CHAPTER 16-5
BIRD NESTS – NON-PASSERIFORMES, PART 2

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Figure 1. Bird's nest with living moss in Malaysia rain forest at 110 m alt. Photo courtesy of Tamas Pocs.

Columbiformes: Pigeons & Doves

Columbidae – Pigeons & Doves

Wolf (2009) found only one species of **Columbidae** that uses bryophytes in their nests in parts of North America: ***Patagioenas fasciata*** (Band-Tailed Pigeon; Figure 2-Figure 3).

Figure 2. ***Patagioenas fasciata***, Band-Tailed Pigeon, the only member of **Columbidae** that uses mosses in their nests in parts of North America. Photo by Gary Kramer, through public domain.

Figure 3. ***Patagioenas fasciata***, Band-tailed Pigeon, on nest. Photo by Cgates326, through Creative Commons.

Cuculiformes: Cuckoos & Relatives

Cuculidae – Typical Cuckoos

Wolf (2009) found one species of **Cuculidae** that uses bryophytes in their nests in parts of North America: ***Coccyzus americanus*** (Yellow-billed Cuckoo; Figure 4). Unlike the European Cuckoo, the Yellow-billed Cuckoo usually builds its own nest, only occasionally laying eggs in the nest of another species (Wikipedia 2017).

Figure 4. ***Coccyzus americanus***, Yellow-billed Cuckoo, a bird that uses mosses in nests. Photo by Factumquintus, through Creative Commons.

Strigiformes: Owls

Strigidae – Typical Owls

Wolf (2009) found five species of **Strigidae** that use bryophytes in their nests in parts of North America:

Bubo virginianus (Great Horned Owl; Figure 5-Figure 6)
Bubo scandiacus (Snowy Owl; Figure 7)
Glaucidium gnoma (Northern Pygmy Owl; Figure 8)
Strix nebulosa (Great Gray Owl; Figure 9-Figure 10)
Aegolius acadicus (Northern Saw-whet Owl; Figure 11-Figure 12)

Figure 5. ***Bubo virginianus***, Great Horned Owls, in nest where mosses are often used. Photo by John Kees, through Creative Commons.

Figure 6. ***Bubo virginianus***, Great Horned Owl chicks. Photo by G. M. Stolz, through Creative Commons.

Snowy Owl (*Bubo scandiacus*)

Snowy Owls (***Bubo scandiacus***; Figure 7) use mosses as nest liners (Giannetta 2000).

Figure 7. ***Bubo scandiacus***, Snowy Owl. Members of this species use mosses to line their nests. Photo by David Syzdek, through Creative Commons.

Figure 8. ***Glaucidium gnoma***, Northern Pygmy Owl, a species that uses bryophytes in their nests in parts of North America. Photo by Ken-ichi Ueda, through Creative Commons.

Figure 9. ***Strix nebulosa***, Northern Pygmy Owl. Members of this species use bryophytes in their nests in parts of North America. Photo by jok2000, through Creative Commons.

Figure 10. ***Strix nebulosa***, Northern Pygmy Owl, on nest. Photo by Kuva, through Creative Commons.

Figure 11. ***Aegolius acadicus***, Northern Saw-whet Owl. Members of this species use bryophytes in their nests in parts of North America. Photo by Robert L. Curtis, through Creative Commons.

Figure 12. ***Aegolius acadicus***, Northern Saw-whet Owl, young. Photo by Kathy and Sam, through Creative Commons.

Burrowing Owls (*Athene cunicularia*)

Thomsen (1971) reminds us that Burrowing Owls (***Athene cunicularia***; Figure 13-Figure 14) decorate their burrows (Figure 15) with mosses, among other things. The burrowing owl often does not make its own burrow, but rather uses the underground village of a marmot or prairie dog (Rennie 1857). At St. Domingo the owl digs a burrow 70 cm deep and deposits its eggs on a bed of moss.

Figure 13. ***Athene cunicularia***, Burrowing Owls, ground-nesting birds that use burrows. Photo by Travelwayoflife, through Creative Commons.

Figure 14. ***Athene cunicularia hypugaea***, Burrowing Owl. Members of this species decorate their burrows with mosses. Photo by Teddy Llovet, through Creative Commons.

