A Season with the Osprey

Pandion Haliaetus

W.H. Majoros

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For Wimpy and Bruno.

May the wind and the waves conspire to bring them joy—

and many juicy fish.

Preface

My fascination with the osprey (scientific name: *Pandion haliaetus*) began when I was watching a family of bald eagles (scientific name: *Haliaeetus leucocephalus*) in Maryland. Although I could see an eagle any time I wanted, just by setting up my telescope across the river from their nest, I rarely saw ospreys. There were no osprey nests (that I knew of) within a short drive of my home, and my only encounters with these attractive birds occurred when an individual would pass through the eagles' territory (where I spent most of my free time), searching for unlucky fish along the river. Because eagles and ospreys generally don't get along very well, these encounters tended to be quite rare.

After watching the eagles for about eleven years I relocated a bit further south, to the Research Triangle area of North Carolina. This region is blessed with several (man-made) lakes, which are literally teeming with fish. On the weekends the fishermen reel them in both from the lakeshore and from boats. And from the sky they are hunted by both eagles and ospreys—the latter being so common in these parts that it is a near certainty that you will glimpse one if you spend any significant amount of time here. Now my sightings of these two raptors are skewed in the opposite direction from before: whereas I occasionally see an eagle, my opportunities for observing ospreys have substantially increased.

At about the same time that I moved to North Carolina I took up photography. Bird photography has several uses. One (obviously) is as a form of art: because so many species of birds are highly photogenic, making beautiful art out of photographs of birds is in many cases as simple as pointing the camera at the bird and

"pushing the little button". (And let me tell you, that little button is extremely addictive!) The other use for bird photography is as a documentation tool. Birds are fascinating scientific subjects, and there is certainly more to know about birds than will be discovered in the next hundred years by all the ornithologists in the world. Much of what can be discovered about birds derives from their behavioral repertoires, which in many cases can be very conveniently captured via either videotape or through an appropriately-timed series of still photographs. It is the latter medium that I have opted to employ in my nascent studies of osprey behavior, and which I hope to exploit to good effect in this volume.

I hope you will take two things away with you after you read this book. First, I think you will see that the osprey is both a beautiful bird and a fascinating subject, with a remarkable range of behaviors. More importantly, I hope you will be able to grasp, in some measure, what it was like for me as I entered into the lives of these birds. Through the course of this brief study I became intimately familiar with a family of ospreys. I came to *know* them as *individuals*. I think that in order for us to truly understand and appreciate the other animals that inhabit our small planet, we need to begin relating to them on an *individual* level—not as generic members of a species, but as individuals each of whom has intrinsic value. Just as you the reader are a unique and irreplaceable member of your species, these birds whose lives I am about to chronicle (in part) are individuals whom this world will never again know once they are gone. To me, each one is precious.

UPPER RIGHT: *Ospreys in flight are fairly easy to identify, due largely to their starkly black-and-white plumage and their long, slender wings.*

Part I

What is an Osprey?

Although this is a story about a particular family of ospreys, it will be useful to know some basic facts about ospreys in general—i.e., regarding osprey biology, their behavior, and their conservation status. Although ospreys have been fairly intensively studied, due to their special role in the discovery of the negative effects of organochlorine pesticides on bird survival, much remains to be learned about this fascinating animal.

Basic Facts

The scientific name of the osprey, according to the "binomial" naming convention introduced many years ago by the great naturalist and taxonomist Carolus Linnaeus (also known as Carl

LOWER RIGHT: *Juvenile ospreys are distinguishable from adults by their orange (instead of yellow) eyes and by the white edging on their dorsal feathers.*

UPPER RIGHT: *A male osprey on his way back to the nest with a partially eaten fish.*

von Linné), is *Pandion haliaetus*. The first term, *Pandion*, specifies the genus, whereas the second term, *haliaetus*, specifies the particular species within that genus. In this case, the species name is somewhat redundant, since the osprey is the only member of its genus. The Linnaean system consists of the following hierarchical categories, into which each species is uniquely classified:

class
order
family
genus
species

Above these are also the *kingdom* and *phylum*, which in this case would be *Animalia* (animals) and *Chordata* (consisting primarily of the *vertebrates*—animals having a backbone), respectively. The class of all birds is known as *Aves* (hence the tendency for scientists to refer to things related to birds as being *avian*). The order into which the osprey falls is called the *Falconiformes*, consisting of the birds of prey: hawks, eagles, owls, and falcons. Ospreys are generally considered a type of hawk, though a very specialized one, with many unique adaptations and a unique evolutionary history to go along with those adaptations. Thus, they are given their own unique family, *Pandionidae*, and their own genus, as mentioned above. Taxonomists often group the Pandionidae with the hawks by forming a super-family called the *Accipitrinae*, which includes both the osprey family and the family Accipitridae which contains all of the many types of hawks.

LOWER RIGHT: *As soon as he arrives in the nest tree, the female confiscates the male's fish, so that she can feed it to the chicks.*

To non-scientists, the osprey is known by a number of other names. The most common are *fish-hawk*, *sea-hawk*, and *fish*

eagle—and these latter for an obvious reason: ospreys are extraordinarily well adapted to catching and eating fish. This is why they are generally found only near waterways: lakes, rivers, and of course the ocean. If you frequent any large body of water with a healthy fish population, you're likely to encounter ospreys during at least some part of the year. In the eastern United States, particular in the mid-Atlantic region comprising the Carolinas and Virginia, you can see ospreys both along the Atlantic coast and also at many inland sites bordering both rivers and lakes. In central North Carolina, the osprey is very common around both natural and man-made lakes and reservoirs. In these locations you can often see them perched very prominently on dead branches overlooking the water, as they scan the surface for signs of fish. On windy days they can be seen soaring high in the sky or hovering a moderate distance over the water in search of prey. If you are lucky enough to catch one hovering in mid-air, be sure to watch the bird closely: once the bird catches sight of a potential meal he or she is likely to dive straight into the water in order to procure its catch. Both the dive and the subsequent capture are always thrilling experiences for those lucky enough to witness them.

The osprey is a rather large bird. From beak to tail it is roughly two feet in length, and when in flight, from wingtip-to-wingtip it can measure five to six feet—very likely *as wide as you are tall!* To see an osprey's full wingspan at close range in person is a breathtaking experience, as it is for all of the larger raptors. Yet, despite its considerable size, the osprey is, like most birds, much less weighty than you might expect: a mere three to five pounds. As with most birds, they achieve this feat by maintaining an exceptionally lightweight skeleton and harboring numerous air sacs within their body. Their bones are in fact *pneumatic*—densely packed with air pockets. The air pockets of course reduce their weight, while the

OVERLEAF: *Not every osprey seen flying low over the water is hunting: this one has just finished dragging his legs through the water—possibly to clean them, or just to cool off.*

slender sheets of bone delineating each pocket lend great strength to the bird's skeleton. Combined with an efficient musculature, the result is a body plan capable of great strength as well as the lightness necessary for efficient flight. And ospreys are among the most superb of flyers. Their exceptionally long and slender wings give them the maneuverability needed to efficiently procure their prey.

Perhaps the most remarkable aspect of ospreys is their cosmopolitan distribution: they occur on every single continent in the world, with the exception of Antarctica. As with any species so widely distributed, it is difficult indeed to argue against the fact of their finely adapted nature and their success as predators. Their status as a species with a worldwide population places them in the company of peregrine falcons and barn owls. Yet, despite this worldwide distribution, the fragility of the species was starkly revealed during the 1960's by their sensitivity to a man-made substance (DDT) which threatened to cause their extirpation from North America and elsewhere. The osprey has thus served as a weather vane of sorts for gauging human impact on the environment. The very fact that just *one* human activity (treatment of crops with pesticides) could so seriously jeopardize a species with such a global distribution serves as a testament to the wide-ranging, unpredictable, and in some cases pernicious impact upon the planet that individuals of our own species can have.

Those ospreys which spend the warmer months in the United States generally do not stay all year round. North of Florida, most breeding ospreys migrate south each autumn to spend the winter in South America. Migration routes may extend over thousands of miles. Successfully navigating and surviving such a journey, year-in and year-out, is surely a remarkable feat for a four-pound animal. Keep in mind that many ospreys migrate back to the *very same*

nesting territory each year, even back to the exact *same tree* that they used the previous year to raise young. The young may also harbor a tendency toward *natal philopatry*—returning to their hatching locale—though of course it is incumbent on them to find their own breeding territory upon reaching adulthood, whether near or far from their parents' territory.

Ospreys are a very long-lived species. Any particular individual that you encounter in the wild may be fifteen or twenty years of age, having spent that long span of years eking out a meager living in the hard world, migrating between entire continents each spring and fall. Over that span of time one could imagine that an animal would form quite a rich memory—not only of places, but also of familiar faces: mates, offspring, competitors, perhaps even familiar bird-watchers and photographers.

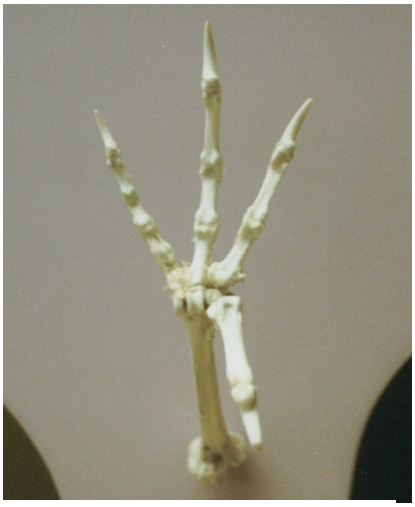
Like the rest of us, ospreys come in two basic varieties—namely, male and female. Surprising as it might seem, the female ospreys tend to be larger, stronger, and dominant over the males in several ways. Simply in terms of body mass, female ospreys can weigh as much as 25% more than their mates. Exactly why this is so is not completely known, though it is a common phenomenon in raptors. Commonly known as *reverse sexual dimorphism*, this tendency within the raptors for females to be (on average) larger than the males might be due to incubation efficiency, since a larger female would presumably be able to provide more heating to the eggs, though this may not be the only explanation. Whatever the root evolutionary cause, reverse sexual dimorphism among raptors means that the female of a pair is likely to get her way—with food, with favorite perches, or possibly any other resource which the pair may squabble about. We'll see at least one example of this later in the book.

