

**Post Release Monitoring of a  
Rehabilitated Brown Wood Owl  
(Aves: Strigiformes, Strigidae, *Strix leptogrammica*)  
in Hong Kong Special Administrative Region, China**



**26 August 2011**

Kadoorie Farm and Botanic Garden Publication Series

Number 7



## **Post Release Monitoring of a Rehabilitated Brown Wood Owl (Aves: Strigiformes, Strigidae, *Strix leptogrammica*) in Hong Kong Special Administrative Region, China**

Tan Kit Sun<sup>1</sup>, Ko Chi Hang<sup>1</sup>, Paul Crow<sup>1</sup>, Alessandro Grioni<sup>1</sup>, Debbie Ng<sup>1</sup>, Louise Fung<sup>1</sup>,  
Poon Chi Ho<sup>1</sup>, Roger C. Kendrick<sup>1</sup>, Gary W.J. Ades<sup>1</sup> & Rupert Griffiths<sup>2</sup>

<sup>1</sup> Kadoorie Farm & Botanic Garden, Lam Kam Road, Tai Po, New Territories, Hong Kong

<sup>2</sup> Greenwing Ltd., 14A, Kai Fat Building, 204-210 Wing Lok St, Sheung Wan, Hong Kong

### **Abstract**

In April 2009, a nestling Brown Wood Owl was discovered on the ground by a hiker at Tai Mo Shan, surrendered to the Agriculture Fisheries and Conservation Department and subsequently transferred to Kadoorie Farm & Botanic Garden's Wild Animal Rescue Centre (WARC) for rehabilitation.

After being successfully raised, the young owl was released by rescue centre staff into the wild in May 2010. To determine its ability to survive (able to self feed and adapt to wild habitat), a radio transmitter was attached to the bird's central tail feathers prior to release. Radio tracking data indicated that the bird was alive up to 34 days post release. The signal was lost on Day 35 and picked up again on Day 38. An intensive search on Day 52 yielded a completely decomposed carcass. Review of the data suggested that the probable time of death was on Day 37 as no movement was detected from Day 38 onwards. The cause of death was undetermined. Starvation, injury, disease, predation or a combination thereof were possible as a cause or causes of death.

Based on weight data for captive raptors, it is estimated that a 748 gram owl would not survive longer than 14 days without food. As the bird survived for 37 days, our data suggests that the hand reared owl had the instinctive skills to acquire food and locate suitable roosting habitats, although sadly it perished during the monitoring period. Previous studies have demonstrated that the mortality rate of wild raptor species ranges from 60% to 90% within the first year. Data also suggests that contiguous mature forest facilitates the movement of this species and may be a requirement for the re-establishment of this owl in localities from which it has become extinct.

Kadoorie Farm and Botanic Garden Publication Series: No. 7

**Post Release Monitoring of a Rehabilitated Brown Wood Owl  
(Aves: Strigiformes, Strigidae, *Strix leptogrammica*)  
in Hong Kong Special Administrative Region, China**



Fauna Conservation Department, Kadoorie Farm & Botanic Garden

26 August 2011

Report prepared by Tan Kit Sun & R. C. Kendrick  
Editorial review provided by G.W.J. Ades & R. C. Kendrick

Contents

Abstract .....	1
Introduction .....	3
Methods .....	4
Results .....	6
Phase 1 - Pre-release assessment .....	6
Phase 2 – Adaptation to the tail mounted transmitter and leg band .....	8
Phase 3 – Soft release and Short Term Monitoring .....	9
Discussion .....	13
Conclusions .....	14
Acknowledgements .....	14
References .....	14
Appendix 1 – Brown Wood Owl Project Log .....	15
Appendix 2 – Brown Wood Owl radio track data .....	18
Appendix 3 – Soft Release .....	20
Contributions to this paper .....	20

**Copyright**

© 2011, Kadoorie Farm & Botanic Garden Corporation, all rights reserved

**For enquiries about this report, please contact:**

Fauna Conservation Department,  
Kadoorie Farm and Botanic Garden Corporation  
Lam Kam Road, Tai Po, N.T.  
Hong Kong Special Administrative Region  
[fauna@kfbg.org](mailto:fauna@kfbg.org)

**Document citation:**

Tan K.S., Ko, C.H., Crow, P., Grioni, A., Ng, D., Fung, L., Poon C.H., Kendrick, R.C., Ades, G.W.J. & Griffiths, R. 2011. *Post Release Monitoring of a Rehabilitated Brown Wood Owl (Aves: Strigiformes, Strigidae, Strix leptogrammica) in Hong Kong Special Administrative Region, China*. Kadoorie Farm and Botanic Garden Publication Series, Number 7. Kadoorie Farm and Botanic Garden, Hong Kong Special Administrative Region. 20 pp.



## Introduction

The Brown Wood Owl (*Strix leptogrammica* TEMMINCK, 1831) is a wide ranging species found in India, Sri Lanka, South East Asia (except Cambodia) to Java and Borneo, and from southern China as far east as Anhui province, including the islands of Hainan and Taiwan. Two subspecies occur in the areas adjacent to Hong Kong; *Strix leptogrammica ticehursti* DELACOUR, 1930 is known from north and central Myanmar, northern and western Thailand, through southern China to Anhui province, northern Laos and northern Vietnam; *Strix leptogrammica caligata* (SWINHOE, 1863) occurs in Hainan and Taiwan. Throughout its distribution, *S. leptogrammica* is recorded from mature forest, usually dense and undisturbed (Holt *et al.*, 1999). Holt *et al.* (1999) noted that over this range the two subspecies may actually be a species complex.

The Brown Wood Owl appears to be rare in Hong Kong. The first recorded sighting of this species was in the central New Territories on 6<sup>th</sup> November 2007 (Hong Kong Bird Watching Society, 2009). The nestling, discovered by a hiker on Tai Mo Shan on 4<sup>th</sup> April 2009, is the second officially confirmed individual recorded for the territory. Little is known about the recently recorded population of the Brown Wood Owl in Hong Kong. The subspecies present in Hong Kong has not yet been determined. Several owl species are believed to have extended their natural range from Guangdong and colonized Hong Kong in the last 10 years (unpublished data, Hong Kong Birdwatching Society), thus it is likely that the Hong Kong population should be attributed to *Strix leptogrammica ticehursti*.

