

# Field identification of **White-collared Kite** *Leptodon forbesi* and similar-looking species in north-east Brazil

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The Critically Endangered White-collared Kite is one of the least known raptors in the world. A group of experts resolve the identification challenges that this raptor poses in the field, opening the first window toward its understanding: knowing what you are looking at!

**W**hite-collared Kite *Leptodon forbesi* (also called Forbes's Kite) is a Critically Endangered mid-sized raptor inhabiting humid forests below 600 m a.s.l. in Alagoas and Pernambuco states in north-east Brazil<sup>2</sup>. This species is among the most endangered raptors in the world, having a very limited range and suffering from ongoing destruction of its forest habitat, now reduced to just 1% of its former extent<sup>9</sup>.

Very little is known about the morphology, plumage variation, ecology and geographical range of the White-collared Kite. H. K. Swann<sup>23</sup> described the species in 1922 from a single specimen collected by W. A. Forbes in Pernambuco in 1882. This specimen, held at the Natural History Museum (Tring, UK, colour photos available at <http://www.cbro.org.br/CBRO/arq.htm>) was considered an aberrant plumaged (perhaps immature) Gray-headed Kite *Leptodon cayanensis* by some authorities, but more recently recognised as a valid species by others (see Mallet-Rodriguez<sup>15</sup> for an exhaustive list of references on the subject). In 1987, Teixeira *et al.* (1987) collected a pair in breeding condition at São Miguel dos Campos (Alagoas, Brazil), and a second female of unknown age at Murici (Alagoas), and although no detailed descriptions or photographs of these specimens were published, they stated that *L. forbesi* is not an abnormal immature of *L. cayanensis*. Finally, an unreported specimen of an adult White-collared Kite was discovered at the Museu de Zoologia da Universidade de São Paulo (MZUSP) in São Paulo, Brazil. Altogether, only five

museum specimens of this enigmatic species are known.

Effective conservation of raptors must be based on a sound understanding of several factors including, but not limited to habitat use, distribution and population density, taxonomy, breeding behaviour and reproductive rates. However, gathering field data on Neotropical species is not always easy, as some of them are difficult to find and identify in the field<sup>1</sup>. In recent years raptor identification in the Neotropics has received more attention from field researchers<sup>5,6,14,18,19</sup>, but few field guides provide descriptions or illustrations of White-collared Kite<sup>9,10,12,20</sup>. More importantly, no accurate illustrations of White-collared Kite's flight silhouette have been published. This paucity of information on the identification of the species leaves field researchers, conservationists, and birdwatchers without appropriate tools to identify birds in the field. An example of this problem can be found in Roda *et al.*<sup>17</sup> who reported a sighting of a White-necked Hawk *Leucopternis lacernulatus* on 19 February 2000 at Engenho Coimbra (Alagoas). In subsequent correspondence, the observer acknowledged that this was probably a mistake and that the bird was most likely a Mantled Hawk *Leucopternis polionotus* or a White-collared Kite (C. J. Carlos pers. comm.). This illustrates the lack of quality information on the identification of some species of raptors of the Atlantic Forest in north-east Brazil, as these three species actually appear quite different in flight (Plate 1).

In this paper we describe phenotypic variation in White-collared Kites and present information on how to identify adults, as well as other species of mostly 'black-and-white' raptors occurring in north-east Brazil. Taxonomy of the White-collared Kite is discussed elsewhere (Dénes *et al.* in press).

## Methods

We examined, photographed, measured, and studied moult of both the Tring and São Paulo White-collared Kite specimens, and more than 100 specimens of typical Grey-headed Kites in museums around the world. We conducted two raptor surveys in Alagoas and Pernambuco states in October 2007 and February 2008 to look for White-collared Kites and other raptors. Localities visited included, from north to south, Mata do Leão, Sirinhaém, Pernambuco (8°32'S 35°10'W), Mata da Cobra, Sirinhaém, Pernambuco (8°34'S 35°09'W), Mata do Taua, Sirinhaém, Pernambuco (8°34'S 35°10'W), Engenho Cachoeira Linda, Barreiro, Pernambuco (8°49'S 35°20'W), Mata do Açude Cachoeira, São José da Laje, Alagoas (8°55'S 36°03'W), Mata do Açude Capiana, São José da Laje, Alagoas (8°56'S 36°00'W), Mata do Açude Espinho, São José da Laje, Alagoas (8°57'S 36°01'W), Mata do Pinto, Sirinhaém, Pernambuco (8°58'S 36°06'W), road to Coimbra, Ibataguara, Alagoas (8°59'S 35°52'W), Fazenda Boa Sorte, Muruci, Alagoas (9°11'S 35°56'W), Fazenda Varrela, São Miguel dos Campos, Alagoas (9°42'S 36°00'W) and Roteiro Lagoon, Roteiro, Alagoas (9°49'S 35°59'W).