Diet

The osprey diet is a fairly monotonous one: roughly 99% of their food consists of fish of one type or another (Evans, 1982), though the range of fish species which they will eat is very wide. Unlike that other common "sea hawk" in North America—the *bald eagle*—ospreys overwhelmingly prefer their prey to be alive when it is caught. Thus, while many bald eagles can make a living by perching lazily in a tree by a river, waiting for a dead fish to float by, ospreys more often have to exert significant effort in order to procure a meal. This fact is readily apparent to anyone who has watched an osprey hang stationary in the air over a lake for minutes at a time, hovering with rapid wing beats. Although hummingbirds and kingfishers also make extensive use of hovering, the much larger size of the osprey makes hovering an especially costly activity, in terms of energy expenditure. Fortunately, fish provide a high-calorie reward for the skilled forager.

RIGHT: *A half-eaten fish dropped (accidentally) by a juvenile osprey.*

ABOVE: *Ospreys can switch between an anisodactyl toe arrangement (photo on right) and a zygodactyl one (above) by reversing the outer toe. Two sets of tendons allow the bird to open or close its grasp. Notice the grooves and slots in the bone accommodating the tendons.*



ABOVE: *Most birds have an anisodactyl toe arrangement, with one toe (the hallux) in back and three in front.*

Specimens: USNM/Smithsonian Institution.
Photos by author.

Ospreys possess a remarkable array of biological traits—both anatomical and behavioral—specifically adapted to catching and consuming fish. Their ability to hover for relatively long periods of time—likely due, at least in part, to the slender profile of their long wings—is just one of those valuable adaptations. A sharp, decurved beak and strong musculature provide the necessary tools for tearing apart fresh fish—by no means a trivial task. Exceptional eyesight is obviously necessary as well, in order to detect signs of fish moving beneath an expansive and rippling lake surface.

Perhaps the most remarkable among the osprey's many adaptations are its feet. Although nearly all birds have four toes on each foot, different types of birds have different anatomical arrangements of those toes. The most common arrangement is known as *anisodactyly*, in which three toes are in front and one (the "thumb" or *hallux*) is in back. Owls are the most well-known violators of anisodactyly, since they have two toes in front and two behind—an arrangement known as *zygodactyly*. Unlike the owls, most other raptors are anisodactyl. Ospreys, on the other hand, are like owls in that they have two toes in the front and two in the back. However, since their outer toe is reversible, ospreys are rather unique in that they are able to switch between an anisodactyl and zygodactyl toe arrangement *at will*. Exactly why they have evolved this trait is not known with certainty, but it seems very likely that this is at least partly an adaptation for catching or otherwise handling fish.

Once an osprey has spied a fish at or near the surface of the water, the bird draws its wings in close to its body and uses gravity to help it plummet quickly toward its prey (a maneuver sometimes referred to as a *stoop*). Shortly before hitting the water, the bird throws back its wings, extends its talons, and enters the water feet-

TOP: *An osprey hovering in the late-afternoon sun. Note the spread tail feathers, which help to stabilize the bird in a stationary position. The ability to hover is quite useful to a predator that hunts over large bodies of water.*

BOTTOM: *Upon sighting potential prey, the bird begins a controlled dive.*

RIGHT: *When a fish is sighted from a considerable height, drawing the wings close to the body allows a rapid descent.*

BOTTOM LEFT: *Regaining flight after submerging requires strong flaps of the wings.*

BOTTOM RIGHT: *Once back in the air, the bird shakes its body like a wet dog, to shed the water from its feathers.*

first. Those feet are formidable fish-catching devices, since they are not only very strong and with robust, pointy talons, but they also possess tiny barbs, called *spicules*, which act as miniscule hooks that help the toes to gain purchase on the otherwise slippery scales of a submerged fish.

TOP: *When flying with a fish, ospreys almost always orient the carcass so as to minimize air resistance.*

Unlike bald eagles, ospreys rarely hesitate to fully submerge when diving after a fish. Whereas an eagle will typically snag a fish from the surface, with only the eagle's legs and tarsal feathers getting wet, an osprey will literally dive fully into the water in order to catch fish that are located some distance beneath the surface. As a result, once they've acquired their prey they typically need to exert substantial effort in order to extricate themselves from the water. For those birds that submerge completely, the buoyancy of their bodies—largely conferred by the air sacs and pneumatic bones mentioned earlier—ensures a rapid rise to the surface, where only a second or two is needed for the bird to catch its breath. By thrashing its wings violently against the water's surface, the floating bird is able to propel itself the six or twelve inches into the air which are needed in order to achieve powered flight. After rising a bit higher over the water the bird will typically pause for half a second in mid-air to shake its body like a dog to rid its plumage of water.

Once in the air with its prey, ospreys will almost always maneuver the fish so as to be facing forward. This is not so that the fish can see where the osprey is taking it, but rather so that the fish will produce the minimal air resistance, thereby reducing the effort needed by the bird to haul the (sometimes quite large) prey item to its destination. In the case of a large, heavy fish, it can be rather important for the bird to get to its destination (typically an inconspicuous tree branch where it can consume its meal) as quickly as possible, since piracy among fish-eating birds—called

BOTTOM: *Theft of fish, whether by conspecifics (other members of one's species) or hetero-specifics (different species) is a constant threat in many osprey communities.*

kleptoparasitism—can be quite rampant among certain species. Bald eagles are certainly the most celebrated thieves of osprey-caught fish, and it is the rare eagle that will pass up a chance to rob, or at least harass, an osprey laden with a heavy carcass. The strategy typically employed by the eagles is to force the osprey to circle higher and higher into the sky, until the smaller bird drops its cargo, which the eagle then retrieves (if possible) in mid-air. There can be little doubt how ospreys feel about the presence of eagles in their hunting range.

The ultimate fate of a fish caught by an osprey depends not only on whether the fish is stolen by a marauding eagle, but also on the season and the gender of the bird that caught it. During the breeding season, many fish find their way into the nest, where they are typically fed to chicks or eaten by the incubating female. However, many fish caught by breeding males are instead taken to a discrete location away from the nest, where the male takes his share of the catch—typically the head. Since females tend to be larger than males, any fish brought by the male into the nest in the female's presence will typically be confiscated immediately by the female, with nary any resistance from the smaller male. Thus, in order for the male to satisfy his daily caloric needs, he will generally need to "pilfer" a bit from each catch before bringing it in to the nest. Since the head (with its several orifices) provides the best entry point into a fish carcass, it's typically the head that the male takes, which explains why many fish brought into osprey nests by males are of the headless variety.

It's worth noting that, despite being impaled by stout talons, many fish survive the trip to the nest. I once observed a male bringing a fish (with head intact) to a nest in a North Carolina swamp in which the female and her two very large and near-to-fledging chicks were waiting, and I found myself wondering whether the

fish—with no blood apparent on its exterior—might still be alive, since all the birds in the nest stared most intently down into the nest cup while quick flicks of what appeared to be a fish tail showed above the rim. A few seconds later the unmistakable form of a fish appeared above the rim, as the captive spontaneously flopped across the nest. After several such flops—clearly observed by the apparently stunned ospreys—the fish launched itself over the rim and into the air. I was able to catch a few photographs of the escapee as it plummeted toward the watery marsh below. That was one lucky fish.

LEFT: *A freshly-caught fish proves a bit too fresh—it somersaults across the nest, while the adult and two large juveniles watch in surprise.*

RIGHT: *The fish impels itself over the edge, plummeting back toward the freedom of the swamp. The ospreys appeared powerless to stop it, and made no attempt to retrieve it from the shallow water at the base of the nest tree.*

Although ospreys rely heavily on fish for food, there have been observations over the years of them taking various other prey items, including snakes, salamanders, muskrats, and other small animals (Poole *et al.*, 2002). After catching any prey item, an osprey will sometimes clean its legs and feet by dragging its feet (in flight) in the nearest body of water. This behavior clearly differs from hunting behavior, since the latter tends to be very vertical in nature (e.g., the "stoop") whereas the former involves dragging the legs for long stretches across the surface of the water.

Reproduction

As with the vast majority of animal species on this great planet, reproductive efforts consume a significant portion of the average adult osprey's life. Raising a brood of young ospreys requires a sizeable expenditure of energy—particularly so for larger broods. Unfortunately, not all young ospreys survive to adulthood, due either to bad luck, bad genes, or bad nutrition. Thus, the problem of reproduction is not an easy one, though it is one that ospreys take very seriously.

Reproduction begins, of course, with courtship. In ospreys, courtship behavior ranges from the purely ritualistic—such as the ostentatious courtship flight displays sometimes performed by the male—to the thoroughly practical—i.e., provisioning of food to the female by the male. The latter, in particular, is quite important, since the courtship period is when females begin their long period of total dependency on their mates for food. All through the laying, incubation, and brooding phases the female will remain in the nest and will rarely leave. Though I have personally observed females opportunistically hunting fish from their vantage point in the nest, females are clearly dependent on the male to make regular deliveries of food. Although research indicates an average of approximately five deliveries per day (McLean and Byrd 1991), the number and timing of deliveries varies widely from day to day. The timing of deliveries, in particular, is (in my experience) totally unpredictable.