The bird was surrendered by the hiker to the Hong Kong Special Administrative Region Government's Agriculture, Fisheries & Conservation Department [AFCD] ranger station at Tai Mo Shan, arrived at the KFBG Wild Animal Rescue Centre on 16<sup>th</sup> April 2009 and was found to be healthy and without injuries. The arrival of this owl presented a great opportunity to determine the husbandry care necessary to successfully rehabilitate this species and also an opportunity to carry out post-release monitoring to determine survival ability after its stay in captivity. It was a good candidate for rehabilitation and release for the following reasons:-

1. As it was found as a nestling located close to natural secondary forest, it very likely was a result of local breeding and it was assumed to be of wild origin.
2. Brown Wood Owls were first recorded in Hong Kong at Lead Mine Pass (on 6<sup>th</sup> November 2007) and also unofficially recorded in Lam Tsuen Valley (M. Kilburn, Hong Kong Bird Watching Society, *pers. comm.*), thus a small population clearly existed adjacent to KFBG.
3. Brown Wood Owls are recorded by Bird Life International and IUCN as occurring along the coastal forest areas of China.
4. The owl has been maintained in an environment with minimal human contact.
5. Although listed as "not threatened" by IUCN (IUCN, 2005), the species is listed in appendix II of CITES, and is thus perceived to be of conservation concern.

## Methods

The project was divided into 3 phases as follows:

Phase 1 – Pre-release assessment

Phase 2 - Adaptation to the tail mounted transmitter and leg band

Phase 3 - Soft release and Short Term Monitoring (42 days)

Phase 1- Pre-release assessment.

Assessment by the rescue team of the bird's suitability for release, following Ades *et al.* (2008). This included the bird's health, feather condition and ability to hunt live prey. The growth data was recorded and utilized to estimate the adult bird weight and hence estimate the appropriate transmitter size.

Phase 2 – Adaptation to the tail mounted transmitter and leg band

As in previous releases (Griffiths & Tsim, 2004; Kadoorie Farm & Botanic Garden, 2008) and based on other studies of related owl species (Griffiths *et al.*, 2010), a tail mounted transmitter was employed. We were not comfortable with a back pack transmitter (Smith & Gilbert, 1981; Forsman, 1983) as it was not designed to cleanly detach from the bird at the end of the study, whereas a tail mounted transmitter would fall off during the bird's next moult.

The transmitter used was a Biotrack TW-3 weighing 14g (2% of the Wood Owl's adult weight of 700g), with a single battery cell and an estimated working life of 8 months. Nominal operating frequency at 172.255MHz and an operating range of 15 to 30 km line of sight [LOS], or 3 to 6 km ground to air non-LOS, or 1.5 to 3 km ground to ground non-LOS. Fitting of the tail mounted transmitter (Figure 1) was conducted by Asia Ecological Consultants [AEC] using string and cyanoacrylate glue (super glue).

**Figure 1. first attachment of the transmitter to the tail of *Strix leptogrammica***



Phase 3 – Soft release and Short Term Monitoring (42 days)

As the bird was found at Tai Mo Shan, it was proposed that the bird be “soft released” (Wildlife International, undated, see Appendix 3 – Soft Release.) into the wild on forested hillside at KFBG (300m elevation), based on the following reasoning;

1. KFBG is contiguous with Tai Mo Shan and close to the location where the bird was found;
2. There is well forested hillside at KFBG, contiguous with secondary forest at Ng Tung Chai in Lam Tsuen Valley. The flight distance to where the bird was originally found is less than 5km;
3. A local bird watcher had heard Brown Wood Owls calling in the Lam Tsuen Valley (M. Kilburn, *pers. comm.*) and hence the habitat was considered appropriate;
4. Prior to release, the bird was held in a long flight cage on a slope at KFBG. This cage was therefore a familiar location to the bird and hence suitable as a soft release site; and



5. There is a known population of rodent prey on the Kwun Yum Shan hillside, upon which the owl could feed.

The bird was soft released by opening the door to the Flight House (Figure 2). Fresh food was placed at the Flight House for a period of 12 days post release.

**Figure 2. Flight House used for “soft” release**



Once the bird left the Flight House, signal positions were determined daily by triangulation (Mech, 1983). As the objective was to determine survival, visual confirmation was only to be made when convenient. Griffiths *et al.* (2010) found that a period of 6 weeks (42 days) post release monitoring appeared to be indicative of a successful release and survival for the related and similarly sized owl *Strix aluco*.

Radio tracking took place daily for a period of 42 days. Materials used for the radio tracking (other than the transmitter, see above) were as follows:

1. A Yagi-Uda 3 element antenna;
2. A Communications Specialist Inc Model R1000 radio receiver with an operating frequency range of 148-174MHz;
3. ICOM IC-R10 radio receiver
4. BTO rings provided and placed on the bird by Asia Ecological Consultants, Hong Kong;
5. Garmin GPSmap 60C satellite navigator (GPS unit);
6. iPhone 3GS Map App and TOMTOM Satellite Navigation App
7. Compass.

A project log was created on an Excel file to record the date, time, signal, food provision at the Flight House, personnel involved and further comments, based on the number of days pre- or post-release (Appendix 1).

For each location, recording of at least 2 base positions in decimal latitude and longitude was determined by GPS. These data were transferred to Google Earth and saved as a KMZ format file for overlay in Google Earth. Triangulation data was recorded for each position by taking a compass directional bearing of the signal and projecting onto Google Earth from the GPS base positions, from which an estimate of the actual position of the bird was determined.

Once it was confirmed that the transmitter location remained unchanged over several days, meaning either the bird had died or the transmitter had dropped off, maximum effort was made to locate the bird and transmitter.