Eight observers totalled 430 man-hours of survey. Observations were mostly made from roadside or hillside lookouts using 8×42 and 10×50 binoculars and spotting scopes mounted on tripods. We photographed 20 individual White-collared Kites and a large number of other raptors, from as many angles as possible, using digital cameras with 100–400 mm lenses. C. Albano, C. Dietzen and M. Cardoso de Sousa kindly sent us photographs of an additional four White-collared Kites. We also made written descriptions of two more individuals in the field that were too distant to photograph. For each individual we attempted to establish 1) coloration of the head and neck (n = 22), 2) colour of the leading edge of the wings (n = 17), 3) the number and width of pale bands on the uppertail visible in the field (n = 14), 4) number of dark bands in the undertail visible in the field (n = 21), 5) coloration of underwing-coverts (n = 25), 6) the contrast between patterns on primaries and secondaries in three categories a) *high contrast*, secondaries almost plain below or

bars did not form continuous lines across feathers, b) *medium contrast*, secondaries with bars forming ill-defined yet obvious lines across feathers, and c) *low contrast*, bars on secondaries formed continuous lines (n = 19), 7) number of white bars on primary 6 (or 7 if 6 was absent, counting from the secondaries outwards) (n = 15), 8) colour of the trailing edge of the wings (n = 13), 9) colour of the cere (n = 15), and 10) colour of the legs (n = 14).

Information on similar species is based on numerous Grey-headed Kites (from São Paulo [Brazil], Misiones [Argentina], Bolívar and Monagas [Venezuela], and Petén [Guatemala]), Crane Hawks *Geranospiza caerulescens* (from Alagoas state), White-necked Hawks (from São Paulo state), Mantled Hawks (from Santa Catarina, São Paulo and Alagoas states), and Short-tailed Hawks *Buteo brachyurus* (throughout the Neotropics) observed and photographed by us.

The illustrations were based upon photographs to ensure accuracy in pattern and proportions.

## Results

We took c.750 photographs of 20 individual White-collared Kites, studied photographs taken by others of an additional four kites, described two kites that were too far to photograph, and examined two museum specimens, establishing and recording the state of at least one of ten plumage characters on 28 individual White-collared Kites.

We could determine age for 26 individuals: 23 (88%) birds were adults, two (8%) were moulting from juvenile into adult plumage (Fig. 10), and one (4%) captive bird was in fresh juvenile plumage (Fig. 7). An additional two birds were aged as possible juveniles.

Plumage characters differed among birds, resulting in considerable phenotypic variation. Some features remained constant across all individuals. All birds had the hind neck white (but not all had darker heads). The back, rump and upperwing-coverts (except for lesser) were slate-coloured on all birds, usually with mantle and upper back feathers white-tipped (difficult to see in the field). Underside of body was uniformly white in all birds, and all had dark eyes. Other characters were variable as discussed below:

**1) Coloration of head and neck** (n = 22). Nine (41%) had a pale ashy-grey helmet defined by a white collar on the hindneck; seven (32%) had all-white heads and necks; three birds (14%) had only pale-grey crowns; two (10%) showed brown sides and top of the head (we think these were juveniles); and one (4%) captive juvenile had white

head and neck but a few black specks on the back of the crown.

**2) Colour of leading edge of wings** (n = 17). Most birds (13; 76%) had noticeable white leading edges to wings, while four (24%) were dark in this area.

**3) Number and width of pale bands in the upper-tail visible in the field.** (n = 14). Ten birds (71%) had a single whitish band on the uppertail, of which in five (50%) it was broad, in one (10%) it was of intermediate width, and in the remaining four (40%) it was narrow. Four birds (29%) showed two light bands of varying width on the upper-tail.