Figure 15. ***Athene cunicularia***, Burrowing Owl, nest hole. Photo by USFWS, through Creative Commons.

Caprimulgiformes: Goatsuckers & Relatives

Caprimulgidae – Goatsuckers

Wolf (2009) found one species (***Chordeiles minor*** – Common Nighthawk; Figure 16) of **Caprimulgidae** that uses bryophytes in their nests (Figure 17-Figure 18) in parts of North America.

Figure 16. ***Chordeiles minor***, Common Nighthawk, on a bed of mosses. Photo by Gavin Keefe Schaefer, through Creative Commons.

Figure 17. ***Chordeiles minor***, Common Nighthawk, eggs in nest of mosses. Photo by Mike Allen, through Creative Commons.

Figure 18. ***Chordeiles minor***, Common Nighthawk, hatchlings in nest. Photo by Mike Allen, through Creative Commons.

Apodiformes: Swifts & Hummingbirds

Apodidae – Swifts

Wolf (2009) found only two members of the **Apodidae** that use bryophytes in their nests in parts of North America:

Cypseloides niger (Black Swift; Figure 19-Figure 20)
Aeronautes saxatalis (White-throated Swift; Figure 21-Figure 22)

Figure 19. ***Cypseloides niger***, Black Swift, adult on mossy nest. Photo by Terry Gray, through Creative Commons.

Figure 20. ***Cypseloides niger***, Black Swift, nest. Photo through Creative Commons.

Figure 21. ***Aeronautes saxatalis***, White-throated Swift, at cliff. Members of this species use bryophytes in their nests in parts of North America. Photo by Richard Crossley, through Creative Commons.

Figure 22. ***Aeronautes saxatalis***, White-throated Swift, in flight. Photo by Michael Woodruff, through Creative Commons.

Glossy Swiftlets (*Collocalia*)

Medway (1966) found that at least some of the European swiftlets (***Collocalia*** and ***Aerodramus***) build bracket-shaped nests of mosses and other bryophytes that are bound together. The Glossy Swiftlets (***Collocalia esculenta***; Figure 23) include bryophytes in their nests, along with horse-hair fungi and palm fibers (Sick 1957; Medway 1962).

Figure 23. ***Collocalia esculenta***, Glossy Swiftlet, a species whose members build nests made entirely of bryophytes in the Philippines. Photo through Creative Commons.

In the Philippines, Tan *et al*. (1982) discovered three nests of ***Collocalia esculenta*** (Glossy Swiftlet; Figure 23) that contained only bryophytes. One was a nest of a single species of the leafy liverwort ***Frullania*** (Figure 24). One nest was constructed of stems of the tiny leafy liverwort ***Mastigolejeunea*** sp. (85%) with scattered mosses [***Papillaria fuscescens*** (see Figure 25), ***Meteorium*** (Figure 26), ***Acroporium*** (Figure 27)]. The third nest had a large compartment of only the leafy liverwort ***Frullania*** and a small one of the mosses ***Papillaria fuscescens*** and ***Aerobryidium*** *cf.* ***filamentosum*** (Figure 28). In all three nests the bryophytes were neatly glued together with saliva from the birds. Some of the bryophytes continued to grow

in the nests, but the shoots were attenuated and the leaf shapes abnormal. Of the mosses, only pleurocarpous species were used, and all the bryophytes were epiphytic high in the canopy of a dipterocarp forest. Furthermore, the bryophytes used were only common close to the summit of the mossy forest. Abundant ground species were completely ignored.

Figure 24. ***Frullania*** sp., a leafy liverwort used to make nests of ***Collocalia esculenta*** in the Philippines. Photo by Li Zhang, with permission.

Figure 25. ***Papillaria***, a genus used in nests of ***Collocalia esculenta*** in the Philippines. Photo by Michael Lüth, with permission.

Figure 26. ***Meteorium***, a genus used in nests of ***Collocalia esculenta*** in the Philippines. Photo by Janice Glime.

Figure 27. ***Acroporium pungens***, member of a genus used in nests by ***Collocalia esculenta*** in the Philippines. Photo by Michael Lüth, with permission.