## Results

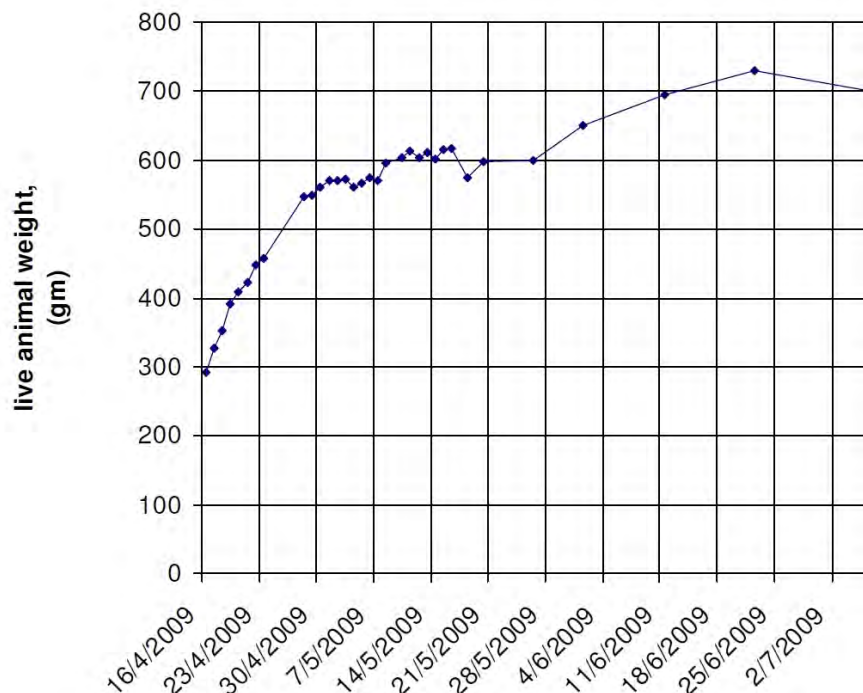
### Phase 1 - Pre-release assessment.

The Brown Wood Owl was assessed by the KFBG veterinarian on 10<sup>th</sup> March 2010 and found to be healthy and without any physical encumbrance that might reduce its chances of survival in the wild. Based on international protocols (Miller, 2000), it was determined the bird was suitable for release back into the wild for the following reasons:-

1. the bird was determined to be healthy and free of disease as determined by the KFBG veterinarian;
2. the bird was able to fly well and did not have any disability that would compromise its survival in the wild; and
3. the bird was able to catch live prey as tested in captivity.

The growth data is presented in Figure 3, and plumage for nestling, fledgling and immature bird phases in Figure 4, below. The estimated adult weight was calculated by determining the point at which no significant weight change occurred. This was found to be 700g. By reference to Griffiths & Ades (2008), the maximum useable transmitter weight was calculated as 14g, assuming a maximum weight of 4% of the bird's body weight.

**Figure 3. Growth curve (weight gain) for captive reared juvenile *Strix leptogrammica***





**Figure 4. *Strix leptogrammica* plumage development**

- (a) nestling (16 April 2009), front view
- (b) fledgling (21 May 2009), front view
- (c) fledgling (21 May 2009), three quarter lateral and back view, showing wing plumage
- (d) immature (13 May 2010), front view
- (e) immature (26 May 2010), back view, with extended wing





## Phase 2 – Adaptation to the tail mounted transmitter and leg band

The owl was observed for 14 days to determine the adaptation of the bird to the tail mounted transmitter. The transmitter was subsequently pulled off by the owl after seven days. The transmitter was refitted with epoxy resin glue attached to the base of the central tail feather shaft by WARC staff, and this stronger fixture resisted the owl's attempts to detach the transmitter.

**Figure 5.** re-attaching the transmitter with epoxy resin to the central tail feather



Phase 3 – Soft release and Short Term Monitoring

The project log documenting monitoring activity is given in Appendix 1. GPS base positions and compass bearings, tabulated in Appendix 2, were then converted by triangulation to estimated locations (Table 1, below) and mapped as per Figures 6 to 6d. The owl was observed to move only short distances (Table 1) per day for the first eight days, then a longer move, before returning back towards the original release site and then staying in a small territory near to Tai Om Shan village (Figure 4), where the bird was eventually found dead on day 53 after release.

**Table 1. Estimated owl locations and straight line distances between locations**

day	estimated location		straight line distance from previous location / km
	N	E	
0	22° 55' 54.71"	114° 7' 11.23"	
1	22° 26' 9.77"	114° 7' 17.64"	0.39
2	22° 26' 13.79"	114° 7' 22.46"	0.19
3	22° 26' 4.41"	114° 7' 32.04"	0.40
4	22° 25' 58.43"	114° 8' 39.02"	1.93
5	22° 25' 55.28"	114° 8' 19.16"	0.58
6	22° 26' 21.81"	114° 8' 7.34"	0.92
7	22° 28' 10.52"	114° 11' 31.27"	6.73
8	22° 25' 35.20"	114° 9' 47.13"	5.62
9	22° 25' 58.39"	114° 9' 44.93"	0.72
10	22° 26' 33.73"	114° 9' 11.14"	1.45
11	no data		
12	no data		
13	22° 26'54.34"	114° 8' 45.79"	0.96
14	22° 26'47.24"	114° 8' 46.04"	0.23
15	22° 27'1.53"	114° 8' 51.30"	0.47
16	22° 26'35.27"	114° 8' 28.73"	1.03
17	22° 26'14.70"	114° 8' 21.23"	0.68
18	22° 26'13.74"	114° 8' 22.00"	0.04
19	no data		
20	22° 26'15.37"	114° 7' 57.77"	0.70
21	22° 26'15.11"	114° 7' 55.70"	0.06
22	22° 26'9.65"	114° 8' 20.95"	0.74
23	22° 25'59.62"	114° 8' 4.27"	0.57
24	no data		
25	22° 26'33.39"	114° 8' 5.12"	1.06
26	no data		
27	22° 26'19.85"	114° 8' 6.15"	0.42
28	22° 25'48.63"	114° 8' 4.12"	0.98
29	no data		
30	no data		
31	22° 26'1.90"	114° 8' 8.15"	0.43
32	22° 26'1.99"	114° 8' 4.96"	0.09
33	22° 25'54.87"	114° 8' 28.96"	0.73

release day = day 0

no data = days when the owl could not be located by telemetry



Figure 6. Estimated daily positions of released Brown Wood Owl; boundaries of Figures 6a to 6d indicated by dashed line boxes a to d. (key: R=release site; numbers = post release day, day 21 onwards in yellow)

