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"Listen Carefully to the Voices of the Birds": A Comparative Review of Birds as Signs

Felice S. Wyndham[1*] and Karen E. Park[2]

Abstract. Around the world, people notice birds, talk about birds, and learn from birds. Birds are identified as signs, messengers, augurs, teachers, and beings that can affect one's life and livelihood. The significations of birds vary across cultures and shift over time, but not in entirely arbitrary ways. In this review of published literature from the Human Relations Area Files and elsewhere on birds as signs, we extracted details about 498 kinds of birds in 123 ethnolinguistic groups and found that, worldwide, owls, crows, cuckoos, woodpeckers, herons, eagles, nightjars, and chickens were the most reported as sign-bearers. Ninety-two percent of signifying birds were categorized as of Least Concern in terms of conservation priority. Half of all signs were communicated by vocalizations and a quarter by bird behavior. Contrary to our expectations, when analyzed by order, passerines were not the most common sign-vehicles (23%); rather, near-passerines made up 34%, and 23% were non-passerines, both of the latter over-represented in comparison to number of species worldwide. Predictive signs can be understood as keys to human cognitive processes for remembering details of past experience and predicting/hypothesizing the future. The honed ecological awareness acquired by paying attention to birds translates more generally to sophisticated connective worldviews that extend our perceptive awareness in space and time.

Keywords: ecosemiotics, ecological indicators, biocultural salience, ethno-ornithology, cross-cultural ethnobiology.

Introduction: Birds as Signs

During one of Bernie Sanders' speeches in the 2016 US election primaries, a House Finch (*Haemorhous mexicanus*) landed on his podium and the crowd, then the internet, lit up with delight. Commentators called it a good omen, an appropriate sign (e.g., Berkeley 2016). During field work in an Ayoreo communities in Paraguay, the first author was told that the day before a community leader won a thousand American dollars in the lottery, a *tirínta* hummingbird (*Trochilidae*) flew by his head—a portent of very good news. He bought a nice motorcycle with the cash.

People everywhere and throughout history seek meaning in their environments, think about the future, and look for clues as to what is coming in their lives (Chambers 1728; Gilbert and Wilson 2007). These clues are taken most frequently from the natural world; rarely are they taken from cultural artifacts or human behavior (Beerden 2013). Among these natural signs, birds figure prominently. Turpin et al. (2013:10–11) found that over half of ecological or phenologic indicator species identified by Arandic speakers in Central Australia were birds and, as general readers in ethno-ornithology over several years, we noticed this prevalence of birds as signs consistently echoed in ethnobiology accounts around the world. To document this observation, we compiled a comparative database of 598 reported cultural signs and communications by birds from 123 ethnolinguistic groups around the world. In this article, we identify which birds emerge

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most prominently cross-culturally as sign vehicles and speculate as to why these patterns emerge as they do. An analysis of the cultural content of the signs themselves is forthcoming in another publication.

Our framework for this meta-analysis of ethno-ornithological data assumes sign reading as a human universal (Raphals 2015:153). We also assume that birds are a productive domain for people to read, as a means to reduce uncertainty and to engage creatively with biophysical and sociocultural environments. Prospection, or how people represent and communicate possible futures, can be considered a core organizing principle for human (and, more generally, animal) behavior (Seligman et al. 2013). Seeking patterns of meaning and guidance in their environments, people pay attention to certain birds more than others, influenced by local ecologies, cultural histories, and species-specific characteristics (Dove 1993). In the words of a Tukano hunter (Reichell-Dolmatoff 1971:224–225; emphasis added): we "must…*listen carefully to the voices of the birds* because they predict success or failure…."

While communications from birds have long been recognized in non-industrial societies and documented in ethno-ornithological studies, our stance is that they are important among all peoples. Once we started paying attention, we observed that, in our everyday lives in the industrialized societies of the US and UK, conversations about signs communicated by a bird or birds that come into our perceptual sphere are extremely common, if often treated as a quaint or passing concern. At individual and local levels, the skills of tracking and understanding ecological bird sign are newly popular in urban areas (e.g., Bird Language 2016; Young 2012) and are increasingly documented by biologists. For example, Streby et al. (2015) recorded how flocks of Golden-winged Warblers (*Vermivora chrysoptera*) evacuated a danger-zone well in advance of destructive tornadic storms in Tennessee, demonstrating their ability to sense distant weather events. And at national and global levels, birds' utility as ecological indicators are increasingly well documented and integrated into long-term planning, such as for climate change (Lemoine et al. 2007).