Figure 28. ***Aerobryidium filamentosum***, a moss species used in nests of ***Collocalia esculenta*** in the Philippines. Photo by Taiwan Liverworts Color Illustrations, through Creative Commons.

Unlike most birds I have seen, ***Collocalia esculenta*** carry their nesting materials with their feet, flying at the tufts of epiphytes, grabbing with their feet and leaning back (Medway 1962). They beat their wings and tug at the bryophyte fronds. Carrying the mosses in their feet makes

the birds tail-heavy and flying is laborious. Fragments are often dropped, and long strands may hang from the nest until the birds are able to weave them into the nest. The mosses are held in place by gumming them to the underlying debris or cave wall. Nests are often deep in caves. This species is able to echo-navigate, so total darkness in the cave is no hindrance.

Mossy-nest Swiftlet (*Aerodramus salangana*)

The moss use by the Mossy-nest Swiftlet (***Aerodramus salangana***; Figure 29) is obvious by its name. The Mossy-nest Swiftlet in Malaysia builds a rounded nest made of plant material (Figure 30) (Medway 1962). Among three nests examined by Medway, the components were *Selaginella* sp. (a lycophyte; Figure 31) 75%, ***Piloecium pseudorufescens 5%***, ***Piloecium pseudorufescens*** 90%, ***Octoblepharum albidum*** (Figure 32) a little; ***Neckeropsis lepineana*** (Figure 33) 80%, ***Pinnatella kuehliana*** 10%, These are all epiphytic mosses except *Selaginella*, a genus that often resembles a moss. ***Octoblepharum*** is the only acrocarpous genus.

Figure 29. ***Aerodramus salangana***, Mossy-nest Swiftlet, showing its cave habitat. Photo by Bernard Dupont, through Creative Commons.

Figure 30. ***Aerodramus salangana natunae***, Mossy-nest Swiftlet nest and nestlings, showing mosses in nest. Photo by Bernard Dupont, through Creative Commons.

Figure 31. ***Selaginella willdenowii***, a moss-like lycophyte in a genus used in nests of the Mossy-nest Swiftlet in Malaysia. Photo copyright Patrick Blanc, permission implied.

Figure 32. ***Octoblepharum albidum***, a moss included in the nests of the Mossy-nest Swiftlet (***Aerodramus salangana***). Photo by Bramadi Arya, through Creative Commons.

Figure 33. ***Neckeropsis lepineana***, a moss included in the nests of the Mossy-nest Swiftlet (***Aerodramus salangana***). Photo by Colin Meurk, through Creative Commons.

Mascarene Swiftlet (*Aerodramus francicus*)

Billiet and Jadin (1979, Jadin & Billiet 1979) reported that the **Mascarene Swiftlet** (***Aerodramus francicus***; Figure 34) uses mosses, liverworts, and lichens glued together with saliva.

Figure 34. ***Aerodramus francicus***, Mascarene Swiftlet, a bird that uses bryophytes in its nests. Photo by Eliane Küpfer, through Creative Commons.

Philippine Swiftlet (*Aerodramus vanikorensis amelis*)

The Philippine Swiftlets (***Aerodramus vanikorensis amelis***; Figure 35) use both lichens and mosses in their nests (Tan *et al*. 1982).

Figure 35. ***Aerodramus vanikorensis amelis***, Philippine Swiftlet, sitting on its mossy nest. Photo by Guy Poisson, with permission.

Trochilidae – Hummingbirds

Wolf (2009) found eight members of the **Trochilidae** that use bryophytes in their nests in parts of North America:

Hylocharis leucotis (White-eared Hummingbird; Figure 36)
Eugenes fulgens (Magnificent Hummingbird; Figure 37)
Archilochus alexandri (Black-chinned Hummingbird; Figure 38-Figure 40)
Calypte anna (Anna's Hummingbird; Figure 43-Figure 46)
Stellula calliope (Calliope Hummingbird; Figure 47-Figure 48)
Selasphorus platycercus (Broad-tailed Hummingbird; Figure 49-Figure 51)
Selasphorus rufus (Rufous Hummingbird; Figure 52-Figure 53)
Selasphorus sasin (Allen's Hummingbird; Figure 54-Figure 55)

Figure 36. ***Hylocharis leucotis***, White-eared Hummingbird, a bird that uses bryophytes in its nests in parts of North America. Photo by Amado Demesa, through Creative Commons.