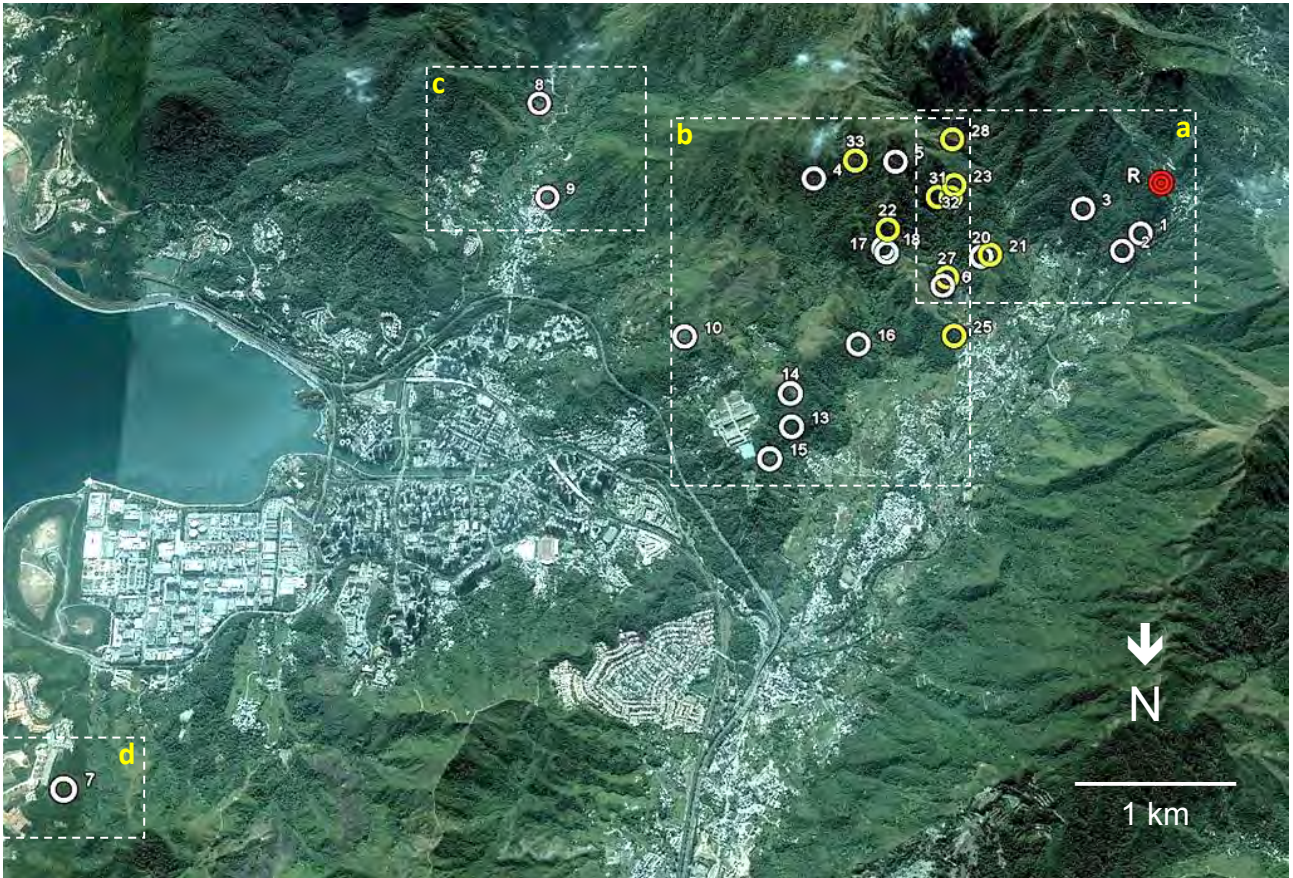


Figure 6a. Close up of western section of tracking area to show habitat at daily positions





Figure 6b. Close up of central section of tracking area to show habitat at daily positions



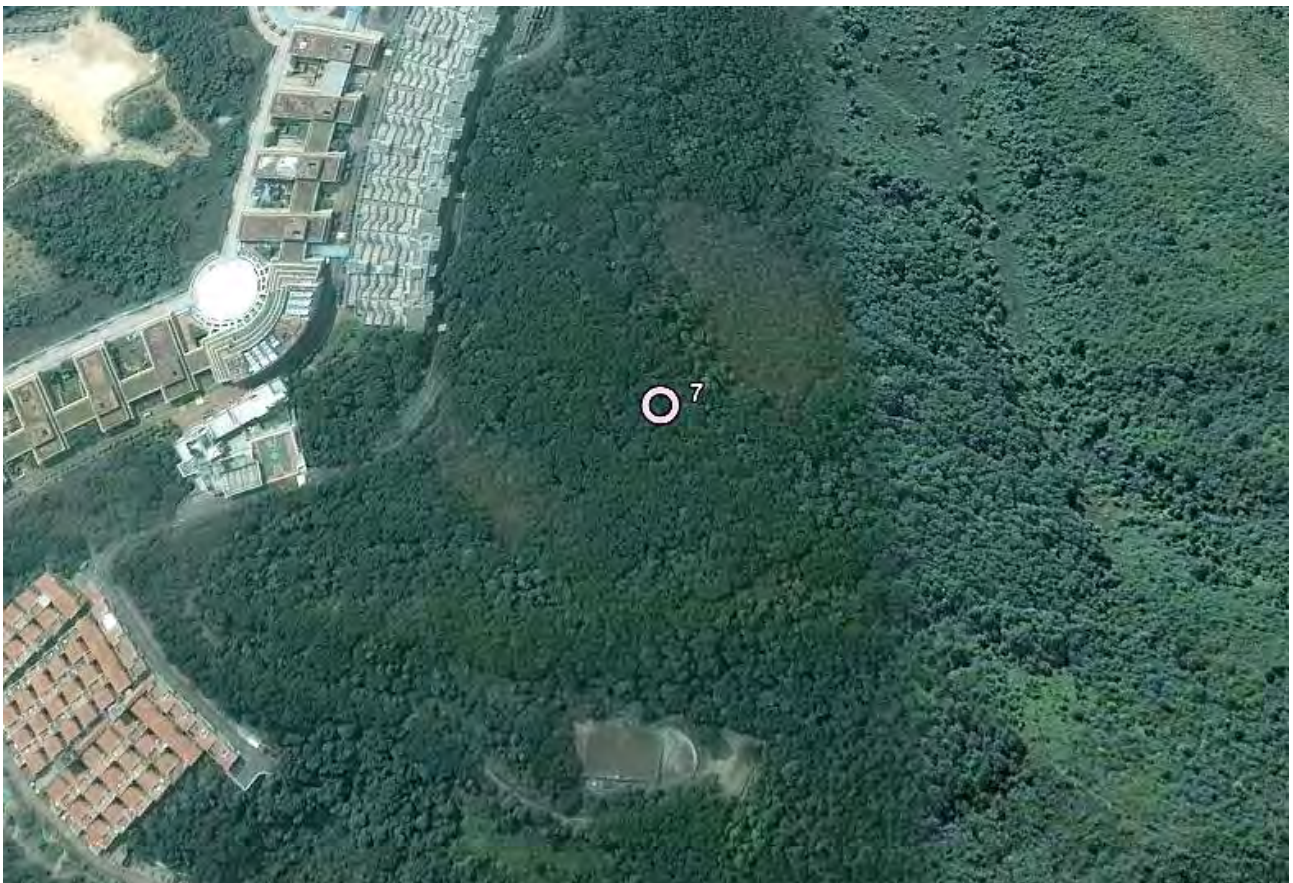
Note – Tai Om fung shui wood is demarcated with a yellow border around point for Day 25, to the centre right edge of the figure