From the perspective of the male osprey, the process of courtship all is about convincing a female to stay and participate in further reproductive activities. The first of those activities is of course *copulation*, which I will describe shortly. In order to convince the female to stay, however, the male first needs to demonstrate both his ability to provide for her and her offspring, and also his ability to defend his territory. As an additional requirement,

the male's territory must be of sufficient quality to produce food and relative safety for the coming brood. These latter requirements are to a large degree established (presumably) via the male's consistent delivery of food to the female during the courtship and early incubation phases. A male competent enough to claim and defend a territory and to reliably extract food from the surrounding environs would most likely be a good catch for an unpaired female osprey.

LEFT: *A pair of ospreys copulating in the nest. The male stands on the female's back, flapping his wings as necessary to maintain balance.*

RIGHT: *This red-tailed hawk chose the wrong osprey territory to invade. Both male and female ospreys will aggressively defend the immediate vicinity of the nest.*

Once a female has committed to pairing with a particular male, the twain engage regularly in copulation. As in all birds, the act of copulation is a rather awkward one—and one which is not always successfully accomplished, even by willing participants. The problem is that the reproductive orifice of both male and female birds is located on the underside of the body, just below the tail. In order copulate, the male has to *stand on the female's back*, flapping his wings all the while in order to maintain balance, while he twists his tail down and around the female's tail, so as to place his *cloaca* against hers. The female likewise has to shift her tail to the side and twist it upward so as to allow her underside to meet his underside. Needless to say, this is not an easy task. Making it even more difficult is the fact that the male's feet are equipped with long, pointy talons, which he must be careful not to poke into his mate's fragile form as he balances on her back. I have seen first-year ospreys

repeatedly attempt—and fail—to properly complete the task of insemination; though they were successful at carving out a territory and building an impressive nest structure, they ultimately abandoned the effort, presumably due to their inability to produce fertilized eggs.

The nests used by ospreys can vary quite widely in their size, composition, and degree of isolation (from humans). Though they are generally constructed of sticks, ospreys can sometimes be seen taking other forest products in to the nest, including pine cones, dead leaves, and vines; of course after a season of use, the interior will also contain a great many fish bones and downy feathers, which can accumulate over the years, causing the nest to grow. Even after the chicks have hatched and have grown quite large, the adults will still occasionally bring in additional twigs and branches to add to the structure. If a nest gets heavy enough, it can challenge the strength of the supporting boughs, possibly even breaking them; an older nest can also succumb to wood rot. As we will see later in this book, nests can and do fall out of trees, sometimes with the chicks still in them, though in many cases the chicks can survive and continue to receive care from the adults.

Ospreys are remarkably tolerant of nearby human activity—at least compared to other raptors (especially eagles). They will readily build their nests atop man-made structures, such as utility poles and the like. During (and after) the DDT era, conservation efforts resulted in the placement of many artificial nest platforms atop utility poles, and these were often accepted by osprey pairs as suitable sites for building a nest. Compared to bald eagles, ospreys also seem to be less demanding of leaf cover over their nests. Since eagles generally dominate ospreys socially, any eagles in the area

RIGHT: *Ospreys using an artificial nest platform near Cape May, NJ.*

ABOVE: *An active osprey nest situated next to Interstate 85 in North Carolina. Many local residents talk about the "eagle nest" next to the highway.*

will get first pick at available nest sites, leaving local ospreys to make due with whatever remains. In the case of bald eagles, leaf cover appears to be necessary in order to provide needed shade to the chicks during the hot days of late spring and early summer. Without shade, the chicks of large species such as eagles suffer a greater risk of death by heat exhaustion. Since birds do not possess sweat glands, raptor chicks can eliminate body heat only through a combination of *panting* (i.e., through the evaporation of saliva) and by exposing sparsely feathered "hot-spots" (such as the *axillary* region beneath the wings) to a cool breeze. The lack of direct access to water (excluding that which they obtain through their diet) means that panting must be used sparingly. In nests with little or no natural shade, the female often provides shade for the chicks by shielding them from the sun with her body.

LEFT: *Incubation is carried out primarily by the female, who keeps a wary eye out for intruders.*

The incubation period in ospreys lasts about 35 days (roughly the same length of time as in bald eagles). The clutch generally consists of two or three eggs, or rarely as many as four; most of the nests I've observed produced exactly two chicks each season. Since the eggs hatch several days apart, the first chick begins

feeding and growing before the others, and thus develops a size advantage over its nest mates, which it can use to bully the others during feeding. In seasons in which food is scarce, this size difference and the resulting social dominance during feeding may allow the larger chick to avoid starvation (at the expense of its nest mates), whereas equal partitioning of food in such an environment might otherwise result in *all* of the chicks starving (or suffering from malnutrition that might lead to death or lowered reproductive chances later in life).

When the chicks emerge from the egg, they are covered with a buff-colored layer of downy feathers. During the first two weeks they remain especially vulnerable to cold and wet weather, and are generally kept close to their mother's body. After this they will have replaced their natal down with a second coat that is darker in color and somewhat thicker; this together with their increased weight helps them to *thermoregulate* on their own, without depending so critically on the mother's body heat.

RIGHT: *Clear views of the chicks, when they are still very young, are rare for ground-based observers, due to their diminutive size.*

After about four weeks the first hints of actual flight feathers begin to emerge, and these will continue to lengthen and cover more of

their body over the next month. They chicks remain in the nest for roughly two months total, from hatching to fledging, though this can vary (especially if forced to fledge early, due to a collapsed nest or other dangerous situation).

LEFT: *Both the adults and the young share a keen interest in anything that happens in the sky.*

Feeding is generally administered by the female. When the male brings a fish to the nest, it is quickly confiscated by the female, who feeds tiny pieces to the chicks. Holding the fish in place by standing on it, the adult removes chunks of meat from the carcass using her sharp beak. Each chunk is held out toward one of the chicks, with the adult typically turning her head slightly to the side to facilitate transfer into the chick's beak. Unlike in many songbirds, the food is *not* inserted directly into the chick's throat by the adult; rather, the chick reaches out and takes the food in its beak and then chucks the bolus back into its throat with quick jerking motions of the head. They do not chew it (since birds have no teeth). If the chunk removed by the adult seems too large for the chicks, the adult will immediately swallow it, rather than offering it to the chicks. Occasionally, a piece is given to the chick which is slightly too big to be swallowed, and the chick will struggle with it for a moment or

two; eventually, either the chick will drop it into the bottom of the nest (after which it is generally ignored and becomes part of the nest detritus) or the adult will gently take back the chunk and swallow it herself (or offer it to the other chick if the other is larger).

RIGHT: *On hot days, adults and chicks alike suffer from the heat, though panting brings some relief.*

When the chicks are large enough they will begin feeding themselves. The male will continue to deliver fish, which the chicks then take and pick apart themselves. The larger chick generally gets the first delivery of the day, with the smaller chicks making due with any leftovers (unless another delivery is made while the larger chick is still satiated). At this time the chicks also begin to vigorously exercise their flight muscles, by flapping their wings in the nest. As the time of fledging approaches, their flapping becomes so strong that they are able to lift their bodies several inches above the nest; an ill-fated gust of wind may well cause a chick to fledge before it otherwise would.

At the time of fledging, the chicks will be fully as large as the adults, though they can be distinguished from them quite easily by their red eyes (adults' eyes are yellow) and by the white edging on their feathers.

LEFT: *A hungry chick accepts a piece of meat from the adult. Transfer of food between adult and young raptors is a delicate business, due to the sharpness of their beaks.*

LEFT: *Feedings are among the most interesting events to observe a raptor nest, especially with multiple chicks vying for possession of each morsel.*

FACING PAGE: (TOP) *As the chicks get older, their plumage becomes more similar to that of the adults.* (BOTTOM) *Once their flight feathers have begun to emerge, the chicks feel an irresistible urge to exercise their wings.*

Conservation

Although osprey populations seem to be largely prospering as of now, it was not always so. Centuries ago it was common practice within many cultures (particularly in farming communities) to shoot all hawks on sight, and ospreys were generally not spared this treatment. Even today, roughly one-third of ospreys admitted to rehabilitation centers in the U.S. are treated for gunshot wounds (Poole *et al.*, 2002). Today it is illegal to shoot an osprey in the U.S., however, and it may be hoped that changing public opinions toward birds of prey may reduce the incidence of intentional persecution. Ospreys are in many ways very similar to the bald eagle—the national bird of the U.S., and for many Americans a proud symbol of their nation. The fact that many ospreys are mistakenly identified by casual observers as bald eagles may, at least in the U.S., help reduce their persecution to some degree.

Ospreys not subject to persecution or other causes of premature death can live very long indeed—25 years at least (Spitzer, 1980). It takes three years for an osprey to reach reproductive age, and some do not successfully breed until even older than this (Poole *et al.*, 2002). Thus, the species can be slow to recover from setbacks, especially when nesting habitat is limited. Most ospreys in North America migrate south into Central and South America for the winter, and those who are not yet reproductively mature are thought to spend their first several years there, so that North American populations can be significantly affected by habitat conditions and legal protection status outside of the U.S.

In the 1960's and 1970's, osprey populations in many parts of the world plummeted, due to the use of DDT and other *organochlorine* pesticides. *DDT*, and its breakdown product *DDE*, were implicated in sharp reductions in reproductive success in

ospreys, as well as in bald eagles and peregrine falcons (Wiemeyer *et al.,* 1975, 1978, 1988; Spitzer *et al.,* 1978). Although DDT was banned in the U.S. in 1972, it may still be used (legally or otherwise) in third-world countries where migrants may ingest it via consumption of prey. Furthermore, DDT residues still exist in many North American waterways, where they have in many cases been sequestered in silt but are easily stirred up again by such activities as the dredging of shipping channels and the like. DDE can still be found in varying amounts within osprey tissues today (Elliot *et al.*, 2000).

