

CHARACTERS DIFFERENTIATING CERTAIN SPECIES OF STERCORARIUS

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Though it is often more or less difficult to separate races of the same species, it is generally rather easy to distinguish birds that differ specifically. One of the exceptions to this rule appears to be furnished by the Parasitic and Long-tailed jaegers. That these two birds are specifically distinct there can be little question. Insofar as the writers are aware, there have been no recorded instances of either intergradation or hybridization between them. However, a careful study of available material has shown that none of the characters hitherto stated to differentiate between these two birds is one hundred per cent diagnostic. Adult birds in breeding plumage are easily distinguished, though even in some of these, features attributed to them in various keys are not constant. Fall and winter adults and sub-adults and, particularly, juvenals and second year birds are much more difficult to segregate. In studying material of the latter class, it is found that keys generally used are not easy to follow, for the reason that they are properly applicable only to adult birds. Therefore it is very probable that many collections contain juvenile specimens that are wrongly identified.

The principal characters that have been used in separating *Stercorarius parasiticus* and *S. longicaudus* are size, length and width of central tail feathers, comparative length of supra-nasal saddle and unguis, width of bill, color of tarsi, and color of shafts of outer primaries. In adult and sub-adult specimens examined by the writers (twenty-two in number) only one of these characters, the color of the tarsi, holds throughout the series. The length of the central tail feathers proves diagnostic in all summer adults except one, a male *parasiticus* (L. B. Bishop coll., no. 43814), which has central tail feathers 239 millimeters long, just within the range of *longicaudus* as given by Ridgway in his Birds of North and Middle America. The length of these feathers is of little value in separating winter adults or immature birds. Their width also varies considerably with degree of molt and wear.

Most specimens of *parasiticus* with unmolted primaries show white shafts on the three outer ones, the majority of *longicaudus* having shafts of this color on only two. However, two young specimens of *parasiticus* in Dr. Bishop's collection, both possessing black tarsi, display white shafts on only two primaries, and in two adult *longicaudus* in the Los Angeles Museum collection the third primary shaft is almost as white as the two outer ones. The color of the tarsi, as before stated, appears to be truly a diagnostic character in adult and sub-adult birds, being black in *parasiticus* and blue in *longicaudus*, but, as one of us has pointed out (Willett, Pac. Coast Avif., no. 21, 1933, p. 72), this does not hold during juvenility. Another color character that is suggested in the two available juvenile specimens of *longicaudus* is the generally black and white effect of the under parts, particularly the flanks and lower tail coverts, the rusty tone of coloration present in comparable specimens of *parasiticus* being absent. Study of a sufficient series of specimens, however, may show this character to be valueless. The generally larger size of *parasiticus* is indisputable, but here again, there are exceptions which, if judged on size alone, as determined externally, might be assigned to either race with equal propriety.

Coming now to the bill measurements of the two species. The differentiating character most frequently used is the comparative length of the supra-nasal saddle, or cere, and the unguis. Ridgway (Birds of N. and Mid. Amer., 8, 1919, p. 687) and Stejneger (Bull. U. S. Nat. Mus., 29, 1885, p. 88) give slightly varying methods of computing this difference, the former measuring the unguis from the anterior tip

of the cere, and the latter from the anterior border of the nostrils. Neither of these writers states definitely whether these measurements are to be taken along the top of the culmen or along its side, and we find considerable difference between the two methods. Several specimens examined might be referable to one species if measurements are made on the top of the culmen and to the other if measured along the side. The latter method is apparently the more accurate, all available specimens of *longicaudus* showing unguis longer than cere, when measured in this manner. However, in one adult, two second year, and two juvenile birds in our series, all undoubtedly *parasiticus*, the unguis and cere are about equal in length; a fact that would seem to detract considerably from the diagnostic value of these measurements. Furthermore, at least two factors interfere to render accurate measurements difficult. These are the wear of the supra-nasal saddle, which is almost absent in some specimens, and the difficulty in detecting exactly the posterior border of the same, this being frequently more or less obscured by encroachment of the feathers. Even when great care is exercised, we find ourselves unable to obtain exactly the same results in repeated measuring of identical specimens. It is probable that no two students would agree on the measurements obtained from the same material.

Although the total length of the culmen is generally greater in *parasiticus* than in *longicaudus*, averaging, in our series, 30.3 millimeters for the former and 26 millimeters for the latter, there are five specimens of *parasiticus* with culmen as short as the longest of *longicaudus*, and four specimens of *longicaudus* with culmen as long as the shortest of *parasiticus*. While the width of bill, measured at the first upper feathering, is usually considerably less in *longicaudus*, extremes overlap. In our specimens this measurement averages 9.4 millimeters in *longicaudus* as compared with 11.8 millimeters in *parasiticus*, but twelve specimens of *parasiticus* possess bills as narrow as or narrower than the widest bill of *longicaudus*.

All of the foregoing being considered, the conclusion was reached that, up to the present time, no infallible method of separating these two jaegers, in all phases of their plumage, has been advanced. Therefore, having been unable to find any further external differences of value, an examination of osteological material was decided upon. This study has produced results that are here submitted for such consideration as they may merit.

