

Raptor Prey Remains: A Guide to Identifying What's Been Eaten by a Bird of Prey

Author: Schmitt, N. John

Source: Journal of Raptor Research, 56(3) : 376-379

Published By: Raptor Research Foundation

URL: <https://doi.org/10.3356/0892-1016-56.3.376>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

BOOK REVIEWS

J. Raptor Res. 56(3):376–379

© 2022 The Raptor Research Foundation, Inc.

Raptor Prey Remains: A Guide to Identifying What's Been Eaten by a Bird of Prey. By Ed Drewitt. 2020. 230 pp, 750+ photographs. Pelagic Publishing, UK. ISBN 9781784272074. Paperback, \$30.63, £24.99.

At a size of 216 mm × 140 mm and 230 pages, *Raptor Prey Remains: A Guide to Identifying What's Been Eaten by a Bird of Prey* by Ed Drewitt appears to have been designed to be taken into the field. The first eleven pages are devoted to: species index; introduction; several categories listed under the heading *Finding and identifying raptor prey remains*; a section titled *Parts of a bird* (bird topography); and a glossary. Two pages at the end of the guide are devoted to photo credits and a list of the common and scientific names of species mentioned in the text. The bulk of the guide is devoted to 210 pages of color photographs of mostly European avian prey remains, with a few featuring mammalian prey remains.

It seems appropriate that I provide some background of my qualifications to review this book. To date, I have analyzed prey remains from the nests of several species of raptors—primarily Peregrine Falcons (*Falco peregrinus*) since 1977. Like the author of this book, I began developing my skills in childhood. As a boy I was obsessed with wildlife, especially birds, and I was keenly interested in the exquisite geometry and organization, or pterylosis (e.g., the arrangement of feathers on a bird) of a bird's plumage, especially that of the wings and tail. Whenever the opportunity presented itself, I would take home birds I found dead to study and draw them. I was particularly interested in the wings and tails, which I would also prepare, dry, and save. I obsessively collected feathers, and consequently learned not only where and when to seek them, but also the places predators sought to consume their victims. Molted feathers of the Ring-necked Pheasant (*Phasianus colchicus*) were especially prized, and the male pheasant's contribution to my knowledge of feather form and function cannot be overstated. For me, the male Ring-necked Pheasant was, in effect, a sort of “Rosetta stone”; because the male ring-neck's spectacular plumage is color-coded for each region of its body, I would almost instantly know from which region of the pheasant's body a particular feather came. As a teenager, I taught myself the art of taxidermy, which further contributed to my growing understanding of pterylosis and bird anatomy. I have been an avid and active birdwatcher/naturalist throughout my life, and the skill of identifying a bird from its molted

feathers, or from its remains left behind by a predator, has always been an integral and enjoyable part of those activities. Later, as a biologist participating in the Peregrine Falcon and California Condor (*Gymnogyps californianus*) recovery programs, my skills were put to practical use and, in their way, added to the body of knowledge of peregrine biology, and marked the beginning of well over four decades of analyzing prey remains from the nests of several species of raptors.

Several categories are listed under the section title *Finding and identifying raptor prey remains*, under which is the single subheading titled *Where to begin*. Drewitt summarizes that prey remains may be encountered in a wide variety of situations, and recommends collecting and/or photographing as much material as possible for later identification. The content of this heading would have been more thorough had the author included the critical concept that locality, site characteristics, and season are important clues to the identity of the prey species, and when unknown, the predator.

Under the heading *Who's been at work? A mammal or bird predator?* there are two subheadings, the first of which is *Signs of a raptor kill*. Drewitt describes the feathers of prey left behind by a raptor as being largely undamaged, but with the larger feathers often having subtle damage distinctive of a raptor, and smaller body feathers of a bird, or the fur of a mammal often occurring as clumps variably scattered about. Although this ecological information is important, based on my career of identifying prey remains for raptor researchers, I believe the heading and content would have been more helpful to lay people and early career raptor researchers were it added that accipiters and buteos often excrete near the prey remains, often in the form of a long bright white streak. In my experience, these raptors often wish to eat immediately after killing prey, if they are not transporting prey to the nest site or mate. Whereas some buteo species consume their prey in the open, accipiters typically seek secluded sites within cover, favoring a stump, horizontal bough (where prey remains may be found caught on the bark, surrounding branches, foliage, etc.), or simply a hidden location on the ground, to pluck and consume their prey.

In contrast to the accipiters, some buteos and falcons often seek sites in the open (e.g., a solitary large boulder, cliff, snag, hummock, or spot on the ground), where they can consume their prey. In addition, these raptors are far more prone to stripping most of the meat cleanly from the bones of bird and mammal prey (mammals bite off chunks of meat and bone which they swallow whole), leaving limbs articulated and sometimes still connected to the sternum unit or pelvic girdle as well (examples of this in the photo

section). Further, falcons often bite out wedge-shaped bits from the margin of the sternum's keel (carina) of medium to large avian prey, producing the ragged, saw-toothed appearance diagnostic of a falcon kill.