Worldwide, the domain of "birds that tell people things" (Thompson et al. 2008) includes diverse ontologies that posit birds as people or spirit beings (essentially or occasionally; e.g., Forth 1998); birds as exceptional animals who act as messengers from supernatural realms (e.g., Dove 1993); and birds as animals whose own ecological knowledge is an information source (e.g., Spottiswoode et al. 2016). The larger context for this article includes relationships between people and birds that are culturally understood as person-to-person interactions (e.g., in Ayoreo concepts of deep time ontology), and as relations of kinship, power, healing, and harm (Krech 2009). This larger context informs rich oral literatures, songs, myths, art, and practices (Aillapan and Rozzi 2004; Chachugi 2013; Feld 1982; Ibarra et al. 2013; Figure 1), of which we analyze only a subset. The personification of birds is found among all peoples; for example, writing about British bird knowledge, Robinson (1882:341) refers to plovers (*Charadriidae*) as the "plover folk." An Ayoreo story tells that when *Haái*, Toucan (*Ramphastos* spp.), was a person in the deep mythical past, he was a man of little importance, but the song he left can relieve fatigue and illness. Quiáquiai (*Caracara plancus*) was the original recipient of the Ayoreo Chikenó clan design still used today and taught to others. There are also many examples that explicitly describe people learning detailed local natural history by observing birds, testing hypotheses, and discussing with peers (Liebenberg 1990).

Our working definition of "sign" uses Peircian distinctions within a generally Saussurean framework. Thus, sign refers to the ensemble of 1) the sign vehicle (Saussure's "signifier"; here, the bird), 2) the

Figure 1. Prototypically "signifying" birds. Ballpoint pen on paper by Romero Cáceres, Chaco, Paraguay, c. 2014; from the collection of the first author.

sense or cultural concept/definition of the sign vehicle's meaning (Saussure's "signified"), and 3) the object or, in our case, outcome (Chandler 2002:34). For example, in England, an encounter with a *Pica pica* would be considered a sign when: 1) a magpie is 2) seen and if one fails to salute the bird one may 3) experience bad luck. Another example is when: 1) an akerrke (Western Bowerbird, *Chlamydera guttata*) is 2) observed by Australian Arrente speakers near fig trees 3) they know to look for ripe fruit (Turpin et al. 2013:21). Our sign vehicles are material—vocalization, body presence, and action—in the sense of Voloshinov's (1973:10–11) modifications of Saussurean semiotics. Given the robustness of cross-cultural use of birds as signs, we let this corpus define bird sign rather than delve deeply into a discussion of semiotic distinctions between signs, symbols, and indices (though see Leach 1976 on these in human communication). This is treated more extensively in a forthcoming companion article, which focuses on communicative aspects of bird sign in human communities. Here, we analyze how signs are reportedly delivered to people (voice, presence, behavior) and present patterns of which birds "signify" more than others and discuss why this might be. We also discuss implications for avian and ecosystem conservation.

As we investigate why certain birds are considered more culturally significant than others, we explore the parameters of biocultural salience. Biocultural salience, or the ways in which an organism "jumps out" from background environments and is remembered by the perceiver, draws on

a suite of factors, including phylogenetic, phenotypic, behavioral, demographic, and eco-cultural characteristics. The actual phenomenological-sociocognitive experience is almost certainly multi-factored and draws on combination effects (Agnihotri and Si 2012:200; Bulmer 1979; Hunn 1982). Boster et al. (1986; see also Berlin et al. 1981) found that Aguaruna and Huambisa consultants in the Peruvian Amazon tended to name and know birds differently depending on the evolutionary or genetic relatedness of the birds. In particular, birds in the order Passeriformes were more likely to be confused or taxonomically lumped with each other. The authors hypothesized that, as passerines represent the most recent evolutionary radiation of bird families, they look more alike and have more similar habits. The song- and perching-birds in this one order are the most common avifauna for most of Earth's peoples, comprise about 58% of globally extant bird species (BirdLife International 2015). Non-passerines (24 orders) and near-passerines (11 orders) make up all the rest of the birds—the raptors, water birds, storks, owls, toucans, ostriches—and are less closely related to each other and, thus, probably also more distinctive and salient to humans.

Methods

Our sample of published data was compiled by first searching the Web of Science using the term "ethno-ornithology" and variants thereof, yielding 166 books and articles. We reviewed these and selected the 20 publications that topically focus on birds as sign vehicles. That is, their authors describe perceptions of birds as harbingers, omens, teachers (e.g., people copy their weaving techniques), indicators (e.g., activity is a known correlate to other ecological phenomena), or purveyors of messages. After an initial analysis of 153 described instances (Wyndham et al. 2015), we increased our sample substantially by adding examples from the electronic Human Relations Area Files (eHRAF) World Cultures database. eHRAF World Cultures is a curated collection of published ethnographic literature that has subject-indexed paragraphs, allowing for detailed topic-location for cross-cultural comparative analyses[1].