**4) Number of dark bands in the under-tail visible in the field** (n = 21). Thirteen individuals (62%) had two dark bands, one band near the tip of the tail, plus an additional band in the middle of the tail. Six birds (29%) had only one subterminal dark band. One individual (5%), a juvenile moulting into adult plumage, had new rectrices with three dark bands on the under-tail. We observed 11 pairs. All four pairs for which we could establish tail pattern on both members consisted of individuals in post-juvenile plumages with different tail patterns.

**5) Colouration of under-wing coverts** (n = 25). Twenty-two birds (88%) had all-white linings; one (4%) had the greater coverts and carpal patches black on an otherwise white under-wing; one (4%) had only the greater coverts black, the rest white; and one bird (4%) had a mostly white under-wing with two brown areas in the proximal half of each wing. This last bird had a mix of brownish and greyish flight feathers suggesting that it was a juvenile moulting into adult plumage, while the bird showing dark greater coverts alone was an adult. With backlight, sometimes greater upperwing-coverts (dark) will project a shadow in the under-wing creating the illusion of dark greater under-wing coverts. This is an effect of lighting conditions as white under-wing coverts were confirmed from photographs of the same individual taken at different angles.

**6) Conspicuousness of barring on secondaries observed from below** (n = 19). Thirteen kites (68%) showed high contrast between primary and secondary patterns; four (21%) showed medium contrast between primaries and secondaries; and two (10%) had a low level of contrast between the primaries and secondaries. Overall, boldly patterned primaries contrasted with rather faintly barred secondaries in about 90% of White-collared Kites observed.

**7) Number of white bars on primary 6 (or 7 if 6 absent)** (n = 15). Ten (67%) had three; four birds (27%) had four bars; and one kite (6%) had only two bars.

**8) Colour of the trailing edge of the wings** (n = 13). Ten (77%) had white trailing edges to wings; two birds (15%) had dark trailing edge to the wings, and one bird (7%), most likely a juvenile moulting into adult plumage had a mix of white tipped new primaries and old brownish secondaries and outer primaries, showing a noticeable brown band on the trailing edge of wings (Fig. 10).

**9) Colour of the cere** (n = 15). Ten (67%) had ashy-grey ceres; four (27%) had lighter pearl grey ceres; and, one (7%) captive juvenile had a yellow cere.

**10) Colour of legs** (n = 14). Eight (57%) had shades of yellow on their legs; four (29%) had greyish legs; and one (7%) captive juvenile had yellow legs. One museum specimen (8%) has yellow tarsi but darker blackish-green toes; perhaps a post mortem change.

## Descriptions

Given the considerable plumage variation in the White-collared Kite, and the relatively small sample size we studied, the descriptions that follow are not intended as definitive but as helpful for identifying most birds encountered in the field.

**Perched adult** (Plate 1, Figs. 1e, 1f, 6). Smallish, rounded, all-white head, or with a pearl-grey helmet and white collar, or only a pale grey crown. Slate-coloured feathers on mantle, back and tertials, and most noticeably secondaries and primaries are white-tipped. Primaries extend two-thirds down tail tip on perched kites, sometimes reaching the subterminal black tail-band. Uppertail pattern is variable. Most birds had only one whitish band near the middle of the tail, and others showed two pale bands. Undertail is also variable. Some birds showed a mostly white tail with only one dark subterminal band and a white tip (dark base of tail covered by undertail-coverts is hard to see in the field). We called this the 'single dark tail-band type'. Most birds had an additional dark band near the middle of the tail. We called this the 'double dark tail-band type'. Sometimes the median dark band is partially covered by undertail feathers on perched kites. The underside of the body is plain white. The bill is black, cere and eye-ring are grey, and eyes are dark.

**Flying adult** (Plate 1, Figs. 1a-d, 8, 9). Flight silhouette is similar to that of Grey-headed





Plate 1 (facing page). White-collared Kite *Leptodon forbesi* and similar species (Frederick Pallinger). Adult White-collared Kite *Leptodon forbesi* (1) compared to Grey-headed Kite *Leptodon cayanensis* (2), light morph juvenile Short-tailed Hawk *Buteo brachyurus* (3), Mantled Hawk *Leucopternis polionotus* (4) and White-necked Hawk *Leucopternis lacernulatus* (5). Birds are not to scale. Bold arrowheads indicate diagnostic field marks; slender arrows, other characters useful for identification.

