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# Overview of Harbor Seals, Their Behavior, and Previous Rehabilitation Attempts:

## An Introduction to Seven Case Studies of Harbor Seal Pup Rehabilitation and Tracking after Release

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The seven case studies of post-release rehabilitated harbor seal pups, carried out in County Down, Northern Ireland, presented here were undertaken to compare the pups' progress and behavior with that of wild pups weaned naturally in the same population. The studies arose out of a concern that if harbor or grey seal pups are retained in their rehabilitation facility for three or more months, as is typically the case, their chances of survival and normal behavior may be reduced because they are unable, in the captive environment, to go through the normal stages of development and learning experienced by wild pups of this age. The following catalogue of behaviors and developmental patterns of wild harbor seal pups has particular relevance to the rehabilitation of newborn or preweaning stranded harbor seal pups and provides important background for understanding the studies.

### Preweaning

The lactation period usually lasts three to four weeks (Wilson 1974; Muelbert and Bowen 1993). Pups weigh about 11 kg at birth and are weaned at an average of 25 kg on Sable Island, Canada (Muelbert and Bowen 1993). The mother's milk contains 45% fat, 9% protein, 0.2% lactose and 45% water (Harrison 1960, cited by King 1983). The daily weight gain may be as much as 0.6 kg/d (Bonner 1989). The mother appears to wean her pup by abandoning it at the haul-out site (Wilson 1974; Wilson and Corpe 1996).

Throughout the lactation period, pups swim and dive with their mother in the shallow waters surrounding their natal site and haul-out with her in the company of other seals (Wilson 1974; Wilson and Kleiman 1974). During this period they therefore become locally

orientated, experience seal responses to tidal and diurnal rhythms, and participate in the social haul-out.

Pups apparently do not accompany their mothers on feeding dives. They are either (from about two weeks of age) left by the mother at the haul-out site and later reclaimed by her or they are taken with her, but left sleeping on the surface while she makes repeated dives (Wilson 1974; Wilson and Corpe 1996). So far as is known, the mother does not teach her pup to catch prey; the pup does not at this stage have the opportunity to watch its mother do so, and the mother does not give her pup any fish she has caught. Muelbert and Bowen (1993) found from stomach lavage that milk and solid food were never found together in the stomach and concluded that weaning is abrupt in the harbor seal. At weaning, therefore, the pup has probably experienced neither fishing nor eating of fish, and has had only its mother's milk.

During the lactation period pups socialize almost exclusively with their mother. Immediately after birth, mother and pup nose each other intensively in the nose, head, and neck region and continue to do so less intensively throughout the lactation period while swimming around the haul-out site and playing with each other. Pups do not socialize with one another until close to the time of weaning (Wilson 1974; Wilson 1978; Wilson and Kleiman 1974).

### Postweaning

After weaning, pups begin to follow both one another and other seals, often to the haul-out rock where they cluster together (Wilson 1978; Wilson and Corpe 1995). In Maine, U.S.A., pups were observed to return in small groups to the haul-out rocks from the

sea and engage in synchronous diving in a manner that suggested foraging (Wilson 1978).

A study in northeastern Ireland of five pups radio-tagged at three to four weeks of age at their natal haul-out site indicated that during the next three weeks the pups dived in the area immediately surrounding that haul-out site and less than 2 km offshore. Over the following weeks they dispersed to individual foraging areas along the coastline adjacent to the haul-out site, extending up to 40 km along the coast in either direction and up to about 10 km out to sea. Each pup remained in the vicinity of their selected foraging area for several weeks at a time. Because they were only rarely located at that or other haul-out sites during that period, they were presumed to sleep at sea (Wilson and Corpe 1996). Only one of the five pups in this study was thought to have eventually dispersed from the study area at about 10 weeks of age. This finding is consistent with an Orkney study, in which the majority (80%) of 29 nursing pups fitted with plastic numbered tags were found within 50 km of their nursing site, while only six dispersed more than 100 km away.

Pups may begin to feed as soon as three days after weaning. On Sable Island, 10% fed within three to five days of weaning, 70% were feeding after 14 days, and the remaining slowest pups were feeding by 23 days (Muelbert and Bowen 1993). Prey items from pups at this stage are very tiny. Pups aged one to three months on the East England and Dutch coasts have fed largely on shrimps (Sergeant 1951). Gol'tsev (1972) reported finding small crustacea such as amphipods and decapods, and small fish, such as sand eels, from pups of five to eight weeks of age, while the initial postweaning diet of pups from

Sable Island consisted of very small prey, such as 6–7 cm sand eels and hake, as well as shrimp (Muelbert and Bowen 1993). Two pups aged about six weeks from County Down (including pup 9 of the present studies) were found to have been eating tiny gadoid fish of about 7 cm in length.

