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LACTATION AND BIOENERGETIC STRATEGIES FOR RAPID GROWTH

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Accelerated growth is a common attribute to the pinnipedia and cetacea, being most pronounced in the phocid and mysticete groups. Rapid postnatal development appears to be associated with accelerated in utero development. Of all mammals, phocids exhibit the most rapid postnatal development ranging from a lactation interval of just 4 days in the hooded seal to 4-5 weeks in Monk and Weddell seals. In contrast, otariids exhibit a birth to weaning interval of 4 months in the antarctic and northern fur seals and to 2 to 3 years in the Galapagos fur seal. Short lactation periods occur in the mysticetes (7 months in the grey whale). In odontocetes it is protracted, an extreme example is the observation of milk in the stomach of a 17 year old pilot whale calf(?)! The rapid growth of phocids and mysticetes is even more incredible when we consider that many females fast while lactating. Extensive behavioural and energetic information is available for comparisons within the pinnipedia. For example, otariid pup growth rates normalized for body mass scaling (adult female body mass)<sup>-0.75</sup> are less variable between species ranging from 2.6 g day<sup>-1</sup> kg<sup>-0.75</sup> in the New Zealand fur seal, to 6 g day<sup>-1</sup> kg<sup>-0.75</sup> in the antarctic fur seal. This is in marked contrast to the phocids which range from 20 g day<sup>-1</sup> kg<sup>-0.75</sup> for the monk seal to 145 g day<sup>-1</sup> kg<sup>-0.75</sup> in the hooded seal. However, even though the overall growth rates of phocids are greater, their total energetic investment is less than that measured in otariids. Grey seals, invest 29 MJ kg<sup>-0.75</sup> over a 18 day lactation interval, while northern elephant seals invest 28 MJ kg<sup>-0.75</sup> over a 27 day lactation interval. These values differ markedly from a total milk energy investment of between 36 to 50 MJ kg<sup>-0.75</sup> in northern fur seals. Surprisingly, the total lactation interval in this fur seal is 4 months, but the total time spent with the pup onshore is on the order of 21 to 28 days a value similar to some phocids. This greater energy investment may be possible due to intermittent feeding during lactation. The rapid growth and energy transfer rates seen in all species are made possible by the high fat content of marine mammal milk. Further, the increased variability and exceptionally short lactation demonstrates the extreme selection for rapid growth in pagophilic species. This analysis has been funded by NSF grant DPP #8311799 and NOAA grant NA80AA-D-00120.