

individuals from Ghana and Nigeria measured 305 and 268 mm respectively. While not conclusive this might be taken to suggest that the grey morph occurs in both sexes.

In Ivory Coast, the Long-tailed Hawk is not uncommon in Yapo Forest, 5°42'N 4°6'W (Demey & Fishpool 1994). Although we regularly heard the species there, we rarely saw it. Indeed, during 167 visits to Yapo forest over the course of five years we observed the Long-tailed Hawk on 18 occasions only, involving 22 individuals: two of these were seen to be melanistic birds, although the proportion could have been slightly higher since in some cases (number unrecorded) the observations concerned rear views of birds in flight. Brief details of these sightings are as follows. On 25 May 1986, RD observed a bird corresponding to the description of the melanistic morph (Mackworth-Praed & Grant 1970). The bird crossed a clearing at less than 10 m from the observer, and landed in a tree. It was not shy, allowing close and detailed observation through a telescope of 20× magnification during more than 15 minutes. Notes taken on the spot describe the underparts as slate-grey, concolorous with the upperparts; upper- and undertail-coverts pure white; tail very long, black with white spots, looking somewhat worn; underwing barred. Eye yellow; bill greyish-black; legs yellow. A second melanistic individual was seen under similar circumstances at a different locality in Yapo by LDCF on 14 February 1988. The plumage description taken at the time matches the foregoing exactly. The only addition was that the cere of this individual was noted as grey.

Another record of this morph has been documented from the Lower Guinea forest block, in Gabon. Brosset & Erard (1986) report a sighting, in April 1985, of a 'mixed' pair, of which one of the birds showed uniformly grey underparts.

It thus appears that the claims of the existence of a melanistic morph of the Long-tailed Hawk are indeed well founded.

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References:

- Allport, G., Ausden, M., Hayman, P. V., Robertson, P. & Wood, P. 1989. *The Conservation of the Birds of Gola Forest, Sierra Leone*. Study Report 38, International Council for Bird Preservation, Cambridge.
- Bannerman, D. A. 1930. *The Birds of Tropical West Africa*. Vol. 1. Crown Agents, London.
- Bannerman, D. A. 1953. *The Birds of West and Equatorial Africa*. Vol. 1. Oliver & Boyd, Edinburgh.
- Bates, G. L. 1930. *Handbook of the Birds of West Africa*. Bale & Danielsson, London.
- Britton, P. L. (ed.) 1980. *Birds of East Africa*. EANH, Nairobi.
- Brosset, A. & Erard, C. 1986. *Les Oiseaux des Régions Forestières du Nord-Est du Gabon, vol. 1: Ecologie et Comportement des Espèces*. Société Nationale de Protection de la Nature, Paris.
- Brown, L. & Amadon, D. 1986. *Eagles, Hawks and Falcons of the World*. Vol. 2. Hamlyn, Middlesex.