Our search in eHRAF used the parameters of "all cultures," "ethnozoology," and "bird," from which we extracted texts related to birds as signs. These search parameters may have missed instances of bird signs that only used specific birds' names and were not coded as ethnozoology. Our sample is not exhaustive of published ethno-ornithology. The publication year for materials in our sample ranges in a fairly even spread from 1864 to 2015 (see Supplement for a list of sources by decade); note that publication dates are often much later than fieldwork dates. Many of the eHRAF ethnographies do not specifically focus on birds or ethno-ornithology, but mention bird signs amongst other topics, unlike our pilot study sample. Using ethnographic material published over this span presents particular advantages and problems. Advantages include: the richness of in-depth, extensive field inquiry evident in past ethnography (e.g., Hilger 1957); access to the original voices of knowledge-holders in the many autobiographical publications (e.g., Akiga and International Institute of African Languages and Cultures 1939; Mountain Horse 1979; Talayesva and Simmons 1942; Underhill and Chona 1936); and an appreciation for how the history of this type of inquiry has unfolded over time (e.g., noting the near-equal numbers of women ethnographer-authors in this sample). Significant problems that arise include: a subset of publications use offensive terms (e.g., Grout 1864; Speck 1935) or publish items that the community of origin deemed secret (e.g., publication of certain formulas in Mooney 1982 [1891] was considered by some to have stripped them of their power). These problems

should not necessarily preclude using the materials if/when deemed ethnographically appropriate, but they do need to be addressed in ways that return control over materials to communities of origin, to label, rebut, re-interpret, set use-rules, or proscribe in culturally appropriate ways made possible now through online archives and networks (e.g., Wyndham et al. 2016). This is systemic and infrastructure work that remains to be done.

In total, we analyzed 598 examples of culturally-defined signs related to 498 birds from 169 publications and 123 ethnolinguistic groups (Table 1). Our full data set is viewable at the Ethno-ornithology World Atlas[2] (including links through to the full original literature sources from eHRAF). Overall, while not an exhaustive accounting of all material published on this topic in English and Spanish, we judge our sample to be a fair representation and the most extensive to date.

We used a judgmental design, rather than a random sampling, searching the entire eHRAF World Cultures database instead of using HRAF's Probability Sample Files (Ember and Ember 2016), in order maximize our sample size. Due to the breadth of our comparative study, we are not able to provide detailed ethnographic or linguistic context that would help to understand particular cultural significances of bird communications. For example, we can not tease out how prospective signs vary in perceived reliability and seri-

Table 1. Ethno-linguistic groups included in this study.

Region	Count	Countries (Ethno-linguistic Groups)
North & Meso-America	37	**Belize/ Guatemala** (Garifuna)
		Canada (Innu; Lillooet; Mi'kmaq; Nuxalk; Ojibwa)
		Honduras/ Nicaragua (Miskito)
		Mexico (Ch'ol Maya; Chan Kom Maya; Rarámuri; Seri; Zapotec)
		Panama (Emberá; Kuna)
		United States (Apache; Blackfoot; Cherokee; Chumash; Comanche; Creek; Fox; Gros Ventre; Hopi; Ingalik; Iroquois; Klamath; N. Paiute; Navaho; N. Pima; Omaha; Pawnee; Pomo; Quinault; Sahaptin; Seminole; Yokuts; Zuni)
Africa	23	**Angola** (Ovimbundu)
		Botswana (!X~o; /Gwi; San)
		Republic of Congo (Tembo)
		Democratic Republic of Congo (Mbuti)
		Kenya/ Tanzania (Maasai; Okiek)
		Malawi/ Tanzania (Nyakyusa)
		Mali (Dogon)
		Morocco (Berbers)
		Nigeria (Igbo; Tiv)
		Rwanda (Rwandan)
		South Africa (Khoi; Tsonga; Zulu)
		Sudan (Azande; Nuer)
		Uganda (Baganda; Banyoro)
		Zimbabwe (Ila; Shona)

Table 1. (*Continued*).

Region	Count	Countries (Ethno-linguistic Groups)
Asia	19	**China** (Miao)
		India (Andaman Islanders; Badaga; Gond; Khasi; Solega; Toda)
		Indonesia (E. Toraja; Mentawaians; Nage; S. Toraja)
		Japan (Ainu)
		Malaysia (Iban)
		Philippines (Ifugao; Tau-batu; Waray)
		Sri Lanka (Sinhalese)
		Vietnam (Central; Southern)
South America	18	**Argentina** (Toba)
		Bolivia (Siriono; Wichî)
		Brazil (Bororo; Marubo; Trumai; Yanomami)
		Chile (Mapuche; Selk'nam [Ona]; Tehuelche; Yaghan)
		Colombia (Goajiro; Kogi; Tukano)
		Ecuador (Shuar)
		Paraguay (Ayoreo)
		Peru/ Bolivia (Aymara)
		Venezuela (Warao)
Europe & Middle East	15	**Finland** (Saami)
		Georgia (Abkhazians)
		Great Britain (British; Irish; Scottish; Shetlanders; Welsh)
		Greece (Archaic, Classical, Hellenistic; Sarakatsani)
		Iran (Iranians)
		Italy (Romans)
		Russia (Yakut; Nenets)
		Spain (Basques)
		Syria/ Saudi Arabia (Rwala Bedouin)
Oceania	11	**Australia** (Arandic; Euro settler)
		Hawai'i (Hawai'ians)
		Marshall Islands (Marshallese)
		Melanesia (N.E. Massim; Yapese)
		New Zealand (Maori)
		Papua New Guinea (Orokaiva; Siwai)
		Tonga (Tongan)
		Vanuatu (Malekula)
Total	123	

ousness within particular cultures. We encourage interested readers to consult the original publications for more information about the people with whom work was done, their cultural contexts, and particular ethnographic methods used. Because the material we compare—bird signs—are relatively discrete cultural facts that are often straight-forwardly phrased and learned by children (e.g., the Ayoreo dictum: hearing the tanú's [*Cyanocorax cyanomelas*] warning call alerts us to the presence of a jaguar), they are more likely to have been reliably recorded by ethnographers of the last 150 years (compared to more complex or abstract knowledge), and because our sample size is large, we feel that our comparative approach is methodologically robust.

