

Heron Conservation – a History

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Abstract.—Hérons comprise a distinctive family of birds, the Ardeidae, adapted to living in aquatic environments. The history of herons in human culture dates back at least 4,000 years, continuing through successive cultures. Through the millennia, hunting herons for sport, food, or feathers has been one of the more enduring conservation issues for the group. Killing egrets for their feathers initiated the modern conservation era in the United States and Europe. Overall, protection of nesting sites and feeding habitats has been, and remains, a significant theme in heron conservation. Owing to their longevity, wetland dependence, and site specificity, herons have been proposed as potential indicators of environmental conditions and trends. It has been recognized that landscape and regional conservation action is the most effective conservation tool for most species, but several species and populations have been identified as being at risk and requiring special species- and population-level planning and action. To facilitate the conservation of herons, HeronConservation, the Heron Specialist Group of the International Union for Conservation of Nature, was founded in 1982 and has since led global engagement in heron conservation through communication, networking, technical syntheses, and action planning and facilitation. Received 30 April 2017 accepted, 2 May 2018.

Key words.—Ardeidae, conservation, egret, endangered species, heron, history, wading bird, waterbird, wetlands. Waterbirds 41(4): 345-354, 2018

Hérons, egrets, and bitterns comprise a distinctive family of birds (Ardeidae; hereafter referred to as herons) characterized by their relatively long legs, necks, bills, and toes; powder down; pectinate toe nails; and other adaptations for living in the aquatic environment and feeding in water (Kushlan and Hancock 2005). Although there are notable variations of this evolutionary theme, their distinctiveness makes most species readily recognizable as herons. Because many species in this group frequent human-dominated landscapes, herons have been recorded far back in human history and continue to occupy places within local cultural traditions. Their conservation has been a matter of concern since the 1200s but has grown in priority since the early 1900s as a result of population declines due to plume hunting, concern for effects of chemical contaminant and the loss and functional modification of habitat. This article traces the conservation issues and history of heron conservation, notably documenting for the first time the history of HeronConservation, the Heron Specialist Group of the International Union for Conservation of Nature (IUCN).

HERONS IN HUMAN ANTIQUITY

The history of herons within human culture spans millennia, at least 4,000 years.

Many heron species were apparently well adjusted to cohabitation of water courses as they became populated with humans and so became part of everyday human life. In ancient Egypt, they were called *Benu* and were the most frequently illustrated birds in surviving images from ancient Egypt (Hart 2005). They were generally depicted within Nile wetlands and associated with birth and the sun, playing a part in the Egyptian creation story (Hart 2005). Herons figured similarly in the origin story of the Aztecs, who before settling down wandered for centuries from their home place of Aztlan, “the place of the heron” (thought to be present day San Blas) (Andrews 2003). In Greek mythology, they were messengers from Athena (Jashemski and Meyer 2002; Homer 2004).

Hérons and their behavior became symbolic for grace, calmness, beauty, solitude, patience, and resilience. The Egyptian heron hieroglyph represented both “vigilance” and “rising”, showing an appreciation for Grey Heron (*Ardea cinerea*) behavior as it feeds by standing and waiting invisibly tucked away in the reeds, noticeable only when it startlingly takes flight. It has been speculated that the heron’s story of rising from the marshes was transferred to Greek as the phoenix, a tale Herodotus transcribed from Egypt in the 5th century B.C. (Lecocq 2009). In China, herons were a symbol of

ascension. In Maori culture, the Eastern Great Egret (*Ardea modesta*), “Kotuku”, was a spiritual messenger and object of beauty, its feathers being worn only by chieftains. Historically, as now, Eastern Great Egrets were likely rare in prehistoric New Zealand and as such highly prized (Hutching 2016). In Japan, herons have been honored as associates of rice and for symbolizing grace and beauty (Werness 2003; Mashiko and Toquenaga 2013). Not all of the heron’s attributes were viewed so nobly; they were also seen as cowardly in their tendency to flee rather than fight. A mid-1300s poem, *Voeux du héron*, depicts Robert III d’Artois inciting England’s Edward III to war by making a chivalric oath over a cooked heron, which was meant to represent the English king’s cowardliness to fight (Grigsby and Lacy 1992; Baker 2000). Although it is doubtful that a roasted heron was actually involved in initiating the Hundred Years’ War, the poem remains a notable literary appearance for herons.

