THIS YEAR IN ARGENTINA, a rare event – flowering of the Takuarusu (*Guadua chacoensis*) – is giving us a unique opportunity to search for one of the world’s most endangered birds, the Purple-winged Ground-Dove (*Claravis godefrida*). Like many other birds of the Atlantic forest biodiversity hotspot, the Purple-winged Ground-Dove is threatened by severe habitat destruction. Unlike most other species, however, it depends not only on the Atlantic forest, but on a key resource that fluctuates enormously over space and time: bamboo seeds.

*Seeds of the Takuarembo (Chusquea ramosissima) seem to be preferred by Uniform Finches.*
The Purple-winged Ground-Dove is critically endangered, with only a few undocumented records in recent years. In reviewing the published records of this dove in Argentina, we noticed that it is only recorded in Argentina every 15-18 years, coinciding perfectly with the flowering events of our two common Guadua bamboos: Takuarusu and Yatevo (Guadua trinii). In 2007 we set out to look for the mysterious Purple-winged Ground Dove in the first stands of flowering Takuarusu around Puerto Iguazú, in the province of Misiones. Since there seem to be no recordings of its voice, we could not use playback. Never the less, our recent sight record at Iguazú National Park encouraged further expeditions to other sites with Guadua bamboo, where we hope to tape-record this elusive bird.

Bamboo: a resource for birds

The Purple-winged Ground-Dove belongs to an interesting but poorly studied group of birds: the bamboo specialists. Bamboos are a diverse tribe of grasses, with more than 1500 described species worldwide. They form a key component of forest ecosystems in Asia, Africa, Oceania, and South America, but reach their peak diversity in parts of Asia and South America. The Atlantic forest of Brazil, Paraguay and Argentina is one of the most important centres of bamboo diversity, and supports an unusually rich community of bamboo specialist birds.

A key feature of bamboo biology is especially critical for the conservation of specialist birds. Fast-growing and often invasive, most bamboos are semelparous. Each plant flowers only once, then dies. Additionally, many bamboos are masting plants. Over large areas, they reproduce vegetatively without flowering for many years, providing a stable and apparently productive habitat for a number of specialist insectivores. After many years of vegetative growth, plants of a given species will flower in synchrony, producing an incredible abundance of seeds and attracting many species of granivorous birds. These...
include generalist granivores like parrots, but they also include nomadic bamboo seed specialists like the Purple-winged Ground-Dove, which travel long distances between patches of masting bamboos, to take advantage of this locally abundant food resource. The period between flowering events can be up to 150 years, depending on the species of bamboo. The Takuarusu, for example, flowers synchronously over a large area every 30 years, then dies.

### Bamboo-specialist insectivores

Bamboo-specialist insectivores feed on insects in, on, and around living bamboo. In Southeast Asia, the Bamboo Woodpecker (Gecinulus viridis) is found only in stands of bamboo. In 1973, L. Short described the close relationship between this inconspicuous bird and its bamboo habitat. The woodpecker climbs the slippery bamboo with its legs clasped around the stalk, methodically gleaning and sometimes drilling for ants. It drums on bamboo to signal, and apparently nests in cavities in bamboo. Similarly, in south-western Amazonia, the Rufous-headed Woodpecker (Celeus spectabilis) feeds on insects in stands of large spiny Guadua bamboos.

A diverse suite of bamboo specialist insectivores inhabit the Atlantic forest. The Yellow Tyrannulet (Capsiempis flaveola) hunts for insects among the leaves and stems of various species of bamboo, sometimes using bamboo fibres to build its cup-like nest on the node of the bamboo, where the leaves meet the culm. When a favoured species of bamboo dies, Yellow Tyrannulets become uncommon and move to other species of bamboo. The Large-headed Flatbill (Ramphotrigon megacephalum) also hunts for insects, but, at least in Argentina and Paraguay, it is a specialist on Guadua bamboo and is not found in other bamboo genera. Bertoni’s Antbird (Drymophila rubricollis) and the Dusky-tailed Antbird (Drymophila malura) are common understory insectivores that specialize on dense thickets of Merostachys or Chusquea bamboo, becoming rare when these bamboos die.

One of the most fascinating bamboo-specialist insectivores of the Atlantic forest is the White-bearded Antshrike (Biatas nigropectus). Globally, it is considered vulnerable. In Argentina, at least, it has only been found in spiny Guadua bamboo, especially Yatevo. A secretive bird, it seldom sings and is easily overlooked. What does it eat and why does it only inhabit Guadua bamboo? With so little habitat remaining, will it be able to survive through the next massive die-off of Yatevo, expected for 2018?

### Bamboo seed specialists

In 1972, H. D. Jackson was one of the first to point out the specialist relationship between a seed-eating bird and the masting events of bamboo. He noticed that records of the Pied Mannikin (Lonchura fringilloides) in Rhodesia were closely tied to masting events of the Bindura Bamboo (Oxytenanthera abyssinica), which produces seeds about every 30 years.

An unusual diversity of bamboo seed specialists is found in the Atlantic forest. In 1996, F. Olmos reported large numbers of Uniform Finches (Haplospiza unicolor) breeding during a masting event of Chusquea bamboo in the Atlantic forest of Brazil. In Argentina, there always seem to be some patches of Chusquea ramosissima bamboo with seeds, providing a constant source of food for the Uniform Finch. The globally vulnerable Temminck’s Seedeater (Sporophila falcirostris) and Buff-fronted Seedeater (Sporophila frontalis), on the other hand, like the Purple-winged Ground-Dove, appear only when Guadua bamboos are flowering. However, both species have been observed feeding on other bamboo seeds, and the Buff-fronted Seedeater has been suggested to feed on rice crops in Brazil.