- Brown, L. H., Urban, E. K. & Newman, K. 1982. *The Birds of Africa*. Vol. 1. Academic Press, London.
- Carroll, R. W. 1988. Birds of the Central African Republic. *Malimbus* 10: 177–200.
- Cheke, R. A. & Walsh, J. F. 1996. *The Birds of Togo*. B.O.U. Check-list no. 14. British Ornithologists' Union, Tring.
- Dekeyser, P. L. & Derivot, J. H. 1966. *Les Oiseaux de l'Ouest Africain*. Fasc. I. Initiations et Etudes africaines No. XIX. Inst. fon. Afr. noire, Dakar.
- Demey, R. & Fishpool, L. D. C. 1994. The birds of Yapo Forest, Ivory Coast. *Malimbus* 16: 100–122.
- Dowsett-Lemaire, F. & Dowsett, R. J. 1989. Liste commentée des oiseaux de la forêt du Mayombe (Congo). Pp. 5–16 in R. J. Dowsett & F. Dowsett-Lemaire (eds), *Enquête faunistique dans la forêt du Mayombe et check-liste des oiseaux et des mammifères du Congo*. *Tauraco Res. Rep.* 2.
- Elgood, J. H., Heigham, J. B., Moore, A. M., Nason, A. M., Sharland, R. E. & Skinner, N. J. 1994. *The Birds of Nigeria*. B.O.U. Check-list no. 4 (2nd edn). British Ornithologists' Union, Tring.
- Halleux, D. 1994. Annotated bird list of Macenta Prefecture, Guinea. *Malimbus* 16: 10–29.
- Hillman, J. C. & Hillman, S. M. 1986. Notes on some unusual birds of the Bangangai area, South-west Sudan. *Scopus* 10: 29–31.
- Kemp, A. C. 1994. Long-tailed Hawk *Urotriorchis macrourus*. P. 164 in J. Del Hoyo, A. Elliott & J. Sargatal (eds), *Handbook of the Birds of the World*. Vol. 2. Lynx Edicions, Barcelona.
- Lippens, L. & Wille, H. 1976. *Les Oiseaux du Zaïre*. Lannoo, Tielt.
- Mackworth-Praed, C. W. & Grant, C. H. B. 1952. *Birds of Eastern and North Eastern Africa*. Vol. 1. Longman, London.
- Mackworth-Praed, C. W. & Grant, C. H. B. 1970. *Birds of West Central and Western Africa*. Vol. 1. Longman, London.
- Reichenow, A. 1901. *Die Vögel Afrikas*. Vol. 1. Verlag von J. Neumann, Neudamm.
- Schouteden, H. 1954. Faune du Congo Belge et du Ruanda-Urundi. III. Oiseaux Non Passereaux. *Ann. Mus. Congo belge*, 8°, Sc. Zool., vol. 29.
- Serle, W., Morel, G. J. & Hartwig, W. 1977. *A Field Guide to the Birds of West Africa*. Collins, London.
- Sharpe, R. B. 1870. On a fourth collection of birds from the Fantee country. *Ibis* (2) 6: 52–59.
- Sharpe, R. B. 1874. *Catalogue of the birds in the British Museum*. Vol. 1. British Museum (Natural History), London.
- Snow, D. W. (ed.) 1978. *An Atlas of Speciation in African Non-Passerine Birds*. British Museum (Natural History), London.
- Williams, J. G. & Arlott, N. 1980. *A Field Guide to the Birds of East Africa*. Collins, London.

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Food delivery and chick provisioning in cypseloidine swifts

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Swifts (Apodidae) catch all of their arthropod food on the wing. These items, mostly insects, are brought back to nestlings in two strikingly

different ways which in turn affect the kind of food adults capture, their foraging range and chick provisioning rate.

Swifts and swiftlets in the subfamilies Chaeturinae and Apodinae bring the food items back to nestlings in a consolidated mass or bolus glued together with saliva and carried in the mouth. For *Apus apus*, an individual bolus typically weighs 0.70–1.75 g, occasionally 2.0–2.5 g (Lack & Owen 1955, Martins & Wright 1993), and contains 90–850 individual prey items (Lack & Owen 1955, Collins unpublished). A bolus can contain as many as 1500 very small insects such as aphids (Homoptera, Aphididae) (Lack & Owen 1955). Although food boluses can occasionally consist of only one or a few types of insects, they typically contain representatives of numerous orders and families of insects and ballooning spiders (Hespenheide 1975, Collins 1968, Tarburton 1986a, Bull & Beckwith 1993). The food bolus causes a visible distension of the floor of the mouth which is observable in swifts returning to feed nestlings (Lack 1956, Arn-Willi 1960, Cramp 1985). The adult inserts its bill into the open mouth of the begging chick (Lack 1956, Arn-Willi 1960) and usually passes most or all of the bolus to a single older chick; the bolus may be divided among several very small chicks (Lack & Lack 1951). Swifts are efficient foragers and can rapidly gather a bolus of food. Lack & Lack (1951) report individual *Apus apus* gathering 1.2 g and 1.7 g of insects in 47 and 64 minutes respectively. Feeding rates in the Chaeturinae and Apodinae are highly variable, ranging from 3–4 feedings per hour to 4.6–10.7 feedings per 10 hours (Moreau 1942a,b, Lack & Lack 1951, Collins 1968, Tarburton 1986b, Bull & Collins 1993). Feeding rates are correlated with both brood size and weather-related differences in food abundance (Lack & Lack 1951, Lack & Owen 1955, Tarburton 1986b). The mode of food delivery, boluses carried in the mouth, directly limits the amount of food which can be brought back per feeding trip and, indirectly, the effective foraging range. It would be inefficient for such birds to expand their foraging range to the extent that excessive time and energy are spent in transport of individual boluses from distant foraging areas. The Ecological Cost of Transportation (Garland 1983) or “percent of total daily energy expenditure which is consumed by locomotion” to and from foraging areas (Whitacre 1992) would become unacceptably high. Additional theoretical discussion of foraging efficiency in birds and the trade-offs between load size and foraging distance is presented by Krebs & Davies (1993).

