WHISH: MORE THAN A TOOL-USING FINCH

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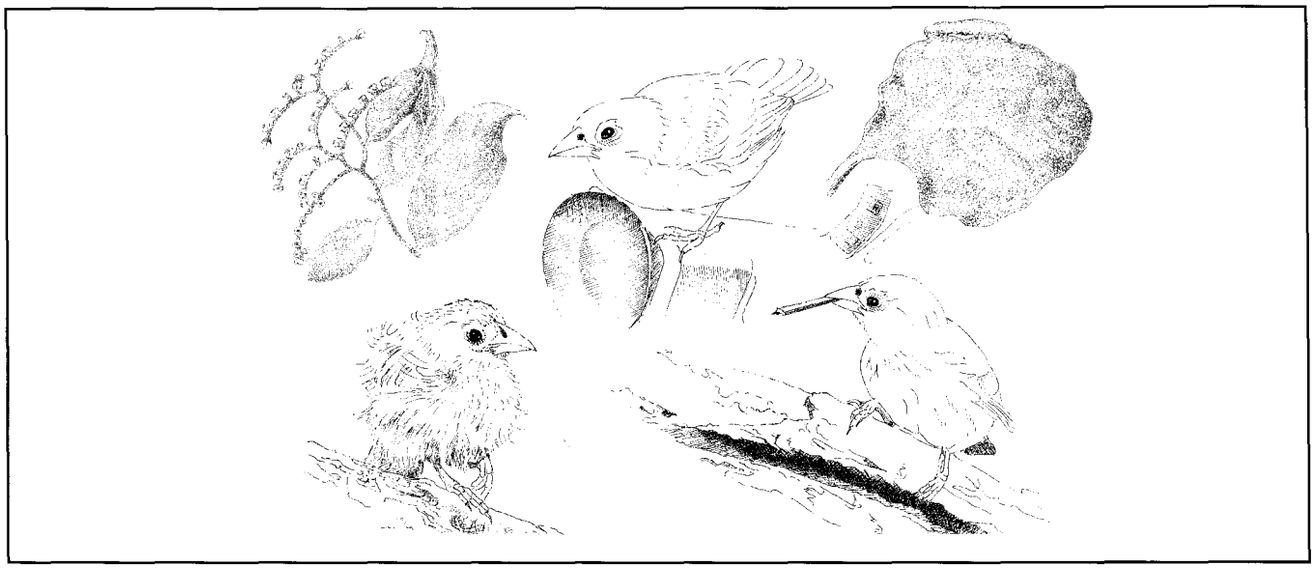

Whish grew from a bedraggled chick to a full fledged bird through a fortuitous year which abounded in a steady supply of protein-rich caterpillars and succulent fruits. His bold, curious nature led him to investigate every new object, including all the buttons and controls of a video camera.

Dr. Habel, of New York, visited Galápagos in 1868 (Salvin 1876). Without either a grant or private yacht, the determined collector reached the Islands from Guayaquil aboard a leaky sailing vessel which was engaged in the "orchilla" trade (orchilla, a small, tree-borne lichen, *Roccella babingtonii*, being the source of commercial dyes).

Perhaps Habel is best remembered for the pretty white-flowered vine *Ipomoea habeliana* that decorates the cliff-tops in the arid zone. In fact his journey was more remarkable for the large collection of bird skins (460), which he managed to carry to England. There he placed them in the hands of the English ornithologists, Osbert Salvin and Phillip Sclater (Sharpe 1906), who described seven new species (Sclater and Salvin 1870). Among them are two skins of pale-colored finches with long, strong beaks gathered on the island of Indefatigable (Santa Cruz) (Salvin 1876). Perhaps they were collected at Puerto Garrapatero, which Habel mentions (Salvin 1876), a few miles from present-day Puerto Ayora. They were the first finches to receive the specific name *pallida*, now known as the woodpecker finch (Sclater and Salvin 1870), and were labeled as co-types.

Pallida remains a good species name to this day, but the taxonomy at higher levels has been confused, demonstrating the complex morphological relationship among Darwin's finches. When first described, the species was placed in the genus *Cactornis*, along with the cactus finches, *C. scandens* (Sclater and Salvin 1870). (*Cactornis* was originally a sub-genus used by J. Gould to describe cactus finches collected by Charles Darwin.) This was followed by *Camarhynchus* in 1897 (Ridgway) and *Geospiza* in 1899 (Rothchild & Hartert). Thirty-two years later, Swarth retrieved an earlier name, *Cactospiza* (Swarth 1931). He dropped the cactus finches, whose beaks were considered only fortuitously similar to *pallida*, but included *heliobates*, the mangrove finches, the rarest and perhaps least-studied of all the finch species. Fifty years after Ridgway, David Lack rekindled *Camarynchus pallidus* (Lack 1947) (*pallida* changes to *pallidus* through the rules of nomenclature and Latin grammar).

