



Endangered Birds: Comparing Research Effort on the Specific and Subspecific Levels

Howard O. Clark, Jr.
Darren P. Newman

H. T. Harvey & Associates,
7815 N. Palm Avenue, Suite
310, Fresno, CA 93711

The Endangered Species Act is considered successful when a species is reported as “delisted” or “recovered” (Gibbons 1992). Sound peer-reviewed research is paramount for the recovery of endangered species, and on-going research is necessary for the continued maintenance of the recovered population. For example, the American Bald Eagle (*Haliaeetus leucocephalus*) population, listed in 1967, increased from 400 nesting pairs in the 1960s to several thousand pairs today (Gibbons 1992, USFWS 2007). Research and population monitoring contributed to its recovery. Currently, however, more than 90 bird species are still listed (USFWS 2010), and of these, 6 have gone extinct while listed (Restani and Marzluff 2001).

Budget constraints require the U. S. Fish and Wildlife Service to prioritize what species on the Endangered Species List obtain research funding (Restani and Marzluff 2001). In order to recover species, research is required to address data gaps, which will hopefully lead to the recovery and removal of the species from the list, or at least downgrade the species from “endangered” status to “threatened.” Any information discovered during basic research is important for the recovery of the species, no matter how insignificant it may appear at the time (Ralls and Brownell 1989). Before research can be conducted, permits to study endangered species must be secured. However, obtaining these permits is time consuming, convoluted, and overall very difficult (Ralls and Brownell 1989). The permit applications are reviewed by the appropriate resource agency, such as the U. S. Fish and Wildlife Service, and not all applications are accepted. In the meantime, research is not being conducted. The associated bureaucracy with the permit application process may lead to substantial differences in research objectives for one species versus another.

Herein we analyze if some recovered or delisted species were substantially researched, and how much research was conducted on these delisted species compared to other endangered species and subspecies still on the list (See Table 1 for a summary of listing and delisting dates). Inventorying peer-reviewed papers is a reliable way to quantify endangered species research; these papers represent agency-permitted projects and the researchers’ success in answering a particular question or set of questions. We queried three popular scientific literature databases (BioAbstracts, JSTOR, and ScienceDirect) to determine the number of papers published for a sample of delisted and listed avian species. Additionally, several avian species were added to the Endangered Species List as subspecies; to determine if there were differ-

Species	Date First Listed	Date Delisted
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	11-Mar-67	9-Jul-07
Brown Pelican (<i>Pelecanus occidentalis</i>)	2-Jun-70	4-Feb-85
Canada Goose, Aleutian (<i>Branta canadensis leucopareia</i>)	11-Mar-67	20-Mar-01
Clapper Rail, California (<i>Rallus longirostris obsoletus</i>)	13-Oct-70	Still on list
Clapper Rail, Light-Footed (<i>Rallus longirostris levipes</i>)	13-Oct-70	Still on list
Clapper Rail, Yuma (<i>Rallus longirostris yumanensis</i>)	11-Mar-67	Still on list
Least Tern, California (<i>Sterna antillarum browni</i>)	2-Jun-70	Still on list
Peregrine Falcon, American (<i>Falco peregrinus anatum</i>)	2-Jun-70	25-Aug-99
Peregrine Falcon, Arctic (<i>Falco peregrinus tundrius</i>)	2-Jun-70	5-Oct-94
Wood Stork (<i>Mycteria americana</i>)	28-Feb-84	Still on list

ences between specific and subspecific research, we also queried the databases using the subspecies Latin name as well as the species name.

In 1967, the Aleutian Canada Goose (*Branta canadensis leucopareia*) was listed as endangered, and delisted in 2001 (USFWS 2010). When querying the 3 databases, research papers on the subspecies (*B. c. leucopareia*) differed markedly from the species (*B. canadensis*; Figure 1). Between 1967 and 2010, BioAbstracts (2010) reported only 13 published papers on the subspecies, while the JSTOR (2010) database cited 41 papers, and ScienceDirect (2010) listed 6. However, the species (*B. canadensis*) yielded 618 papers in BioAbstracts,