The 12–13 species of New World swifts in the genera *Cypseloides* and *Streptoprocne* (Sibley & Monroe 1990, Chantler & Driessens 1995) have many distinctive morphological and breeding characteristics warranting their separation as the subfamily Cypseloidinae (Brooke 1970). Included is their tendency to nest in dark damp locations, frequently near or behind waterfalls (Knorr 1961, Snow 1962, Collins 1968, Marin & Styles 1992). It has also been noted that the rate of food delivery to chicks is notably low. In the Chestnut-collared Swift *Cypseloides rutilus*, feeding intervals were usually longer than 100 minutes (Collins

1968). Similarly, in the Black Swift *Cypseloides niger* Michael (1927) noted several hours between feedings and possibly only a single feeding late in the day or at dusk. The larger White-naped Swift *Streptoprocne semicollaris* and White-collared Swift *Streptoprocne zonaris* also appear to make only a single feeding trip to the nest per day (Whitacre 1992).

Another subfamilial difference which has not been given attention is the mode of food delivery to chicks. The cypseloidine swifts do not carry food for the chicks as a saliva-coated bolus in the mouth, but as an unconsolidated mass in the oesophagus. The distended oesophagus in White-naped and White-collared Swifts was 100–135 mm long, 26 mm in diameter, and contained 538–1078 insects 80.7% of which were flying ants (Formicidae: *Azteca*, *Solenopsis*) (Rowley & Orr 1962, 1965). There also appeared to be a “fringed valve situated immediately behind the glottis” (Rowley & Orr 1962). The mean weight of the oesophagus contents of White-collared and White-naped Swifts was 5.0 g and 6.7 g, and they contained up to 1044 and 1218 prey items respectively (Whitacre 1992). Collins & Landy (1968 reported masses of Hymenoptera (72.4% of one species of winged ant) in the “throat” (=oesophagus) of two adult Black Swifts collected at night near nests in Veracruz, Mexico. Captured individuals of several swifts in both *Cypseloides* and *Streptoprocne* readily regurgitated masses of insect food, 35–100% again being winged ants (Foerster 1987, Marin & Styles 1992, Whitacre 1992, Collins unpublished). Other swarming insects as fig-wasps (Hymenoptera, Blastophagidae) and termites (Isoptera) were also prominent in some food samples (Collins 1968, Whitacre 1992, Marin & Styles 1992).

The preponderance of swarming insects, particularly lipid-rich winged ants, in the diets of *Cypseloides* and *Streptoprocne* swifts ranging in size from 20 to 180 g body mass suggests that the Cypseloidinae are foraging specialists feeding on prey that occur in dense, but possibly widely dispersed, patches. These swifts would be expected to forage over wider ranges than other swifts (Chaeturinae, Apodinae) to locate such food sources. This seems to be true for several species of *Cypseloides* (Collins pers. obs.) and has been confirmed by radio telemetry for *Streptoprocne* (Whitacre 1992). The ability to bring back in the oesophagus larger quantities of food, than could be accommodated as individual boluses carried in the mouth, would seem to involve a critical morphological adaptation enabling these swifts to utilize both distant and patchily distributed prey resources. I suggest that a single large mass of food carried in the oesophagus can be used to provision a chick in the form of multiple feedings at one time, or sequential feedings over an extended period of time, thereby compensating for the infrequent feeding trips to the nest which is typical of these swifts.

