

The Terminology of Courtship, Nesting, Feeding and Maintenance in Herons

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Each species of heron has a species-specific repertoire of behavior it uses. However among species, there is much communality and similarity. Some of this similarity is due to the behaviors being evolutionarily homologous although some may just be due to constraints that a bird of a certain morphology in a certain place can do. During courtship these behaviors are used to attract, pair, and maintain contact with a potential mate. During nesting, these behaviors are used to build and maintain the nest and eggs. During foraging, various behaviors are used to catch and handle prey. Similarly herons have behaviors they use for maintenance. The behaviors and the repertoire for most species are often not clearly described or understood; and much additional descriptive research is needed. Because there is a significant communality among species in the behaviors each shows, a common set of terminology can be used to facilitate comparison and contrasts among or within species. The unified terminology for heron behavior is described below. Specific behaviors are shown in bold in the descriptions below. Those studying and describing heron behavior are urged to use this standard terminology. Due to advances in knowledge, the terminology does evolve over time and this evolution will be captured in the present document as it occurs. The paper should be cited as: "The Terminology of Courtship, Nesting, Feeding, and Maintenance in Herons", James A. Kushlan, www.HeronConservation.org day/month/year.

Courtship and Nesting

Of all heron courtship and breeding behaviors the **Stretch** is the most typical. Some form is used by most species. It is a primary male advertising display and used also between the pair. The Stretch has been observed in most herons so far studied. Typically it consists of the heron lifting its head and closed bill towards the vertical. At the peak, a call may be given; in the Great Blue Heron it is a moan or howl. As the head is brought down the legs are usually flexed, and in some species a bill snap is given. The crest and the plumage of the lower neck and scapulars are usually erected. This is a very conspicuous display, one that accentuates a heron's specialized plumes and the bright soft-parts colors of the head and bill. In some species the head is down, in others it placed all the way to the back, the Stretch of the Great Egret perhaps being among the more sensational with its head back and huge plumes erect and waved. The Stretch is especially characteristic of *Ardea* and *Egretta* and is used not only in advertisement but also in the **Greeting Ceremony** of the *Ardea*.

The **Snap** is also a typical heron display, although also variable in form among species and individuals. It is primarily a defensive display, the last behavior before an attack occurs. But it is also used for male advertisement in that it may convey a lot of information about the male and is the display that the female has to overcome to gain access to the display site. Generally the displaying heron, with its head and neck feathers erected, moves its head smoothly forwards and downwards; with the neck fully extended out; it snaps its mandibles shut, typically while bending its legs. Variability involves the direction of the neck movement (whether down or up), neck curvature, body orientation, and the extent of bending of the legs. Snaps by a displaying heron are generally not directed to their recipient. Some species do not have an actual snap component and some bite at or grab branches. In some species, such as the Reddish Egret, the Snap includes pronounced **Bowing**. In the Black Crowned Night Heron, the head is extended, feathers of head, back and neck are partially erected, and the bird snaps the bill or grasps a twig. Snap-type behavior is so varied among species that the homologies are not always clear. Its presence in some species is similarly undetermined.

The Snap can be connected to other displays, such as the **Stretch-Snap**. In the Tricolored Heron and the Great Egret, the Stretch and Snap may be performed together in a single sequence. The Black Crowned Night Heron also uses a Stretch-Snap, which has been called **Reverse Stretch** and also snap-hiss, and song-and-dance. The bird stands erect, treading from one foot to the other, extends its head and neck forward and down, feathers of back, crown and breast fully erect, eyes bulging. With its bill down, it gives **Plop Calls**, which can go on for many minutes. Between songs it does Preening to its belly and Twig Shaking.

One of the most conspicuous components of the courtship displays of herons is the **Advertising Call**. The sound of this long distance signal varies among species, from a gurgle to a yell. The Green-backed Heron gives a "Skeow," the Grey Heron a yelp. The Boom Calls of the large bitterns are remarkable. Such low-frequency sounds penetrate the surrounding vegetation and allow for localization.

The **Forward** is the primary defensive, territorial, and antagonistic display, found in most species. . The heron erects its head crest or head feathers as well as any plumes on the neck or scapulars, the head and neck fully extended upwards with bill horizontal, wings slightly drooped. The heron lifts its wings, retracts its head and then rocks forward and lunges toward another bird, usually giving a call or a Bill Snap. The Forward may be the final precursor to an attack. The display is variable among individuals and species. The Forward seems always to be used as an aggressive display in territorial defense. Even young chicks aggressively perform Forward displays while still in the nest. **Tail Flipping**, in which the tail is flipped up rapidly. It is an agonistic display, preparatory to a strike at another bird. In some species it is part of Forward.

