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Palm Fruits in the Diet of the Oilbird, *Steatornis caripensis*

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The oilbird, *Steatornis caripensis*, subsists entirely on fruit. It forages for this fruit by night and during the day it roosts in caves where it also breeds. It plucks and swallows the fruit whole, digests the edible pericarp, and regurgitates the seed intact. Many, probably most, of the seeds are regurgitated in the caves, where they may accumulate into deposits many feet thick.

We have studied the oilbird's diet in Trinidad, W.I., from 1957–1961 (Snow, 1962) and visited the Caripe cave in Venezuela in 1976 and the Los Tayos cave of eastern Ecuador (3°6′ S, 78° 12′ W) in July, 1976.

The fate of seeds taken by oilbirds into caves depends on the nature of the cave. In Trinidad all the seeds taken into two sea caves must be lost, as are the seeds taken into the inland dry limestone caves. But a small proportion of seeds taken into limestone caves with streams may be washed out again and so dispersed.

In Trinidad the main study of the oilbird's food was made at a small colony in the Arima valley in the Northern Range between April, 1957, and September, 1961. Here catching trays were erected below four nest sites that are also roosting perches. The trays were emptied weekly and collected a total of 112,717 seeds, of which 58,176 were palm seeds. The species concerned, and their proportions of the total palm seeds, were: *Euterpe langloisii* Burret 78%, *Bactris cuesa* Crueger ex Griseb. & H. Wendl. 11%, *Jessenia oligocarpa* Griseb. & H. Wendl. 8%, and less than 1% each of *Livistona chinensis* (Jacq.) R. Br. ex Mart. (introduced), *Roystonea oleracea* (Jacq.) Cook and *Geonoma vaga* Griseb. & H. Wendl. There were also small numbers of another *Bactris* species, a *Desmoncus* sp., and an *Aiphanes* sp. In addition, there were 660 unripe *Bactris*-type fruits, regurgitated whole. These fruits were small and soft, without a seed.

Euterpe langloisii had no clearly defined fruiting season and was present in every sample. *Jessenia oligocarpa* was also always present, in much smaller numbers than *Euterpe*, except for one period from January to March, 1960, when it completely failed. A few *Roystonea oleracea* were found in the samples in all months of the year. *Bactris cuesa* on the other hand was seasonal with a fruiting peak from June to September except in 1958 when the peak extended from July to November. Eighteen seed samples taken in seven different months from the four other occupied oilbird caves in Trinidad showed the same palm species represented in approximtaely similar proportions.

During a three-day visit in May, 1976, to the Caripe oilbird cave of Venezuela, freshly regurgitated seeds of *Euterpe* and *Jessenia* were collected, identical in appearance to the seeds of *Euterpe langloisii* and *Jessenia oligocarpa* from Trinidad. Since this visit Dr. B. Tannenbaum has collected seeds of *Bactris* and *Roystonea* that again appear identical to the seeds of *Bactris cuesa* and *Roystonea oleracea* of Trinidad.

Information on the diet of the oilbirds inhabiting the Los Tayos caves of eastern Ecuador at 550 m was collected during three visits in the second half of July, 1976.

A random sample of 460 seeds from the top foot of seed deposits showed 34% to be palm seeds; as palm seeds are the most indestructible of those deposited by the oilbirds, the true figure is probably slightly lower than this. The total of 149 palm seeds was made up of 55% *Socratea* sp., 30% *Euterpe* sp., *Morenia caudata* 8%, and *Jessenia bataua* 7%. On the three visits 428 freshly regurgitated seeds were collected of which 89% were palms, almost entirely *Euterpe* although the other three species of palm were also represented. A small seed sample collected from the Yaupi oilbird caves 33 km E.N.E. of the Los Tayos caves, at an altitude of approximately 290 m, included all the same palm species found at the Los Tayos caves.

