DETERMINING YOUR PASSAGE PEREGRINE'S 'SIZE'

FROM MIGRATION DATA

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Falconers want their birds to enthusiastically pursue wild quarry with the strength and stamina of a wild bird, while still remaining responsive to the falconer. In earlier times assessing the condition of a bird was accomplished by paying close attention to its behavior, feeling the keel, or palpating fat deposits. Although modern falconers still utilize these subjective methods, the use of accurate scales to determine a bird's weight is now the most common method of assessment. We ask other falconers what weight their bird flies at. The assumption is that at some particular 'flying weight' their bird is in 'optimum condition'. This is a big assumption.

The worst, and sometimes fatal mistake falconers can make is lowering their bird's weight below a critical level. Dr. Pat Redig found that the majority of falconry birds killed at 'flying weight' showed a complete depletion of fat stores despite falconers' claims that "they were flying their bird fat". Given the recent increase in the use of passage peregrines, we thought it would be useful to be able to compare the weight of a passage falconry bird to a wild falcon of the same 'size'.

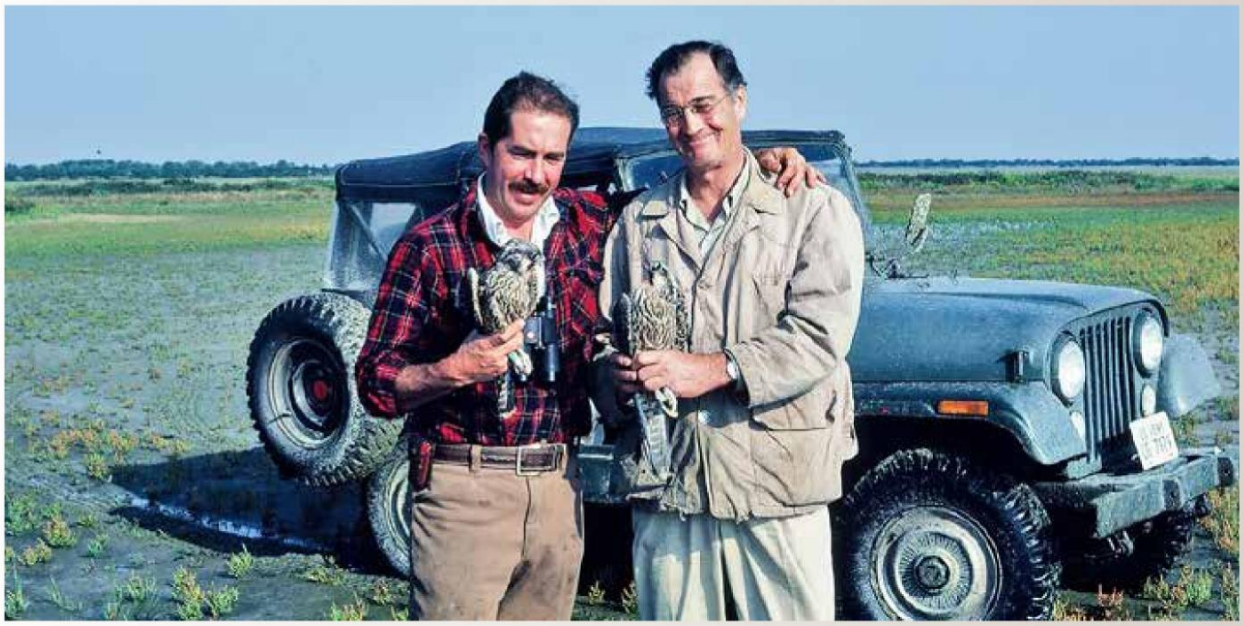
Many structures of a bird's body are relatively static and do not change much as a bird's weight changes. The nervous, digestive, respiratory, skeletal and integumentary systems account for 60% or more of a bird's weight but do not respond significantly to moderate weight reduction. The main body components that fluctuate with weight are first fat deposits and then muscle. Since the pectoral flight muscles form the largest muscle mass of the falcon's body, a reduction in weight that goes beyond the loss of fat tissue will begin to affect the ability of your bird to fly with strength.

Most falconry texts suggest that a weight reduction of around 10% is necessary to bring a passage falcon down to a weight where it will respond to 'training'. The problem in using weight as the sole criterion for condition is that weight alone does not distinguish between fat and muscle or of the presence or absence of food in the digestive tract. It also does not recognize that birds differ in absolute physical size. Two men of the same height and weight may differ greatly in terms of condition. One may be fat and flabby, the other well-muscled with little body fat. We're talking here of the 6 foot, 250 pound couch potato versus the similarly dimensioned NFL linebacker. With falconry birds, the former may be lethargic and unresponsive to the falconer, show lack of interest in quarry and have little strength or stamina, while the latter is performing wonderfully. Both at the ***same weight***.