The **Twig Shake** is also an obvious display in which the heron partially extends its head and neck slowly out, grasps a twig with its bill, sometimes with a slight elevation of crest or neck plumes, and vigorously shakes it. There may be a flexion of legs causing a bounce, such as in the Great Egret. The intensity may become greater with approach of females or other intruders. This display has been called a Bow in the Great Egret. Some species call.

The side-to-side movements resemble the behavior used to insert twigs into the nest, from which the stereotyped behavior probably originated. In addition to actually making the nest, this can be an aggressive or defensive display aimed inter or intra specifically and used by both males and females - the heron equivalent of saber rattling.

Many displays are derived from normal comfort movements, and in fact continue to function as such. Some of these named displays are no different than the usual behavior but while done on the nest site carry such functions as advertisement, defense and contact. In the **Body Shake** the bird vigorously shakes its body with feathers loosely ruffled. At the nest site, this display brings attention to the bird. **Standing** at the nest or display site also has a display component to it as the bird makes itself obvious and its presence claims the site or attracts interested birds. In the **Alert Posture**, the bird goes beyond Standing and stands very vertical with body feathers raised or smoothed, observing in a highly aware manner. The heron assumes the Alert Posture when it senses a disturbance or threat. This is also called Alarm Posture. In the **Upright**, the heron raises its head up and out until straight, body feathers are raised moderately, and a threat call is usually given. This is a common antagonistic display among herons, used in many contexts, and is also a feeding posture. At the nest sites, it is a mild form of territorial display.

Preening is the same as actual comfort preening and is not ritualized in the strict sense. Nonetheless it is a recognizable behavior during courtship and serves a display function when done at the display or nest site. In the **Wing Touch** the bird brings head and neck forward arching it under the chest, to under the wings where it mock touches the flight feathers or front of wing. Given as a display at the potential nest site by male, it often alternates with the Stretch. It is an advertising and contact display and also a conflict display a between males and females in the presence of the other. A similarly derived display is the **Wing Preen**, in which the heron moves its bill smoothly along its primaries as if preening. In doing so it often orients towards the observing heron, but in many cases does not even touch its own feathers. This display has not been observed in all herons, but its subtlety allows it to be overlooked easily. It is an aggressive display. In the **Back Bite** the bird nibbles at its mate's back feathers. Back Biting is a common form of **Allopreening**, in which one bird preens or mock preens each other aimed towards various spots. Back Biting and Allopreening may have a **Bill Clapping** component.

Given its obvious centrality to a heron's appearance, there should be little surprise that a number of displays involve neck positioning. In the **Fluffed Neck** display, the heron raises its head and neck, erects its neck feathers, and opens its bill at a slight inclination. This behavior is usually used in a low intensity **Greeting Ceremony** between mates, and has been seen in most species studied. The **Head Shake** involves, with neck fluffed and crest raised, the bird shaking its head gracefully. In the **Arched Neck** display, the heron erects its neck feathers and head plumes and curves its neck in such a way that the closed bill is aimed downwards. It is usually used by a moving heron as a threat, and has so far been reported from the typical *Ardea* species. The **Wing Spread** involves the wings being spread downward with the bird making rocking movements as if balancing and all plumes partially or fully erect. It is used after a Circle Flight, before a Forward, and while walking.

Another common display for some species is **Crest Raising**, in which the heron erects its head plumes. This behavior increases the apparent size of the bird and is used as a threat. The Cattle Egret shows the great complexity of Crest Raising in herons. Fear inhibits the erection of the anterior crest and aggression stimulates erection posterior of crest. So the combinations of feather erection indicate emotional state. The development of long posterior crown plumes in many species involves aggressive posturing. In **Bill Wiping** the bird wipes its bill on a branch or any other structure. In **Neck Craning** the bird looks far forward with head and neck out-stretched. In **Straddling**, the bird stands hunched over, with back plumes erect, and prances from foot to foot. This is a characteristic display of the Cattle Egret. The most typical heron posture involving the neck is the **Bittern Posture**. Although best developed in bitterns, it is used by most short and moderately necked herons at one time or another. In the Bittern Posture the neck and bill is held vertical in response to disturbance or just for surveillance. In its full glory, the bitterning bird watches horizontally beneath its vertical bill, sways in the breeze along with its nearby reeds and turns slowly to continue to face a moving intruder. Chicks assume the Bittern Posture while in the nest.