Hérons were depicted in Greek and Roman pottery and mosaics and in Japanese drawings and culture. The White Heron Dance, Shirasagi-no-Mai, in which dancers become herons, likely Little Egrets (*Egretta garzetta*), in a careful imitation of the herons’ postures, walking, and feeding behaviors, originated over a thousand years ago at Yasaka Shrine in Kyoto, Japan. The performers parade to ward off human and crop disease (Matsumura 2013). Although the dance was passed around to different places over the centuries, it is best known in its resurrected form, which since the 1960s has been performed for tourists in Tokyo, Japan, where, as is not atypical for herons’ muddled cultural history, the dancers are called cranes.

In most of these historic settings, there is little to suggest that herons enjoyed any overt protections, nor was there likely much need as they have always been relatively common and, being wary, not easily killed by ancient methods. There are exceptions, of course. Hindu communities and Maha Rajas in India and royalty in Japan protected colonies for generations (Spillett 1968; Perennou *et al.* 2000; Kushlan and Hancock 2005; K. Matsunaga, pers. commun.). In Europe,

herons were valued in that they were used as quarry for falconry. Emperor Frederick II of Hohenstaufenin’s *De Arte Venandi cum Avibus* from the first half of the 1200s, essentially the first ornithology text, describes how they were hunted (Anker 1979; Wood and Fyfe 1961). Because of their value as falconry quarry throughout the European Middle Ages, herons were valued by nobles and protected within their hunting reserves from commoners.

HUNTING

Killing of herons for sport, as food, as pests, or for their feathers has been one of the most enduring and impactful themes in heron conservation history. Theoretically, as a long-lived animal, herons would be expected not to tolerate excessive adult mortality and so hunting and other killing pose a potentially serious conservation threat. Herons were among the protein fare of the Middle Ages (Abramson 2004); 400 herons were served at a single banquet in 1465 (Hibbert 1987). But with few adequate weapons other than falcons available to hunters and herons being prized by the aristocracy, their killing would likely have been localized, infrequent and probably having minimal population-level impact. But as hunting methods became more lethal and more widely available, localized effects from hunting likely occurred. As a recent example, during and after World War II, residents of the Camargue in southern France began eating Little Egret and Black-crowned Night-Heron (*Nycticorax nycticorax*) chicks, starting a tradition that continued long after the food crisis waned (Yeates 1950; Voisin 1991). The most definitive information on population-level hunting effects comes from islands where isolated heron populations disappeared coincident with the arrival of humans (Kushlan and Hancock 2005). Herons have been, and in some cases still are, hunted in places such as China, Mali, Madagascar, India, and southern Europe (Kushlan and Hafner 2000).

Hérons also have a long history of being killed as pests. Throughout history, people have often had trouble sharing their fish

with birds. Although local predator control at scattered fish ponds or fishing sites probably had little population-level effect over the centuries, such mortality intensified greatly over the past century as commercial fishing and aquaculture increased worldwide, high-powered guns became more widely available, few protective measures were in place, and, in fact, such predator control in many locations was legally permitted if not encouraged by governments. Until the 1970s, tens of thousands of herons were killed annually in Europe (Marion 2000). In the 1980s, over 4,000 Grey Herons were being killed annually in the United Kingdom alone, about equal the population's annual productivity (Marion *et al.* 2000). In 2011-2013, in the United States, over 20,000 Great Blue Herons (*Ardea herodias*), 14,000 Cattle Egrets (*A. ibis*), 12,000 Great Egrets, and 2,000 Snowy Egrets (*E. thula*) were officially reported killed at aquaculture facilities (Bale and Knudson 2015); such killing was potentially under-reported. Most studies have shown consumption of fish by herons at fish farms to be low in absolute impact, relatively low contrasted with other losses, relatively low contrasted with other fish-eating birds, and often focused on unharvestable stock (Marion 2000; Glahn *et al.* 2002). Despite limited scientific justification and counter-measures being available, killing of fish-eating birds as pests continues worldwide. This mortality continues to pose challenges for conservation of local heron populations.