Drewitt provides a brief description of the condition of the prey remains and how it may be diagnostic of a mammal kill. The most important indicator of a mammalian predator is the combination of darkened and matted condition of the feathers or fur, caused by the dried saliva, and the neatly sheared appearance of the calamus and rachis (shaft) of the remiges, rectrices, associated coverts, and even the bones, caused by the carnassial (molars modified for shearing) teeth.

Drewitt recommends that sites regularly used by raptors should be visited to collect prey remains, not only to identify the material, but also to remove it so that the remains found on subsequent visits will likely be new. Further, it is recommended that researchers visit sites as frequently as possible, as smaller material may be blown away or damaged by the elements; raptor researchers have long been aware of bias involved with different methods of prey remains analysis (see Simmons et al. 1991, Lewis et al. 2004, Tomberg and Reif 2007). In my opinion, the content would have been more thorough had the author noted there is an urgency to visit often to collect material, because there are many species of insects that consume and damage feathers. Further, many birds and some rodents often collect feather material for their nests, and avian and mammalian scavengers routinely visit those same sites to scavenge remains, especially in the vicinity of active raptor nests.

Under the subheading *Pellets*, the author notes that the contents of pellets from raptors that swallow most of their prey whole are useful for researching what those raptors ate, but emphasizes that the principal purpose of this guide is the identification of cached or discarded prey remains. Drewitt also cites good references for pellet analysis.

In the section titled *Collecting safely*, Drewitt presents a number of tips for collecting and managing prey remains. Some tips include firm recommendations: using gloves and thoroughly washing one's hands after handling prey remains; drying feathers, wings, tails, and bones and sealing them in labeled plastic bags; and keeping detailed records. It would have been helpful to this section if it were pointed out that bloody, wet, and maggot-ridden specimens should be sealed in plastic bags and frozen for a few days, to kill the maggots, before preparation and drying of the specimens. Ideally, the specimens should be frozen twice, with the goal of the first freezing to kill maggots, followed by thawing for a few days, followed in turn by a second freezing to kill maggots hatching from eggs that survived the first freezing.

The section titled *Legalities of prey remains* is extremely important for anyone (layperson, student, researcher, teacher, and museum curator) who may collect and use raptor prey remains. Drewitt offers wise advice about informing oneself about all the laws pertaining to the possession of the remains of birds and mammals (and

insects, in localities where rare insect species are protected). It is incumbent on the collector and prey remains specialist, as well as the researcher, to take appropriate measures to comply with local and national rules and laws, and to obtain the necessary permission/permit/license to legally possess prey remains.

When analyzing prey remains, researchers often wish to know how many individuals of a species may be represented in a large sample of prey remains. Drewitt describes a protocol that he uses for prey remains analysis. This includes setting aside items like the head or parts of heads, counting legs, and collecting and isolating certain unique remiges and tertials, which aid in establishing the number of individuals of a species present. He also describes circumstances that might duplicate the numbers of individuals (leading to an incorrect species tally) and how to mitigate this possibility. This section could have been more thorough if (1) it elaborated on other unique feathers that occur on birds that are key in establishing the number of individuals of a species present in a sample (e.g., regardless of the number of rectrices a particular species may have, there are always four unique rectrices useful in establishing the number of individuals present in a sample: the left and right #1 rectrices (innermost pair) and the left and right outermost rectrices; (2) it included a tutorial on how to distinguish a left foot from a right, or a right femur from a left femur, etc.; and (3) it advised researchers to collect sternums and pelvic girdles for which there is a positive ID. This section reveals the necessity for this guide, and other prey remains identification guides that may follow, to include a comprehensive chapter on feather form and function.

The section on *Building up a reference collection and protecting it from insects* details basic measures for keeping records, curating, and storing one's reference collection. Along with the good advice provided under this heading, it would have been helpful to recommend utilizing good quality thick resealable plastic bags, as some insects (some larger dermestid beetles) are able to detect the scent of feathers and dried tissues through thin plastic, or minute holes, and will chew through and consume and/or damage the contents. In addition, a good reference collection would be greatly enhanced by creating measurement tables for key remiges, rectrices, and even limb bones, as measurement values between males, females, juveniles, and even races, often vary, in some cases significantly. Researchers keeping prey remains should make sure that the reference collection is legal.

Drewitt helps the reader by presenting a brief section of hints for determining the predator when prey remains are found without direct association to a known raptor species. *What clues do different raptors leave behind?* provides a general description of habitat types and the species of raptors that might be responsible for various prey remains. He includes a list of diurnal and nocturnal raptors, and a brief accounting of their hunting biology, habitat preferences, and places where one might expect to encounter their prey

remains. Several species are marked with asterisks to denote a species with certain legal considerations.