We extracted and transcribed each description of perceived bird signage into a spreadsheet, leaving out unclear or uncertain data (for examples see column "Signification" in our full data set[2]). We counted as a single instance those cases of the same bird sign found in different publications about the same ethnolinguistic group. A first criterion for inclusion in our analysis was that signs needed to be conventional rather than one-off accounts. Though there were many myths and stories that included a case of a bird talking to a person this was included only if it represented a more general and ongoing sign relationship. We did not include avian cultural symbolism, totems, power or dream-animals, or descriptions of how people use bird calls to communicate with other people, as noted in many accounts of hunting and warfare. These significations are important ethnoecologically—myths, stories, sayings, and songs often encode significant ecological information about a bird's life history, appearance, behavior, or relationships (Ibarra et al. 2013), but are beyond the scope of the present study.

Because, cross-culturally, taxonomic identifications are often not one-to-one (e.g., a local name for a bird may correspond to several Linnaean species or vice versa) and, for many signs, the associated bird was undifferentiated below order or genus (e.g., "owl" vs. "Saw-whet Owl," or "hawks" rather than "Red-tailed Hawks"), we identified each instance to its closest identifiable Linnaean taxon. We followed authors' identifications but, where possible, updated the scientific names, as well as conservation status, following the BirdLife International (2015). In a few cases, a sign was attributed to any bird (class Aves; e.g., it is bad luck to disturb a bird's nest). Subfamily names emerged as being particularly useful for grouping and comparing birds, as this was a common level of identification. We made two taxonomically awkward decisions about representing our results. First, though bird subfamilies emerged as the grouping most congruent with vernacular uses, in the case of owls, a majority of reports (67%) did not differentiate to which of the two owl families (Typical Owls or Barn Owls)—much less subfamily or genus—the bird belonged. Second, most of the reported signs from the subfamily Pheasants concerned chickens (*Gallus gallus domesticus*), so, for clarity, we identified them as such.

We coded all data according to its core sign or communication, the means of delivery (voice, behavior, physical presence, or extispicy), and whether we thought, judging from the textual context of the record, the communication was emically "supernatural" (explicitly stated agency from "other worlds" or supernatural beings), "ecological" (decipherable, non-arbitrary, ecosystemic knowledge, such as meteorology, biogeography, ethology), both, or "other/don't know." This latter category includes meaningful signs that may be magical, auspicious, or inauspicious, such as omens. "Supernatural," "ecological," and "other/don't know" are not necessarily emically mutually exclusive categories. Due to space constraints, we limit our discussion here to the ways signs in our sample are communicated and whether

and why there are discernable patterns in the kinds of birds that are identified as signs worldwide.

Results

Out of 307 total ethnolinguistic groups searched on eHRAF, 113 (37%) included at least one mention of birds as signs. All inhabited continents are represented, confirming that recognizing birds as signs is a widespread human phenomenon. However, our geographic coverage is not uniform across continents; our sample includes more ethnolinguistic groups in the Americas than elsewhere. Similarly, the geographic ranges of the birds studied were not systematically considered but would, of course, limit potential sign-vehicles in any region.

Although we do not have a quantitative measure of whether birds are more likely than other creatures or plants to be perceived as communicative signifiers, several authors suggested this was the case for particular ethnolinguistic groups (e.g., Agnihotri and Si 2012:203; Kane 2015:35; Turpin et al. 2013). Why are birds especially good for "knowing things with"? Local explanations for this frequently referenced birds' visual powers. They are far-sighted in the landscape (Turpin et al. 2013), have special abilities to gain altitude for a "birds-eye-view," and, in the case of nocturnal birds, can see in the dark. For example, Janashia (1937:148–149) reports the Abkhazian belief that the *aqaqab* bird (unidentified), tasked by the god of mountains, protects game animals by soaring high in the sky and screeching a warning when hunters approach. In the early 1900s, Crow consultants explained that the prevalence of nocturnal birds, such as owls, among birds that signify was because they "can see in the dark and into the future" (Wildschut and Ewers 1960:115). Similarly, La Barre (1951:171) reports the Aymara practice of drinking the blood of "*pi-citanka*, a small sparrow-like bird [*Passerellidae*]...to keep sickness at a distance; this bird is believed to be able to see far into the distance, and to be able to prophesy future events," particularly the quality of potato harvests, and the approach of snow or visitors.