Heron use their bills for display in several distinct ways. Newly paired birds engage in **Bill Duels**, which are ritualized attacks in which the male stabs while the female retracts her head, finally lowering it below that of the male. The female may instead seize the male's bill and hold it. This behavior serves to strengthen the pair bond as the female tolerates the decreasingly intensive attempts of the male to drive her off his display or nest site. Over time, Bill Duels help to reduce the male's aggressiveness towards his new mate. Bill Duelling occurs in Great Blue Herons, Great White Egrets and Cattle Egrets, and probably in other but not all species. **Bill Clapping** is the rapid chattering of the mandible tips (also called Bill Nibbling). If no contact is made with another bird, clicking noises can result. It may be performed while nibbling on the feathers of a mate, in pushing at another bird, or without making contact with the other bird (**Non-contact Bill Clapping**). **Contact Bill Clapping** is a very common interaction between paired birds and is used in making close, appeasing contact with a mate. All heron species studied use some form of Bill Clapping behavior. The origin of Bill Clapping has been much discussed and is probably derived from preening behavior.

Most species use flight for display. Aerial display behaviors are used more frequently by smaller herons than by larger ones. These have been variously described and named. **Circle Flights** start from the colony, travel around, through, over and beyond the colony sites and return to about the same place. Herons dangle their feet, call, raise their crest, cut about in curious curves and zigzags, and make species characteristic flapping noises on slow wing beats. These sounds are rendered as "whomp, whomp" or similar, and the display is frequently called a Flap Flight. It is principally a male advertisement display, although both sexes may do it in some species. And in others several birds will be flying at once. In the **Tumbling Flight** display a bird, and perhaps also its mate, flies upward, and then drops toward the ground tumbling over and over until just prior to landing when it straightens up and alights. **Pursuit Flights** consist of one bird chasing the other around, usually in aggression. In the **Aerial Stretch** display, a heron launches into flight while bringing its head and neck into the Stretch display position. It may sway its head from side

to side and call. It begins and ends the flight with its plumage erected. A **Landing Call** is often given when alighting, the heron extending its head and neck when doing so; it is often part of a Greeting Ceremony.

Most of these displays are given at the nesting site. It has been poorly documented, but some heron species appear to display on the feeding ground as well. Some of these displays are purely aggressive, but dominance on the feeding ground might carry over into the nesting colony. The Reddish Egret has the best described, although still little understood, **Dancing Ground** display. The displaying bird uses Head Shaking, rapidly raising and lowering its head with crest erected, walking or hopping toward other birds, giving a “Crog” call. A similar observation of the Eastern Great White Egret is of a bird advancing on feeding party with bill up, head erect stiff legged and plumes erected. Another feeding ground display is **Peering Down**, in which standing birds bend over with bills touching the water for up to a minute or two. Both birds on the feeding area use **Jumping Over**. The jumping bird head tosses and erects its head, back and chest plumes and leaps over its mate. **Upright and Spread Wing** is also a feeding ground display shown by the Great Blue and Sumatran Heron. Two herons encounter each other, spread their wings, fan their tail droop and spread their wings, extend their neck and head high over back, and become more vertical as the display continues.

When territorial displays fail, herons fight. After the Forward, the next level of near contact is **Bill Jabbing**, which is jabbing the bill at opponent, perhaps making contact. At a longer distance, a **Supplanting Run** occurs when a bird takes off after another and to chase it from a spot. When perched birds face off and duel to the point of attack and counter attack, this is called **Face to Face Fighting**. Birds will stab, bite and kick. In a **Supplanting Flight**, a bird with its feathers erect and while calling flies at another bird. The attacker lands on the spot vacated by its opponent or on top of the opponent itself. The display carries a message of impending attack, and may end in a fight if the opponent does not withdraw. **Aerial Fighting** occurs when two herons fly up from the ground facing each other, lunging bills and thrashing feet, often with the aggressive vocalization. The **Withdrawn Crouch** is a submissive posture given in response to aggressive birds.