Figure 1a. Adult White-collared Kite soaring; single dark tail-band type. Sharp contrast between boldly patterned outer primaries and white linings diagnostic. Note wide white band on tail and partially hidden dark tail base

Figure 1b. Adult White-collared Kite soaring; two dark tail-banded type. Sharp contrast between boldly patterned outer primaries and white linings; almost unmarked secondaries are diagnostic. Note second narrow dark band on tail. White leading edge to wings is noticeable on seeing kite head-on, even from below

Figure 1c. Adult White-collared Kite gliding away from observer; single dark tail-band type. Contrasting boldly patterned outer primaries and white linings diagnostic. Birds glide on markedly bowed wings

Figure 1d. Adult White-collared Kite performing the 'butterfly display'. Partially folded wings are held above horizontal and fluttered conspicuously while gliding. Usually combined with eeeAW calls, or rapid series of cow-cow-cow... (c.20 notes). White leading edge noticeable and useful for identification. Some birds can look almost white headed (perhaps because of plumage fading)

Figure 1e. Head of adult White-collared Kite (fresh plumage). White collar on hind-neck and pale grey helmet diagnostic. Birds in spring can look almost white-headed. Note white tipped feathers on upper back

Figure 1f. Perched adult White-collared Kite. Slender, long necked. Note white tipped feathers on upper back and tertiaries. White tipped primaries extend two-thirds down tail, sometimes reaching the dark subterminal band. White tips of secondaries are noticeable when kite seen close

Figure 2a. Adult Grey-headed Kite *Leptodon cayanensis* soaring. Black linings, grey head, and noticeably barred secondaries diagnostic

Figure 2b. Light morph juvenile Grey-headed Kite soaring. Shows white head like 1, but has barred secondaries

Kite, but secondaries are noticeably wider than primaries with a noticeable taper at their junction. Small head and longish neck. Noticeable 'wrists' (even on soaring birds) on otherwise straight (mostly) white leading edges to wings. Noticeable 'fingers' on wing tips (5–6 outer primaries separated) curved upwards. Mostly black, boldly patterned primaries contrast with mainly white, faintly barred secondaries and white linings.

Figure 2c. Head of light morph juvenile Grey-headed Kite. Note black crown and eyeline, and orange-yellow cere. Mostly white head contrasts with brown uppersides. Note warm brown edgings on upper-wing coverts

Figure 2d. Head of adult Grey-headed Kite. Complete lead grey helmet (no white collar on hind-neck) diagnostic. Lacks white feather tips on black upper back

Figure 2e. Adult Grey-headed Kite perched. Slender upright posture. Lead grey head (no white collar) diagnostic

Figure 3a. Light morph juvenile Short-tailed Hawk *Buteo brachyurus* soaring. Pale cheeks and eyebrow (a few months after fledging) can make the head look very pale, but note dark eyeline. *Buteo*-like wing shape with rounded trailing edge and rather pointed wings. Tail has several narrow dark bands

Figure 3b. Head of light morph juvenile Short-tailed Hawk. Note yellow cere and warm brown eyes. Lacks white collar on hind-neck. Cheeks and eyebrow fade and make head look pale

Figure 3c. Light morph juvenile Short-tailed Hawk perched. Note pale cheeks and tail with many inconspicuous narrow dark bands. Primaries extend to tail tip. Upper-wing coverts often show pale edgings

Figure 4a. Mantled Hawk *Leucopternis polionotus* soaring. All-white tail (thin dark bands at tail base usually not noticeable under field conditions) and striking white trailing edge diagnostic. Shares white leading edge to broad, rounded wings with 1, but wing shape and pattern of primaries differ

Figure 4b. Mantled Hawk perched. Head large. Broadly white tipped secondaries diagnostic. Note all-white tail, and primaries that extend beyond tail tip.