Fortunately, the rather significant effort that was mounted during and immediately after the DDT era to aid osprey recovery has been very successful, with populations increasing dramatically during the 1980's and 1990's. A rough census in 2001 indicated a U.S. population of about 18,000 breeding pairs (Poole *et al.*, 2002). Like the peregrine falcon and the bald eagle, the story of the osprey shows that conservation efforts—including strong policy changes at the federal level as well as on-the-ground re-introduction efforts—can bring back populations approaching the brink of extirpation. As the human population continues growing, however, the further degradation of habitat and development of new and potentially harmful pesticides and other toxins introduced into the environment leave the future uncertain. As always, constant vigilance remains wise.

Part II

The Ospreys of Ledge Rock

In the spring of 2007, in the piedmont of North Carolina, I was fortunate enough to find an active osprey nest situated in a highly accessible location. I'd found it while kayaking with my Labrador retriever on one of the several lakes near my house. As I paddled by the elevated structure, a female osprey alighted on the rim, glanced quickly into the cup of the nest, and then settled her gaze on me and my passenger. Although neither of us knew it at the time, this bird and I were to become quite familiar with each other over the next several months.

The nest was located very conveniently at the end of a short trail originating at a boat ramp with a spacious parking lot. The trail—actually an old road bisecting a valley that was flooded in 1981 by the Army Corps of Engineers to produce a very sizeable man-made lake—leads quite literally right up to the tree in which the nest sat. Being able to haul my rather large and heavy camera

FACING PAGE: *The nest site in late summer, when a severe drought formed a wide shore. You can see the bird perched high in the nest tree. A long telephoto lens (800 mm) was required in order to obtain close-up shots of the birds from the ground. My eager assistant is visible in the foreground.*

equipment to the nest site made this nest especially attractive for me. Though I had extensively monitored other raptor nests previously (including a bald eagle nest in Maryland that I followed for eleven years), this was the first osprey nest that allowed close and easy access. Osprey nests are relatively numerous in this part of North Carolina, but most of those that I had tried to monitor in the past had required lengthy hikes, were located along dangerous highways, or were effectively inaccessible except by boat.

TOP: *The female of the pair arrives with a stick to be added to the nest structure. In ospreys, both adults generally contribute to nest-building. Notice the speckling on her breast—this is one of the most salient features allowing discrimination between the male (who has a clear breast) and the female.*

Ospreys breeding in North Carolina are migratory, and thus are not present during the winter. In spring they begin to trickle through in late February, with the local breeding population being largely re-established by mid-March (Hagan and Walters, 1990). Those individuals returning to a previously-held territory often have little real work to do in preparation for breeding, since they will typically have a mate already (pair fidelity is very high in this species), as well as a nest from the preceding year. In the case of the ospreys here at Ledge Rock, there is a good chance that both the breeding pair and the nest structure had been formed in a previous year, though I can't be sure. When I arrived, the nest was already present and clearly inhabited.

That the female already had a mate was soon apparent. On my first (land-based) visit to the nest, the female was again present, standing idly on the rickety structure; the male arrived shortly thereafter to perch on a prominent bough supporting the nest. His arrival was heralded by a series of high-pitched calls from the female, which were echoed by the male as he landed. This is their way of saying *Hello!* A slightly different series of shrill calls are made at the approach of strange birds or human intruders, and this is clearly meant to be more of a warning or expression of annoyance than a friendly greeting. I was often greeted with the second type of call. In time, however, I would become so familiar

BOTTOM: *The male of this pair has a penchant for perching on the prominent snag protruding from the front of the nest.*

to this female that her warning call to me became rather timid, often barely audible from my position, and sometimes was absent entirely. Even if she didn't enjoy my company as much as I enjoyed hers, she at least became quite tolerant of my presence, ignoring me during the vast majority of the time that I spent observing her family. She obviously knew that I posed little threat.

Unfortunately, I wasn't able to monitor the nest round the clock. Although having a day job is useful when it comes to affording photography gear, it can be downright inconvenient in terms of one's daily schedule. Obviously, birds don't put their lives on hold whenever their human observer has to leave to go to work. Since the nest site was only about twenty-five minutes from my home, I was able to put in about an hour each morning and then several more hours in the late afternoon; of course, the weekends were more open. But since I found the nest quite late in spring, I missed the entire courtship and egg-laying period. No matter—there was still much to see during the remainder of the season, and I was excited by the possibilities.

Only about a week and a half after discovering the nest, I had my first sighting of the chicks. Judging from their size and the state of their plumage, they appeared to be about three weeks old. Because the chicks are still so small at this stage—and the nest so very large—they tend to be exceedingly difficult to see from the ground, with only the tops of their tiny heads appearing during brief periods of activity (such as during feeding). Most of the feeding is done by the female, who rips tiny pieces of meat from a carcass and gently offers them to a chick. The chick takes the morsel in its beak and swallows it with quick flicks of the head. Of course, precious little of this is visible from the ground until the chicks get older, so that during the first few weeks the female can only be seen to deposit tiny bits of meat to unseen locations in the nest.

Although ospreys are known to lay three eggs on average (Poole *et al.*, 2002), by the end of my second week I was still counting only two chicks in the nest. As they continued to grow I was soon able to catch glimpses of more than just the tops of their heads. Feeding times are a good opportunity to take a count of chicks in a newly found nest: even if the chicks aren't visible, it's sometimes possible to infer how many hungry mouths are present, by observing how many distinct spots below the nest rim receive bits of food from the adult during feeding. Occasional appearances of a tiny beak in each location confirm the presence of a chick there to receive the food. Of course, after another couple of weeks all uncertainty is gone, since the chicks become large enough that they are almost certain to be seen during feeding (though they can still hide away out of site from the ground between feeding sessions). In this case, I ended up with only two chicks. That was good enough for me.

When the female wasn't feeding the chicks, she was almost always loafing on the nest. Late spring in North Carolina can be quite hot, so during much of the day she sat in the nest, panting steadily while keeping an eye out for potential threats. In this particular arm of the lake there were quite a number of other osprey nests, so that at any point in time there was likely to be at least one osprey visible off in the distance. Whenever one of these would venture too close to the Ledge Rock nest, the female would warn them off with her shrill cry. Sometimes they called back, though not always. Once she had become habituated to me, it was clear that the female of this nest tolerated my presence far more than she tolerated strange ospreys flying by. On rare occasions she would even leave the nest momentarily to chase off an intruder. Even rarer were the appearances of bald eagles (primarily juveniles), which were treated with even less welcome. In at least one of these cases the female

recruited her mate to assist her in actively harassing the eagle in flight. The eagle didn't stick around long.

LEFT: *Bald eagles are among the least welcome visitors to any osprey territory, due largely to their tendency to steal fish caught by ospreys.*

The female's constant presence on the nest serves a number of purposes. During the incubation period she obviously needs to provide warmth to the eggs; the transfer of heat from her body, through the egg shell and into the developing embryo, provides energy needed for the embryo to grow within. Although male ospreys will sometimes incubate eggs, the female handles most of the incubation duties, especially at night. After the chicks have hatched, she keeps them warm and shields them from the elements. During the first two weeks or so of their life, the chicks cannot *thermoregulate*—that is, they cannot control their body temperature without help from the parent—and are absolutely dependent on their mother to provide warmth (or shade) as needed.

One of the biggest dangers for chicks during this time is cold, hard rain—which, unfortunately, is not an uncommon occurrence in spring. Persistent rain, especially *cold* rain, can easily kill an entire brood of chicks, if they are not properly insulated from the weather by their mother. Since the cup of the nest is typically lined with soft,

insulating materials such as feathers, moss, and dry leaves, the chicks can be kept in a warm and safe microclimate as long as the mother keeps her body positioned on top of them.

ABOVE: *For highly-exposed osprey nests, shade can be a particularly valuable commodity.*

Once the chicks are old enough to generate sufficient body heat for themselves, the mother spends less time actually sitting on them, and will spend more time standing alert on the nest rim to keep an eye out for potential threats. An eagle or great horned owl (*Bubo virginianus*) would gladly eat a brood of small, defenseless osprey chicks. As the season progresses, the mother also begins shading them from the heat of the summer sun. As was mentioned earlier, birds have no sweat glands, so they must resort to other means of eliminating heat from their bodies. The most obvious method is through panting, which permits heat loss via evaporation of saliva. During my time at the Ledge Rock nest, the mother and chicks were seen to pant almost constantly whenever the sun was out. Early morning and late evening provided some respite from the heat, especially on days when a steady breeze blew across the water.

During hot weather the chicks would often watch me from the dark shade between their mother's legs, panting constantly despite the shade she was providing.

While the mother stays home and tends to the young ones, it is the father's job to go out and catch fish for the family. During the many hours I spent observing this nest in 2007, I rarely saw the father except during food deliveries. Most of my time was spent watching the mother as she sat panting on the nest, usually alert, though sometimes napping for short periods. Several times each day, however, she would suddenly lock her gaze onto some distant point on the horizon—a point often not visible from my angle, since I was surrounded on three sides by enormous pine and oak trees. Soon she would begin to whine loudly while continuing to gaze into the distance, often leaning forward and extending her neck low over the nest rim. At these times it was clear—even if *I* couldn't yet see him—that she had spotted the male off in the distance, hauling a prey item toward the nest. By observing the direction of her gaze and then rushing from my observation point out to the lake shore, I was sometimes able to observe the male's approach. By then rushing back to my tripod-mounted camera I hoped to photograph his arrival in the nest.