Given the intense territoriality of the male, pairing takes several days. As birds enter the Paired Phase they interact with each other in sophisticated ways. Standing, Preening and Allopreening increase as the birds spend time together. At this stage and thereafter, **Greeting Ceremonies** occur. These are important because they allow a returning bird access to the nest site. Depending on the species, these ceremonies may be complex and involve such displays as **Landing Call**, full mutual Stretches with heads and necks arched up, heads held horizontal, often with a call or Bill Clapping. The mate at the nest may answer the Landing Call. The Greeting Ceremony is first-of-all a display that allows individual recognition and therefore reengagement after a time apart. But it is fundamentally a sequence of behaviors that appease the intense nest defense of the guarding mate. Nest relief and twig passing are two times when this behavior is used.

Eventually **Copulations** begin, usually at the nest site. The female assumes a horizontal posture, without ceremony the male mounts by stepping on to her back, often waving or

slowly flapping wings for balance, and brings the cloacae into contact briefly. In some species, the male grabs the female with his bill. The male steps off, often **Wing Waving**.

Following courtship, the birds enter the next named phases of breeding: **Nest Building, Laying, Incubation, and Hatching**. These have been well documented for a number of herons and, as in courtship, herons use similar behaviors that can be named and described.

In some species the males begin to build a nest, but in nearly all, the female chooses the site of the nest and does most of the construction. The behavior used is called **Tremble Shoving**. The female grasps the twig or reed and positions it in the nest by wiggling it up and down and sideways. Sticks are usually gathered by the male and presented to the female. Greeting Ceremonies at this time often involve **Stick Presentation**.

Eggs Laying occurs at intervals of one to several days, depending on the species. For most species, both parents incubate; sometimes their schedules have the sexes incubating at different times of day. Incubating birds develop brood patches and in some species become very broody. **Incubation** involves sitting tightly on the eggs and periodically rising and resettling, often **Rearranging** the eggs beneath, which is done by moving the eggs with the bill. If temperatures at the nest rise too high, the incubating bird may lift up from the nest and **Shading** the eggs, which allows them not to overheat. **Pipping** occurs when the chick makes a hole in the shell with its beak. This is followed by **Hatching**, which is almost always asynchronous, meaning that the oldest egg hatches first followed in turn by younger eggs.

There are several recognized stages of post hatching: **Brooding Stage, Guard Stage, Brancher Stage, and Fledging Stage**. Parents care for the young chicks by either **Brooding** or Shading, depending on thermal conditions, for 1-2 weeks after hatching. After that the parents no longer sit on or over the chicks, but continuing **Guarding** them for 1-2 weeks. In Guarding the parent stands at or near the nest while periodically conducting its own maintenance activities. Parent herons feed their young by **Regurgitating** food they had consumed. This food is usually only semi digested or not at all. Whether they put food in the nest or into the chick's bill or have it taken from their gullet by the aggressive chicks differs among species and age of chick. At the Brancher Stage, day time Guarding stops and both adults begin to forage at the same time away from the nest. When young first fly this is termed **Fledging**. Young return to the nest for some time before eventually leaving the vicinity of the nest permanently.

Feeding

Each species of heron has a repertoire of feeding behaviors from which it may choose when appropriate. Nearly all herons feed at times by standing and waiting for prey and by walking slowly after prey. Most also have other behaviors in their arsenal. They may use their feet, head, wings or full body in various ways to access particular prey opportunities. Overall, many behaviors used by herons are similar among species, sufficiently so that they

can be named. The use of this common terminology in the study and description of heron behavior is encouraged so as to allow comparison and contrast among species and studies.

Hérons usually catch prey with a **Bill Stab**, which is a downward or lateral strike involving fast, directed movement of the head and neck while the body remains still. This is the characteristic capture stroke of the long necked herons, which have full development of specialized neck vertebrae, the elongated sixth cervical vertebra acting as a hinge for the forward strike. The Bill Stab is the fundamental foraging behavior of most herons.

Hérons can also catch prey by moving the body forward. This is more characteristic of species with relatively shorter, stouter necks. One way to do this is with a **Bill Thrust**. The head, neck and body are pushed forward as part of a headfirst leap, and the feet may leave the substrate. Another approach is the **Bill Lunge**. The bird lunges its body forward but its feet stay in place. This is a behavior perfected by species with shortened lower legs, the "knee" joint serving as the hinge allowing the longer upper leg to push forward as the neck and bill are also extended. Herons also use Bill Thrusts and Bill Lunges in their threat behavior. Perched herons have a couple of modifications of the typical prey catching moves. In **Forward Throwing** a bird grasping the branch, throws its body toward a prey item but remains attached to the branch. The Green Heron **Hangs Upside Down** to catch fish beneath its perch.