Today Dr. Peter Grant, world-renowned expert on Darwin's finches, prefers to differentiate the genera and uses the older name of *Cactospiza pallida*. However, although woodpecker finches are now separated from cactus finches morphologically and genetically, both species occur in the arid zone, where cactus spines form a definitive part of the woodpecker finch's remarkable feeding adaptation — the use of tools. A finch with a culture.

Habel never noted this unique feeding behavior and it remained unrecorded until Edward Gifford, Assistant Curator of Ornithology at the California Academy of Sciences and a member of the Academy's Galápagos expedition of 1905-06, wrote in his field notes that several people, including himself, had observed these finches using twigs as probes into recesses in branches (Gifford 1919).

From that time on, these small, buffy-breasted birds,

with their distinctive pale eye stripes, have fascinated visitors to the Galápagos Islands, whether tourist, voyager, or scientist. Many leave disappointed, for not only are the birds most common in the humid zone, where they spend much of their time in the tree canopy and are difficult to observe or even find in the spangled light among the leaves, but tools are an adjunct to their feeding habits and not necessarily a constant feature of their feeding behavior. Often the most that can be noticed is the buzz of their wings and the rapid staccato notes of their calls.

"Woodpecker" or "carpenter" are both good words to describe *pallida's* foraging behavior, as these mainly insectivorous birds spend much time chipping and wrenching at the bark and old wood on dead branches, with their relatively powerful pick-like bills, in an endeavor to uncover grubs and beetles. As they work, torn off splints of wood may make ideal digging tools, allowing the birds to reach into crevices unavailable to the beak. But a bird using a tool? An evolutionary surprise from a remote archipelago, formed in a unique habitat? There can be few things more astonishing than to see a finch working away on a dead branch, as other Darwin's finches do, when suddenly it seizes a piece of its wood-working as a longitudinal extension of the bill and inserts it with precision into some inaccessible recess or uses it as a pry-bar. Even more astonishing is to see that, by careful manipulation of the tool, a choice grub is brought to the surface and consumed, with the tool often being abandoned to the leaf litter below.

Various objects are used as tools depending on where the birds are found, for they live over a wide altitudinal range on all the principal islands. Cactus spines are commonly used in the arid zone, but often small twigs, about 2-5 cm long, are broken off and cropped for this specific purpose. In the higher, wetter regions, leaf petioles, such as from the shrub *Miconia robinsoniana,* and the rachis of ferns are also trimmed down for use. Although most tools are abandoned after successful or unsuccessful probing, on some occasions these active birds will guard a tool under a foot while continuing to dig with the pick-axe-like beak. Thus, bill and tool are used, turn and turn about. On other occasions, a tool may actually be carried from one foraging site to another as the bird moves through the trees.

The use of tools as crevice probes is found in one other group of birds, the Corvidae (Magpies, crows, and jays) (Heinrich 1989) but the common, daily habit seen in the woodpecker finch seems to be unique. As far as we are aware, there are only two records of even other Darwin's finch species attempting to manipulate objects in their bills. George Millikan and Robert Bowman (1967) observed a captive large-billed cactus finch, *Geospiza conirostris,* which managed to manipulate a tool with some facility, but never seemed to associate the use of a tool with food. They believed that it had picked up the habit from living in close proximity to caged woodpecker finches which were using tools. If this is so, it shows a remarkable mental and physical ability for the possibility of adaptation, perhaps the secret of success of all Darwin's finch species. In 1963, Margaret Hundley observed a warbler finch, *Certhidea olivacea,* at Conway Bay, on the north side of Santa Cruz Island, use a leaf petiole or flower stem as a probe. This appeared to be unsuccessful since it bent and was soon abandoned.

However, 130 years after the first woodpecker finches were collected and 91 years after tool use was first described, the origins of this remarkable habit remain obscure. As far as we are aware, no tool-using finch has been bred in captivity, although a number of other Darwin's finch species have been.