Figure 5a. White-necked Hawk *Leucopternis lacernulatus* soaring. Shares white head and body; also tail colour and pattern but shows wide black band on primaries, and trailing edge and wing shape differs. Tail often fanned. Barring on primaries not obvious. This figure updates fig. '2a' on Plate 1 of Seipke et al.<sup>49</sup>

Figure 5b. White-necked Hawk perched. Note dark-tipped primaries and secondaries. Primaries reach or fall a little short of tail tip. Yellowish cere

Longish tail variable in pattern. Dark base of tail, if present, is seldom visible. Head is usually completely white, especially in bright sunlight.

**Juvenile and older immatures.** We did not encounter individuals in fresh juvenile plumage in our field surveys, but observed two birds we aged as possible juveniles, and studied photos of an additional two unconfirmed juveniles moulting into adult plumage (Fig. 10), and of one captive

juvenile (Fig. 7). Juvenile flight feathers showed a brown cast (unlike in adults). Brown subterminal band on the secondaries results in a brown (not white) trailing edge to the wings, and secondaries are more strongly barred than on adults. New tail feathers had three dark bands in a juvenile moulting into adult plumage (Fig. 10). Both individuals identified as possible juveniles (one of them flying together with an adult) were overall dark above and had brown sides to the head and neck. Head, neck, and underside in one captive juvenile were white, except for a few dark spots on the back of the crown and behind the eyes. This bird was overall dark brown above and had extensive rufous tips to darker-shafted upperwing-coverts. Eyes were amber; tarsi were partially feathered, and toes were yellow (Fig. 7).

### Behaviour

White-collared Kites were observed perched during periods of 5–25 minutes in the early morning, mostly on exposed branches within forest patches, usually alone, but occasionally in pairs. Then, they typically engaged in territorial displays (see below) for periods of between a few minutes and one hour. After displaying the kites usually landed on exposed perches for a few minutes and went into the forest by mid morning. After mid morning birds remained inside the forest and were rarely observed above the forest. One individual was observed within the canopy near noon. Another individual was observed soaring high in late morning and gliding to another patch of forest. One individual was observed perched on the edge of a forest patch catching and eating a smallish prey—perhaps an insect—and disappearing into the forest shortly after.

The territorial flight displays we observed deserve further comments. Birds were observed flying mostly during the early morning and usually for less than one hour. Lone individuals, pairs or trios soared in circles above the forest or sugar cane plantations, mostly less than 100 m above the tree tops, but sometimes higher, usually quietly but sometimes giving *eeeAW* or *cow-cow... cow* calls. We frequently observed *butterfly display*<sup>25</sup>, consisting of rapid (vibration-like) shortened wingbeats while partially folded wings were held well above the horizontal. Otherwise, birds soared and glided on bowed wings. The tail was always (n>100) folded when flying above the forest.

### Field marks and other useful characters

*In flight* look for **boldly patterned primaries contrasting with white linings, almost plain secondaries**, and white leading edge to wings. Keep in mind that also Mantled and White-necked Hawks, and Black-and-white Hawk-Eagles (*Spizastur melanoleucus*), show white leading edges to wings, but the primaries are not boldly patterned in any of these species. Tail pattern and white under-wing coverts (shared with light plumaged juvenile Grey-headed Kite) alone should not be used to identify White-collared Kite.

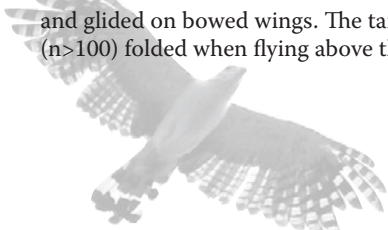
*When perched*, because the **pearl-grey head and white neck** may be absent (head can be white as well), and because other raptors in the Atlantic Forest of north-east Brazil show either white lesser upper-wing coverts, white tipped dark feathers on mantle, or white tipped secondaries or primaries there are no plumage features that would apply exclusively to all perched White-collared Kites. This is the only species occurring in the region, however that has a combination of **white-tipped dark feathers above with primaries reaching only two-thirds down tail tip**. Do not eliminate White-collared Kite because of multi-banded tail pattern.

### Similar species

Grey-headed Kite (Plate 1, Fig. 2a, 2d, 2e), especially paler juveniles (Plate 1, Fig. 2b, 2c), or older immatures (Fig. 11), can be very similar to White-collared Kites. Grey-headed Kites of all ages show **noticeable barring on secondaries** (but see Fig. 11), unlike most White-collared Kites. Adult Grey-headed Kite shows black linings and grey head without a white collar. Tail pattern is also quite variable in this species.