Dr. Walter Braun, a retired agricultural scientist from Petropolis, has a unique perspective on bamboo seed specialists of the Atlantic forest, having watched these birds arrive during three masting events of several bamboo species in the state of Rio de Janeiro, Brazil. Dr. Braun tells of thousands of Buff-fronted Seedeaters (locally “Chanchão”) arriving in 1944, 1974, and 2007, to feed on the bamboo mast, then disappearing when the seeds are gone. At these times, comments Dr Braun “the three species of flowering bamboos are like blankets covering the forest over our mountains. Flocks of hundreds of Chanchão come from several hundred meters above, descending rapidly in a spiral toward the forest, where something attracts them: either the seeds themselves, or the loud, shrill songs of the other
Alejandro Bodrati examines a new Takuanusa culm.
Takuarusu flowers (top) and seeds
Two Takuarusu plants on a small island in the Río Iguazú. The plant on the left flowered a few months later. By that time, the other plant was dead.

In Brazil and Paraguay, nearly all of the Interior Atlantic forest has been replaced by large-scale agriculture and pastures.
Chanchãos, already inside the forest, calling for the new flock to join them.” The sound of these thousands of male Buff-fronted Seedeaters has been described by Brazilian naturalist Helmut Sick as “a unique roar that echoes strangely in the mountain forests.”

Why specialise on bamboo seeds? Bamboo masting events provide an enormous abundance of large, apparently nutritious seeds. They seem to provide an excellent opportunity for nesting. Where bamboos are diverse and abundant, bamboo seed specialisation must be a good strategy, even if it requires travelling from place to place.

There is a great deal still to be learned about bamboo seed specialists. How are they different from other granivores? How do they find stands of masting bamboos? How much do they specialize on just one genus or species of bamboo? How long do they live and how far do they go in search of bamboo seeds? We know so little about the bamboo seed specialists that in many cases we do not even know which bird species belong in this group. The recent description of the Carrizal Seedeater (Amaurospiza carrizalensis) in Venezuela suggests that there may be several, as yet undiscovered, bamboo specialist birds.

What happens when the bamboo dies?

When the bamboo stops producing seeds in a given area, the nomadic bamboo seed specialists move elsewhere. The bamboo specialist insectivores seem to be much less mobile. How do they respond to massive bamboo death? These species have a relatively stable habitat over several generations. When their preferred species of bamboo dies, they must either move long distances or rely on less suitable habitat, and they probably experience population declines.

We have been studying the birds of Cruce Caballero Provincial Park, in Argentina, since 2003. From 2003 to 2005, much of the understory was dominated by dense Takuapi bamboo (Merostachys clausenii). Bertoni’s and Dusky-tailed Antbirds were abundant, and Yellow Tyrannulets were common. In 2006, the Takuapi flowered and died. By 2007, the understory was completely changed. Bertoni’s Antbird, Dusky-tailed Antbird, and Yellow Tyrannulet are now uncommon, remaining only in the small patches of Guadua and Chusquea bamboo.

Threats to bamboo specialists in the Atlantic forest

Bamboo specialist insectivores are threatened by destruction of their specific bamboo habitat. While some bamboos are favoured by selective logging, the loss of more than 90% of the Atlantic forest to pasture and agriculture must have had severe impacts on many bamboo specialist insectivores, much less mobile than the nomadic birds that specialize on bamboo seeds. Clearing of Atlantic forest, and specifically bamboo stands, continues to threaten specialist insectivores like the White-bearded Antshrike.

Bamboo seed specialists like the Purple-winged Ground-Dove can move long distances, but can only
use each stand of bamboo for a short period of time. They need many different patches of their preferred bamboos. With the clearing of the Atlantic forest, bamboo seed specialists must travel many times farther in search of food, or make do with other food sources. The enormous loss of Atlantic forest, particularly in Brazil and Paraguay, has already disrupted the natural cycle of nomadic movements made by flocks of Purple-winged Ground-Doves, and this species may already be doomed to extinction.

Both types of bamboo specialists – insectivores and granivores – probably experience population cycles. Presumably, granivores are most abundant during masting periods of their favoured bamboos, and their populations shrink outside of those periods. Likewise, populations of insectivores like the White-bearded Antshrike presumably grow during periods between bamboo masting, and crash when their preferred bamboo dies off. Thus, to conserve bamboo specialist birds, we must work to ensure sufficient habitat so that populations do not crash to zero during periods of food shortage.

Conserving bamboo specialist birds in the Atlantic forest

Conserving bamboo specialist birds is difficult anywhere. In the Atlantic forest, the task is made even more difficult because bamboo specialist birds compete for space with the major population centres of Brazil, the most important agricultural lands in Paraguay, and some of the poorest farmers in Argentina. Conserving bamboo habitat will require efforts on several fronts. International strategies for conserving the Atlantic forest should specifically take into account bamboo habitat. Bamboo stands should be considered in the design and zoning of protected areas. Exploitation of Guadua bamboos for crafts and construction should be monitored to ensure long-term sustainability and seed supply for specialist birds. In Argentina, at least, environmental education is essential to encourage small-holder farmers to maintain, on their land, stands of bamboo for the White-bearded Antshrike, the threatened Sporophila seedeaters, and the mysterious Purple-winged Ground-Dove. Bird-watchers and scientists can help generate information to conserve these species, by taking photos of these specialist birds and photos or samples of the bamboos where they are found.

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Further reading


Parodi, L. R. 1936. Las bambooses indígenas en la Mesopotamia argentina. Revista Argentina de Agronomía 3: 229-244.