The total consumption of palm fruits by oilbirds must be considerable. A single night's consumption by a nestling oilbird ranges from 20 fruits when 30 days old to 86 when 56 days old, which represents one-third to one-quarter of their body weights. An adult bird, which weighs less than a 56-day-old young, probably takes in the region of 50 fruits per night throughout the year, of which 15 to 25 will on average be palm fruits. The oilbird population of the Los Tayos caves was estimated as 2,000, that of Caripe as up to 20,000, and the total oilbird population in Trinidad was estimated at 1,460 birds, so millions of palm seeds are taken in a year by just these colonies. While most of the seeds will die in the caves, some will be washed out by streams and some regurgitated by adult oilbirds during a night's foraging. An example of this was seen beneath a *Dacryodes* sp. (Burseraceae) tree half a mile from the Los Tayos caves where a number of *Jessenia bataua* seeds were found germinating. The seeds of *Dacryodes* outnumbered all other seeds in the caves and there was little doubt that the *Jessenia* had been brought by the oilbirds to this rather unsuitable dry ridge at 600 m.

The oilbird is likely to be both an effective short-range and long-range dispersal agent. In its nightly foraging it ranges up to 15 or even 30 miles. Occasionally vagrant oilbirds appear well outside their normal range. For instance a single first-year male has been trapped in Panamá, the nearest known colony being in western Colombia (Wetmore, 1968); and one was recently found near Quito (F. Ortiz, pers. comm.), again outside its normal range.

Besides palm fruits, oilbirds take all but a very small fraction of their fruits from two other families, the Lauraceae and Burseraceae. The fruits taken from these three families have several common characteristics: they all have firm nonsucculent pericarps enclosing a single seed and they are all sufficiently small for an oilbird to pluck and swallow the fruit whole. The pericarp of these fruits, besides being low in water content, is high in nutritive quality. Analysis of the dried pericarp of *Bactris cuesa* and *Jessenia oligocarpa*, respectively, showed the following composition: protein 13% and 5%, fat 39% and 26%, carbohydrates 48% and 69%. Four Lauraceae fruits and one Burseraceae fruit that have been analysed show a pericarp composition equally high in protein and fat.

The high nutritive quality of the fruits on which oilbirds and other frugivores feed is probably the result of coevolutionary interaction between the trees and their dispersal agents (Snow 1971). Probably fruiting seasons have also been affected by this interaction. Thus in Trinidad the fruiting seasons of 20 species of *Miconia* (Melastomaceae) are staggered throughout the year, so that some fruit is always available (Snow, 1965). It seems that as a result of competition between the different tree species for dispersal by frugivorous birds there is a selective advantage in fruiting at a time when as few other species as possible are in fruit. A similar situation was found in the ten species of Lauraceae on which oilbirds feed, but not in the palms. At least two palm species, *Jessenia oligocarpa* and *Euterpe langloisii*, produce fruit throughout the year. Their fruit ripens slowly over a period of months, and individual trees may have bunches of fruits at different stages of maturity. It would be interesting to make detailed studies of fruiting seasons of other kinds of palms whose fruits are eaten by birds, to see whether there are any cases of staggered fruiting seasons among congeneric species. In trees that have prolonged flowering and fruiting seasons, extending over most of the year, species-formation should be less easily achieved than in trees with short flowering and fruiting seasons, as overlapping flowering seasons will inhibit reproductive isolation. It may be significant in this connection that, unlike the Lauraceae, the main palm species on which oilbirds feed are not closely related but are all in different genera.

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the amount of fertilizer he needs, and has reduced his watering. It also makes a wonderful bed in which fallen seeds germinate.

After a delightful lunch outdoors at a dockside restaurant, we went to see the extraordinarily large palm collection of longtime member Randy Fuller. If he can get it he has it! He has a wonderful collection of antique cars too, especially Franklins, so we had much to enjoy there. New member John Henning has a rapidly growing collection, with help and guidance from Randy Fuller. In fact, Randy is responsible for quite a few new members in the Naples area, as is Hank Taylor. Hank was our guide in Naples.

Some members then went on to Sarasota to spend the night and meet next morning at the home of Dr. and Mrs. Byron Besse to admire their delightful location, planted with both palms and a large cycad collection. Libby Besse then took the group to the Marie Selby Botanical Garden, small in physical size but large in collection of epiphytes, in which they specialize. Their display house is a fascinating place. They have some smaller palms, like *Reinhardtia*, that enjoy the warm, humid atmosphere provided for the orchids, gesneriads, and even a pitcher plant.

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