Hérons also catch prey by subtler bill and neck movements. A heron can use a **Probing** technique by quickly and repeatedly moving its bill into and out of the water or substrate, in a method more typical of ibises. Probing is a non-visual, tactile foraging technique. A more common behavior is **Pecking**. The heron merely picks up an item from the substrate, often repeating the movement. The substrate may be the ground, a plant, or surface of the water. A specialized method is **Scooping** used by the Boat Billed Heron. By **Scooping**, the individual walks forward with its bill partially submerged, thrusting forward and Scooping with each step.

Prey are caught in the bill either by **Impale Capture** or **Grasp Capture**. Impaling means the bill tip goes into or through the prey. This occurs mostly on large and wide prey, and mostly by herons with bills large enough to withstand the stress of impaling and landing a larger prey item. Grasping is the more common capture method in which prey are caught in a tweezers grip.

Hérons may use several different postures to feed. Their choice of posture can enhance the effectiveness of foraging in a particular habitat or for a particular prey item. Posture also has a signaling function, indicating a heron's presence and perhaps its claim to territory. In **Crouched** posture, the heron stands legs bent with its body parallel to the ground or perch. The head is withdrawn or pointed downwards. This posture is used for concealment, stalking, and in preparation to strike. The Crouched posture is particularly used by species feeding in the open and in very shallow clear water and when feeding from along banks and from over hanging branches. The crouched posture is also used in interactions. A **Submissive Crouch** is assumed when deferring to a threatening bird. In

Upright posture, the heron stands straight, its body and neck angled away from the water above horizontal. This posture allows scanning of a larger feeding zone than it can in a Crouched posture. The feathers are often slightly erected and it is used as a threat pose. In **Erect** posture, the head and neck are held high, up to 90° from horizontal, and the bill is level or pointed upwards. An erect posture offers the highest visibility, both to see and to be seen. The Erect Posture has also been called the Alert Posture, and it is often assumed in response to a disturbance or to conduct a reconnaissance of the area. In this mode, the body feathers are smoothed down and the head extends up almost to a vertical.

An interesting high posture relatively characteristic of herons is the **Bittern Posture**. The bird not only puts its head straight up but its bill as well. The bird looks forward beneath the upturned bill. Given the lined ventral coloration of most herons, especially bitterns, the posture is camouflaged.

Head posture is an important component of feeding behavior. The heron holds its head in one of several identifiable ways that permit it to influence its visual field, usually to make optimal use of its narrow binocular field of vision. It may extend its neck and tip its head so that its bill points straight down towards the ground. This **Peering Over** head posture reduces glare and distortion. It also provides a binocular view of a potential prey item by looking down the tip of the bill rather than beneath it. **Head Cocking** is when a heron turns its head to one side so that it is looking straight down with one eye and straight up with the other. This is probably used to fix on a prey item with its monocular vision. In other birds, Head Cocking is used to observe aerial threats, and this possible function should not be overlooked in herons. **Head Tilting** is turning both its head and its neck to one side of its body. It is to reduce glare by shifting its head away from the strike zone. **Facing Down** is when a heron puts its bill, head and neck straight down. It is usually used to probe or pick something up. This posture is also used as a display in some species. **Neck Craning** is looking about with head and neck out stretched. Herons also move their head and neck around to look more carefully for prey. While **Head Swaying**, a heron moves its head and neck from side to side. A head movement in the other plane is **Head Bobbing**, a sinuous forward and backward movement of the head and neck. Head Swaying and Head Bobbing are probably used to obtain parallax and gain a more accurate estimate of a prey item's location and distance. Head Swaying is usually used while Standing, and Head Bobbing while Walking. While **Neck Swaying**, the neck and sometimes the body is moved from side to side, the head tending to be rather stationary. Neck Swaying while feeding may be a method of enticing small movements of prey, while the heron's head remains ready to strike. Neck Swaying is also used in the Bittern Posture, probably to increase camouflage value. While **Head Swinging**, the heron moves its bill from side to side in the water like a spoonbill (*Platalea*).