Bones of twenty-three individual Jaegers have been examined. All except three of these are represented by skins in one of the following collections: Los Angeles Museum, California Museum of Vertebrate Zoology, Loye Miller, Kenneth Stager and George Willett. There are eight specimens of *parasiticus* which are in adult or second year plumage (with black tarsi) and three adult and one sub-adult *longicaudus*. The remaining eight specimens are juvenile or second year birds with blue tarsi, six of *parasiticus* and two of *longicaudus*. Since the majority of specimens belong with skins, the present observations have necessarily been largely confined to those elements which are not needed in the preparation of the skin; however, measurements were, of course, possible on all tarsi.

The conclusion resulting from the study of skeletal material is that though *longicaudus* is on the whole a smaller bird than *parasiticus*, this is not true of every bone in the body. The important distinction between the species lies, rather, in the difference in bodily proportions. The hind part of the body is proportionately larger in *longicaudus* than in *parasiticus*. The most marked expression of this difference is found in the ratio of the tarsus to the humerus or to the ulna-radius segment of the wing. The former ratio averages 53 per cent in *longicaudus* and 45 per cent in *parasiticus*, while the ratio of tarsus to ulna in the two species averages 49 and 42 per

cent respectively, and to radius, 52 and 44 per cent, a difference of seven or eight per cent, with no overlapping of extremes.

This difference is manifested not in the length of tarsus but in the length of the wing bones. Measurements of tarsi are practically the same for both species, ranging from 43 to 46 millimeters in *longicaudus* and from 42 to 47 millimeters in *parasiticus*. Measurements of the humerus, on the other hand, show a length in *longicaudus* of from 83 to 87 millimeters and in *parasiticus* of from 94 to 104 millimeters, a difference of seven millimeters between the largest *longicaudus* and the smallest *parasiticus*. This amount, by the way, is 2 millimeters more than is to be found between *parasiticus* and *pomarinus*.

A similar distinction in size is evident in the ulna and radius, the shortest *parasiticus* measuring 102 mm. for the ulna and 98 mm. for the radius, the longest *longicaudus* only 97 mm. and 94 mm. for the same bones. Though it is possible that a larger series of specimens would lessen the difference between the species in some degree, it is highly improbable that an overlapping of extremes would occur.

Examination of the sternum, where available, indicates that this element, also, is markedly shorter (though not necessarily narrower) in *longicaudus* than in *parasiticus*. However, with this element available from only a few of our specimens, we do not include its measurements here.

It is unfortunate for the ornithologist who is studying skins that the small skeletal structure of the wing is not reflected in the length of the wing as measured by the feathers. However, the humerus is easily procured in skinning a bird, and since this bone is unnecessary to the proper preparation of the skin, we found it the most satisfactory element to save for identification. In the case of already prepared museum specimens where identification is questionable, it is not a difficult procedure to moisten the wing and remove the ulna or radius. This has been done satisfactorily with several of our specimens, including adult *longicaudus*, in order to make possible the measurements here presented.

In view of the studies outlined here, we are convinced that any modern jaeger, regardless of age or sex, with a humerus of 88 millimeters, ulna 97 millimeters, radius 94 millimeters, or less, can safely be identified as *longicaudus*, while any specimen with a humerus of 94 millimeters, ulna 101 millimeters or radius 98 millimeters, or more (until the size of *pomarinus* is reached), may be identified as *parasiticus*. It is conceivable that birds may be encountered, the measurements of which would fall between the maximum for *longicaudus* and the minimum for *parasiticus* as revealed in our specimens. We believe, however, that in such instances, the size would closely approximate one species or the other, and that the ratio of tarsus to wing bones could be used as a final check.

A key to the measurements and ratios in the two species, as represented in our specimens, appears below.

	<i>S. longicaudus</i>			<i>S. parasiticus</i>		
	Min.	Av.	Max.	Min.	Av.	Max.
Length of humerus.....	83.0 mm.	85.4 mm.	87.6 mm.	94.3 mm.	100.4 mm.	104.6 mm.
Length of ulna.....	90.9	92.5	96.7	101.8	107.2	110.8
Length of radius.....	88.3	90.6	93.7	98.5	103.5	107.5
Ratio of tarsus to humerus.....	50.7%	52.7%	54.1%	43.6%	45.4%	48.0%
Ratio of tarsus to ulna.....	47.4%	48.8%	50.2%	41.0%	42.5%	43.6%
Ratio of tarsus to radius.....	50.6%	51.6%	52.7%	42.2%	44.0%	46.0%

Among the facts brought out by the above study, is the discovery that only two of the four specimens recorded by Willett (Pac. Coast Avif., no. 21, 1933, p. 71) as secured by him off San Pedro, are really referable to *longicaudus*. Of these two birds, both juvenals, one was taken July 29, 1933, and the other September 13 of the same year. The other two specimens, while displaying features hitherto generally believed to belong only to *longicaudus*, are referred to *parasiticus* on osteological characters.

Los Angeles Museum, April 16, 1934.