The author provides an account of his history in the section *My own story—learning my feathers and identifying peregrine prey*; he writes of his collecting and learning to identify the species of bird that a feather came from during his childhood, and how he has been identifying the prey remains from urban peregrines for over 20 years. He recounts the efforts required to identify a number of difficult feathers, including those that ultimately proved to be those of the declining and now scarce Corncrake (*Crex crex*), which he found in the city of Bath, Somerset, UK, and the ensuing difficulty in having the record accepted by the local county recorders team. As the reader will see, Drewitt's enthusiasm for collecting, identifying, and recording raptor prey remains continues to be undiminished.

The section *Parts of a bird* was a disappointment, and a weak treatment of bird topography and pterylosis. A critical step to identifying a prey species, whether from a single feather, or from a large sample of feathers, is to have an advanced understanding of feather form and function, as it relates to pterylosis. The accompanying four photographs are of uneven utility with minimal accompanying text. There is no discussion of feather form and function, nor feather anatomy and nomenclature, which could assist the reader in using the reference photographs that compose the bulk of the guide. The photographs are an odd assortment, of limited usefulness, for showing the pterylosis of the wings and tail. Two photographs feature only partial views of the wings; one of these features a view of the inner half of a passerine's right wing, with a small portion of the primary remiges and associated greater coverts visible. Most of the feather groups were labeled accurately, but the alulas and greater primary coverts are not, despite being well defined in the photo. The fourth (and most mystifying), photograph features a small section of the left underwing where it meets with the trunk. The only visible feathers are the axillaries and a small portion of the underwing coverts and adjacent secondary remiges, which are simply labeled "secondary feathers" and "underwing coverts," respectively. In so doing, the author seems to imply that the underwing coverts are inconsequential to the goal of this guide. Yet, the coverts that are visible are marked in such a way that the coverts ranks are well delineated, and had they been accurately labeled they would easily have conveyed to the reader that, like the upperwing coverts, the underwing coverts are equally as complex and organized. The author neglects to discuss this, rendering this photo of little value. In addition, the wing featured in this photo appears to be that of a Great Shearwater (*Ardenna gravis*) and could have been utilized as an example of a wing type that, unlike those of passerines, has a more complex pterylosis of the underwing. In my experience, and here I suggest strongly, the coverts of the underwing are very distinctive and easily identified, and that the color and/or markings of these feathers may contribute significantly to the identification of a prey species. To be able to recognize and categorize this

unique group of feathers is an important step in identifying some prey species.

In addition, there was no photo or text devoted expressly to the pterylosis of a bird's tail and associated coverts. This is puzzling, as being able to distinguish remiges from rectrices is fundamental to identifying a prey species. A bird's tail often holds more clues to the identity (species, sex, and age) of a prey species than do its wings. Tails often have unique shapes, colors, and patterns, and the undertail coverts of some species have colors and patterns that can clinch an identification. The only photo in this section that features a bird's tail is that of a juvenile Brown Pelican's (*Pelecanus occidentalis*) fully spread wing and tail, which shows many more rectrices and secondary remiges than a researcher will typically encounter in a set of prey remains. The author could have utilized this image to elaborate on how variable the number of rectrices and secondary remiges can be.

It seems logical that any book promoted as a guide for identifying the species of bird from which a feather, or mass of feathers came would have a comprehensive treatment of all aspects of feathers, especially pertaining to the asymmetry of the feathers of the wings, tail, and associated coverts on which this guide places considerable emphasis. In addition, a good comprehensive treatment would include making the reader aware of variability of feather structure, color, patterns, length, and shape due to sex, age, race, morph, season, and geographic origin. It could be a fundamental source of information for the reader, establishing a foundation that would be built upon with each encounter and subsequent exercise in identifying feathers. I certainly hope that any subsequent printings of this book, or any other treatment of raptor prey remains would sufficiently guide the reader with the full panoply of how remains may be identified in the field or in the laboratory.

The glossary is composed of 25 terms associated with bird or feather anatomy, or the types of patterns found on feathers. Each of the terms have accompanying definitions. Some definitions may be a bit confusing to the reader, while others are not comprehensive enough. An example may help explain my perception. Drewitt uses "tertiary feathers," which the definition states "are usually longer and wider than the secondaries they border." A detailed perspective might include that tertiary feathers are a set of remiges continuous with the secondary remiges, but differing in several ways, including (1) they tend to be more symmetrical in form, (2) they have a unique molt schedule, and (3) they often bear colors and patterns distinct from the adjacent secondary remiges. The length of this set of feathers, relative to the adjacent secondaries, varies depending on the family and species, but they are not "usually" longer than them. In general, the definitions accompanying the terms are adequate, but in future books that are crafted on raptor prey remains analysis, it will be helpful to the reader to be more comprehensive.

