Wilson, 1996; Bekkby and Bjørge, 2001; Bjørge, Bekkby and Bryant, 2002). In contrast to seals in sanctuaries, wild harbour seals do not normally scavenge dead fish and they most often forage at or close to the sea bed at depths of 10–100m (Bjørge *et al.*, 1995; Tollit *et al.*, 1998); there is no indication from field studies that they forage competitively. The sanctuary experiences in this regard can therefore not prepare the pups for the wild. This point was illustrated by one study (Morgan *et al.*, 1993) in which 16 pups ready for release were presented in individual trials with live juvenile fish — but only two out of 16 pups killed and ate a fish during a 10-minute trial. There is also a concern that pups accustomed to feeding on dead fish may after release attempt to scavenge from fishing nets, fresh bait in lobster creels or discards from fishing boats, and thus be at risk from adverse interaction with fisheries (e.g. Glain, 1998; Morgan *et al.*, 1993).

Because so many harbor and grey seal pups annually are now rehabilitated and released into the wild, Rehabilitation activities and procedures may have a significant impact on local population structure with implications for local conservation issues

and seal-fisheries interactions as well as for welfare of individual seals (e.g. Glain, 1998).

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Figure 1. Growth of pups in the trial programme from their admittance to release.