Short-tailed Hawk juveniles (Plate 1, Fig. 3a-c) can show very pale cheeks and eyebrows making head look almost white under certain light conditions or angles. In flight, wings are pointed and lack noticeable fingers. Barring on tail is not as obvious. On perched birds, look for bright yellow cere (not orange or grey). Toes are long in the hawk, but short on the kite. Primaries reach tail tip on perched Short-tailed Hawk.

Mantled Hawks (Plate 1, Figs. 4a, 4b) soar with wings held above the horizontal (dihedral) or on flat, broad, rounded wings with **white trailing edges and all-white tail** (dark banding at base hard to notice). Beware of white leading edge, a feature shared with White-collared Kites. On perched birds, look for **broadly white-tipped**



**secondaries, and dark primaries reaching or surpassing tail tip**<sup>19</sup>.

White-necked Hawks (Plate 1, Figs. 5a, 5b) soar on a dihedral and show a **black band on the trailing edge of wings**. As in White-collared Kites, the tail has a subterminal black band. On perched birds primaries reach or fall short of tail tip. Both Mantled and White-necked Hawks usually soar with tail fanned, unlike White-collared Kites.

Black-and-white Hawk-Eagle has a flight silhouette virtually identical to that of juvenile Short-tailed Hawk (Plate 1, Fig. 3a), but head and leading edge of wings are white as in White-collared Kites, and Mantled and White-necked Hawks.

Crane Hawks, while very different in coloration from White-collared Kites, can look remarkably similar in flight silhouette (smallish head, longish tail, bowed, rounded wings with noticeable 'fingers'); especially on glides and with a cloudy background. Look for white crescents on primaries.

## Discussion

### Plumage variation

We present a detailed treatment of phenotypic variation in the White-collared Kite based on photographs, direct observation, or examination of 28 individuals. We show that plumage variation in White-collared Kites is greater than previously reported<sup>23</sup>, and is greater than in Grey-headed Kites in adult plumage, being perhaps comparable in some respects to that of juvenile Grey-headed Kites<sup>13</sup>.

Leg coloration is correlated with age in Grey-headed Kites. Juveniles have yellow, or orange-yellow legs while adults have grey legs<sup>11</sup>. We found variation in this character in White-collared Kites where both adults and juveniles showed yellow legs. More information is needed to establish whether there is a correlation between age and coloration of the legs in this species too.

There is no sexual dimorphism in plumage of Grey-headed Kites<sup>11,12</sup>, but our data suggest a possible sexual dimorphism in undertail pattern of adult White-collared Kites. We recorded two different undertail patterns in adults (Plate 1, Figs. 1a-f, 8, 9). Of 19 adult individuals, 68% had two dark bands in the undertail, while 32% had only one. We observed 11 pairs and established tail pattern on both members on four occasions. All four pairs consisted of members with different tail patterns. If we assume that tail pattern is not linked to sex, and that the relative frequency of the

tail patterns we encountered is representative of the population, the probability of finding four pairs with members having different tail patterns would be 1/28. While by no means conclusive, our limited data support the idea of sexual dimorphism in tail pattern. The specimen at the Museu de Zoologia da Universidade de São Paulo is a female and has a single subterminal dark tail band. On the other hand, a 'pair' taken by Teixeira *et al.*<sup>24</sup> in Alagoas consisted of two birds with two dark tail-bands. Unfortunately, the type specimen was not sexed.