Figure 37. ***Eugenes fulgens***, Magnificent Hummingbird, a bird that uses bryophytes in its nests in parts of North America. Photo by Dmitry Mozzherin, through Creative Commons.

Figure 38. ***Archilochus alexandri***, Black-chinned Hummingbird, a bird that uses bryophytes in its nests. Photo by Greg Lasley, through Creative Commons.

Figure 39. ***Archilochus alexandri***, Black-chinned Hummingbird. Members of this species use bryophytes in their nests. Photo by Jerry Oldenettel, through Creative Commons.

Figure 40. ***Archilochus alexandri***, Black-chinned Hummingbird, nest. Photo by Benedict Gagliardi, through Creative Commons.

Ruby-throated Hummingbird (*Archilochus colubris*)

The Ruby-throated Hummingbird (***Archilochus colubris***; Figure 41) builds a tiny nest (Figure 42) to house two pea-sized eggs (Bell 2001). These nests are located on thin branches of understory trees. They consist of an inner cup lined with fine plant down and camouflaged on the outside with small pieces of mosses and lichens. These are held together with spider webs, which are also used to affix the nest to the branch.

Figure 41. ***Archilochus colubris***, Ruby-throated Hummingbird. Members of this species use mosses and lichens on the outsides of their nests, creating camouflage. Photo by Matt Tillett, through Creative Commons.

Figure 42. ***Archilochus colubris***, Ruby-throated Hummingbird, on nest. Photo by Choess, through Creative Commons.

Figure 43. ***Calypte anna***, Anna's Hummingbird. Members of this species use bryophytes in their nests. Photo by Don Loarie, through Creative Commons.

Figure 44. ***Calypte anna***, Anna's Hummingbird, head. Photo by James Maughn, through Creative Commons.

Figure 45. ***Calypte anna***, Anna's Hummingbird, nest with mosses. Photo by Steve Berardi, through Creative Commons.

Figure 46. ***Calypte anna***, Anna's Hummingbird, nest with mostly lichens on the outside, but with a few bryophytes mixed in. Photo by Emily Hoyer, through Creative Commons.

Figure 47. ***Stellula calliope***, Calliope Hummingbird. Members of this species use bryophytes in their nests. Photo by Jerry Oldenettel, through Creative Commons.

Figure 48. ***Stellula calliope***, Calliope Hummingbird, feeding young in nest. Photo by Katia Schulz, through Creative Commons.

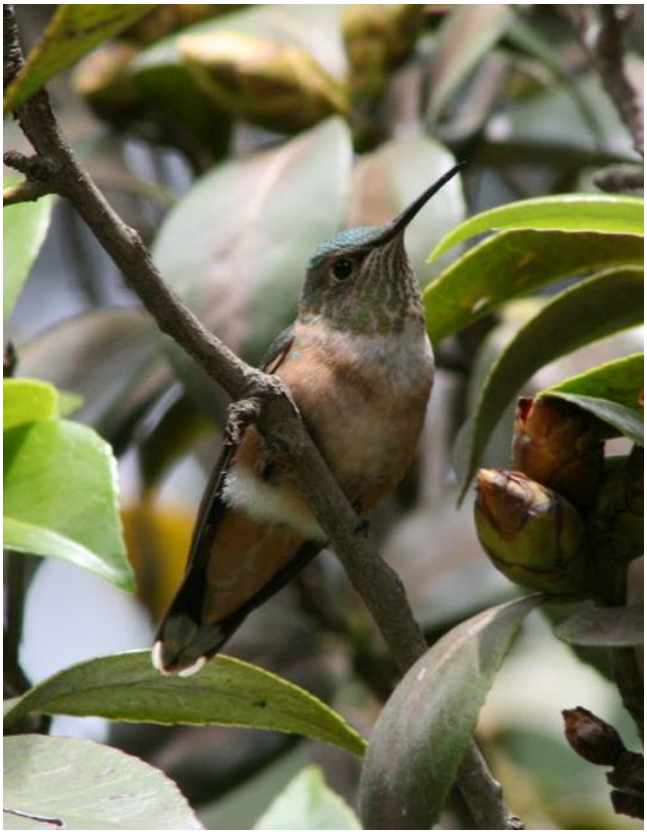

Figure 49. ***Selasphorus platycercus***, Broad-tailed Hummingbird. Members of this species use bryophytes in their nests. Photo by Alfonso Gutiérrez Aldana, through Creative Commons.