A common descriptor in ethnographic texts about signifying birds was that they looked "queer," or "curious," or behaved strangely. Even a common (normally non-signifying) bird might be considered a sign if there were something unexpected or unusual about it. Thus, an Ojibwe woman counted a hawk as a sign when she caught it "in a rabbit snare, [it]…was considered 'queer' since this type of bird is almost never caught in a snare" (Rogers 1962:d34). Identifying signs in unusual looking or behaving birds parallels a much broader human propensity for reading meaning into, and often attributing special powers to, anything out of the norm, whether in zoology, astronomy, geology, teratology, or meteorology. From an evolutionary perspective, it makes sense that people would pay special attention to animals that are behaving strangely, in that this is potentially a sign of disease or of impending events that the animals detect but people cannot. From a semiotic perspective, power gathers in things that transgress boundaries.

Birds That Tell People Things

A total of 498 birds are considered by at least one of the 123 ethnolinguistic groups to be signs, messengers, or communicators. One hundred of these birds were either not identifiable/translatable to Linnaean systematics or were not differentiated below Aves; the remaining 398 could be categorized into 23 orders, 77 families, 98 subfamilies, and 247 species (Table 2).

We found that the category "subfamily," with a few modifications, proved most useful in analyzing cross-cultural bird data, as the majority of ethnographic reports identified birds to this level, rather than to generic or species-level. For example, most reports cited crows and jays separately, not lumping them meaningfully into what Linnaean taxonomy calls the family Corvi-

Table 2. Signifying birds recorded for 123 ethno-linguistic groups; ordered from most to least frequently cited. Subfamily names are used, except for the chickens which are identified to species rather than their subfamily name of Pheasants, and owls. Typical Owls and Barn Owls are grouped together, though they are in different families because this is how they are most commonly identified in the vernacular. **Passerine** sub-families are in bold; near-passerines in regular font; *non-passerines* in italics.

Bird Group	Reports as sign
Aves/ uncategorized	100
Owls	57
Crows	23
Cuckoos	19
Woodpeckers	17
Herons	15
Chickens; *eagles*; nightjars	13
Doves; *hawks*; kingfishers	12
Jays	10
Hornbills; **swallows**	8
New-World blackbirds	7
Honeyguides; parrots	6
Cranes; *sandpipers*; **wrens**	5
Chickadees; *loons*; *plovers*; toucans; trogons; **tyrant fly-catchers**; *vultures*	4
American sparrows; *ducks*; *falcons*; **finches**; **honeyeaters**; *rails*; **thrushes**; **whistlers**	3
caracaras; **drongos**; *geese*; *gulls*; hummingbirds; *ibises*; **old-world flycatchers**; *old-world vultures*; *partridges*; *pheasants* (non-chickens); pigeons; **robins**; *snipes*; **tits**; *turkeys*; **wagtails**; **weavers**	2
African barbets; Asian barbets; *auks*; **babblers**; [bats]; **bee-eaters**; **bluebirds**; **bowerbirds**; *chachalacas*; **chats and Old-World flycatchers**; cockatoos; *coots*; **cuckoo-shrikes**; **fantails**; **flowerpeckers**; *frigatebirds*; *guineafowl*; hoopoes; **larks**; **martins**; **meadowlarks**; **mockingbirds**; **monarch flycatchers**; **monarchs**; **nuthatches**; **Old-World warblers**; **orioles**; *osprey*; owlet-nightjars; **pardalotes**; *quails*; rollers; sandgrouse; **shrikes**; **sparrows**; **starlings**; *storks*; swifts; *thick-knees*; **thornbills**; *turacos*; **waxbills**; **wedgebills**; **Western tanagers**; **woodcreepers**; **woodswallows**	1

dae (Crows and Jays). Subfamilies seem to reflect an important worldwide vernacular perception of avian taxonomy.

Out of 498 birds that were taxonomically identifiable to order, 114 (23%) were passerines, 171 (34%) were near-passerines (10 orders represented out of 11 near-passerine orders), and 112 (23%) were non-passerines (12 orders represented out of 24 non-passerine orders) (Figure 2).

When we compare the numbers of signifying birds with extant (potentially signifying) species in each of these groups, passerines are under-represented compared to number of species worldwide (23% vs. 58%), and both near-passerines (34% vs. 25%) and non-passerines (23% vs. 18%) are over-represented (Birdlife International 2015). Of the orders identified, four together comprise more than half of all the signifier birds: Passeriformes (song/perching birds 29%), Strigiformes (owls 14%), Piciformes (woodpeckers, etc. 7%), and Accipitriformes (hawks, eagles, falcons 7%).

Vocalization was the most common sign vehicle (50%), followed by bird behavior (24%), and bodily presence (10%).