I soon learned, however, that the male didn't always take his catch directly to the nest—in fact, he seemed rarely to do so. Just past the nest tree there was a small cove, and on the opposite shore of that cove was a tall pine tree with a prominent branch where the male liked to take his catch. Here he would eat the head before hauling the rest of the carcass to the nest. Taking his own

UPPER RIGHT: *Having already taken his share, the male hurries back to the nest with the remainder of his catch.*

LOWER RIGHT: *As the chicks increase in size, finding a shady spot beneath or behind Mom can become an exercise in creativity.*

share first was a smart move for him, since the female confiscated every food item he brought to the nest, as soon as he arrived. I never once saw the male ingest a single bite of food in the nest, and it was fairly obvious that this was because the female forbade it: upon arriving in the nest, anything he carried was forfeit to her. And when the chicks got large enough that she no longer needed to stay in the nest with them, they took over her role in confiscating all arriving cargo.

UPPER RIGHT: *A common sight: a male osprey hurrying back to the nest with a headless fish.*

Since the male's job consisted solely of catching fish to take back to the nest, he spent very little time at the nest itself. Upon being liberated of a carcass, he would typically spend about five minutes or so loitering on the nest rim or on an adjoining branch while the female fed the chicks. Between mouthfuls she would usually whine loudly in his direction, presumably prodding him to get back to work collecting provender for the growing juveniles. During his brief visits he would always alternate between scanning the skies for avian threats and glaring in my direction, panting all the while. Flying with a heavy fish in tow must be a taxing activity even for an adult osprey, and especially so in hot weather. Yet, he did more than merely rest his weary bones during these visits—on at least one occasion he launched himself suddenly into flight to chase off another osprey that had wandered too close. With the female distracted by her chore of feeding the chicks, the male's presence served to provide another pair of watchful eyes.

Precisely how the male spends his time away from the nest was very difficult for me to determine. I'd assume he spends most of that time hunting—either from the air or from a lakeside perch—with quite a number of breaks to cool off or preen his feathers. After making a delivery at the nest, he'd usually fly off into the distance, with his exact flight path often obscured from my view by trees.

LOWER RIGHT: *Dad arrives with yet another carcass while Mom is in the process of administering the previous catch to the hungry youths. Note the stark contrast between the red eyes of the juveniles and the yellow eyes of the adults.*

In cases where I was able to watch his retreat, he seemed to fly quite far away, presumably to another arm of the lake where the hunting was—for whatever reason—somewhat better than near the nest site. It is well known that ospreys defend a tiny area around the actual nest site but share hunting zones with other ospreys and eagles. There is also some evidence that they are able to identify promising hunting locations by observing the success rate of their competitors. It's not unlikely, then, that the male of my pair was commuting to very specific locations—locations that could change day-to-day—out on the lake where he and the other local raptors would congregate to work a particularly productive hunting site. I have sometimes seen small groups of them soaring over an arm of the lake in the vicinity of Ledge Rock, their shrill calls audible from a considerable distance.

UPPER RIGHT: *Dad hurries back to the nest with yet another headless fish.*

One thing that I found truly remarkable was that the female could apparently recognize her mate from as far away as perhaps a mile or so, whereas I found it virtually impossible to distinguish most individuals from each other—at least in flight—through my 8× binoculars. Most passing ospreys elicited a warning call from the female only when they passed too close to the nest, but at the approach of the male—even from great distances—she would begin to whine loudly while intently tracking his approach with her gaze. Exactly what types of cues she is able to use in distinguishing her mate from other ospreys at that distance (and whether she is able to do so unerringly) is unclear; it could be a combination of his plumage, the particular rhythm of his wing beat, or perhaps just the fact of his flying in a direct line toward the nest. Whatever it is, I doubt I could learn to do it so reliably.

Although I obviously found the behavioral repertoire of the adults to be fascinating, it was the prospect of being able to observe

LOWER RIGHT: *Mom appraises the newest catch while a tiny chick rests nearby.*

the chicks, as they grew and adapted to their environment, that most excited me. Watching baby raptors grow up is a wonderful and amazing thing. They begin life as tiny, helpless creatures, and within the span of a few short weeks, they develop into large, powerful predators capable of migrating 2500 miles between precise locations on the globe, twice a year, for a quarter of a century or more (barring an unnaturally early death). Whether learned or innate, the great host of adaptations which allow these animals to survive in the wild, unaided by technology, is truly impressive.

UPPER RIGHT: *Two very large juveniles watch as a distant bird passes.*

Even when still very tiny they exhibit great curiosity about their surroundings. Since their days are filled mostly with sights of monotonously tangled sticks all around, a span of largely empty sky above, and their ever-present (and much loved) mother always at hand, the sight of a two-legged mammal accompanied by a huge telephoto lens and an energetic canine companion must offer quite an interesting diversion to the usual monotony of life in the nest. Certainly, they've given me many lengthy moments of undivided attention during their occasional excursions up out of the nest cup. Apart from me and my little traveling circus, they are also clearly interested in the other birds that fly within view of the nest, tracking them visually as they intrude on their visual field. Unlike their parents, however, they do not offer any calls—warning or otherwise—to the creatures passing just outside their little world: they watch and listen only.

LOWER RIGHT: *The older of the chicks emits a food-begging call, presumably hoping that one of the adults is within earshot. Note that the prominent speckling on the breast of the juvenile is, unfortunately, not a reliable indicator of gender, since this is known to be an unreliable diagnostic trait in young ospreys.*

As the chicks got larger they tended to spend more time up near the edge of the nest where I could see them. Since the weather was generally quite hot by this time, much of that time was spent panting in the shade provided by mom. Even at this stage they're not always visible, however, since even a large bird can lie down in the cup of the nest and be completely invisible to an observer on the ground. But in the cool evenings they were often lounging up

high where I could see them, gazing out toward the horizon, perhaps wondering when dad would return with a tasty treat.

During the doldrums, my dog provided entertainment both for myself and for the nestlings. After chucking a stick in the lake and returning to my camera's viewfinder, I would often see the juveniles watching my canine friend as she rushed out into the lake to retrieve the decoy. Exactly what they were thinking as they observed her forays into the water is of course a mystery. A young osprey needs to become very skilled at spotting fish lurking just below the surface, so perhaps watching animals or other objects floating on the lake might help the young to exercise their visual acuity in a watery environment. What I can say for sure is that they seemed to take a keen interest in anything that happened in the water.

It's worth noting that there is plenty of other wildlife present at this site besides ospreys and other raptors. Small birds like the prothonotary warbler (*Protonotaria citrea*) and the yellow-billed cuckoo (*Coccyzus americanus*) made occasional appearances near the nest, showing no fear whatsoever of their larger, carnivorous relatives nesting nearby (a healthy songbird would be exceedingly difficult for an osprey to catch in flight). Herons and egrets were readily found on the lake, while turtles and lizards could often be spotted moving about in the underbrush below the nest. In most of these cases I saw virtually no interaction whatsoever between the ospreys and these other animals. One interesting case of an interaction that I did observe is documented in the photograph on the facing page, where you can see a tiny blue-gray gnatcatcher (*Polioptila caerulea*) dive-bombing the male osprey. The osprey was clearly annoyed with the antics of the tiny bird, and was just as clearly unable to do anything about it.

UPPER RIGHT: *The prothonotary warbler is, without doubt, one of the most beautiful songbirds living in these woods.*

LOWER RIGHT: *A Blue-gray Gnatcatcher "mobbing" the adult osprey. Repeated body-slams to the osprey's head suggested that the much smaller bird probably had a nest nearby .*

TOP: *One of the most interesting insects encountered in the vicinity of the nest was the hummingbird moth (Hemaris thysbe), which many a casual observer will at a distance mistake for a true hummingbird.*

BOTTOM: This lizard—a six-lined racerunner (Cnemidophorus sexlineatus)—was often seen hunting invertebrate prey on the trail leading to the osprey nest.

TOP: *Although great blue herons (Ardea herodias) are more often seen in the water, they can occasionally be found perched in the trees at Ledge Rock.*

BOTTOM. *Baby turtles were often spotted in the stagnant pond next to the osprey nest.*

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The time that I spent at this nest, during this particular season, can be roughly divided into two parts. The first part extended from my discovery of the site up until the time that the chicks left the nest (which I'll be getting to shortly). The second part extended from their fledging to the time that they gained their complete independence and entered into the wider world as solitary individuals. The more interesting, for me—though much more challenging to capture, photographically—was the second part.

Right around the time that I began thinking that the chicks were finally approaching the size of the adults, I also noticed that the nest seemed to be getting *smaller*. At first I thought this was probably just an illusion, since the chicks were obviously becoming larger relative to the size of the nest. But after a few days it had become apparent that the nest was *disintegrating*. Keep in mind that North Carolina—at least here in the piedmont—tends to be a very moist and swampy state. As a result, dead wood tends to rot fairly quickly. In the span of about two weeks, the nest had gone from being an impressively large structure to absolute nothingness. One morning as I arrived at the nest site I realized that there was no longer any *nest*—only a *nest tree*. And in this nest tree were perched

LEFT: *Severe sagging is a fairly sure sign of nest rot.*

two juvenile ospreys, neither quite ready to fledge, but getting by just the same.

RIGHT: *A large portion of the osprey nest, after it had fallen to the ground.*

For the next week or so the chicks climbed around in the upper branches of the nest tree—a behavior known as *branching*. Each morning before work I'd arrive at the nest site to see them perched in a different location in the tree.