Historically, herons were also killed for their feathers, especially the elaborate courtship plumes of some species, some of which are called egrets because of their plumes, or aigrettes. No doubt plume hunting goes back as far in human history as there were warriors, chiefs, nobles and priests who needed to be impressively decorated. Although for centuries hunting for the few rich and powerful probably had little population-level impact, by the mid to late 1800s, many others became wealthy enough to care about their clothing and also wanted feathers, issuing in an era of worldwide slaughter of egrets. In Europe, Little and Great egret colonies were devastated, as they were in Asia and Australia. In the Americas, pristine colonies were

within reach of well-armed American backwoodsmen and Native Americans.

Aigrettes, once off the bird, kept well, weighed little, and shipped easily via trade routes leading from local hunter to trading post, to consolidator, to shipper, to factories in London, Paris, New York, Berlin and Vienna, and finally to the tops of ladies' hats. In 1902, a tabulation was made of the London plume season from which it can be calculated that over 192,000 egrets were killed for their feathers that year (Ehrlich *et al.* 1988). Around Paris, nearly 10,000 people were employed in the millinery trade, and in America the trade employed one of every 1,000 workers (Ehrlich *et al.* 1988). Historically, any efforts to protect herons came up against economically and politically powerful opponents.

The first concerted effort at heron conservation was the founding of the Plumage League in London in 1889, which was an attempt to stop feather use by influencing custom and law. In the United States, ornithologists, museum curators, and journalists followed the British lead and began publicizing egret slaughter, leading to the creation of many local Audubon societies and the American Ornithologists' Union Model Law for States to follow in protecting birds. Once States passed protective laws, the Federal government was able to use its authority to regulate interstate commerce to prohibit interstate shipment of birds taken contrary to State law (Kushlan 2012). This intervention was followed by the Migratory Bird Treaty Act that asserted direct Federal control of migratory birds (Kushlan 2012). The Plumage League became the Royal Society for the Protection of Birds, which now has over a million members (Adams 2004). The Audubon movement coalesced through the National Association of Audubon Societies in 1905, later evolving into the National Audubon Society, the symbol of which remains a flying Great Egret (Graham 1990). Hunting egrets for their feathers and the conservation initiatives that resulted from it were the foundation for the modern conservation movement in Europe and the United States, and eventually to the wider environmental protection policies, legislation, and international conservation treaties that followed.

PESTICIDES

Most, although not all, heron populations rebounded with the end of plume hunting, slowly repopulating and reclaiming their historic ranges. But by the late 1940s, herons and other top aquatic predators, such as cormorants and terns, were found to face a new challenge, organochlorine pesticides. Eggshell thinning was found to have occurred in Great Blue Herons and Black-crowned Night-Herons, and other chemicals, such as dieldrin, were found to cause direct mortality of adult herons (Custer 2000). It turned out that despite eggshell thinning, Great Blue Heron mortality rates of adults did not increase, and there were no widespread population decreases owing to organochlorine pesticides (Custer 2000). This history of organochlorine impacts led to increased scrutiny of other potential environmental contaminants, such as organophosphate and carbonate pesticides, metals, and petroleum. Poisoning events from such chemicals too have been shown to have only localized effects on herons (Custer 2000).