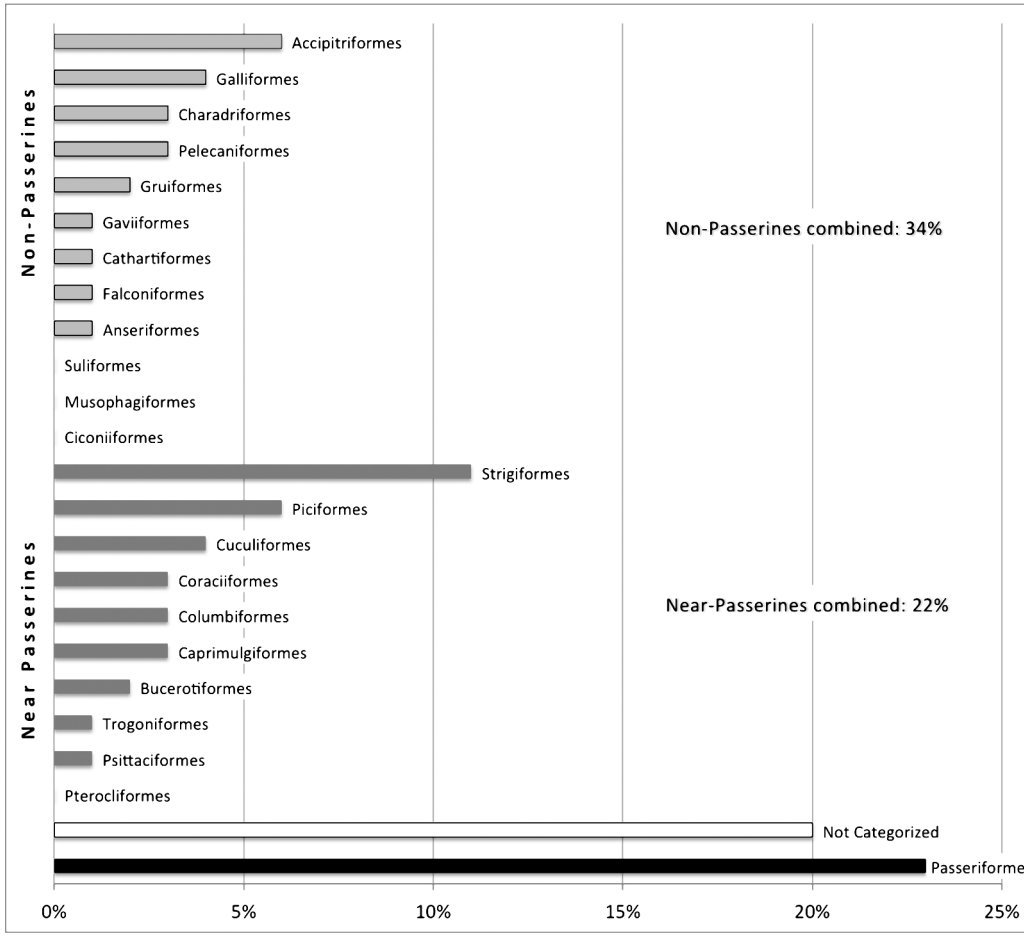

Figure 2. Signifying birds, grouped by their 23 orders. Passerines (black) comprised 23% of the birds in our sample, near-passerines (dark grey) as a whole made up 34%, non-passerines (light grey) 23%, and 20% were unknown (not identified below Aves). Passerines are under-represented, while near- and non-passerines are over-represented compared to their prevalence in world environments (BirdLife International 2015).

Finding a nest as a sign was a minority report (1%), as was divining with bird innards (extispicy) or eggs (ooscopy) (2% combined). Thirteen percent of reports did not specify the means by which a sign was read. In broad terms, our second, more extensive sample showed the same overall patterns as did our pilot study sample that did not include e HRAF data.

There are notable differences in conservation status between the sign-bearing birds in our study and those on the IUCN red status list. That is, of the 247 identified species of sign-bearing birds, by far the majority (92%) were of Least Concern and only 4% considered to be Near Threatened (eagles [*Terathopius ecaudatus*; *Harpia* spp.], trogons [*Harpactes duvauceli*; *H. diardi*], a Crested Jay [*Platylophus galericulatus*], Greater Scythebill [*Drymotoxeres pusherani*], and a Red-headed Woodpecker [*Melanerpes erythrocephalus*]); 2% are considered to be Vulnerable, (hornbills [*Bucorvus leadbeateri*; *Buceros* sp.; *Anthracoceros marchei*] and the Hawai'i Elepaio [*Chasiempis sandwichsis*]) and 2% to be Endangered or Critically Endangered (the Flores Crow [*Corvus florensis*],

Yellow-shouldered Blackbird [*Agelaius xanthomus*], Crowned Crane [*Balearica regulorum*], and Hooded Vulture [*Necrosyrtes monachus*]) (BirdLife International 2015). These numbers indicate an over-representation of birds identified by the IUCN as of Least Concern. In other words, though globally 77% of all birds are categorized as of Least Concern, our sample of signifying birds were 92% "of Least Concern for conservation." Conversely, signifying birds are under-represented among those labeled Near Threatened (4% vs. 10% globally), Vulnerable (2% vs. 7%), and Endangered or Critically Endangered (2% vs. 6%).

