Development And Application Of A Mass Estimation Method: Weddell Seals As A Case Study[tws]

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In contrast to terrestrial systems where abundance of food resources of large predators is generally easily monitored, food resources of large marine predators are difficult to monitor. As a surrogate measure of marine predator food availability, researchers have used both direct and estimated measurements of body morphometrics and mass. However, subsequent uses of estimated mass measurements have failed to explicitly incorporate error variance around estimated values. Using the Weddell seal (*Leptonychotes weddellii*) population in Erebus Bay, Antarctica, we present development of a mass estimation method and techniques that incorporate prediction error variance around mass estimates. The equipment and procedures were developed for estimating mass of Weddell seals by taking morphometric measurements from digital photographs. Mass measurements were collected following initial photographic sampling so that regression models correlating known mass with photogrammetric measurements could be built. To select the model with the narrowest prediction intervals, we used predicted sum of squares (PRESS) as the model selection criteria. Resulting regression models predict mass of adult female seals to within ±13.8 percent of estimated mass, and ± 25.9 percent of estimated mass for pups. Differences in mass transfer between 7 experienced and 3 inexperienced maternal females and their pups were successfully tested using explicit incorporation of prediction error variance around mass estimates. We suggest that future use of mass estimations should include prediction error variance and that these techniques be used to explore links between variation in population parameters of the McMurdo Sound Weddell seal population and environmental variation.