Figure 6c. Close up of eastern section of tracking area to show habitat at positions on post release days 8 & 9



Figure 6d.  
Close up of north-eastern section of tracking area to show habitat at position on day 7 post release





## Discussion

Although at the time of being rescued this species had not been recorded as breeding in HKSAR, the finding of the nestling indicated that there was at least one breeding pair locally. Recent anecdotal evidence from the Hong Kong Bird Watching Society (R. Barretto, pers. comm.), suggests that the territory now supports a small breeding population of this species within the contiguous forested areas around Tai Mo Shan.

During preparation of the tail transmitter, we learnt that the attachment mode via a two part five minute epoxy resin (Selley's 5 Minute Epoxy) produced a superior bond than using cyanoacrylate (Super Glue) adhesive, as was indicated by the owl detaching the mount a week after the first attachment with cyanoacrylate, compared to the epoxy resin bond still effective at the time of death, with the tail mounted transmitter attached to the feather shaft upon retrieval with the decomposed carcass.

A very useful tool during the radio tracking process was the use of the iPhone 3GS Map function. The hybrid satellite and road view gave us an indication of the terrain in deciding the next point to achieve triangulation. Additionally, the use of the TOMTOM vehicle navigation system made driving to the desired point much easier.

All point locations and bearings were recorded and plotted on Google Earth. The Satellite View was an essential aid in determining the estimated roosting position of the owl. The Elevation View gave us a very good representation of the terrain – valleys, ravines and forest types. In Street View mode on Google Earth, we could even determine the bird's preferred habitat.

Due to the mountainous terrain in Hong Kong SAR, signal bounce presented a complication during driving. When the bird roosted in forested valleys the signal was attenuated or lost. In some cases the valleys appeared to channel the signal and bounce it off the adjacent mountain slopes, giving the operator a bearing diametrically opposed to where the signal originated. The estimated position on Day 7 located at Tai Mei Tuk may have been a case of signal bounce and valley channelization of the signal may have given a spurious location. Note that the Tai Mei Tuk position, is in line with the owl's roosting site on Day 8 and 9. The Ng Tung Chai valley is deep and may have channelized the signal, which bounced off an adjacent slope near Sha Lo Tung.

The results suggest that the owl did not move more than a kilometre a day between roosts. The bird appeared to prefer roosting sites with mature trees and, excluding the position determined on Day 7, it would appear that it crossed neither roads, nor other open areas. This has implications as to the habitat type a Brown Wood Owl instinctively prefers. Results indicate that the Brown Wood Owl prefers mature forested areas and that open areas appear to be a barrier to movement. This behaviour might suggest that *S. leptogrammica* requires contiguous mature forest in order to undertake range expansion.

Previous studies of wild raptors have indicated that survival is low in a raptor's first year of life. A mortality rate of 60% to 90% within the first year after fledging has been recorded by other researchers (Griffiths et al., 2010). Our data strongly indicates that a hand raised Brown Wood Owl can instinctively choose suitable habitat and acquire food to survive at least up to a month post release.

Cause of death could not be determined as the carcass was already in an advanced state of decomposition when it was recovered, with the head and left foot missing. We speculate that death could be due to predation by another raptor based on the position of the carcass which was consistent with feeding behaviour by a raptor. However we cannot rule out starvation, injury or disease.



## Conclusions

From the study, we can conclude that a hand raised Brown Wood Owl can instinctively choose appropriate habitat and hunt. Results also suggest that the Brown Wood Owl is able to instinctively choose mature forests to roost and that the species tends not to move across open areas lacking mature forest cover, therefore connectivity of closed canopy forest appears to be important for this species during range expansion or for dispersal of juvenile birds.

## Acknowledgements

The authors and KFBG would like to thank the Agriculture, Fisheries and Conservation Department of the HKSAR Government for approving permission for this project; Asia Ecological Consultants [AEC] for providing assistance during the attachment of the tail mounted transmitters; Yik Hei Sung, a research student at The University of Hong Kong, for the temporary use of the ICOM radio receiver and antenna and all KFBG volunteers who assisted with this project.