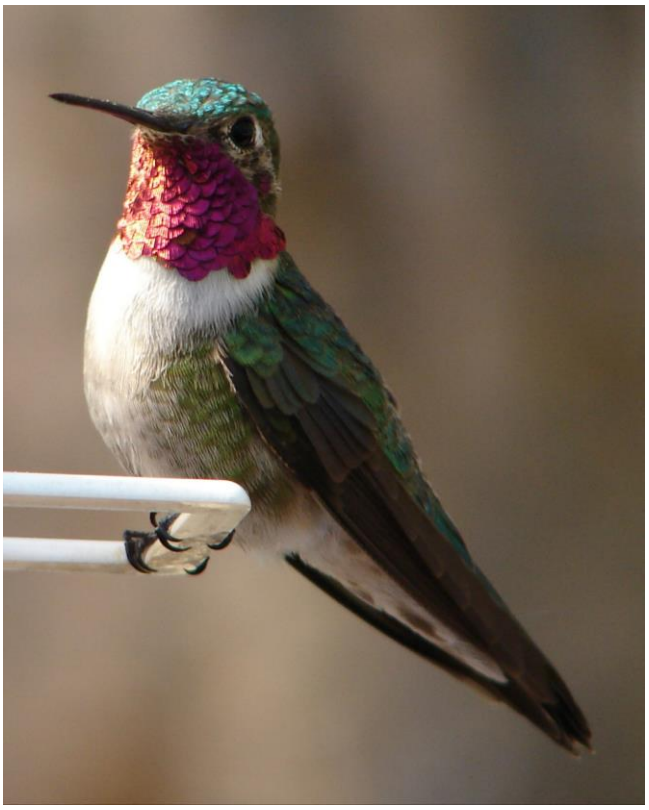

Figure 50. ***Selasphorus platycercus***, Broad-tailed Hummingbird. Photo by Michele Lynn Reynolds, through Creative Commons.

Figure 51. ***Selasphorus platycercus***, Broad-tailed Hummingbird, feeding young in nest. Photo by Bill Ratcliff, NPS, through public domain.

Rufous Hummingbird (*Selasphorus rufus*)

The Rufous Hummingbird (***Selasphorus rufus***; Figure 52) breeds in open areas and forest edges of western North America (Wikipedia 2011). It nests the farthest north of any hummingbird and the female builds its nest (Figure 53) in a shrub or conifer where it is protected. The male aggressively defends this tiny nest. The nests are built in lower branches in spring, benefitting from the temperature amelioration by the canopy. In summer the nests are built higher in the tree (Horvath 1964).

Figure 52. ***Selasphorus rufus***, Rufous Hummingbird male. Photo by Rick Leche, through Creative Commons.

Figure 53. ***Selasphorus rufus***, Rufous Hummingbird, female on nest with mosses and lichens on the exterior of the nest. Photo by Rick Leche, through Creative Commons.

Figure 54. ***Selasphorus sasin***, Allen's Hummingbird. Members of this species use bryophytes in their nests. Photo by Jesse Rorabaugh, through Creative Commons.

Figure 55. ***Selasphorus sasin***, Allen's Hummingbird, on nest that has a few bryophytes. Photo by Asicnewbie, through Creative Commons.

Picaflor Rubí (*Sephanoides sephaniodes*)