In 1939, the California Academy of Sciences became the caretaker of 30 finches (Orr 1945). Among the species were large, medium, and small ground finches, as well as cactus finches. These were originally collected on the Galápagos by David Lack and were on their way to England. On arriving to Panama, Lack was confronted with the imminent outbreak of the Second World War and, at the same time, the deteriorating condition of the finches, one of which died.

The precious cargo was thus diverted to California, where they were received by Mr. Kinsey, who nursed them back to health. Later, they were transferred to the California Academy of Sciences and were studied by Robert Orr (1945). He was skeptical of the study to begin with, but quickly found that they behaved similarly to wild birds and soon they even began to breed. They were fed a bird seed mixture, a substitute nectar food, plus berries and greens. The nectar food was made from honey, Mellin's baby food, evaporated milk, and water. The finches relished cotoneaster and pyrocanthus berries, but accepted sowthistles, dandelion flowers, and lettuce. Cuttle bone was left in the cages (Orr 1945).

Robert Bowman, from San Francisco State University, also held a number of Darwin's finches in captivity in the late 1950s and the early 1960s. He concentrated on the tree finches, large, medium, and small, as well as the vegetarian, the woodpecker, and the large-billed cactus finches. He also obtained some examples of the 14th Darwin's finch species, *Pinaroloxias inornata,* from Cocos Island. There were six woodpecker finches, five males and a female (Millikan and Bowman 1967). Bowman states in a communication to Hernan Vargas (1998), ornithologist at the Charles Darwin Research Station, that the woodpecker finches did not breed in captivity.

Millikan and Bowman's "Observations on Galápagos tool-using finches in captivity" (1967) is a fascinating account of the behavior of these unique birds. However, on page 31, they remark on the "abnormal" behavior of one of the finches and open the difficult subject of whether tool-using is innate or learned.

They state:

"Of the six birds, one, a male (58-132537), cocked its head and held food under its feet like the other birds, but we never saw it probe with a twig, even during two periods of intensive observation carried out within an interval of about one year. On looking back into its history we discovered that this individual, captured when young, had, unlike the other five, been housed by itself for the three months before it was caged with the tool-using *pallida*. We are unable to conclude that association with experienced birds is necessary for the development of tool-using behavior, since this bird may have suffered another deficiency of experience or inheritance which impaired its performance. If association is important, however, it is apparently maximally effective during a 'sensitive' period when the bird is young, since later exposure to experienced birds did not cause the bird to start using a tool."

A number of tool-using finches have been maintained in captivity, over relatively short periods of time, at the Charles Darwin Research Station. These have been used by scientists and film-makers to record their remarkable habits — a very difficult proposition in the wild. The birds settle down very quickly, become tame, and perform well in captivity. What was curious was that, in 1985, a group of woodpecker finches refused to use tools at all and were released. A second group that was obtained used tools and were easily filmed. Did this mean that the first group of birds were somehow "put-off" the tool-using habit? Or did it mean that there exist birds that use tools and those that don't? That might indicate that there cannot be some general genetic background to woodpecker finches that ensures that they will use tools instinctively, but that they learn it from watching other birds, probably their parents. On the other hand there may be areas on the island where food is obtained efficiently without the use of a tool and, therefore, although the ability to manipulate objects is innate, it is never developed.

Perhaps tool-using was developed under very specific habitat conditions where it was useful, and still is, but when the species moved into other habitats it became less advantageous to spend the extra time gathering and using tools. How many things are we capable of but never develop? We may be able to run backwards, but it serves us little and we don't do it!

Thus, until 1997, it seems that no woodpecker finch had ever been raised in captivity and, moreover, definitely none had been raised in the absence of its parents. This brings us to the subject of Whish.

By chance a small, bedraggled, lame, yet mentally strong finch came into our hands on April 9, 1997. Godfrey finally released this charming creature back to his home country among the upland *Scalesia* forest on June 6 of the same year, when the finch was nearly 100 days old. He went back to the wild with a remarkable confidence, but perhaps he did not survive, for, even though equipped with natural instincts of fright and flight, without those days of youth when he would have followed his knowledgeable parents, his caged life may have led him quickly into harm's way.

But that is another story. What is recalled here are the events that occurred during the short stay that Whish, for so he was named, spent with us. We do not know his sex, but the neuter gender can hardly be applicable. Thus, for us, Whish became male. We cannot say that these historical notes reveal answers to deep biological questions, but perhaps there is information that might be useful for a future finch caretaker. We were, however, through this bird, made acutely aware of the power that the unique Galápagos environment has had over its native inhabitants and that we were extraordinarily privileged to have been able to nurture one of its unique products.