### Proposed amendments to field guides

Four books present either text or illustrations (or both) potentially useful for field identification of White-collared Kites<sup>9, 10, 12, 20</sup>. We comment on them hoping that their authors will incorporate the new information in future editions. Moreover, we encourage users of these books to take into account our comments as well. Figure '7' in plate '3' of the *Handbook of the Birds of the World*<sup>9</sup> should have grey cere, darker eye, and longer primaries. Figure '2a' in plate 15 in *Raptors of the World*<sup>12</sup> shows an adult bird with white-tipped primaries and secondaries, but primaries should be much longer reaching two-thirds down tail tip. The back of the neck in this illustration shows black feathers tipped white, but these feathers are white in White-collared Kites, an important field mark. This mottled pattern is noticeable on the mantle, not the back of neck. Eyes are shown to be light on this plate, but adult White-collared Kites have dark eyes. Figure '2b' in the same plate (flying adult) has a very broad black band near the base of the tail we have not observed in any wild bird or museum specimen. Figure '9' on the plate 'Kites' in *Birds of South America*<sup>10</sup> is a fair representation of adult White-collared Kite, however primaries should be longer, and eyes darker. The reference in the text 'flight feathers as in 8' (i.e., Grey-headed Kite) should be taken with care as secondaries can be almost plain in White-collared Kites, but rather noticeably barred on Grey-headed Kites. Both figure '3 vrt' and '3 jv' in plate 47 of *Birds of Eastern Brazil*<sup>20</sup> are perhaps the best published representations of tail variants of adult White-collared Kites. Only this book shows a White-collared Kite with the multi-banded tail pattern; a pattern exhibited by c.70% of the kites we recorded in the field. Both figures show primaries too short, and lack white tips to secondaries and primaries. Fig. 7 shows that a juvenile White-collared Kite was dark brown above (not black as in fig. '3 jv') and had extensive rufous tips to the upperwing-



Clockwise from top left

Figure 6. Adult White-collared Kite *Leptodon forbesi* perched exposed on tree after aerial display. Alagoas, Brazil, October 2007. Head can look all-white in some individuals. Primaries go two-thirds down tail tip over wide white tail band, and reaching black subterminal band. Note white tips to feathers on mantle, back, secondaries and primaries (Sergio H. Seipke)



Figure 7. Juvenile White-collared Kite *Leptodon forbesi* held captive in Parque dos Falcoes, Itabaiana, Sergipe in 2007. Note the subtle black markings on the crown on an otherwise white head, and the extensive rufous tips to the upper-wing coverts (M. Cardoso de Sousa)



Figure 8. Adult White-collared Kite *Leptodon forbesi* gliding. Alagoas, Brazil, October 2007. Boldly patterned outer primaries contrast with lightly barred secondaries and white linings. Note white leading edge of the wings, and head. Many birds have two dark tail bands (Sergio H. Seipke)



Figure 9. Adult White-collared Kite *Leptodon forbesi* soaring. Alagoas, Brazil, October 2007. Boldly patterned primaries contrast with rest of under-wing. Note bulging secondaries on trailing edge of wings. This bird had a dark base of the tail and only one subterminal black tail band (Sergio H. Seipke)

Figure 10. Juvenile White-collared Kite *Leptodon forbesi* moulting into adult. Alagoas, Brazil, September 2008. Inner secondaries and outer primaries retained from juvenile plumage browner. Note dark trailing edge of wings on juvenile secondaries. This bird was flying with adults (Christian Dietzen)







Figure 11. Grey-headed Kite *Leptodon cayanensis* subadult soaring. Misiones, Argentina, August 2008. Note a mix of black and white linings and yellow legs and facial skin. Although flight and tail feather look adult-like, coloration of bare parts and linings indicate this is not yet a full adult bird (Sergio H. Seipke)

Figure 12. *Leptodon* kite showing somewhat intermediate characters between White-collared and Grey-headed Kites. Alagoas, Brazil, November 2008. Inner primaries are growing on both wings. Since outer primaries are adult-like as well, this bird must be at least entering its third pre-basic moult, thus is not an immature. A mix of dark and white linings and mild barring on secondaries do not match well typical White-collared Kite plumage, but tail pattern and head coloration agree well with other birds observed in the area (Sergio H. Seipke)

coverts. Tail in juveniles shows a multi-banded pattern (unlike '3 jv' in Sigrist<sup>20</sup>).

### Possible previous records of White-collared Kites

Teixeira *et al.*<sup>24</sup> mention that all three birds taken in Alagoas had 'contrasting white nuchal collar, white underwing-coverts, and a tail which is distinct from the *L. cayanensis* pattern.' We think these three specimens are valid records of the White-collared Kite, but recommend that either photographs or detailed descriptions (including standard morphometrics) be published, or that the specimens become available to the public.