Discussion

Biocultural Salience, Ecological Roles, and Character of Signifying Birds

A general result emerging from our analysis is that, in any part of the world, certain birds, if present, will have a higher probability of being considered signifiers than others. There are both emic and etic explanations for this pattern. Among local groups, the most common (emic) explanations draw on cosmology. For example, Rea (2007:48) describes O'odham "sanctions" identifying spiritually powerful birds "endowed with 'strength' or 'way' from the beginning." The significance of certain birds can be intrinsically entangled with modes of life and knowledge-creation for particular peoples. This knowledge-creation often pivots on transactional power-relationships with a particular bird or bird species. An example of this are healers who have individual bird "spirit-medicine." Such is the case with generations of Ayoreo doctors who used various healing formulas taught to them by birds who were people in a mythical deep past. We acknowledge the importance of this local, culturally embedded perspective on bird-knowledge. Our comparative, cross-cultural analysis is offered as a complement to, not a replacement for, any local, particular person-bird relationships.

The Importance of Voice and Character

Our results show that half of all signs were vocalizations, which is to be expected given the ecological importance of bird voice in intra- and extra-species signaling to communicate locations, food-begging, and warnings. The majority of vocal augural signs are bird calls rather than songs. That is, our top sign-bearing birds are the owls, crows, cuckoos, woodpeckers, herons, and eagles (all "callers" rather than "singers"), rather than the birds that are widely known for their voices, such as parrots, nightingales, mockingbirds, or other songbirds. Bird song, on the other hand, is usually a male passerine musical vocalization, most heard during breeding seasons. Our results also show that a common aspect of many of the top signifiers, such as owls, the corvids, and raptors, are ecologically associated with death as meat or carrion feeders. Accounts of these birds eating human corpses after a battle, for example, may have prompted the fear and awe many people report. Nocturnal birds may generally be associated with heightened danger as well, given that, like all primates, we are more vulnerable to attack in the dark and, thus, culturally malevolent beings tend to be associated with night.

Owls, our top signifier, are perhaps the prototypical bird as sign. They combine a salient voice, human-like visage, strange swiveling neck, nocturnal habit, and sensory powers beyond what people are capable of, leading us to speculate that breaking categorical boundaries is key to making a bird an effective sign-vehicle. Its high rank in our sample is also at least partially due to its presence on all continents except Antarctica. However, we also have reason to think that owls have been important to people ever since we started communicating symbolically. One of the earliest known depictions of a bird—the 30,000-year-old engraving in France's Chauvet Cave—is of an owl (Bradshaw Foundation 2016).

As ecological indicators, birds with particular life histories and seasonal

behavior are most useful as signs. Birds that are extremely rare, extremely common (as suggested by our analysis of IUCN endangered status), or closely associated with human activities (such as pets) are practically ineffective as sign-vehicles.

Taxonomy and Biosalience

People relate to birds, as with other living things, at multiple taxonomic levels for different purposes. Most of the signifier birds in our sample were identified at the subfamily level. This should not be interpreted as failure to distinguish a more specific taxonomic level, but rather an indication of cognitive flexibility and utility. People creatively intersect with taxonomic levels that make sense for the task at hand. For culturally-learned meanings that rely on being widely shared in a community, higher level taxa are more likely to persist—e.g., more people can identify a bird as a jay than as a Stellar's Jay. In the case of the owl, more commonly identified at the level of order rather than subfamily, phylogenetic loneliness may play a part in its salience. That is, while most avian orders are comprised of many families and genera, Strigiformes includes only two owl families, and these with few genera, making owls perceptually more "lonely" and, thus, highly distinctive as a taxon.

Our results show that, among bird orders worldwide, Passeriformes was the most represented (23%), which makes sense given how predominant this order is in terms of bird species. However, when passerine/near-passerine/non-passerine categories are considered, we find that the majority of bird signs, as well as the top 13 signifying birds, are not passerines. This may be due to taxonomic salience (phylogenetic loneliness) similar to what Berlin et al. (1981) and Boster et al. (1986) found regarding people's ability to distinguish phenotypically distinctive non-passerines more easily than passerines.

Implications for Conservation

For ethno-ornithologists interested in ways to incorporate cultural importance and knowledge of birds into conservation projects (Bonta 2010; Wyndham et al. 2016) and policy development, it is tempting to focus only on the human-bird relationships that respect and nurture bird life, of which there are many, from taboos against killing certain species to rules about when and how eggs may be gathered (Natcher et al. 2012:1054). Here, our collected examples include positive bird-human relations, such as birds bringing good news or luck, indicating weather or food events, or warning of danger. However, a compilation such as ours also documents the negative cultural valuations of certain birds that are (or were) feared, hated, and killed. This is most notable for owls worldwide (e.g., Lusaka Voice 2014), which, despite their role in rodent control, are in many places associated with sorcery and death. Healthy traditional relationships often involve people killing birds for food or medicine as a core aspect of an experientially connective world view. Oglala Lakota wildlife biologist Richard Sherman (2016:74) expresses this: "As you hunt, you bond with the animals. You start to match heartbeats, and when you do that, respect for them and for the land comes naturally." Hunters often report that their study of birds includes pretending to be them and seeing the world from their perspective (Liebenberg 1990).