The Picaflor Rubí, also known as the Green-backed Firecrown or Picaflor Chico, is a South American hummingbird named ***Sephanoides sephaniodes*** (Figure 57). This tiny bird uses mosses and lichens for its nest (Figure 56), including the moss ***Ancistrodes genuflexa*** (Figure 56-Figure 58) (Torres-Dowdall *et al*. 2007). It seems it prefers this to other pendent mosses in the same family, such as ***Weymouthia cochlearifolia*** (Figure 59) and ***W. mollis*** (Figure 60). On the other hand, in Chile, the Picaflor Rubi uses the tree fern ***Lophosoria quadripinnata*** (Figure 61) in all of the "garments" (materials located inside nest), providing a soft texture and a brown color to the nests (Osorio Zúñiga 2012). The pendent mosses ***Weymouthia cochlearifolia***, ***W. mollis***, and ***Ancistrodes genuflexa*** occur on the outside as 16.6, 26.6, and 100% of the nests, respectively. Among these latter species 20, 37.5 and 40% produced reproductive structures in the nests (Figure 62). In older nests, reproductive structures still occurred on ***Eriodon conostomus*** (Figure 63), ***Ptychomnion ptychocarpon***, and ***Dicranoloma robustum*** (Figure 64). Most of these mosses were taken at heights of 10-18 m from the ground and were not the most abundant species found there. Thus, there is selectivity of the bryophytes used for nesting material.

Figure 56. A nest of the Picaflor Chico (***Sephanoides sephaniodes***), with the bird's tail barely visible, for which the nesting material is primarily ***Ancistrodes genuflexa***. Photo courtesy of Felipe Osorio Zúñiga.

Figure 57. ***Sephanoides sephaniodes***. Members of this species often build their nests almost entirely of mosses. Photo by Greg Lasley, through Creative Commons.

Figure 58. The pendent moss ***Ancistrodes genuflexa*** in Chile, a moss used in the nests of ***Sephanoides sephaniodes***, known there as the Picaflor Chico. Photo courtesy of Felipe Osorio Zúñiga.

Figure 59. ***Weymouthia cochlearifolia***, a pendent moss used in the nests of ***Sephanoides sephaniodes***. Photo by Juan Larrain, through Creative Commons.

Figure 60. ***Weymouthia mollis***, a pendent moss used in the nests of ***Sephanoides sephaniodes***. Photo by Juan Larrain, through Creative Commons.

Figure 61. ***Lophosoria quadripinnata***, a fern used in the nests of ***Sephanoides sephaniodes***. Photo by Franz Xaver, through Creative Commons.

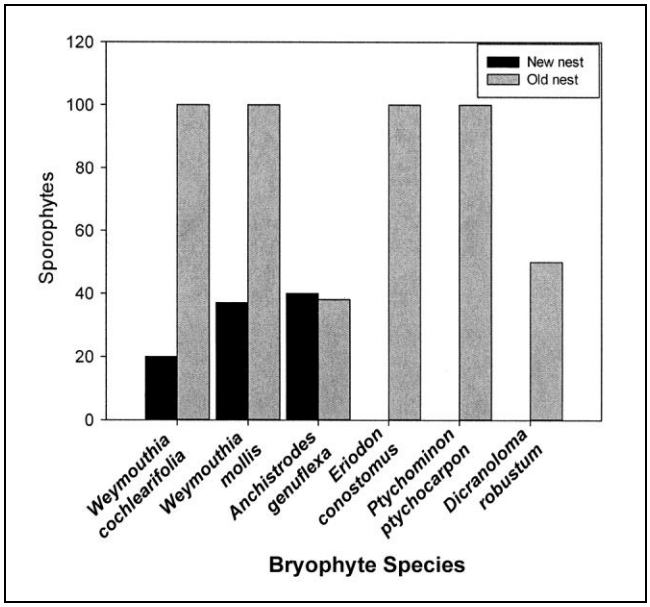

Figure 62. Number of sporophytes vs bryophyte species and nest age of the Picaflor Chico (***Sephanoides sephaniodes***) in Chile. Redrawn from Osorio Zúñiga 2012.

Figure 63. ***Eriodon conostomus*** with capsules, a moss that produces capsules in older nests of Picaflor Rubi. Photo by Juan Larrain, through Creative Commons.

Figure 64. ***Dicranoloma robustum*** with capsules, a moss that produces capsules in older nests of Picaflor Rubi. Photo by Juan Larrain, with permission.

In Patagonia, Argentina, ***Sephanoides sephaniodes*** (Figure 57) is known as the Green-backed Firecrown (Calvelo *et al*. 2014). This species, and the White-sided Hillstar, ***Oreotrochilus leucopleurus*** (Figure 65), likewise used primarily mosses in their nests, but they both interestingly selected mosses with **falcate** (sickle-shaped – see leaves of ***Dicranoloma***; Figure 64) leaves. These were entangled with spider webs and concealed on the outside with spider cocoons, leprose lichens, feathers, and hairs.