## References

- Ades, G., Tan, K.S. & Crow, A. (eds.) 2008. *Operational Guidelines for Wild Animal Rehabilitation* (2nd edition). Kadoorie Farm & Botanic Garden Wild Animal Rescue Centre, Hong Kong Special Administrative Region. 109 pp.
- Forsman, E.D., 1983. *Methods and materials for locating and studying spotted owls*. Gen. Tech. Rep. PNW-162. Portland, OR: US. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. 8 pp.
- Griffiths, R., Murn, C. & Clubb, R., 2010. Survivorship of rehabilitated juvenile Tawny Owls (*Strix aluco*) released without support food, a radio tracking study. *Avian Biology Research* **3**: 1-6.
- Griffiths, R. & Tsim, S., 2004. Post release monitoring of rehabilitated white-bellied sea eagles in Hong Kong. *Hong Kong Bird Report* **1999 & 2000**: 262–267.
- Holt, D.W., Berkley, R., Deppe, C., Enríquez Rocha, P.L., Peterson, J.L., Rangel Salazar, J.L., Segers, K.P. & Wood, K.L., 1999. Family Strigidae (Typical Owls). Pp. 76-243 in del Hoyo, J., Elliot, A. & Sargatal, J. (eds.), *Handbook of the Birds of the World*. Vol. 5. Barn-owls to Hummingbirds. Lynx Edicions, Barcelona.
- Hong Kong Bird Watching Society, 2009. Additions to HK List 本港新增鳥種紀錄. Internet forum posting by HKBWS Records Committee, accessed 8 April 2011. <http://www.hkbws.org.hk/BBS/redirect.php?tid=7468>
- Miller, E.A., ed., 2000. *Minimum Standards for Wildlife Rehabilitation, 3rd edition*. National Wildlife Rehabilitators Association, St. Cloud, MN., USA. 77pp.
- Kadoorie Farm and Botanic Garden [Griffiths, R & Ades, G.]. 2008. *Survivorship and dispersal ability of a rehabilitated Brown Fish Owl (Ketupa zeylonensis) released more than a decade after admission to a wildlife rescue centre in Hong Kong SAR China*. Kadoorie Farm and Botanic Garden Publication Series No.3. Kadoorie Farm and Botanic Garden, Hong Kong Special Administrative Region. iii + 8 pp.
- Mech, D.L., 1983. *Handbook of animal radio-tracking*. University of Minnesota Press, Minneapolis. xii+107 pp.
- Smith, D.G. & Gilbert, R., 1981. Backpack radio transmitter attachment success in screech owls (*Otus asio*). *North American Bird Bander* **6 (4)**: 142-143.
- Wildlife International, undated. *Wildlife Care: Release – Soft Release*. Internet web page accessed 8 April 2011. <http://www.wildlifeinternational.org/EN/rehab/care/release/release.html#soft>

## Appendix 1 – Brown Wood Owl Project Log

Day Post Release	Date (2010)	Time	Activity	Comments	Food Provision at Mews	Owl Signal (Y/N)	Personnel
D-18	10-May	12:00	Tested transmitter	transmitter works when magnet switch is removed.			TKS
		12:30	Affixing tail mounted transmitter	AEC, KFBG			AEC
		13:30	BTO ring applied	Awaiting for BTO ring number from AEC			AEC
		13:30	Morphometric measurements	AEC, to submit data to KFBG			AEC
D-17	11-May		Checked transmitter on owl	tag still attached. Bird chewing on the antenna			LK
D-16	12-May		Checked transmitter on owl	antenna rubber insulation peeled off. Metal antenna exposed.			LK
			checked leg ring on owl	owl fussing over the leg ring. LK detected saliva on the shank of the bird around the ring			LK
D-15	13-May	10:45	checked antenna	rubber insulation completely stripped off. Antenna curly. No snagging on any part of the leg.			TKS
D-14	14-May	14:40	checked reception	signal obtained from conservation building for awhile, then no signal. Presumably the owl moved to a different place in its room.			TKS
D-11	17-May	9:40	transmitter is off the tail	LK brought in the transmitter. The owl managed to pull it off the feather. Option, cable tie a dud transmitter to another feather to acclimatize owl then swap.			LK
D-2	26-May	16:30	reattached transmitter	epoxied transmitter onto leather base with braided nylon string through leather. Transmitter tied and epoxy to adjacent whole tail feather. photos taken of process			LK/TKS
D-1	27-May	10:00	transmitter is still on	checked by LK			LK
D	28-May	08:20	Transmitter check	checked by LK; no signal at Conservation Building, nor at road in front of Facilities Dept.	Y	y	LK/TKS
		10:45		signal received on road in front of Facilities Dept	Y		TKS
		16:30	Doors opened	bird did not move out of the Flight House	Y		TKS
		17:30		bird still in Flight House	Y		TKS
		20:30	strong signal received from Bus stop	bird seems to have moved east from the Flight House along the hillside	Y		TKS
		23:30	strong signal received from bus stop and Ng Tung Chai	Bird seems to have moved east closer to Ng Tung Chai - in the valley between KFBG and NTC.	Y		TKS
D+1	29-May	08:11	strong signal from NTC and Lam Kam Rd	Bird appears to be in the same location as at 2300 hrs the previous night	Y	y	TKS
		14:28	strong signal from NTC and Lam Kam Rd	same position as in the morning. Close to the power pylon	Y		TKS
D+2	30-May	07:29	strong signal from NTC and Lam Kam Rd	same position as the previous day. Transmitter fallen off? Need to check at night	Y	y	TKS
		21:12	strong signal from NTC and Lam Kam Rd	signal bearings have changed and continued to change as the minutes went by. This suggests that the transmitter is still on the bird and that the bird is moving, hence it is alive.	Y		TKS
D+3	31-May	13:00	strong signal from NTC and no signal from Lam Kam Rd.	cross bearing from NTC positions indicated that the bird has moved closer to NTC village but still within the heavy forested area north of the village proper.	Y	y	TKS
D+4	01-Jun	09:45	radio tracking	no signal at the last known location at Ng Tung Chai proceeded to check for signal	Y	y	TKS
		10:30		no signal at all from Lam Tsuen	Y		TKS
		-13:00					