RIGHT: *Once the nest had begun to collapse, the juveniles were forced to begin branching—whether they liked it or not.*

FACING PAGE: *The juveniles seemed unsure as to how to respond to the collapsing of the nest.*

They were able to move from branch to branch through a combination of jumps and short glides of just a few feet. They also spent much time exercising their wings by vigorously flapping them. By this time the chicks were virtually equal in size to their parents, which meant that their wingspan was at least *five feet*. All of the feathers, muscles, and bones making up those wings also made them heavy, and it was pretty evident that flapping them took quite a bit of effort. It would obviously take quite a bit of exercise for the juveniles to develop enough strength to sustain powered flight for any significant distance.

RIGHT: *A juvenile whacks his mother in the head while exercising his wings.*

Before the nest had fallen away, their wing exercises caused some consternation for their mother, and for each other. Since their wingspan was, around the time the nest fell away, roughly the diameter of the nest, any flapping by one juvenile was likely to result in the other juvenile, or either adult that happened to be in the nest at the time, being repeatedly whacked over the head with a wing. Any bird so whacked, whether adult or juvenile, typically glared at the other bird but took no other action to stem the assault. A much more serious threat to a vigorously flapping nestling is surely the *wind*: any sufficiently strong gust of wind arriving at just the right

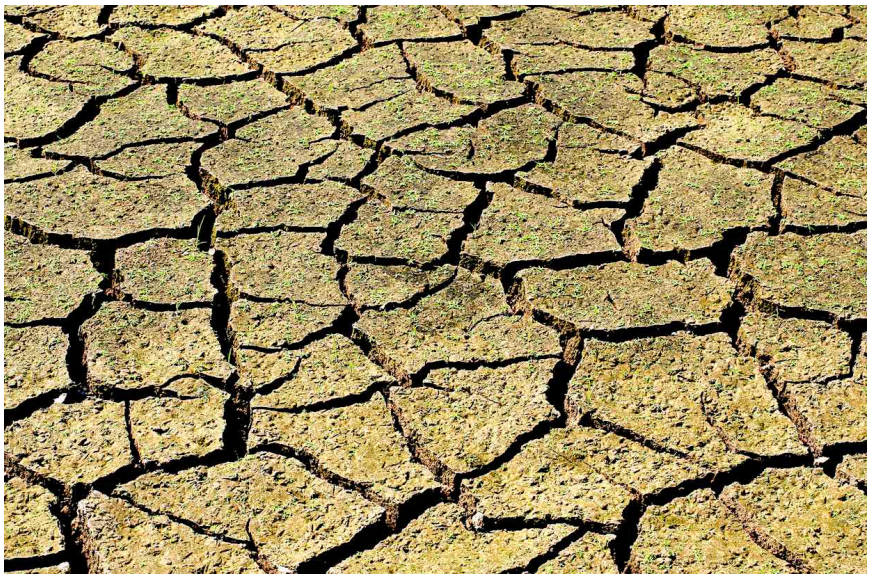
OVERLEAF: *The nest can seem a very crowded place to the adults when the juveniles begin to exercise their wings.*

moment could carry an exercising juvenile out of the nest, committing him or her to an early fledging. Fortunately, neither of these chicks were blown from the nest tree, though after the nest had fallen out from under them this possibility may have increased somewhat.

At about this time I decided it would be useful to *name* the chicks, since I had convinced myself that I had become able to tell them apart—mostly based on subtle plumage differences on the head. While they were younger I had noticed that one bird seemed to dominate the other at feedings, with the dominant bird, being slightly larger and stronger, able to force the other bird to cower and keep its distance while the bully received all the food from the adult. Because the smaller bird never challenged its larger sibling, I named it *Wimpy*. The bully I named *Bruno*. Over the coming weeks these names would seem particularly apt.

Once the nest was gone, Wimpy and Bruno tended to stay close in the nest tree, either on the same branch or on nearby branches; often Bruno would be perched on a branch just above or below the one where Wimpy was perched. By this time the shoreline of the lake had significantly retreated, due to a severe drought, revealing fifteen to twenty-five feet of sandy beach. This allowed me to observe the birds from the wide, open area in front of the nest, rather than from the closed, forested area behind, where most of my early observations were made. In order to get an even better angle I sometimes waded out an additional ten feet into the shallow water with my tripod and telephoto lens. From this vantage point I was able to clearly observe interactions between the juveniles, while getting a slightly more horizontal angle for the photos; the coolness of the water on 90-degree mornings was also appreciated.

RIGHT: *A drought can transform vast stretches of lake bed into a desert landscape—simultaneously reducing the surface area of the lake while also concentrating the remaining fish.*



By this time, Mom was no longer spending all of her time with the chicks; in fact, much of the time I didn't know where she was. Occasionally she or her mate would bring a fish to the nest tree for the juveniles. Upon arrival, the juvenile closest to where the adult had landed would often rush toward the adult and grab at the fish with his or her beak or talons.

RIGHT: *A juvenile, eager to claim possession of the fish brought back by the adult, has mistakenly latched on to the adult's toe, even continuing to grasp his parent's member after the fish has been dropped by the adult.*

The adult, which generally pinned the fish against the branch with one foot, would relinquish the food to the juvenile once the

juvenile had acquired a fairly good hold on the item. This usually took about thirty seconds or so. Once the adult saw that the juvenile had a good grasp on the carcass, he or she would fly off, leaving the young bird to feed him or her self. The chicks were, by now, sufficiently strong and coordinated to rip open a fresh fish—albeit with some effort—and to liberate chunks of meat small enough to swallow. Unfortunately, there was one other skill which they would critically depend upon, which they had not yet mastered—namely, holding onto a slippery fish with one foot while perching with the other. Without this particular skill, any meal could now disappear in the blink of an eye.

FACING PAGE: *A juvenile struggles with the task of perching with one foot while maintaining a grasp of its meal with the other.*

The first time I saw one of the juveniles drop a fish I was quite surprised. I had watched the adult fly in to the nest tree with the rather large prey item, had watched the juveniles vigorously vie for possession of the meaty prize (shrieking excitedly all the while), and then was stunned when I saw the sizeable meal suddenly plummet to the earth below the nest tree. I was unable to determine which juvenile had actually dropped it, since they had been squabbling quite vigorously over it at the time. With the young birds animatedly wrangling over possession of the carcass, perhaps it's not surprising that it one of them could accidentally drop it in the heat of battle. Unfortunately, since the juveniles were as yet unable to fly, neither could retrieve it from the ground. A perfectly good meal, gone to waste.

Over the course of the next two weeks, I saw *numerous* fish plummet to the ground below the nest tree. In most cases the birds were not fighting over the fish; the juvenile in possession of the carcass simply lacked the strength or coordination to retain a sufficient grasp on it while perching with the other foot. This kind of "one-footed" eating, while difficult for us to imagine doing ourselves, is an absolutely essential skill for any adult raptor

feeding in a tree. Normally, at this point in the juveniles' life history, fish would be brought by the adults to the nest, where the juveniles could feed upon it at their leisure in the nest cup; loss of a carcass by having it fall out of the nest is probably quite rare in such circumstances. In this case, with the nest gone, the juveniles were forced to develop essential feeding skills somewhat earlier than they normally would.

FACING PAGE: *A fish in the hand is worth two in the beak. I found many lost fish beneath the nest tree.*

In a number of cases where a juvenile had dropped a fish, I took particular note that one of the adults was perched nearby. I was frustrated to see that the adult *never* made an attempt to retrieve a fish from the ground. I was not surprised, however: on rare occasions in the past I had observed adult bald eagles drop fish from a branch while feeding. Though the carcasses sometimes appeared to have quite a bit of meat left on them, the birds never made any attempt to retrieve them once they hit the ground. My guess is that the danger of being attacked by a ground-based, mammalian predator during retrieval is a very strong deterrent in these cases (though in the case of both ospreys and bald eagles I have often seen them descend to the ground at the edge of a river or lake for a drink or even a bath; why they would not be similarly deterred from descending to the ground in these cases is unclear).

Once a fish had been dropped, I exercised considerable restraint by not immediately walking over to the nest tree and retrieving the carcass. Although I was eager to measure them and see what sort of damage the adults had inflicted when capturing their prey, I also held out hope that one of the birds would retrieve the lost meal, though none ever did while I watched. However, just before leaving for the day, I always made a thorough examination of the area at the base of the nest tree for any fish that had fallen, either while I watched or before my arrival. There was one stretch of about 5 days during which I was able to find a fresh fish under

the nest *every single morning*. In all cases I photographed the fish for later identification, and then tossed the carcass—which was often half-eaten—into the water at the lake's edge.

LEFT: *Though found on the beach near the osprey nest, I suspect these were left by fishermen rather than by clumsy ospreys.*

Although ospreys are thought to primarily eat only live-caught fish, I was curious as to whether I could entice one of them—particularly the juveniles, after they had fledged—to retrieve one of the carcasses that they had dropped.

LEFT: *I tossed each fish found beneath the nest into the water at the edge of the lake, hoping one of the juveniles would "catch" it while I watched from a distance.*

After examining and photographing a fish collected from beneath the nest tree, I would walk very deliberated to the water's

edge, dangle the fish very prominently before me, and then speak very loudly to the birds perched in the nearby tree: *Hey bird: here's your fish!* This rarely failed to get their attention. With the visual acuity that these birds possessed, they surely saw the fish, and given the freshness of most of the carcasses, I strongly suspect that they recognized the carcasses as being those which they had recently possessed.

After tossing the fish about ten feet from the shore I then retreated a very considerable distance, hoping the bird would feel safe from me (and my four-legged companion) at that distance and would attempt to retrieve the carcass. Only once was I successful: after retreating about fifty yards and waiting patiently for about twenty minutes, Bruno (who had by then fledged and was starting to hunt on his or her own) swooped down to what I judged to be the location where I had thrown the fish, and took off with a prey item in his talons.