Recent observations support these suggestions. On 19 July 1997, at a breeding colony of Black Swifts located at Mosse Brae Falls near Dunsmuir, Siskiyou Co., California, an adult returned to the nest at about 19.40 local time. Shortly afterwards it was seen to make open-mouth gaping and stretching motions. The mouth was

clearly empty of food at this time. Following this, the floor of the then closed mouth bulged out with regurgitated food which was promptly fed to a half-grown nestling. In rapid succession, over the next 2–3 minutes 10 more similar sized regurgitations were fed to the chick. In each case, prior to feeding the chick, the floor of the mouth appeared distended, approximately to the same extent as in swifts carrying a single food bolus, and empty afterwards. In total, the chick appeared to receive, in one bout of provisioning, the equivalent mass of food as many individual boluses delivered throughout the day. Multiple feedings over a period of eight minutes has also been observed in British Colombia (Grant 1966). On 8 August 1987, at a nesting site at Lawler Falls in southern California (Foerster & Collins 1990, Collins & Foerster 1995) an adult Black Swift was photographed feeding its chick at dusk shortly after returning to the nest for the night. What appeared to be the same adult again fed the chick over an hour later, well after dark (Collins & Peterson 1998). Thus multiple feedings over a longer period of time are also confirmed. Elsewhere, Black Swifts collected after dark, at a nest, had large quantities of food in their oesophagus (Collins & Landy 1968). This also suggests that the chick would be provisioned one or more times during the night.

Hespendeide (1975) was perhaps the first to suggest that some swifts might be specialists on a limited array of species, particularly calorically-dense swarming insects. However, he suggested that this was limited to a few of the very large species, as those in *Streptoprocne*. Whitacre (1992) verified that swarm feeding was typical of both White-collared and White-naped Swifts but related it mostly to patchily distributed food resources in seasonally dry climates and the development of coloniality. I think there is now enough information on swarm feeding by all species of the Cypseloidinae studied to date to suggest a stronger phylogenetic component to this behavioural specialization, and its morphological correlate, of carrying larger quantities of food in the expanded oesophagus and provisioning chicks at longer intervals. Swarm feeding, however, may not be limited to the Cypseloidinae but also appears in several species of swiftlets (*Aerodramus*) (Harrison 1976, Collins & Francis, unpublished). Studies of the foraging range and feeding rate in these species are clearly called for.

References:

- Arn-Willi, H. 1960. *Biologische Studien am Alpensegler*. Verlag Vogt-Schild, Solothurn.
- Brooke, R. K. 1970. Taxonomic and evolutionary notes on the subfamilies, tribes, genera and subgenera of the swifts (Aves: Apodidae). *Durban Mus. Novit.* 9: 13–24.
- Bull, E. L. & Beckwith, R. C. 1993. Diet and foraging behavior of Vaux's Swifts in northeastern Oregon. *Condor* 96: 1017–1023.
- Bull, E. L. & Collins, C. T. 1993. Vaux's Swift (*Chaetura vauxi*). In: *The Birds of North America*, No. 77 (A. Poole & F. Gill, eds). Academy of Nat. Sci., Philadelphia.
- Chantler, P. & Driessens, G. 1995. *A Guide to the Swifts and Treeswifts of the World*. Pica Press, Sussex, U.K.
- Collins, C. T. 1968. The comparative biology of two species of swifts in Trinidad, West Indies. *Bull. Fla. St. Mus.* 11: 257–320.



Riley, John, Hicks, Damien, and Wardill, James C. 1998. "The taxonomic status of *Halcyon* enigma on the Talaud islands, Indonesia." *Bulletin of the British Ornithologists' Club* 118, 113–117.

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