Whish was born in the first days of March. According to data from various sources, the incubation period for several ground finches is about 12 days and the fledging period in the nest is 13-15 days (Orr 1945, Grant and Grant 1980, Schluter 1984). The young birds then spend a further 28 days or so (Schluter 1984) following their parents (mostly their father), being fed, and learning about their environment. The whole process from egg-laying to independence is thus about 54 days, the period from birth to independence being 42 days or 6 weeks. These times are probably true of tree finches as well and therefore, if Whish was born on the 1st of March, he should have been fending for himself by the end of the second week of April. But he lost his parents.

Born into a domed nest of mosses and grasses tucked into the swaying branches of a giant endemic composite tree, *Scalesia pedunculata,* he lived out the first days of his life with at least one sibling. The nest was observed by Sabine Tebbich and Birgit Fessl, who were studying wild woodpecker finches. They noticed that no parents had visited the young for several days. The nest was examined on April 7 and found to contain two tiny birds. Their eyes were already open, which would probably give them an age of four days or so (Peter Grant, pers comm). They were in poor condition and suffering attacks from the larvae of a fly. The fly has been identified as belonging to the genus *Philornis* (Muscidae) by Dr. Eric Fisher and team of the California Department of Food and Agriculture at Sacramento. This genus is apparently new to Galápagos but elsewhere they are described as a "neotropical subcutaneous haematophage on nestling birds" (W. Harmon, pers. comm.).

The two scientists took the doomed, starving, and pathetic birds to the Charles Darwin Research Station, where the devouring maggots were removed. One of the finches died shortly thereafter, but the other, although partially crippled in the left leg by the parasite attack, survived his first few weeks under the care of

Sabine and Birgit, a dedicated task, for it is known that insectivorous birds are difficult to raise.

He became exceptionally tame, hopping from person to person with total innocence. At the time we inherited him, on April 9, he should have been on the verge of independence, but this was obviously not the case and he still needed help. His food at that time was a commercially prepared bird food containing dead insects. To this was added raw carrot and scrambled egg. If he had been released then, the state of his plumage, his poor flight capability, coupled with his physical disability, would have led him to an early grave. Since Sabine and Birgit were leaving the islands at the end of their study and as there seemed to be no other offers of a home, we became the new foster parents.

Whish was placed in an old aviary that had been built for woodpecker finches 15 years previously. Even some native plants were growing inside it, which provided something of a natural atmosphere to the place. The aviary was 4m by 4m by 2m high. A constant supply of old branches gave him interest and material upon which to hone his skills and beak.

It is, we have to say, difficult to imagine the work of a parent finch unless one undertakes the work oneself. It was decided from the beginning to try to feed him with fresh food. In this we were lucky, for the spring of 1997 was a wet one, which meant that insect life, though often cryptic, was abundant. It also meant that berries were plentiful. It is fair to say that an average of 3 hours per day, wet or fine, were spent in examining rolled-up salt bush leaves (*Cryptocarpus pyriformis*) for caterpillars, trying to catch jumping hemipterans and grasshoppers, outwitting small spiders, and gathering berries. To this must be added cooking scrambled egg and setting out a night light to trap moths. Mainly the work was concentrated into three periods: from 6-7:00 am; 12-1:00 pm and after 5:00 pm. On this diet he grew strong.

Several people helped in the labor. However, there can be no doubt that through the dedication of Gayle, this small bag of feathers became the remarkable finch that he did. Heidi Snell, well versed in Galápagos ways, helped enormously. So too did Anne Schultz, who came to the Station from New Mexico as a volunteer in the library. Anne's first few nights in Galápagos found her sleeping in the lower of two bunks. The upper was occupied by a cattle egret that had been found half-drowned in the bay. Next, she found that one of her library duties was to fill jars with leaves containing caterpillars during many of her spare hours.

Gathering food was one thing, but feeding him was another. As soon as someone approached or entered the cage, Whish would call and fly over, impatiently hopping from one outstretched finger to another in his anticipation. Once the lid was off the caterpillar jar, he would reach down inside to grasp at the leaves. Rather than give him caterpillars directly, we offered him the leaves and he had to explore them himself. He was not a careful eater and tended to fling his food about. Sometimes he would take the food on to one's shoulder or head and dismember it there. In the process, he flung pieces left and right, leaving oozing green remnants of caterpillars and grasshoppers everywhere. Two aspects of Whish's behavior were especially noteworthy in his first days. One was the habit of taking food onto Gayle's shoulder and "bunting" it into her hair. This habit appeared to mimic an action used by finches when building the domes of their nests. The second was shoving food down in the gap between a sock and the top of a boot. Sometimes he left the pieces there, but mostly he returned to remove them in a short while.