Standing is the simplest feeding behavior. It is simply remaining in one place while feeding waiting for a prey to become apparent. It is by far the most common behavior among herons and one that characterizes best the fundamental adaptive suite of the group. Herons Stand in shallow water, on perches next to or over the water, on land, on emergent or floating plants, on a rock, or even on mobile platforms such as large animals. The various postures are used in Standing feeding. Erect posture is particularly common in birds

feeding in groups, where it also has an agonistic and distancing message. From an Upright posture, Standing herons can view a wide area for potential prey, competitors, and predators. Crouched posture is often used on land or from perches.

Walking is also a widespread feeding behavior, used by all species, at least on occasion. Herons walk about looking for prey or stalk specific prey items. Herons walk in shallow water, on aquatic plants, on land, or along branches of trees. Walking slowly merges with Standing behavior as steps become infrequent, perhaps as slow as one per minute. The transition is particularly difficult to determine in species such as large bitterns that take minutes to move a leg.

The speed of Walking varies among species and situations. Typical Walking rates in water are 20-30 steps per minute but can be faster in very shallow water or on land. Slow Walking specialists include such species as the Little Blue Heron, which wades slowly and deliberately in shallow water, and the Cattle Egret, which walks on land, especially when **Following** cattle or other moving objects. Herons **Walk Quickly** when their steps become faster than 60 per minute. It is often considered to be a disturb-or-chase behavior, but it may also be used merely to move quickly from one place to the next.

Active feeding, usually disturbing prey to inspire them to move, such as running from place to place or chasing after prey is as characteristic of certain herons. Actively feeding herons use their wings while on the ground while Standing, Walking, or Running. The simplest active behavior is **Running**. A Running heron dashes about, usually to chase after specific prey items. It often moves so quickly that it uses its wings for balance, to gain lift enabling faster movement, and for stopping or changing direction. In disturb and chase feeding, herons string a series of active behaviors together to disturb prey and then chase them down. Although Running is the principal component of this sort of behavior, other behaviors especially using wings and feet are often part of this sequence of behaviors.

Herons may use their wings in feeding. The simplest wing behavior is **Wing Flicking**. A heron quickly, partially extends and then retracts one or both wings. In **Open Wing Feeding**, a heron extends one wing and leaves it extended for a few seconds before retracting it. In **Underwing Feeding**, a heron puts its head under an open wing in order to strike at a prey item. **Whirling** and **Pirouetting** are variations of Underwing Feeding in which the bird turns rapidly. In Whirling, the heron spins fast with its wing out and peers under it. In Pirouetting a heron walks and turns graceful, not as fast as Whirling. While **Double Wing Feeding**, a heron brings both wings forward and holds them over its head. The fullest extent of wing use is **Canopy Feeding**. A heron brings both wings forward above its head so that the forward edges meet and feather tips dip in the water. This forms an umbrella over the heron's head and neck.

Herons also use their wings to fly while feeding. Aerial foraging is not a commonly used behavior, probably because it uses so much energy. But it does seem to be widespread among herons of all sizes. While **Hopping**, a heron flies from a feeding site for a short distance before alighting again. This behavior may be, used merely to change place, or in response to seeing a potential prey. A variant of Hopping is called **Leap Frog Feeding**, in which a heron flies from the rear of a forward-moving feeding flock to the front. Cattle

Egrets frequently do this, as do Black Herons in South African coastal waters and Whistling Herons prior to roosting. Another variant is **In-place Hopping**, which a heron lands in the same place as it began. While **Hovering**, the heron flies in place over the water, stabbing at prey below. In a variant called **Hovering Stirring** the heron pats, stirs or rakes with its feet while hovering. While **Dipping**, a heron flies along, periodically reaching into the water to pick up prey. A heron may also trail its toes in the water while flying along, a behavior called **Foot Dragging**. While in the air, a heron may catch a flying prey item; this is called **Aerial Flycatching**. Or it may dive into the water from the air - either head first by **Plunging**, or feet first by **Feet First Diving**. Herons may also launch themselves into the water from perches, either by **Diving** head first or by **Jumping** feet first. Green Backed Herons, pond herons and the Great Blue Heron are all known to use these behaviors.