This book is designed and intended as an identification guide to raptor prey remains, primarily those of European

birds, with a few European mammals also represented. The photographic reference section composes the bulk of the guide, and has approximately 750 photographs of feathers and body parts of 96 species of birds, and a few mammals. The number of photos per species account varies, with an average of five to seven photos per account, but ranging from four to 12. The color and detail of the photo's subject matter is generally good to very good. However, the usefulness of many of the photographs was compromised by printing them small, apparently in order to squeeze many onto a page. This is especially true of photos featuring a confusing concentration of feathers mixed among grass and leaves, making it very difficult, if not impossible, to discern the details they were intended to illustrate. A surprising number of photos feature only portions of feathers or wings, rendering them of limited value as a reference resource.

A thoughtful and informative text to accompany each species account would have benefited this section significantly. For example, the Eurasian Jackdaw (*Corvus monedula*) account, starting on page 155, shows five small images on the first page and two larger images on the second page. The accompanying text does not inform the reader or provide basic analysis of the images. The text provided with this account does not address some unique details visible in the small image labeled "tail feathers" or in the large image on the second page labeled "carcass" that identify at least one prey bird as recently fledged. The image labeled "tail feathers" shows five rectrices in the same stage of incomplete growth, strongly indicating they were recovered from the same recently fledged bird. The rectrices had nearly completed growth at time of death, but rectrix #1 (one of the central pair) still shows remnants of sheathing at the point where both the medial and lateral vanes are still emerging from the sheath, producing a "pinched" appearance. The tips of the calamus of all five rectrices are dark, indicating that they contain pulp and the feathers were still growing.

All the photographs are dutifully labeled (e.g., "outer or inner tail feather," "primary feather," "tertiary feather," "wing covert," "tail feathers still growing"), almost invariably without an explanation for why they are labeled as such, thus underscoring either the guide's need for a comprehensive chapter on feather form and function, or a more comprehensive and expanded text to accompany each species account. I do not want to be too nitpicky; however I do believe, based on my experience, that every recovered carcass, wing, and tail feather can tell a nuanced story and provide ecological clues that may be important. In general, the text accompanying the photos is consistently brief and often inadequate, and as an interested reader, I have to wonder if this brevity was imposed upon the author by the publishers as a cost-saving measure.

This book is the first, to my knowledge, devoted specifically to the art and science of prey remains analysis.

I laud the fact that this book was created and published. Often, first attempts at anything may receive what seem to be overly critical comments. Although I have been detailed in the above review, I want to be clear that I do not intend to demean *Raptor Prey Remains*; Drewitt's treatment of prey remains analysis is a good first step, and helps illustrate the complexities involved in obtaining a robust identification of a prey item from a single or series of feathers.

From my perspective, having done prey remains analysis for numerous researchers, and illustrated many raptor-related identification guides and ecological treatments, *Raptor Prey Remains* in its present form would be most useful to a reader already possessed of advanced bird identification knowledge and a good working knowledge of bird anatomy, feather form and function, and pterylosis. Despite the issues with the reference photos elaborated on above, a well-seasoned field researcher or birder may well find that this guide contains images that help solve a feather, or prey remains mystery. The reader would be advised to invest considerable time in the field, learn the variety of plumage through museum collections, and even spend some otherwise idle hours browsing the rich source of bird images to be found on the internet! Knowledge of pterylosis, combined with a good working knowledge of the birds of the bioregion where the sample originated (see Scott and McFarland 2010), and the ability to quickly deduce the region of a bird's body from which a particular feather or group of feathers grew are indispensable skills necessary to identify a bird from feathers recovered from raptor prey remains, an aircraft collision, or wind and solar farm mortalities. Analyzing prey remains is a fascinating aspect of any diurnal or nocturnal bird of prey field study, and is a skill that can significantly benefit research and conservation of wild raptors and their prey throughout the globe.—N. John Schmitt, PO Box 9, Wofford Heights, CA, 93285 USA.

LITERATURE CITED

- Lewis, S. B., M. R. Fuller, and K. Titus (2004). A comparison of 3 methods for assessing raptor diet during the breeding season. *Wildlife Society Bulletin* 32:373–385.
- Scott, S. D., and C. McFarland (2010). *Bird Feathers: A Guide to North American Species*. Stackpole Books, Mechanicsburg, PA, USA.
- Simmons, R. E., D. M. Avery, and G. Avery (1991). Biases in diets determined from pellets and remains: Correction factors for a mammal and bird eating raptor. *Journal of Raptor Research* 25:63–67.
- Tomberg, R., and V. Reif (2007). Assessing the diet of birds of prey: A comparison of prey items found in nests and images. *Ornis Fennica* 84:21–31.

Book Review Editor: Joel E. (Jeep) Pagel