He was very much a meat and veg man. The orange berries of *Tournefortia psilostachya*, which were placed around the aviary each day, were his favorite fruit and he would alternate eating these with insects or larvae. Godfrey has observed the alternating of feeding in this manner in adult tree finches which live around the endemic *Miconia robinsoniana* woodlands at 600 meters elevation. There the finches will alternate between searching for invertebrates among the mosses on the shrubby branches and feeding on the sweet, black berries of *Miconia* in the canopy a few feet above. Whish's berries had to be changed every day, for any that were even a day old were ignored.

Although he was extremely active most of the day, a good meal would nearly always send him to sleep! This was especially so in the first couple of weeks. These periods of rest were short, no more than 15 minutes or so. He was also provided with a permanent supply of fresh water in which he could bathe. This he took to instinctively and caused him to heavily preen himself afterward.

In mid-April, Peter Grant came to visit him and thought that Whish was about three weeks behind in general plumage condition. His ragged appearance may have been due to some extent to his inability to scratch himself. He could not stand on his bad leg and thus could not scratch with the good one. He could stand on the good one, but could not scratch with the bad one! However, he made good progress and his leg began to strengthen. By April 21 he was able to scratch with his good leg. Even though he still suffered somewhat from the disability of his leg, he spent much time working at small holes with his beak. Some of them seemed to fascinate him and became favorite places.

Then, a few days later, at about 54 days old, a remarkable process began to develop. To begin with there was little to notice. Yet within a short time there was no doubt that he was spending more time "playing" with the stems of flowers, such as *Alternanthera echinocephala*, small twigs, and other objects within the aviary. These he would twiddle in his beak in what seemed to be a random pattern, often holding them at right angles to the longitudinal axis of the bill. After a

short time he would discard them and move on to another point of interest.

By May 1 there was no question. He was showing considerable interest in "handling" objects and began rolling them around in his beak and aligning them to a greater and greater extent with the longitudinal axis of the bill. At the same time, his poor leg was becoming stronger by the day, so that by May 10 he was able to fly to the screen-covered walls and hang there on the vertical plane with both legs supporting him. It was at this time that he began to hold objects under his feet, which is a common attribute of many of Darwin's finches, including the ground finches, who often use the beak to grasp seed heads of grasses, which are then transferred to the feet for holding while the bird feeds. Perhaps Whish would have done this earlier if he had not been lame or had had parents to follow.

His interest in all things was extreme. The video camera was an example. It was frequently difficult to film him, for he would often fly over to the camera and examine every item with great curiosity. First the viewfinder lens would be inspected while he clutched the rubber eye cup. Then he would work his way along the top, enquiring into every control and connector. Considerable time was spent in trying to pry out the various buttons, which he tried to tweak out with a twist of the head as if he were removing berries from a twig. At other times he would attempt to remove them by using the upper mandible as a pick. His gape was close to 90°. This action he would also use with some of his favorite holes in branches which were too small for both mandibles to enter. Later, he would be able to insert a tool with precision into these same holes.

His beak was also used as a pry and a wedge. When handed salt bush leaves, *Cryptocarpus pyriformis*, which were often closed by caterpillars with silken threads, he would insert his bill between the leaf edges and open the mandibles to pry them apart. This seemed to allow his line of sight to pass within the leaf. If there appeared to be food inside, then he would set about the leaf, even tearing holes in it. The caterpillars he would normally catch, even if they descended on silk strands, for he kept a sharp eye on them. Spiders sometimes escaped him, as did grasshoppers, but he was extremely quick with his beak and, if necessary, leaped after them. Yet he did not eat everything, and seemed to avoid certain species of spiders and large ants.

Prying was also noted by Robert Orr in a captive cactus finch that he inherited from David Lack (Orr 1945). This bird tried to open Orr's closed fingers. It seemed to Whish that any potential crack was worth trying to open. Even a person's face was not sacrosanct. He would fly to the face and clutch hold on the nose arch. He would then hang upside down and peer into the nostrils. If the face possessed a beard he would sometimes land on the hair, as if on a mossy trunk. From this vantage point, he thrust his bill between the lips and forced them apart. If the mouth opened, he then examined the teeth with the tip of the beak or at times he seemed to want to drink the saliva on the gums.