Herons also make special use of their feet in feeding. Foot movement behaviors include **Foot Stirring** in which the foot and leg are vibrated, **Foot Raking** in which the toes are scratched across the substrate, **Foot Probing** in which the toes are inserted into the substrate, and **Foot Paddling** in which the feet are moved up and down on the substrate. Foot Stirring and Foot Raking. Herons can use their feet to swim. Their feet have slight webbing, but it is probably more functional for standing in mud than for swimming. While **Swimming Feeding**, a heron floats or swims on the surface of the water stabbing at or picking up prey.

Most of the heron's feeding attention is directed downwards into the water. Herons also use several behaviors to catch prey that are not in the water. A heron may catch prey on resting objects above ground such as plants or other animals. This is called **Gleaning**. Or it may catch an airborne prey by **Flycatching**. Variations are **Standing Flycatching**, **Jumping Flycatching** and Aerial Flycatching (as noted above).

Herons not only disturb prey but also use behavior that classifies as tool use. Herons place bait, either natural or artificial, in the water to lure prey. The behavior is called **Baiting**. They can use real food, such as bread, maize, or dead insect, or choose as a lure something that floats, such as stick. Fish are attracted to the lure, coming within striking range of the Baiting bird.

Another way to attract prey is by **Bill Vibrating**, in which a heron places its bill in the water and rapidly opens and closes its bills. The disturbance caused by these bill movements can attract fishes. A behavior described as Tongue Flicking has been described, but it is likely that the two behaviors are the same.

Herons defend their feeding areas. Herons defend their space with ritualistic displays, often interspecifically. The most common defensive display is the **Forward** threat, which is also used during nesting. The heron typically erects its head crest and the feathers on neck and back and makes a threatening lunge toward its opponent. The wings are slightly drooped, the head and neck are fully extended upwards with the bill horizontally aimed the other bird. **Crest Raising** is an important threat and territorial display. **Twig Shaking** is a very obvious display that is primarily a threat. The bird

extends the head out and down while leaning forward, and grasps and shakes a twig, slightly elevating of crest and neck feathers. This is mostly used in nesting but can be used at other times when a physical territory is being defended such as at roosts. Another threat display, which probably has breeding implications, is the **Upright and Spread Wing**, a feeding ground interaction.

More intense defensive and aggressive behavior involves actually engaging the opponent. The **Supplanting Run** occurs when distant threats fail and a bird runs after another bird driving it from the contested spot. The supplanting run is somewhat like a mobile Forward. The other way to displace a bird is from the air. In a **Supplanting Flight**, with its feathers erect and while calling, a heron flies at another bird. The attacker lands on the spot vacated by its opponent or on top of the opponent itself. In engaging the opponent at close quarters, herons use their bills in threats and in attacking other birds. As in feeding, herons project their bill towards their opponent a **Bill Stab**, a **Bill Thrust** or a **Bill Lunge**. They also use a **Bill Jab**, which does not have the extreme movement of the other attacks but is mostly the head and neck jabbing at the opponent. If contact is made, a fight may ensue. **Face to Face Fighting** is on the ground and **Aerial Fighting** is in the air. Two herons fly up from the ground facing each other, lunging bills and thrashing feet, often calling. The feet seem to be an important part of Aerial Fighting, perhaps in fending off the other bird.

Beyond threats and fights, other kinds of interactions occur on the foraging ground. **Following** occurs when one bird trails behind another or in the case of the Cattle Egret a terrestrial animal or even mechanical device. Following may be directed to any part of the followed animal, called the “beater.” Birds also indulge in **Pirating**. This involves robbing other birds of their food. Usually it is done in a Supplanting Attack, which forces the victim to drop its prey. Herons rob other herons and also other birds foraging with them. In turn they are subject to robbing by both larger wading birds and by small agile birds as well.

Maintenance

When not feeding, herons rest or repair to a roost, often with other birds. All the defensive behaviors used while roosting, if practical. Threat and defensive behaviors are used between adjacent roosting individuals and between arriving and already-roosting individuals. Roosting birds also conduct comfort activities such including **Sleeping**, **Preening** and **Sunning**. Preening involves the bill, the toes, and rubbing. They use the bill for nibbling and stropping feathers. The pectinate middle toenail used for scratching, combing, and spreading oil gland secretion. Oil glands are also accessed by **Rubbing** the back of the head on them. To sun, birds assume one of several wing postures, **Spread Wing** sunning, **Droop Wing** sunning, and **Delta Wing** sunning, which are described by the wing position – open, drooping with the wing tips hanging toward the ground, or with the wing joints spread but feather drooping in a military ‘at ease’ posture.