Owing to their wetland dependence, site specificity, and longevity, herons have been repeatedly proposed as suitable indicators of environmental conditions, particularly in wetlands (Kushlan 1993). Some of the non-chemical indicators of environmental conditions measured via herons include mortality, distributional changes, breeding population changes, wintering population changes, reproductive performance, growth rates of young, parasite load, and diets (Erwin and Custer 2000). The jury remains out on how well herons and other birds actually can serve as indicators, which of course depends upon carefully dissecting exactly what an indicator is meant to be indicating and its statistical efficacy at measuring change (Kushlan 1993). However, herons continue to be considered a useful option for system-level environmental monitoring; certainly if herons are doing poorly, so is the environment; however, given herons' adaptability, the converse is not necessarily true.

POPULATION MONITORING

An important result of herons' apparent resiliency with respect to contaminants is that herons became candidates for assessment of long-term sub-lethal population level effects of contaminants, which in turn required that their populations be inventoried and then monitored. In the United States, this effort began with surveys of heron colonies along the Atlantic coast by the Patuxent Wildlife Research Center (Custer and Osborn 1977; Kushlan and White 1977; Custer *et al.* 1980), followed by a compendia of status and trends in other areas (Spindel and Patton 1988; Butler *et al.* 2000). Monitoring of various sorts continued at intervals at local, State, and regional levels and over several decades a diversity of waterbird colony inventory and monitoring activities emerged as did a growing consensus on acceptable methodology (Kushlan 2011; U.S. Fish and Wildlife Service 2016). Existing data sets have proven adequate to infer population sizes and trends, albeit mostly with unknown accuracy, and to make realistic conservation status assessments (Kushlan *et al.* 2002; North American Bird Conservation Initiative 2009, 2016; Rush *et al.* 2015). In Great Britain, population estimation is even more exact and long term given country-wide monitoring of colony sites by the British Trust for Ornithology (British Trust for Ornithology 2018). Various censuses in Europe through the decades have produced a quite clear estimate of populations and permitted recognition of range changes (Voisin 1991; Hafner 2000a; Marion *et al.* 2000; Fasola *et al.* 2010). Inventories have also occurred in many other parts of the world, and repeated counts have more recently allowed analysis of trends for parts of India, China, Japan, and Africa (Subramanya 1996; Liang *et al.* 2006; Mashiko and Toquenaga 2013; Harebottle 2018).

HABITAT CONSERVATION

Worldwide, habitat protection and its appropriate management have proven to be

the highest priority for heron conservation (Kushlan 2007). This concern can be divided into site protection, especially for colony nesting species, and foraging habitat conservation, which ranges over much larger areas and involves conservation not only of habitat area but of ecological function (Perennou *et al.* 1996; Hafner 2000b; Kushlan 2000).

Experience has shown that site management for colonies and roosts requires proactive planning and implementation to be effective (Hafner 2000b), so methods will differ among sites depending on site vegetation and factors that affect it. It has also been proven possible to create artificial colony sites, one of the first being Bird City, in Louisiana, created in 1895 during the plume hunting era (McIlhenny 1939). Hafner's creation of an artificial colony in the south of France in the 1970s inspired others to attempt similar management (Hafner 1982, 2000b).

At its most fundamental, colony and roost site protection involves eliminating threats from disturbance by entering, hunting, or egg taking. One of the more important concepts to develop from studies of disturbance over the last few decades is the concomitant need for a security (or buffer) zone around a colony so as to provide sufficient isolation of the herons to proceed with their nest site selection, courtship, nesting, and roosting uninhibited by disturbance (Rodgers and Smith 1995; Hafner 2000b). The importance of colony site protection was recently emphasized in studies of the Agami Heron (*Agamia agami*), a species extremely sensitive to disturbance, which has been found to nest in few relatively large colonies throughout its range, such that each site is crucial in servicing an expansive regional population (Stier *et al.* 2017).