Figure 65. ***Oreotrochilus leucopleurus***, White-sided Hillstar. Members of this species like falcate mosses for their nests. Photo by Pablo Caceres Contreras, through Creative Commons.

Osorio-Zuñiga *et al*. (2014) determined that ***Sephanoides sephaniodes*** (Figure 57) was selective in its nesting materials. The bulk of the nest was made from the fern ***Lophosoria quadripinnata*** (Figure 61) (and the moss ***Ancistrodes genuflexa*** – Figure 58). Six other mosses were included in lesser quantities, although 19 species were

available in the area. The birds were further selective in collecting higher densities of reproductive mosses than that represented in the environment. These reproductive structures remained for more than a year, suggesting that this nest-building behavior could be an effective dispersal mechanism. By placing the sporophytes at a greater height, the birds enable dispersal to a greater distance.

More recently, Fontúrbel *et al*. (2020) reported that ***Ancistrodes genuflexa*** occurs in 100% of the nests, makes up 97% of the moss biomass in the nests, but is only 0.1% of the total moss biomass in the forest. The other two mosses that are present in any regularity are ***Weymouthia mollis*** (in 27% of nests) and ***W. cochlearifolia*** (in 17% of nests). These two species provide only 3% of the moss biomass in the nests, but comprise 94% of the moss biomass in the forest. Knowing that mosses often have antibiotic properties, reasoned that this attribute might account for the selection. Hence, the researchers tested the three primary nest components for their antibacterial agents. In ***A. genuflexa***, they found 14 compounds. Of these, five are known to have antibacterial properties, one has antifungal properties, and one repels insects (Asakawa *et al*. 2013)! Although the two ***Weymouthia*** species are known to have antimicrobial properties, neither species was effective against the five common bacteria tested. Furthermore, when the mosses were kept in the lab at 4ºC, both ***Weymouthia*** species were attacked by fungi and rotted after six months, whereas the ***A. genuflexa*** samples were unharmed for a year. Since ***Sephanoides sephaniodes*** may reuse its nest for several years, it is likely that it experiences greater survival when it uses ***A. genuflexa*** at its primary nesting material. As Fontúrbel and coworkers titled their article, "Mamma knows best."

The hummingbirds commonly use mosses and lichens in their nests, so it is not surprising that the endemic Juan Fernandez Firecrown (***Sephanoides fernandensis***; Figure 66-Figure 67) makes its nest almost entirely of mosses (Figure 68) (Jaime Jiminez, pers. comm. 19 May 2020).

Figure 66. ***Sephanoides fernandensis*** (Juan Fernandez Firecrown) female in Juan Fernandez area. Photo courtesy of Jaime Jiminez.

Figure 67. ***Sephanoides fernandensis*** (Juan Fernandez Firecrown) female in Juan Fernandez area. Photo courtesy of Jaime Jiminez.

Figure 68. ***Sephanoides fernandensis*** (Juan Fernandez Firecrown) female on nest in Juan Fernandez area. Photo courtesy of Jaime Jiminez.

Trogoniformes

Trogonidae – Trogons

Wolf (2009) found only one species of **Tyrannidae** whose members use bryophytes in nests in parts of North America: ***Trogon elegans*** (Elegant Trogon; Figure 69).

Figure 69. ***Trogon elegans***, Elegant Trogon, a species that uses bryophytes in nests in parts of North America. Photo by Dominic Sherony, through Creative Commons.

Summary

Burrowing Owls may use bryophytes as liners in the burrows, sometimes providing a nest for rodents that move in later. Some swiftlets make extensive use of mosses in their nests. Hummingbirds often use mosses and lichens on the outsides of nests, presumably as camouflage. The Picaflor Rubi is one of the hummingbirds that can make its entire nest with bryophytes, selecting ***Ancistrodes genuflexa*** in much greater proportion than its presence in the forest, apparently for its antibiotic properties.

Pleurocarpous bryophytes are the most common in nests, and tree-nesting tropical birds typically use epiphytic bryophytes, including pendent species.

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