RIGHT: *Only once did one of the juveniles retrieve one of the dropped fish I had thrown into the lake—and only after I had retreated a very considerable distance from the carcass.*

Upon immediately returning to that location I was unable to find the fish I had thrown into the water, suggesting that the bird had indeed retrieved the carcass I had left for it. Unfortunately, the bird took its catch to an inaccessible location further along the shoreline and I wasn't able to determine whether it actually ate the fish, or

whether it had perhaps discarded it along the way; it's not inconceivable that these birds might possess some instinct which directs them to avoid eating any prey which does not show some evidence of being alive when caught. Such an instinct would be useful in avoiding ingestion of bacteria-infested meat, which might explain why ospreys are thought to strongly prefer live fish.

ABOVE: *A juvenile (Bruno) jumps from one branch to another prior to his first real, powered flight.*

Either way, I at least knew that an awful lot of perfectly good food was being wasted, and yet the chicks remained healthy and well-nourished, as evidenced by their bowel movements and continued strength. Their parents were obviously very competent providers.

FACING PAGE: *Wimpy exercises his wings during his "branching" phase.*

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LEFT: *Bruno calls while clutching a prey item delivered by an adult.*

It goes without saying that the first flight of any bird is a wonderful thing to behold. I can't say I've been privileged to observe it many times. For wild birds, it can be difficult for any observer to be sure that a flight which he or she observes is truly the *first* flight of the bird, since many birds—especially raptors—will repeatedly return after fledging to the safety of the nest. Nevertheless, witnessing *any* flight of a recent fledgling—a flight that *could* be the very first for that bird—is always an exciting event.

RIGHT: *Bruno appearing somewhat uncertain during one of his first flights.*

The first time I saw Bruno fly I was shocked. He (or she) was perched in the nest tree, far out on a long branch stretching over the sandy beach toward the lake. I had arrived only about ten minutes prior, had set up my huge lens and was checking to make sure I had correctly identified Bruno and Wimpy. Though only about 8:00 am, it was quite humid, and I was thinking about retreating a few yards so that I could wade in the cool water. Suddenly, Bruno flew out over the water with quick, shallow wing beats, arcing behind me and then tracing a fairly large circle back to

his or her perch. It happened so fast that I wondered if I had really just seen this bird *fly*, or if the heat and my lack of caffeine had caused me to hallucinate the event.

LEFT: *Bruno becoming more confident in his aerial technique.*

About two minutes later Bruno repeated the performance, this time tracing more of an oval, so as to venture a bit further up the shoreline before returning to the perch. Each flight had lasted no more than ten or twelve seconds, yet had covered many square yards. I had watched the birds the previous evening till dusk, and had seen no indication that they were capable of flying before this morning. If this wasn't Bruno's very *first* flight, it was certainly *one* of the first. Either way, I ecstatic at having seen it.

Bruno didn't fly any more that morning while I was there, and Wimpy likewise remained perched for the duration. Over the next several days I came out every morning and evening before and after work to check on my feathered friends. Despite having fledged, Bruno still spent much time in the nest tree. When an adult would arrive with food, Bruno would now fly to the branch in which the adult had landed and aggressively stake his claim to the carcass. Wimpy, on the other hand, seemed to have no interest whatsoever

ABOVE: *Wimpy during one of his first flights.*

RIGHT: *Landing is one of the most difficult aspects of flying.*

in flying. It would be more than a week later that I would eventually see Wimpy make what I assumed was one of his or her first flights. In the meantime, Bruno continued to perch in the nest tree, and Wimpy stayed fairly close to his sibling[1].

LEFT: *Wimpy learning the art of graceful flight.*

Since Bruno invariably claimed the day's first catch from the arriving adult, Wimpy often seemed to covet the other bird's breakfast. On a number of occasions I observed what I interpreted as begging behavior by the younger juvenile. While the more dominant bird ate, Wimpy would make his way to the other bird's branch via jumps and tiny glides. He would then inch closer along the branch until he was beside his big brother, at which point he would watch intently as the other bird ate, sometimes calling in a high, piercing voice that suggested begging. Bruno almost seemed to relish the attention—though he nevertheless kept the food to

[1] Though I say "he" or "his", I was not able to determine the gender of Wimpy or Bruno, since juvenile ospreys can be very difficult to sex; just keep in mind that "he" may actually be "she".

himself.

One morning the tables were turned, however. When I arrived I saw that Wimpy was already in possession of a fish (presumably obtained from one of the adults, since Wimpy had, as far as I could tell, not yet learned to fly). Bruno was perched in a branch on the far side of the nest tree, where he sat craning his neck in the direction of his younger sibling. A minute later he flew to the branch above Wimpy and continued watching from there. Soon he began to emit loud, plaintive calls—calls that sounded less like begging and more like an expression of irritation—or perhaps even *indignation*.

ABOVE: *Bruno just wants to "borrow" Wimpy's fish.*

Before long he had carefully hopped down to Wimpy's branch and maneuvered so as to be perched next to the feeding bird. At this point I expected the dominant bird to confiscate the meal from his submissive sibling, but remarkably Bruno remained outside

ABOVE: *Bruno covets Wimpy's meal.*

FACING PAGE*: Wimpy doesn't trust Bruno so close to his fish (and neither would I!).*

the other bird's personal space. As Wimpy continued to feed—completely ignoring the other bird—Bruno feebly inched his beak ever closer toward the carcass. Only after a very protracted delay did he finally grasp the half-eaten fish with his beak and attempt to wrest it from Wimpy. Since the fish was locked solidly in the iron grip of Wimpy's enormous talons, it was an easy matter for him to deny the dominant bird of the spoils. Pulling the carcass back, Wimpy chastised his sibling by shrieking loudly in Bruno's face. The dominant bird backed off. Apparently the bounds of his dominance had been reached.

Bruno attempted several more times to relieve Wimpy of that fish, but the scene invariably played out the same each time. Whether Wimpy had somehow graduated from the submissive role which he had been forced to assume while in the nest, or whether there was some other asymmetry involved here, I could only guess. About forty minutes later their father arrived with another fish, which soon made its way into Bruno's stomach, and after that I saw no further interactions between the juveniles for the rest of the day. A strikingly similar scene played out about a week later, however, with Wimpy again rebuffing Bruno's attempts to commandeer his meal. It seems Wimpy had indeed outgrown some of his wimpiness.

Eventually Wimpy even gathered enough courage to take to the air himself. His first flight (or at least, the first one that I observed) was a short one: when big brother Bruno relocated to a nearby tree, Wimpy followed along. Though I registered the event mentally as one of importance, Wimpy seemed not to even notice that he had just flown about fifty feet. What seemed to matter more to him was that Bruno could no longer escape him.

RIGHT: *Wimpy practicing the art of graceful flight while encumbered with consumables.*

In the days that followed, both juveniles tended to remain in the nest tree much of the time, despite being able to fly to any of the hundreds of trees nearby. As time marched on, however, they eventually began to wander about the immediate vicinity. Just beyond the nest tree the shoreline angled leftward at the opening to a tiny cove, where the juveniles and adults (especially the father) sometimes liked to perch. Upon arriving at the nest site in the mornings I now had to wander around a bit to find my quarry; very often they could be found in the cove beyond the nest. Fortunately, finding one of the juveniles meant finding the other as well, since they tended to stay quite close to each other, perching either on the

same branch or in nearby branches. On those few mornings when I could not find them perched anywhere nearby, I would wait, typically ten or fifteen minutes, until I heard a bird vocalizing in flight. Soon one would emerge from above the forest, with the other following a short distance behind, to perch either in the nest tree or in one or two other favored trees nearby.

LEFT: *Wimpy and Bruno relax in the "nest" tree while a brooding storm approaches from the north.*

Though the juveniles were still fairly easy to locate during this period, the adults became quite scarce, showing up only to deliver food to the fledglings. When the adults were away the juveniles often vocalized with their food-begging call, which presumably was directed at the adults when the latter were within earshot. Not terribly long after fledging, Bruno began to at least *attempt* to procure his own meals. At this time the juveniles were almost always either watching the surface of the water or watching

FACING PAGE: *Wimpy and Bruno try out various perches around the nest site. The most prominent branches tended to be their favorites.*

the insides of their eyelids—napping is a common pastime for raptors both young and old. Though Wimpy seemed satisfied with *looking* for prey from his comfortable perch, Bruno clearly took the initiative more often in actually attempting to *catch* something.