This experience taught us that he was not only curious and capable of reaching difficult places with ease but also that his grasp was powerful. If the lips did not open right away, he tweaked and twisted the skin as if it were a piece of rotten wood, easily drawing blood. From time to time he encountered small wounds on sandaled feet. These he attacked with his needle-like bill, even eating small pieces of skin or scab or sipping at the fluids.

During late April and the early days of May (thus when he was about 60 days old), his ragged, juvenile contour feathers molted rapidly and soon he was resplendent in a smooth, buffy-breasted, brown-backed plumage that appeared very similar to that of an adult, including the pale eye stripes. The tail was always somewhat deranged, for he used it as a support against the screen, as a woodpecker might, and the rough wiry texture damaged the feathers. The beak, which always had a dark tip on both mandibles, changed slowly from a pinkish hue to that of horn, losing the swollen basal edges of a chick.

The only call that we heard was apparently used when he was in an impatient mood or wished to indicate where he was, as for instance when he knew someone was approaching the aviary with food, especially in the morning after a long night. Once, when he was sitting on Gayle's finger eating berries, she forgot to turn the fresh ones toward him, as was customary. This provoked him to call. He only had to call once, and the twig was turned so that the berries were available to him. This call we have heard from other finches, including woodpecker finches. It seems to indicate a bird's presence, "I'm here."

During the month of May, he became highly adept at handling tools. To begin with, his accuracy with them was not good and he often missed the place he was aiming for. With practice, however, he became highly proficient, aligning the tool with the beak. His relationship to tools was variable. Sometimes while working on old branches — which we collected for him — he would use elongated fragments that came off the wood (usually a couple of centimeters long) to help in the excavation, often using several, one after another, interspersed with rapid and active digging with the bill. At other times he would drop down to the floor of the aviary, pick up a twig — he even once used the rear leg of a green grasshopper — and fly up to a branch to start probing.

On these occasions, he might use a series of tools, one after another, without using his bill directly. It was not uncommon for him to lose his probes in deep holes or when they became jammed under bark when he had been using twigs as pry bars under the loose, springy edge. The time spent with tools varied from a few

seconds to several minutes. We also collected branches with holes bored in them, about 10mm diameter and 20mm deep, which had been made by carpenter bees (*Xylocopa darwinii*). This demonstrated another feature of his feeding habits —"peering".

While Whish was busy excavating wood, which was done with considerable energy — many times he sat on one's finger and the rapid, strong, contractions of the tendons in the feet was very noticeable — he would pause every so often to search with his eyes, or was he listening? On the logs with bee holes this was especially so. Whether he was using a tool or not, he would, on encountering a hole, lower his head to within a centimeter of the recess, cock his head sideways, and peer intently into the dark interior. If he had a tool with him, it was usually held in his beak while peering, but sometimes he placed it under his foot.

Although carpenter bee larvae were readily eaten, it would seem curious if this was a major part of woodpecker finch diet. Usually the bees make a vertical hole into an old, but not rotten, branch and then bore a considerable distance along the grain of the wood before depositing their eggs and sweet-smelling pollen balls that will feed the larva. The distance bored may be at least 20cm and therefore in general totally out of reach to the woodpecker finches, who are not able to tear hard wood apart.

Whish's sight seemed to be important at other times, too. On many occasions, we would use our own fingers and nails to pry up bark and old pieces of wood. Whish would follow this action with great interest, lowering his head to peer under the slowly separating pieces. At the first sight of a spider's silken nest, a grub, a beetle, or insect eggs, his impatience would cause him to rush forward to help in the excavation.

Whish blossomed into a tool-user with remarkable facility. From no tool use to accurate tool placement was a period of about two weeks. It would seem at the very least that there is a strong instinctive drive to pick up and handle all sorts of objects. That, coupled with an insatiable curiosity about holes and the capability of perfecting the technique through copy and practice, may be the ingredients for a tool-using finch. His tools varied and included a feather, a grasshopper leg, twigs, slivers of wood, pieces of shell, and fragments of old water-worn glass that were amongst the debris on the floor of the aviary.

The tool-using habit was apparently not, at least in the case of Whish, initiated by the association of a reward with the time spent using a tool, for we are not aware that any human, let alone his own parents (since he was taken from the nest before fledging), actually demonstrated to him that the use of a tool produced food. When he came to us, he should have been an independent feeder, since he was five weeks old, and therefore one assumes that, under normal circumstances in the wild, he already would have been able to handle tools if this was a vital factor for survival, whether instinctive or learned. However, he did not show an interest in tools until he was nearly eight weeks old.