In October 2001 two Grey-headed Kites were reportedly observed in Coimbra, Alagoas<sup>21</sup>. These birds were identified by LFS based on tail pattern, but we now know that this is not a useful character for telling them apart from White-collared Kites. Since this was the only published record of Grey-headed Kite within the range of White-collared Kite, sympatric occurrence of these species needs

to be clarified by either conclusive photographs or specimens.

*Leptodon* kites observed by Pereira *et al.*<sup>16</sup> in Engenho Cachoeira Linda (Barreiros, Pernambuco) agree well with plumage characteristics of the White-collared Kite. We surveyed this site in October 2007 finding a minimum of three White-collared Kites in the area.

### What is the White-collared Kite?

White-collared Kite was considered an aberrant-plumaged bird or an immature Grey-headed Kite (see Mallet-Rodriguez<sup>15</sup>). Our observations of multiple individuals sharing *forbesi* characteristics in the same area rule out the 'aberrant-plumage hypothesis.' Although we did not observe wild juveniles in fresh plumage, we studied photographs of two individuals that retained juvenile flight feathers, and of one captive juvenile (Fig. 7, 10). Fig. 10 demonstrates that juvenile White-collared Kite has brownish flight feathers with a noticeable dark brown band on the trailing edge. These traits were not observed in adult-plumaged

birds. In addition to this, several individuals we observed had at least two generations of primary or secondary feathers. Since these feathers had no brownish cast we concluded that these were adults. This rules out the 'immature-plumage hypothesis.'

### **Are *Leptodon* kites in north-east Brazil a separately evolving lineage?**

Under the General Lineage Concept of species, a separately evolving metapopulation lineage can be regarded as a species provided that evidence of such separation exists<sup>7,8</sup>. Plumage (white linings, neck, and perhaps sexual dimorphism in tail pattern?) suggest that the White-collared Kite represents a population of individuals sharing characteristics unique to them (autapomorphies); a likely result if they are separately evolving, at least to some extent, from the Grey-headed Kite. Diagnosable populations at the end of a cline should not be recognised as separate species because any delimitation would be arbitrary and will lack biological meaning, but even separate species show 'hybrid zones' where birds display intermediate characters. The presence of unambiguous and constant character states supports the status of the White-collared Kite as a full species (Dénes *et al.*, in press). However, we recorded two birds with some black on white underwing-coverts, a somewhat intermediate state between typical Grey-headed and White-collared Kites (Fig. 12). Our limited knowledge on development and on the presence of plumage phases in White-collared Kite does not permit more advances on this subject and, despite the lack of records of Grey-headed Kites in Alagoas state, the hypothesis of a secondary contact between these two species needs further testing.

### **The importance of coloration of wing linings in display flights**

Underwing is readily visible in *Leptodon* kites during the *butterfly display*<sup>4,25</sup> (Fig. 1d in this article). Display flights are thought to be of importance in territory establishment and pair bonding in birds of prey<sup>3</sup>. Adult White-collared and Grey-headed Kites look very different when performing the *butterfly-display*, mostly because of different coloration of wing linings. White-collared Kites have white linings while Grey-headed Kites have black linings. Other pairs of sister species of kites differ in rather discrete plumage traits. Both species of *Harpagus* kites differ in flight mostly by underwing-coverts coloration (one species having

white coverts, the other dark rufous). Amount of rufous on 'wing panels' (at the base of the primaries) in Plumbeous Kite *Ictinia plumbea* is the main plumage difference with Mississippi Kite *I. mississippiensis*<sup>11</sup>. In both cases, these plumage traits are only or mostly visible during display flights as is the case of *Leptodon* kites.

### **Conservation of White-collared Kite and the Atlantic Forest of north-east Brazil**

Humid forests in north-east Brazil are isolated and unique for their high level of endemism<sup>22</sup>. Whatever the taxonomic status of the White-collared Kite we think it would benefit from conservation action. Conservation of the White-collared Kite would not only result in the preservation of a potentially independently-evolving biological lineage but also the very process of ongoing evolution, in addition to a seriously threatened ecosystem that shelters numerous endemic species. The identification information, the photographs, and the plate we present here should help researchers to identify confidently White-collared Kite in the field. We hope that this will stimulate the production of more reliable information on its biology, habitat preferences, geographic range and population status, and aid in the conservation of this Critically Endangered species.

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