1,550 in JSTOR, and 274 in ScienceDirect. These results seem to indicate that the recovery of the goose was primarily based on research of the species, rather than the subspecies that was distinctively listed as endangered. By listing the Canada Goose subspecies as endangered, rather than the entire species, the U. S. Fish and Wildlife Service is implying that this subspecies needed protection and therefore actions such as proper management and conservation of this subspecies was warranted. Due to lack of research on the listed Canada Goose subspecies, information gathered during the delisting process was likely collected from the research pool addressing the species rather than the

Table 1: Summary of listing and delisting dates on avian species analyzed

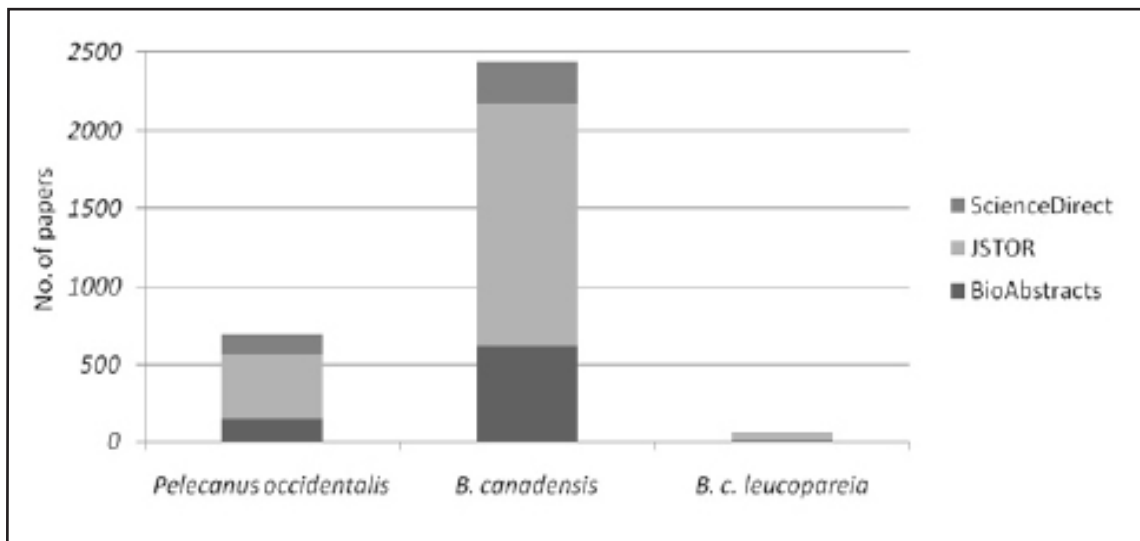
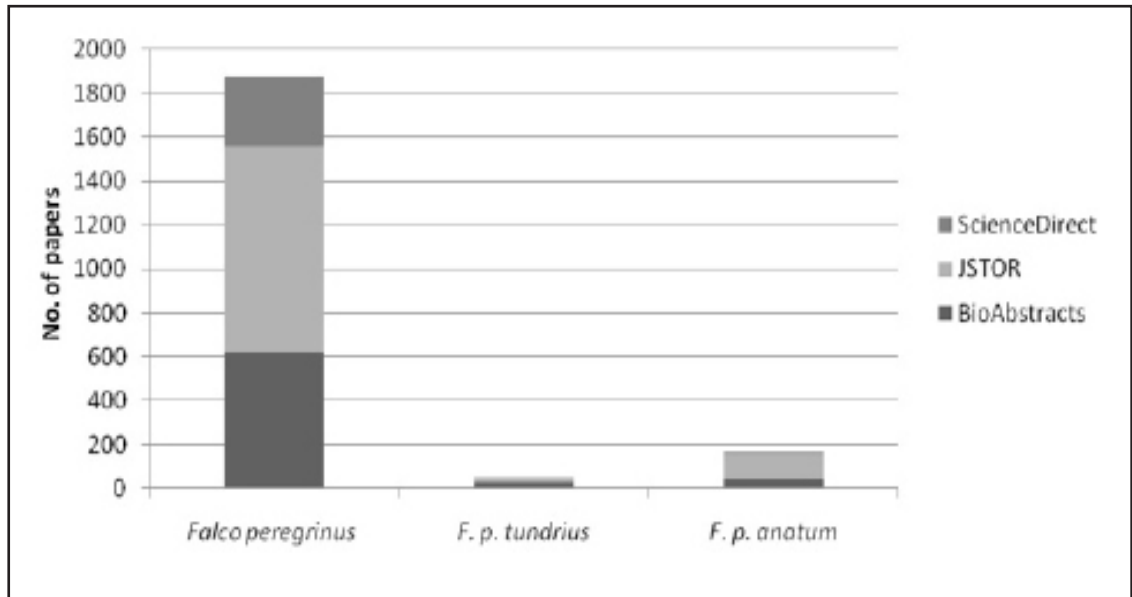