For many wild raptors there are measurements for large numbers of individuals captured by raptor banders at points of concentration during migration. Weight and wing chord (WC), the distance from the carpal joint (wrist) to the end of the longest primary in the unflattened wing, are the two most common measurements. The weights of individual birds are subject to wide variation due to the presence or absence of crop/gut contents, differences in body condition, season of the year, etc. In contrast, a body measurement such as WC is essentially fixed and reflects the 'physical size' of the bird. Because WC is a linear measure while size is volumetric, size is generally assumed to be proportional to the cube of WC (WC3). WC is generally recognized as the best single measure of size and has the advantage of being easily measured on a hooded, perched bird. A straight dowel or rod with a stop attached to one end (which is placed on the wrist joint) or a set of inexpensive woodworking calipers (available at Lee Valley Tools) can be used. This measurement can be easily repeated to ensure accuracy to around 1-2 millimeters.

Using the measurements of the large sample of peregrines trapped along the East Coast at Cape May and Assateague, and along the Gulf Coast on Padre Island (Tables 1 & 2), we analyzed the relationship between weights and 'body size' as reflected by WC measurements of immature peregrines. A few outliers (less than 1%) were omitted from the analysis as being possible errors either in measurement or recording. The plot of weight versus WC3 shows an extremely high variability of weight for a given WC measurement (Figure 1). Each sex appears as a cluster with only a weak relationship between weight and WC3. However, if we assume males and females are proportioned similarly within a species and age class and analyze them together, a much stronger relationship emerges.

Scott Ward, who was a key player in establishing the trapping/banding effort on Assateague and Padre Island, and Jim Rice, one of the original falconers that trapped on Assateague, with two nice beach birds on October 4, 1979



Using both WC and WC3, we analyzed simple linear regressions, exponential, polynomial and power formulas looking for the best fit with the data and a calculation that could be easily used by falconers. Although most formulas made similar predictions of body weight based on WC, not all were easy to calculate. An example is the exponential formula: WEIGHT = 48.8 times e (the natural logarithm base) raised to the power of 7.82, times 10 to the minus 5 power). We decided that not many falconers would use this information. Two previous attempts at developing a model to predict expected flying weights of falconry birds (Evans, Hawk Chalk 1982 and Huff, Hawk Chalkww 1991) used the relationship between wing-loading and expected weight. Unfortunately it required using a rather cumbersome formula and table, and since wing-loading was calculated from WC measurements, in the end it was still about using WC as the measure of body size.

The formula that was simplest to use, but still had excellent predictive power, was a simple linear regression calculated using the means of weight and WC3 for the two sexes. All that is required is a measurement of WC (in millimeters) and a hand calculator to cube it (multiplied by itself 2 times). The formula for East Coast immature peregrines is: WEIGHT = 1.7 X WC3 times 10 to the minus 5 plus 26. To calculate WEIGHT, move the decimal point of WC3 to the left five places, multiply by 1.7, and add 26. This gives the average weight (in grams) of a wild-trapped, immature, East Coast peregrine for a given WC. The corresponding formula for Padre Island is: WEIGHT= 2.29 X WC3 times 10 to the minus 5 minus 131. The discrepancy in the two formulas is because the average weight of Padre Island birds is significantly higher than from the East Coast while the average wing chord is similar.

The heavier average weight of the Padre Island birds for a given WC has a number of possible explanations. One is the possible higher condition of these birds and/or the amount of food material in their digestive tract. Along the East Coast there has been extensive development of the shoreline and increased public use with a corresponding loss of prime foraging habitat. This, along with large numbers of bald eagles are suspected factors in declining numbers of peregrines seen at Assateague and may have significantly decreased opportunities for falcons to feed. We know numbers of East Coast migrants have not decreased because of the high numbers recorded in the Florida Keys. Migrants may detour inland or offshore, while those determined to follow the coast may pay the price of fewer places to rest and successfully forage. This could result in lower body weights of these falcons. Conversely, the conditions along the Gulf Coast may provide a better opportunity to 'fuel up'.