Perhaps his poor condition due to the initial debilitating attack by fly larvae delayed his development. Later, the constant supply of rich food may have reduced the necessity for active tool use. Furthermore, the encouragement of the parents may be needed to foster an innate ability. Perhaps, also, it is a habit that develops quickly under the guidance of tool-using parents when they are supplementing food to the fledgling. Whish's early casual handling of tools, with no food resulting from their use, would have left him a very hungry bird without additional nourishment.

It is difficult to know the effect of self-teaching. As he worked at a trunk, he would often use slivers of wood to advance the project. From the cracks and crevices, he did obtain various grubs, spiders, spider nests, and small ants, but these might have been obtained as easily by the beak alone. And this was often the case. Therefore, it is not clear how he would definitely know that the slivers of wood were important. Perhaps the success in feeding using a combination of beak and "extended beak" is sufficient reinforcement for the habit to become entrenched. There are, perhaps, two elements involved. The instinctive ability to handle, with precision, many objects that are basically longer than wide and thus similar to the bill in shape, and the learning from parents who are efficient in profiting from this "game". One wonders for how long human beings handled round objects in many ways before the wheel was invented!

Once Whish had displayed a real penchant for tool use, which seemed to have a strong instinctive source, we deliberately encouraged him by offering him tools, for, in order to return him to the wild, it was important that he perfected as many skills as possible.

Towards the end of May, his bad leg was as good as the other. He could hang upside-down from the roof of the aviary and had gained powerful wing muscles that allowed him to navigate amongst the branches with ease. He appeared to have his favorite perches for preening and sleeping. Although very tame, Whish became flighty and seemed agitated if people were in the aviary toward night time (5:30 pm), when he wished to remain quiet in his roosting spot. This seemed to be a good sign, for it perhaps meant that he was responding to an instinctive behavior that warned him that the night was a time, not just for sleep, but for wariness, for avian predators, such as barn owls (*Tyto alba*) and short eared owls (*Asio flammeus*) are a threat in the wild.

Peter Grant points out that the barn owl has become a specialist on mice, *Mus domesticus*, an introduced species. In the past they no doubt fed on the rice rats (*Nesoryzimus*) which are now apparently extinct on Santa Cruz. However, in caves where barn owls live, or have lived, the bones of ten species of finches have been

found and appear to have been a part of their diet (Steadman 1981).

During the period Whish spent with us, there were some torrential rains and a box was installed for his protection. This he shunned totally, as if caves contained danger. He preferred to perch on a branch under a waterproof section of the roof.

Any new object was treated with great curiosity. Buttons were tweaked off. Pens and pencils nibbled at. Pockets were investigated. Hair was yanked through the small ventilation holes in a slouch hat. Toes were pried apart with the beak and long tools. Tools were inserted between socks and boots where in previous days he had inserted food (since removed!). Ears were inspected and ear-rings pulled. Drinking straws seemed like enormous tools. His presence captivated every person who encountered him.

Then it was time for us to release him. This was no easy matter, yet was always the plan. The introduction of avian pox to the Galápagos Islands, perhaps through domestic chickens, takes an annual toll of Darwin's finches and is particularly rife around the village of Puerto Ayora. It was always a fear that he would contract this potentially mortal disease. The introduced rats of Europe scuttled across the roof of the aviary and also threatened him. Moreover it was necessary to release him near his old home, for perhaps, even on the one island of Santa Cruz, there may exist genetically differentiated populations of woodpecker finches. And after all, he was a wild-bred bird.

We were fortunate that the rainy season had continued, so that the abundance of food had been maintained. This would not last indefinitely and it would become increasingly difficult to locate a suitable diet as the season changed. Thus on June 6, he was taken, along with a number of his known branches and other objects of the aviary, to the green-canopied *Scalesia* forest at 600m elevation. Godfrey built a semblance of Whish's cage so that, should the young bird need a familiar spot, he might have a place to return to. Godfrey also resolved to spend several days there himself, should Whish be too dependent on foster parents to survive alone. There was no need to worry. Whish spent five hours with Godfrey in that old world that is true Galápagos, the world that created the environment in which the unique woodpecker finch survives and today is changing through the invasion of introduced plants. Around us were the mossy trunks of his native home, the dainty warbler finches darting through sunlight and shade in their quest for insects, and, yes, one could hear the begging cry of a young short-eared owl.