Cultural proscriptions and prescriptions draw on relationships and, perhaps, trans-species metaphors or signatures (e.g., bird's hearts can affect human hearts). For example, Hull and Fergus (2011:51) report that Ch'ol Maya consider that killing a Masked Tityra (*Tityra semifasciata,* which has bumpy facial skin) can give a person warts and that eating a hummingbird heart can enhance a man's attractiveness. Ayoreo children are admonished not to call out disrespectfully to *Cacáca*, the Plumbeous Ibis (*Theristicus caerulescens*), lest she

become irritated and drop lice on their heads as she flies over.

Our results show that it is the common-enough, but not too common, birds that show up most in sign relationships with people. These are often birds that can live with at least some human disturbance, thus less directly relevant to conservation programs focusing on endangered or vulnerable populations. However, as exemplified by BirdLife International's (2017) initiative for "Keeping Common Birds Common," we posit that the embeddedness of people's everyday relationships with bird life are of utmost importance for conservation, as these relationships have indirect but potentially influential effects on awareness and attitudes about all birds, animals, plants, landscape, self, and society.

Predictive signs can be understood as key to human cognitive processes for remembering details of past experience and predicting/ hypothesizing about the future (Gilbert and Wilson 2007), all of which are vital to conservation aims. The honed ecological awareness acquired by paying attention to birds also translates more generally to sophisticated connective worldviews that can extend our perceptive awareness in space and time. By listening carefully to the birds, we can know what is occurring up to a kilometer away; by watching them, we can sometimes know when a big storm is approaching hundreds of kilometers away. By pretending to be birds, we value the world from their perspective. Birds are particularly "good to think with" (Krech [2009:26] discussing Levi-Strauss' more general dictum); the ethno-ornithologies we reviewed frequently mention a special attention given to birds and, by extension, other creatures and living things in people's environs. Hull and Fergus (2011:46) describe Ch'ol communities in Chiapas as acutely aware of avian vocalization around them; the first author has also found this to be true in Ayoreo and Rarámuri communities in Paraguay and Mexico, respectively. Similarly, Fowler (2013:168) describes how people in Northern Paiute country "often monitored the health of the land and safety of a situation by listening to birds singing." These lessons on the importance of culturally embedded, holistic, subtle awareness of interconnected species' wellbeing are where Western conservation traditions will learn most from ethno-ornithology.

Conclusion: Starting with Birds

In history, ecology, and spirit-worlds around the globe, birds are at the intersection of major and minor relationships, as sign-bearers, actors, interpreters, teachers, and antagonists. Stories woven with birds bring whole worlds into focus—narrative threads pull mammals, plants, geology, weather, insects, fish, hydrology, and supernaturals into networks of relationship, transaction, and process. When we start with birds, and bird signs, we can go on to sketch ecosystemic relationships between people, landscapes, plants, and everything else. By watching and listening carefully to birds, we are better informed about what is happening beyond our immediate environment, in both space and time. We speculate that in the evolution of cognition, the human propensity for prospection may have extended from the domain of natural history—reading one's environments through careful observation and tracking—to incorporate additional causal agents in the socio-cultural sphere, such as notions of luck, fate, deities, and supernaturals. The epistemic activities of skepticism, testing, and checking with peers are perhaps less prominent in socio-cultural prospection than in natural history prospection (e.g., among Kalahari Bushmen hunters [Liebenberg 1990]).

The ethnographic literature we surveyed documents how birds are commonly seen as active participants in societies and ecosystems (Hull and Fergus 2011:51) and as helping people deal with uncertainty and respond to changing social,

natural, and supernatural environments. John Rope, quoted in Goodwin and Goodwin (1942:492), relates how, growing up in Western Apache country, "it was not until I was fifteen years old or so, and had started hunting with my older sister's husband and a maternal uncle, that I really began to learn how these birds, animals, and plants were related." The life-span, familial, cultural, and environmental contexts of life experience allow for the development of personal knowledge, as well as community-shared knowledges and broader-scale wisdom. This monitoring of overall relations draws on appreciation of indirect causalities, the "subtle ecologies" of place (Wyndham 2009). If birds, with their fast metabolism and ability to cover considerable ground in daily life, are vocal and going about their business with energy and grace, then it is likely that the plant life (food and cover), water sources (hydration), and other diverse animal life (even predators) are also doing well (Turpin et al. 2013). As Rachel Carson taught the Western world by drawing attention to the ecosystemic effects of DDT in weakened eagle eggshells, birds, as highly salient signifiers to people all over the world, can be important indicators of ecosystem health. Perhaps there is a simple guiding formula: start by keeping the birds happy, and the rest will follow.

Notes

[1] http://hraf.yale.edu; accessed August 21, 2016.

[2] Our full data set is shared with the public at https://ewatlas.net/digital-heritage/listen-birds-supplemental-materials-dataset.

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