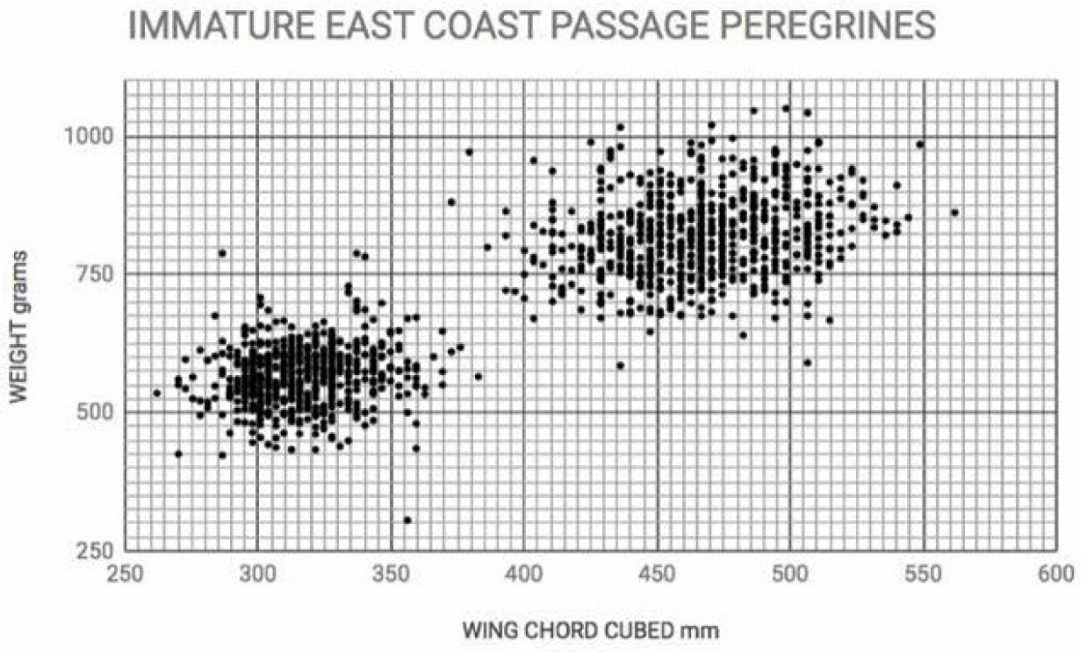


Table 1

MEASUREMENTS OF EAST COAST IMMATURE PEREGRINES

SEX	NUMBER	MEAN WC (mm)	WC RANGE (mm)	MEAN WEIGHT	WEIGHT RANGE
FEMALE	731	360.4	340-388	823.1	585-1051
MALE	570	316.8	297-337	567.3	415-795

Table 2

MEASUREMENTS OF PADRE ISLAND IMMATURE PEREGRINES

SEX	NUMBER	MEAN WC (mm)	WC RANGE (mm)	MEAN WEIGHT	WEIGHT RANGE
FEMALE	458	358.4	338-381	921.4	640-1300
MALE	95	315.7	293-334	588.5	450-740

A second possibility is a real morphological difference in the two populations. Based both on coloration and banding data, East Coast migrants have a greater proportion of typical *tundrius* birds compared to the Gulf Coast. Clayton White, in his 1968 paper defining the *tundrius* subspecies, suggested that because of their long-distance migration, *tundrius* birds may have slightly longer primaries compared to *anatums*. This would mean a lower average body weight for a given WC measurement, other factors being constant. The subspecific makeup of both populations has been complicated by the reintroduction effort and recent data showing Gulf Coast migrants originating from within the range of Peale's falcons.

If your new passage peregrine's weight is well above the average wild weight for its size (predicted by the equations), it probably has fat deposits, food in the gut, or both. If it is still above average after emptying the gut, it indicates that it is probably in very good condition and may require a reduction in weight before being amenable to 'training'. If it is well below the average wild weight for its size, it may have little or no fat reserve. Falling near the lower limit of the average wild weight indicates a bird that is approaching starvation level and has probably begun to metabolize its muscle mass. Reducing such a bird further in weight may be courting disaster. Keep in mind that no peregrines in this population are the equivalent of couch potatoes. Many have already made a migration of many thousands of miles.

Please remember that there will still be individual differences and these calculations can only be a guide. They will be most accurate in the mid-range of WC measurements. Also note that weights of adults are higher, suggesting that 'flying weights' of intermewed birds should generally be higher than they were in the bird's first year.

We thank the Cape May Raptor Banding Project, Inc. and Earthspan in partnership with The Peregrine Fund for providing the data on weights and WC. We also offer our sincere thanks and appreciation for the assistance of the many trappers, other individuals, and entities who have made long-standing migration monitoring of peregrines possible on Assateague and Padre.