On release, Whish stood for a while with cocked head examining the green umbrella of leaves above. Then he moved onto the nearby trees, returned to drink a little water, sat on Godfrey's shoulder, flew to his beard, pried open the lips, and returned to the tree. He seemed to be completely at home, yet for the moment, still contained within the confines of the aviary. He caught several arthropods, a spider, and, prying open the rolled up leaves of the endemic coffee (*Psychotria rufipes*), found a number of insect larvae.

Thus Whish passed the hours, moving amongst the trees, meeting other finches, then returning. In the late afternoon, he began moving off confidently through the forest, finally breaking the physical and mental bounds of confinement that governed his whole life of a period just shy of 100 days. Godfrey followed for an hour, but now Whish was following a life that had no relation to ours and Godfrey finally lost him. Whish's fate was locked into a new set of rules, but at least he was home.

If you should travel to this beautiful forest and see a small finch bearing two rings on his right leg, a black above an orange, then you will know his story.

DIET

Perhaps other insects than those indicated below were consumed, as a variety of creatures wandered in and out of the aviary. We feel, however, that the mainstay of his young life were Tournefortia berries and green caterpillars. This omnivorous diet may change with age. David Lack (1945) stated that woodpecker finches were "almost exclusively insectivorous". Bowman (1961) found that woodpecker finch stomachs contained insects, principally beetles (Coleoptera), larvae of moths (Lepidoptera), larvae of flies (Diptera), and ants (Formicidae). However, he also observed that they ate the ripe fruits of the palo santo trees (Bursera graveolens) and Maytenus octogona in the arid zone and, in the Scalesia forest, where Whish was born, the fruits of Psychotria rufipes, the native coffee plant, and the pollen sacs of the vine Echinopippon.

Peter Grant informs us that he has seen these finches eating Scutia berries at Playa Tortuga Negra. We cannot state that the diet shown below is typical for young woodpecker finches in the wild, which must depend on the particular parents, as well as on altitude and location. We were guided by his taste rather than our knowledge. What is certain is that he grew well, cured his bad leg, and changed his plumage, whilst maintaining an extremely active life.

Vegetation:

Alternanthera echinocephala (Amaranthaceae). Seeds.
Cyperus sp. (Cyperaceae). Seeds.
Solanum nodiflorum (Solanaceae). Berries. There were several plants growing wild in the cage.
Tournefortia psilostachya (Boraginaceae). Berries, both yellow and red, but the red were favorites.
Cordia lutea (Boraginaceae). Flowers.
Cordia leucophlyctis (Boraginaceae). Berries. Not very popular.
Pear.
Apple.

The following were tried but discarded:
Physalis sp. (Solanaceae). Berries.
Lycopersicon cheesmani (Solanaceae). Fruit (tomato).

Meats:
Grasshoppers (Orthoptera). Green, > 2cm in length.
Crickets (Grillidae). Brown, about 2cm in length.
Hemipterans (Heteroptera). Green *Acrosterna viridans.*
Brown (Rhopalidae).
Spiders (Arachnida)
Small, brown, rolled in *Cryptocarpus pyriformis* (salt bush) leaves.
Spider nests (white, woven), found in old wood, were opened and the contents eaten.
Spider web. Noted on three occasions.
Carpenter bee *Xylocopa darwinii.* Larvae.
Large grubs under *Scalesia* trees in soil. Unidentified.
Grubs in dead wood. Unidentified.
Moth larvae (caterpillars). (Lepidoptera):
Green Disoliosipacta stellata. Inside salt bush *(Cryptocarpus pyriformis)* leaves, partially or completely closed by silk strands.
Small, grey (Pyralidae). Inside rolled leaves (like a cigarette) of *Psychotria rufipes* (Rubiaceae).
Red.
Milky white with brown spots.
Geometridae. Inch worms.
Moths (Lepidoptera). Various species, including hawk moths.
Coleoptera. Various species.
Springers.
Small ants. Especially from silken nests.
Scrambled egg. This was replaced by smashed boiled eggs. He ate both.

Offered but not eaten:
Large ants, *Camponotus macilentus.*
Spider. Silver argiope, *Argiope argentata.*
Cockroaches. Coleoptera.

Tools:
Pieces of wood. Splinters from his own workings.
Old pieces of worn glass.
Large green grasshopper hind leg.
Pieces of shell.
Feather.
Twigs.
Inflorescent stems.

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