Figure 1: The Canada Goose subspecies, *B. c. leucopareia*, was not nearly as well researched as the Canada Goose, *B. canadensis*, despite that the subspecies was the listed biological unit. The Brown Pelican (*Pelecanus occidentalis*) is added for comparison.

Figure 2:

The two listed subspecies of Peregrine Falcon were not nearly as well researched as the Peregrine Falcon species, although the two subspecies were the actual listed units. It appears that the bulk of the research that potentially contributed to the delisting and recovery of the two falcon subspecies was based on general Peregrine Falcon research.



subspecies. A possible drawback of using species information to conserve and delist a subspecies is that the information may not be relevant to the needs of the subspecies. There may be regional ecological variables that only affect the subspecies and the not species population as a whole. These drawbacks are applicable to the other listed subspecies discussed below.

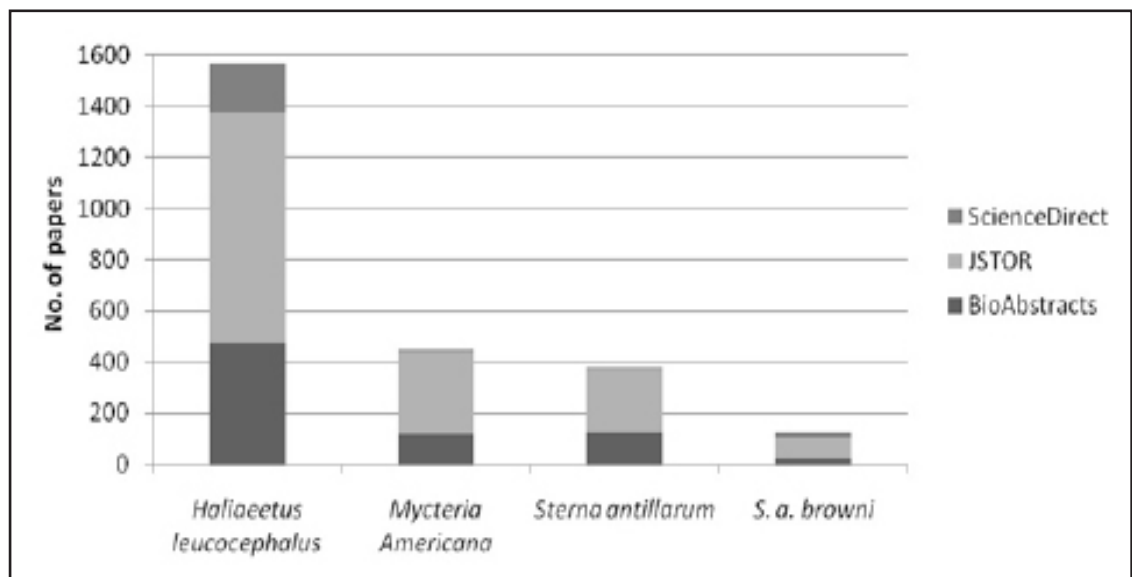
In 1970, the American Peregrine Falcon (*Falco peregrinus anatum*; Pagel et al. 1996) and the Arctic Peregrine Falcon (*F. p. tundrius*; USFWS 1999) were listed as endangered along with the Brown

Pelican (*Pelecanus occidentalis*). Figure 2 compares the number of published research papers on the falcon species and subspecies. The Figure illustrates that the two Peregrine Falcon subspecies were not nearly as well researched as their parent species.

For species not yet recovered and delisted, subspecific research versus specific research follows a similar trend; Figure 3 shows the difference between research conducted on the Least tern (*Sterna antillarum*) versus the California Least Tern (*S. a. browni*). Additionally, Figure 4 presents Clapper Rail research

Figure 3:

The American Bald Eagle has nearly 1600 peer-reviewed papers published, and has been removed from the endangered species list. The Wood Stork and the Least Tern (species and subspecies) are still listed as endangered, and appear to have not been as rigorously researched as the American Bald Eagle.