Day Post Release	Date (2010)	Time	Activity	Comments	Food Provision at Mews	Owl Signal (Y/N)	Personnel
D+4 (cont.)		13:00	radio tracking - checked from Cloudy Hill	weak signal received on the Yagi 6 element antenna and HKU equipment. No signal from KFBG equipment. Bird estimated to be south of Ng Tung Chai in the next valley from Lam Tsuen	Y		TKS
D+5	02-Jun	10:00 -12:00	radio tracking - checked Ng Tung Chai, Tai Om Shan Tsuen, Tai Yeung Che Kadoorie Pavilion	good signal from Ng Tung Chai, Tai Om Shan and Tai Yeung Che. Fair signal from Kadoorie Pavilion, but massive interference and white noise made it difficult. Interference to the point of making tracking impossible at Monkey Haven and Helipad. Owl is in the valley behind Ng Tung Chai and has moved closer to KFBG	Y	y	TKS/LK
D+6	03-Jun	10:00 -13:00	radio tracking	used both HKU Yagi and KFBG H antenna. Found that the Yagi works better. Owl moved close to Tai Om Shan	Y	y	LK/KL
D+7	04-Jun	11:00 -14:30	radio tracking	No signal at all from Lam Tsuen, Ng Tung Chai, and Hong Lok Yuen	Y	n	LK/PH
		20:00 -21:40	radio tracking	Signal at Tai Mei Tuk and cross referenced from Lo Fai Rd. opposite Richwood Park Block 8. Signal was strong at Richwood Park observation point	Y	y	TKS
D+8	05-Jun	08:30 -12:30	radio tracking	drove to Sha Lo Tung, Tai Po Kau and finally located signal at the end of Tat Wan Rd, near the beginning of the Wilson Trail.	Y	y	TKS
D+9	06-Jun	09:30 -12:30	radio tracking	Ng Tung Chai, Tai Om Shan, Cloudy Hill. No signal at those points. Drove to Tat Wan Road, previous days' signal was very weak and could only get approximate position; indicates the bird might be in the next valley to the east. Found the Owl at Tat Wan village. Signal was very strong, cross reference confidence is very high	Y	y	TKS
D+10	07-Jun	10:00 -12:43	radio tracking	Located near Ma Wo Rd, Taipo	Y	y	LK/KL
D+11	08-Jun	11:00 -14:00	radio tracking	Did not detect signal	Y	n	LK/KL
D+12	09-Jun	11:00 -15:00	radio tracking	Did not detect signal	Y	n	LK/KL
D+13	10-Jun	11:30 -15:30	radio tracking	Covered Shing Mun to Tai Po Kau, no signal. Signal picked up at Lam Kam Road. Estimated bird is on the reverse slope of the south eastern ridge from Lam Kam Road near Shek Lin Road in proximity to the Water Treatment Plant at Tai Po	n	y	TKS/DN
D+14	11-Jun	10:00 -14:00	radio tracking	Owl still at the same location	n	y	LK/PH
D+15	12-Jun	10:30 -12:30	radio tracking	Owl still at the same location. Signal strong	n	y	TKS
D+16	13-Jun	10:00 -11:45	radio tracking	Owl moved towards Tai Om Shan. Signal strong	n	y	TKS
D+17	14-Jun	10:20 -15:00	radio tracking	Owl in the next valley south of Tai Om Shan	n	y	LK/RG
D+18	15-Jun	11:00 -14:00	radio tracking TKS and Ken plus volunteers	Owl still in the same place as the day before	n	y	TKS/KL
D+19	16-Jun		No tracking		n	n	N/A
D+20	17-Jun	10:30 -11:30	radio tracking	Owl moved west from the previous position towards Ng Tung Chai and KFBG	n	y	TKS/WT
D+21	18-Jun	09:00 -12:30	radio tracking	confusing bearings. Disregard today's data	n	y	LK/PH/PC
D+22	19-Jun	09:00 -10:00	radio tracking	close to Tai Om Shan village	n	y	TKS
D+23	20-Jun		no tracking		n	n	N/A
D+24	21-Jun	09:00 -11:00	position fixing	close to Tai Om Shan village	n	y	LK/PH
D+25	22-Jun	11:00 -12:30	position fixing	close to Tai Om Shan village	n	y	TKS



Day Post Release	Date (2010)	Time	Activity	Comments	Food Provision at Mews	Owl Signal (Y/N)	Personnel
D+26	23-Jun	10:00-14:00	position fixing	close to Tai Om Shan village	n	y	LK/PH/CARRISSA
D+27	24-Jun	11:00-14:00	position fixing	close to Tai Om Shan village	n	y	LK/KL
D+28	25-Jun	10:00-11:00	position fixing	close to Tai Om Shan village	n	y	TKS/CC
D+29	26-Jun	08:00-08:30	checking signal	close to Tai Om Shan village	n	y	TKS
D+30	27-Jun	08:00-08:30	checking signal	close to Tai Om Shan village	n	y	TKS
D+31	28-Jun	08:00-11:00	position fixing	close to Tai Om Shan village	n	y	TKS
D+32	29-Jun	15:00-15:30	checking signal	no signal from KFBG helipad. Assume owl has moved?	n	n	TKS
	29-Jun	17:00-18:00	position fixing	position fixed from Tai Om Shan and Ping Long	n	y	TKS
D+33	30-Jun	07:30-08:00	position fixing	position fixed from Tai Om Shan and Ping Long	n	y	TKS
D+34	01-Jul	00:00	checking signal	signal from 150 at Tai Om Road Basket Ball Crt. Layby	n	y	TKS
D+35	02-Jul	10:00-15:00	Attempt at visual sighting	1/2 day effort. Owl at Tai Om Shan forest however, terrain made it impossible to sight the owl	n	y	RG/LK
D+36	03-Jul		no tracking		n	n	N/A
D+37	04-Jul		no tracking		n	n	N/A
D+38	05-Jul	09:30-17:00	tracking	Tracking by Rupert Griffiths. Full day. No signal was obtained at all. Areas covered included Lam Tsuen, Lin Au, Tai Po, Tai Mo Shan, Route Twisk	n	n	RG
D+39	06-Jul	am	position fixing	Still at 180--186 N bearing from HLY Roundabout	n	y	TKS
D+40	07-Jul	am	position fixing	Still at 180--186 N bearing from HLY Roundabout	n	y	PC
D+41	08-Jul	am	position fixing and tracking	Still at 180--186 N bearing from HLY Roundabout. Tracked from Tai Mo Shan to Ng Tung Chai - no signal.	n	y	RG/LK
D+42	09-Jul		no tracking		n	n	N/A
D+43	10-Jul		no tracking		n	n	N/A
D+44	11-Jul		no tracking		n	n	N/A
D+45	12-Jul	am	position fixing	Still at 180--186 N bearing from HLY Roundabout	n	y	TKS
D+46	13-Jul		no tracking		n	n	N/A
D+47	14-Jul		no tracking		n	n	N/A
D+48	15-Jul		no tracking		n	n	N/A
D+49	16-Jul		no tracking		n	n	N/A
D+50	17-Jul		no tracking		n	n	N/A
D+51	18-Jul		no tracking		n	n	N/A
D+52	19-Jul		no tracking		n	n	N/A
D+53	20-Jul	am	tracking	transmitter retrieved and carcass found	n	y	RG/LK
D+54	21-Jul	am	carcass retrieval	carcass retrieved	n	n	RG
D+61	28-Jul		examined the carcass	Head missing, left foot missing, tibia + tarsus fractured. Distal half of right wing missing			TKS/AG
D+62	29-Jul		Carcass preserved	At KFBG Fauna Conservation Dept. Specimen room			RK