Fortunately, in North America and Europe, many if not most major heron colony sites are located within parks, refuges and other public lands, or on private lands managed as reserves. National Important Bird Area programs and identification of wetlands of international importance under the Ramsar Convention have been critical processes identifying wetlands of conservation

value, which has led to heron colonies and other heron habitat being included in areas recognized, and hopefully preserved and managed, for their conservation importance (Ramsar 2016; BirdLife International 2018).

It also is clear that from historic times, colonies occur and can prosper at sites that are frequented by people (Hafner 2000b). This paradox has been found to be the result of birds habituating to disturbance that is repeated, controlled, and non-threatening. In India, in the 1990s, 46% of heron colonies were near villages or cities, which, although within highly altered environments, are locations at which the local communities offer protection (Perennou *et al.* 2000).

Some herons, such as the three great herons (*Ardea* spp.), *Gorsachius* night herons, tiger herons, and bitterns, nest singly or in well-dispersed clusters (Kushlan and Hancock 2005). Nesting site conservation for dispersed nesting species is more expansive than colony site protection, requiring protection of entire habitat blocks and nesting marshes, as well as their management of hydrology and of competitive use. When such a species has become threateningly rare, such as the case of the White-bellied Heron (*A. insignis*) and White-eared Night-Heron (*Gorsachius magnificus*) then individual nest site protection and management becomes crucial (White-bellied Heron Working Group 2015).

Foraging site conservation is even more difficult than nest and roost site protection (Kushlan 1981, 1986a, 1986b, 1997). Most herons feed in the aquatic environment using a limited repertoire of behaviors and prey, mostly fish and invertebrates, that must be available in numbers, sizes, species, and water depths that allow herons to access them efficiently (Kushlan 1978). In many habitats, availability changes with water depths or water flow such that individual feeding sites may be available for only a part of the year, sometimes for only a few weeks or days at a time. To the extent that this variation in prey availability is caused by natural cycles of rainfall and hydrology, herons are able to use these resources in a predictable way. When human management of water interferes with

the natural pattern, active management of wetlands is required to accommodate the needs of herons. Accomplishing this has not proven to be a politically or fiscally easy task. However, many highly managed wetlands have proven entirely adequate to support feeding habitat for herons.

Loss and alteration of habitat and ecosystem functioning has markedly affected heron populations worldwide (Kushlan 1989, 1992, 2000, 2007). In the United States, swamp drainage was national policy for a century, set in motion by the Swamp Act of 1850, leading to massive loss of heron habitat. Conversely, wetland protection, management, and restoration have provided habitat. Drainage, diversion, hydropower, diking, water management practices, water use, development, and coastal management all determine the utility of a wetland to herons. Historic trends show little sign of decelerating.

Hérons have benefitted from initiatives, programs, plans, projects, national land protection, and international agreements that protect wetlands and other landscapes they use. Because few herons require directed species-specific conservation action, most heron conservation has taken place within the context of conservation action on the landscape scale for broader purposes than for herons alone (Kushlan 2007). Over the last century, large areas of wetlands in the United States and throughout the world have been set aside as parks, reserves, and refuges, all of which have the potential to benefit herons, if managed appropriately.

SPECIES CONSERVATION

Notwithstanding the overriding need for landscape and regional conservation, some heron species and populations are of such conservation concern as to have required special species- and population-level action. Several species, as well as over two dozen populations, are considered to be of conservation concern due to known threats or lack of information (Kushlan 2007). These include the White-bellied Heron (White-bel-

lied Heron Working Group 2015), Malagasy Heron (*A. humbloti*), Chinese Egret (*E. eulophotes*), Reddish Egret (*E. rufescens*) (Wilson *et al.* 2012), Slaty Egret (*E. vinaccigula*) (Tyler 2011), Malagasy Pond Heron (*Ardeola idae*), White-eared Night-Heron (Fellowes *et al.* 2001; He *et al.* 2016), Japanese Night-Heron (*Gorsachius goisagi*) (Hamaguchi *et al.* 2014), New Guinea Tiger Heron (*Zonerodius heliosylus*), and Agami Heron (Stier and Kushlan 2015). Attention to some of these species through research and especially dedicated species specialist groups is increasing understanding and leading to initiation of conservation actions.