Pups aged four to six months in Northern Ireland were found (from fecal analysis) to be eating mainly gadoid fish and flatfish up to 30 cm long, i.e., of the same size as taken by adult seals from the same haul-out site (Wilson and Corpe 1996).

A study of diving behavior in pups aged two to four months found that dive duration was positively correlated with weight and length, but that although pups are so much smaller than adults (a quarter or less body weight), within one month of weaning they were able to exploit food resources in the same areas as adults (Corpe et al. 1995). These authors found that the median dive time for wild pups of 30 kg body weight diving in waters up to 30 m depth was about 105 s (cited by Wilson and Corpe 1996).

During the postweaning fast, harbor seal pups on Sable Island lost about 5.2 kg (about 21% of their weaning body weight) over the first five weeks of the postweaning period, even though they were beginning to feed. Their total body fat was about 33% at weaning, but only about 12% at 40 days postweaning (Muelbert and Bowen 1993). These authors emphasize that the postweaning delay in feeding is due to feeding techniques having to be learned during this period.

From this catalogue of wild pup physical and behavioral development, the problems facing pups released after three to four months or more in an aquarium are readily apparent. They will have missed the opportunity during the first three weeks after weaning (i.e., up to six weeks of age) of exploring their postweaning area; learning about haul-out and tidal rhythms; learning to catch very small prey, probably in the littoral and sublittoral shallow water; and integrating socially with other pups and older seals in the haul-out.

Over the next few weeks they will have missed the opportunity to disperse locally, establish individualized (or possibly group) foraging areas offshore, and learn to dive to 30–40 m for selecting and catching suitable larger prey. It is important to emphasize that wild pups undergo this critical developmental stage between three weeks and three months of age. The harbor seal pupping season—in Northern Ireland and at least some other regions—is generally well synchronized, with most pups being born over a two- to three-week period (Wilson 1974, 1978; unpublished data), so most of the pups of the year in such a population will go through the stages of postweaning development at more or less the same time.

By the time rehabilitated pups are generally released, at three to four months of age or more, the wild pups are geographically orientated, are socially integrated, have learned to feed via several stages, and—at least in the County Down population—have established offshore foraging areas. The older seals in the British Isles populations have completed their postbreeding season molt by late September and the County Down seals are less in evidence at inshore haul-outs. There will therefore be few “guides” for the rehabilitated pups to follow and imitate. The rehabilitated pups will be not only “uneducated” and disorientated, but their diving potential may be impeded by positive buoyancy due to excess body fat and inadequate muscle development. They may also have to unlearn the behavior patterns associated with seeking and feeding on already dead fish, as learned during the months of rehabilitation.

Observations and discussion of rehabilitation procedures at various facilities in Britain, Ireland, and the Netherlands suggest to this author that rehabilitated pups are usually retained for three to four-plus months before release due to:

- the difficulty of developing an artificial feeding formula that simulates the high-fat content of seal milk and allows pups to grow sufficiently fast to be released close to the natural weaning period;

- misapprehension by many rehabilitation establishments concerning the natural parameters and timetable of pup development; and
- commercial considerations (e.g., it may be “desirable” to retain pups in aquaria for public viewing).

The following case studies (and repetition of such studies in the future) begin to tackle the following questions:

1. What are the postrelease behavior patterns and survival records of pups retained in rehabilitation centers for three or more months? How does their behavior differ from that of wild pups from the same population?
2. Can a high-fat liquid formula, which can be digested by pups and fed exclusively until their release, be developed so that the pup growth rate in rehabilitation may approximate that in the wild?
3. Can a rehabilitated pup, stranded at the nursing stage (usually less than one week of age) and released at about one month of age, survive?
4. Can a rehabilitated pup, stranded sick or starving in the immediate postweaning stage (generally three to six weeks) and released as quickly as possible after medical treatment is complete and given only a minimal nutritional boost, survive?

The seven case studies reported here were intended to address these questions, which will be discussed in the Postscript that follows the case study reports.

*Note: References for this Introduction are given following the Postscript, on page 25.*

#### ABBREVIATIONS USED IN THESE STUDIES

s	seconds
min	minute
hr	hour
d	day
kg	kilogram
m	meter
km	kilometer
n	number
ml	milliliter