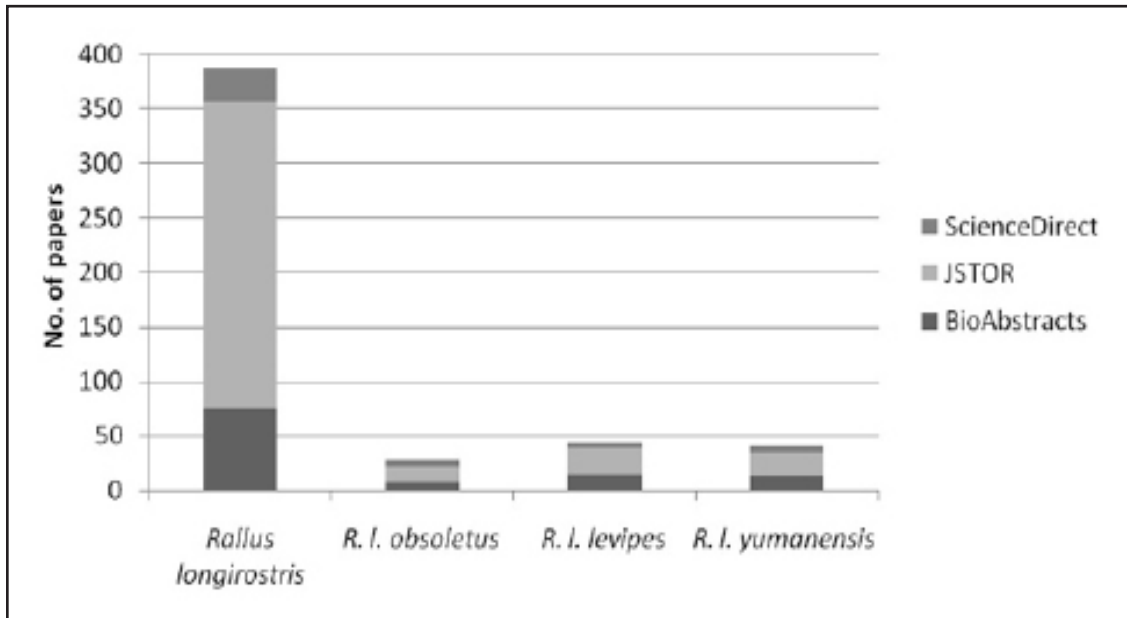


Figure 4: Clapper Rail species research compared to research specifically conducted on three endangered subspecies of Clapper Rail.

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Although there is some overlap in journal titles within the databases we queried, these data provide a research pulse on endangered species. JSTOR has nearly 730 journal titles, whereas BioAbstracts has more than 5,500. ScienceDirect monitors over 600 journal titles. Not all biological and ecological journals are represented, but an adequate sampling of what is available to researchers is accessible in these 3 databases. For example, the larger journal database company, Thomson Reuters, has a database called BIOSIS Previews®. It is a comprehensive reference database for life science research with approximately 6,000 journal titles (BIOSIS Previews 2011). Our combined query from 3 different biological databases amounted to 6,830 journals, which are more titles than what is available in BIOSIS Previews®. Therefore, the number of biological journal titles not represented in our study is likely very small.

It appears from our research that including the avian subspecies name in a peer-reviewed paper is not a common practice, as it is assumed that the

reader can ascertain which region is being studied and can determine which subspecies is being researched. Hence, research on endangered avian species is already implied on the subspecific level. However, not using the subspecific Latin name in scientific research may make it difficult for resource agencies, such as the U. S. Fish and Wildlife Service, to find relevant literature on listed subspecies to make delisting determinations.

A considerable amount of research is being conducted on endangered species, and the amassed information available to resource agencies and species recovery managers is encouraging. As Congress wrote in 1973, endangered and threatened species of wildlife and plants “are of aesthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people” (7 U.S.C. § 136, 16 U.S.C. § 1531 et seq. of 1973 as amended). Even species that are not as well-known as the bald eagle (USFWS 2007) should continue to be researched, and be given an equal research opportunity to facilitate recovery. If a subspecies is placed on the Endangered Species List, then the subspecific Latin name should be refer-

enced in research unique to that subspecies to aid in future queries.

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