LEFT: *Naptime at the nest site was the most popular of unscheduled events.*

While staring out at some point in the vast blue field of undulating waves, Bruno's head would at length begin to systematically rock back and forth—an apparent attempt at improving his *depth perception*. After a few rounds of shifting his head so as to gain a better angle, he would launch himself from his perch—so quickly that I rarely was able to obtain any photos of the act—and then flap quickly to a place over the water where he would then glide or awkwardly hover for an instant before making a

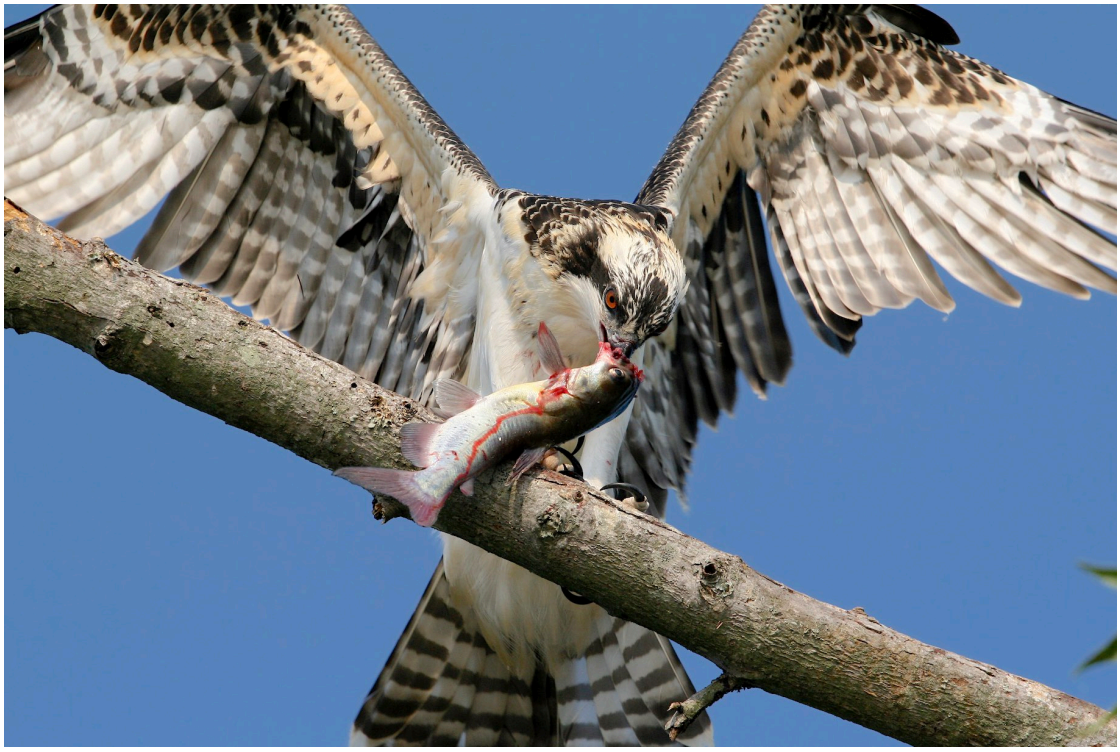
somewhat tentative swoop down to the water's surface, in most cases backing off without making any contact.

The first time I saw either bird catch a fish was of course very satisfying—certainly so for me, and I expect also for the bird. In both cases the juvenile took his hard-won meal to a perch at the lake's edge and rested for a few minutes before beginning to eat.

ABOVE: *Bruno with what is very likely his first self-caught prey.*

The obvious panting and heaving of the bird's chest suggested that a fair amount of effort had gone into procuring the prize. Once the bird was ready to begin feeding, however, he faced yet another difficulty: gaining entry into the carcass. Although a marinated salmon may separate easily into bite-sized chunks at the slightest prodding with your dinner fork, ripping apart a live or half-dead fish without the use of any well-sharpened utensils can be extremely difficult, due to the inherent strength of a fish's scales and underlying sinews. Even using their sharply pointed beaks, ripping

open a fresh fish is no easy matter for a young osprey lacking the full muscular strength of a mature adult.



ABOVE: *Gaining entry into a fish carcass is not as easy as we land-lubbers might assume.*

Even adults seem to encounter considerably difficulty making the first incision. By pinning the fish to the perch with the talons of one foot and pulling hard on the fish's mouth parts with its robust beak, the bird is able to apply, in concert, several large muscle groups in its legs, back, and neck. Even with such a considerable application of force, the bird often must resort to twisting its head around almost in a complete circle to loosen up the corpse. As mentioned earlier, for an inexperienced juvenile, losing its grasp and dropping the fish to the ground is a very real danger. Although I never observed it with these juveniles, loss of prey to marauding eagles or even other ospreys is yet another danger faced by the feeding individual. It's thus in the best interest of the young bird to eat as quickly as possible—to avoid possible theft—without getting

so careless that he drops the carcass, which generally also results in a total loss of the meal.

Although the parents continued to provide food for the chicks even after they had started to catch their own fish, it's obviously important for a young bird to continue developing his hunting skills, so as to achieve self-sufficiency as quickly as possible. With the fall migration rapidly approaching, the juveniles could count on their parents being around for only so long. Obviously, the migration itself would present further dangers to the young birds as they traveled several thousand miles over unfamiliar terrain.

RIGHT: *Wimpy terrorizing the local fish population.*

In the final weeks before their departure, I noticed that while Wimpy and Bruno ranged over a larger area around the nest site, the two continued to stay close together. Research has shown (Edwards, 1989) that young ospreys who hunt together tend to learn more quickly than solitary juveniles. In the case of Wimpy and Bruno, I unfortunately saw little direct evidence of this, since Wimpy seemed to lag behind his larger sibling in his hunting prowess for as long as I watched them. Two weeks after I first saw Bruno catch a fish, Wimpy was still relying heavily on his parents for food, spending

most of his time alternating between preening and emitting his food-begging call. Meanwhile, Bruno split his time between preening and actively hunting.

LEFT: *Wimpy and Bruno hunting while perched about a half mile from the nest site.*

Unfortunately for me, Wimpy and Bruno appeared to come from a relatively late brood, as the chicks from this nest site would fledge much sooner the following year. It was only a few short weeks after I saw Wimpy catch his first fish that the birds

disappeared from the nest site entirely, presumably having left for the fall migration. During these last few weeks the juveniles had become increasingly difficult to follow, partly because they ranged over a larger area, and also because they seemed to become less tolerant of the presence of humans. I've often noticed that the young of both ospreys and bald eagles tend to be more tolerant of humans than adults. Wimpy and Bruno had shown exceptional tolerance of me: whereas either adult would fly away if I approached too closely, neither juvenile would do so (after fledging) even if I walked right up to the base of the tree in which the bird was perched.

RIGHT: *Shortly after fledging, neither chick objected to my standing directly below them at the nest tree.*

Before leaving for work each morning during the early post-fledging period, I would casually approach the nest tree to search for dropped fish, often greeting the juveniles with a loud *Hi bird!* and sometimes making small talk with them as I worked the undergrowth. Though fully able to fly, one or both birds would look down at me for a moment, quickly lose interest, and then ignore me completely. This changed as the season neared its end, with both juveniles becoming more wary of me, no longer allowing me to approach quite as close as I had before. They still seemed more

tolerant than the adults, but they were clearly beginning to develop some sensitivity to any invasion of the area immediately surrounding the tree in which they were perched.

LEFT: *Despite already having a meal of his own, Bruno welcomes an additional delivery by the male. Dad decides against it and instead takes the fresh kill to Wimpy, who is perched not far away.*

In my opinion, this was a change for the better: if these birds were to survive the coming months, they would have to shake off the innocence of childhood and don the healthy skepticism of an adult raptor. Not every human they'd encounter in the coming months would have the same good intentions as this wildlife photographer.

Since juveniles generally spend their first three years on their wintering grounds, it's unlikely that I'll see Wimpy or Bruno again

for several years at least, and it's even more unlikely that I'd recognize them once they've attained their adult plumage. Whether they'd recognize me is another question. Juvenile ospreys are known to have a tendency to return to the general vicinity of their hatching site after leaving the wintering grounds—a behavior known as *natal philopatry*. If and when they do return, their parents are unlikely to welcome them, since the younger birds will by then be adults and will be seen as competitors for food and territory. But *I* for one would be thrilled to see them again—even if they don't share the same feelings for me. Having spent so much time with them during their youth, I almost feel like a third parent—or perhaps an uncle, or a god-father. This was certainly the most intimate I've ever been with an individual raptor over an extended period. I shared many of my mornings, evenings, and weekends with them, and they in turn gave me many cherished memories.

In the years ahead I hope to get to know many more ospreys as well as I have come to know Wimpy and Bruno. In the year after Wimpy and Bruno's departure, the same adults returned to the same nest site and again hatched two chicks—chicks who, as I write this, are now approaching their own fledging date. It will be interesting to see how their story, once it has unfolded, differs from that of Wimpy and Bruno. Of course, Wimpy and Bruno's story isn't *over*—these are long-lived birds capable of surviving twenty-five years or more in the wild. Although I probably won't be there (wherever "there" is) to chronicle the young lives of their own offspring, it pleases me to know that somewhere over the horizon are two birds that I spent many pleasant hours with. I wish them the best of luck and the most enduring happiness—and many juicy fish.

About the Photographs

The photographs featured in this book required many long hours and considerable effort to obtain. Although the birds may appear close in the photos, they were typically quite far in terms of absolute distance. In the photo on page 41 you can see how far away my camera typically was from the bird. In order to get such close views of ospreys at this distance you need a powerful telescope or telephoto lens. For the photos in this book I used one of three lenses, ranging from 600 mm to 800 mm in focal length; the use of teleconverters further extended my range to 1200 mm, though most photos were taken at ~800 mm. All photos were taken using Canon equipment, including both the Canon EOS 30D 8-megapixel camera and the Canon EOS 1D Mark III 10-megapixel camera. Most photos were taken using a tripod and either a remote shutter release or image-stabilization technology; a flash was rarely used, due to the great distances involved.

My assistant, Kelsey the Amazing Dog, in fact did little to assist in the photographic process, though she provided much entertainment during lulls of activity at the nest site.

I believe Wimpy and Bruno enjoyed her company as well: they often watched her with great interest as she fetched sticks in the lake. I suppose she may even have served as a crude model for the young birds, showing how to retrieve long, slimy objects from the water. Whether this helped with their hunting skills, we'll never know.

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Bill Majoros is an American author, scientist, and bird watcher originally from Pennsylvania. He holds a Ph.D. in computational biology from Duke University and a B.Sc. in computer science from Penn State. He currently lives in North Carolina, where he is an Assistant Professor of Biostatistics and Bioinformatics at a large university. His research focuses on the development of algorithms and statistical models for analyzing DNA and RNA, with applications in the genetics of human disease. You can find more of his photography and writing at:

http://www.ThirdBirdFromTheSun.com

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