HERON CONSERVATION PARTNERSHIPS

Through the mid part of the 20th century, conservation became increasingly institutionalized through national legislation, increased authority and scientific grounding of wildlife agencies, the engagement of international organizations, and the implementation of international migratory species conventions. Over 35 years ago, in 1981, the Heron Specialist Group was organized to take advantage of such national and international conservation networks. After its founding, it was accepted as a research group by the International Waterfowl Research Bureau, as a specialist group by the International Council for Bird Protection, and as a specialist group by what was then known as the World Conservation Union (now the IUCN) (Hafner *et al.* 1986; Hafner and Kushlan 1990, 1996; Kushlan and Hafner 1991, 1993). The Heron Specialist Group was headquartered first at Station Biologique Tour du Valat, Arles, France, from 1981 to 2005, before transitioning to the USA and becoming HeronConservation.

Participating in the governance and programs of its partner organizations, the Heron Specialist Group held leadership roles in the International Waterbird and Wetlands Research Bureau and Wetlands International, and supported Wetlands International in population estimation for herons, and BirdLife and IUCN's Red List process. As the

Group's primary partnership has been with IUCN's Species Survival Commission, it has participated in its planning, reporting, and taxon leadership. Through these activities, the Group allowed the message of heron conservation to be elevated and included in international and national deliberations, goals, and projects.

Being primarily a communication and linkage network, the Group's tangible products were those derived from its worldwide information-sharing network such as biological monographs (*Heron Handbook* and *The Herons*) and conservation syntheses such as *Heron Conservation* (Hancock and Kushlan 1984; Kushlan and Hafner 2000; Kushlan and Hancock 2005). Global action plans have also been published, at approximately 5-year intervals (Hafner *et al.* 1996; Hafner and Kushlan 2002; Kushlan 2007), with resource information eventually moving online (HeronConservation 2018).

The activities of HeronConservation are globally oriented, and it is worthwhile to note that bird conservation in the USA has had a trajectory apart from that of the international bird conservation community as a whole, a trajectory that influenced approaches to bird conservation in the rest of the Western Hemisphere. There, in the 1990s, bird conservation began to be organized around taxon-based partnerships (Brown *et al.* 2001; Rich *et al.* 2004, U.S. Fish and Wildlife Service and Canadian Wildlife Service 2012). In response to the desire to put the conservation needs of waterbirds in a similar context to that of other taxa, the North American Waterbird Conservation Initiative organized and undertook a multinational planning effort in which herons figured prominently (Kushlan *et al.* 2002). The various taxon-oriented initiatives came together in the North American Bird Conservation Initiative, which has served to organize bird conservation efforts, including efforts for herons and other waterbirds (Kushlan *et al.* 2002), on the continent (Yaich *et al.* 2000; North American Bird Conservation Initiative 2016). As a result of this engagement, herons became a conservation concern to wetland managers, joint venture planning,

national wetland conservation funding, and State programs.

Formal participation by those concerned about heron conservation at both the global and national scales over the past several decades has served to institutionalize heron conservation. In this way, the conservation needs of herons may be recognized along with those of other waterbirds and other species. As there are few instances, albeit important ones, where single species conservation efforts are practical for herons, embedding the needs of herons within larger frameworks of regional conservation planning and implementation has proven to provide the most effective approach to the conservation of these species.

ACKNOWLEDGMENTS

This paper is based on a plenary presentation invited on the occasion of the Herons of the World Symposium at the 40th anniversary of the Waterbird Society and in anticipation of the 35th anniversary of the IUCN Heron Specialist Group. I thank conference organizers Sara Schweitzer, Clay Green, and Chip Weseloh. And I thank Clay Green, Tina Knezevic, Chip Weseloh and anonymous reviewers for comments and editorial advice.

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