## Appendix 2 – Brown Wood Owl radio track data

Reading	Date / Month & day (2010)	Reading time Hrs:mins.	Reading position (latitude, longitude)		Signal Bearing °
			°N	°E	
015	May 29	07:39	22°26'18.0"	114°07'20.4"	190
016		07:49	22°26'16.4"	114°07'29.4"	235
017		13:11	22°26'05.0"	114°07'12.0"	41
018		13:26	22°26'01.7"	114°07'14.8"	64
019		13:38	22°26'07.9"	114°07'12.6"	64
020		14:01	22°26'16.8"	114°07'20.3"	166
021	May 30	07:18	22°26'18.3"	114°07'20.5"	156
022		07:25	22°26'16.8"	114°07'29.1"	246
024		20:34	22°26'16.6"	114°07'29.1"	220
025		20:51	22°26'12.3"	114°07'28.6"	225
026	May 31	12:49	22°26'18.2"	114°07'20.5"	142
027		13:00	22°26'11.4"	114°07'41.3"	240
028		13:10	22°26'11.2"	114°07'37.5"	207
029	1 June	12:31	22°29'10.5"	114°09'48.2"	204
030		12:40	22°29'11.8"	114°09'46.7"	224
031		12:50	22°29'12.9"	114°09'43.2"	181
032	2 June	10:15	22°26'11.8"	114°07'41.1"	115
033		10:32	22°26'36.1"	114°07'58.6"	206
034		11:14	22°25'29.3"	114°07'33.8"	81
035	3 June	10:45	22°26'10.8"	114°07'44.1"	70
036		11:08	22°26'08.8"	114°07'44.0"	40
037		11:22	22°26'04.9"	114°07'48.9"	22
038		11:52	22°25'52.0"	114°07'50.8"	20
039		12:04	22°25'52.0"	114°07'50.8"	58
040		12:39	22°26'36.2"	114°07'58.5"	145
041	4 June	21:20	22°28'20.3"	114°13'56.1"	279
042		21:28	22°28'13.1"	114°12'38.6"	259
043		21:40	22°27'45.5"	114°11'45.0"	333
044	5 June	10:46	22°25'49.5"	114°09'46.8"	179
045		11:08	22°25'45.6"	114°09'42.1"	no reading
046	6 June	10:42	22°25'45.6"	114°09'42.4"	069
047		10:59	22°25'55.3"	114°10'09.0"	231
048		11:05	22°25'59.5"	114°10'06.4"	270
049		11:13	22°26'09.9"	114°09'53.8"	215
050		11:18	22°26'13.9"	114°09'52.8"	180
051	7 June	11:52	22°26'41.5"	114°07'56.3"	260 spurious point
052		12:07	22°26'39.1"	114°09'32.6"	255
053		12:34	22°26'31.5"	114°09'27.4"	280
054		12:43	22°26'28.1"	114°09'27.2"	290
055	10 June	13:18	22°24'39.4"	114°09'09.5"	no signal
056		13:44	22°25'48.4"	114°10'29.3"	26 intermittent
057		14:15	22°27'14.5"	114°08'28.2"	195 signal weak
058		15:13	22°27'33.8"	114°08'45.2"	209 signal weak
059	11 June	10:53	22°27'34.2"	114°08'45.5"	160
060		11:25	22°26'53.8"	114°09'08.7"	350
061		11:46	22°26'40.9"	114°08'58.4"	300
062		12:46	22°27'13.4"	114°08'43.0"	180
063		13:18	22°27'08.3"	114°08'48.9"	180
064	12 June	11:11	22°27'34.1"	114°08'45.3"	173
065		11:25	22°27'03.8"	114°08'25.8"	067
066		11:34	22°27'39.5"	114°08'54.5"	187
067	12 June	11:39	22°27'29.9"	114°09'03.3"	241
068		11:46	22°27'16.1"	114°09'11.9"	250
069		11:51	22°27'05.2"	114°09'24.4"	219

Reading	Date / Month & day (2010)	Reading time Hrs:mins.	Reading position (latitude, longitude)		Signal Bearing °
			°N	°E	
070	13 June	10:56	22°27'34.1"	114°08'45.3"	191 weak
071		11:09	22°27'14.7"	114°08'28.3"	164 strong
072		11:16	22°27'03.6"	114°08'28.5"	185 strong
073		11:30	22°26'36.0"	114°08'02.0"	091 strong
073a		n/r	22°26'42.5"	114°08' 01.3"	193
074	14 June	11:12	22°26'25.1"	114°08'00.4"	120
075		11:27	22°26'13.3"	114°08'06.2"	082
076	15 June	11:34	22°26'36.5"	114°08'02.1"	146 medium
077		11:45	22°26'42.6"	114°08'01.7"	140 weak
078		12:17	22°26'41.8"	114°08'58.6"	233
079		12:25	22°26'35.1"	114°08'51.8"	291
080		13:38	22°27'14.9"	114°08'28.5"	172
081	17 June	11:10	22°26'36.3"	114°08'02.2"	196 medium
082		11:24	22°26'29.7"	114°07'39.8"	123 weak-medium
083		11:31	22°26'47.4"	114°08'10.4"	207 medium
084	18 June	10:40	22°26'11.1"	114°07'44.0"	120 confused
085		11:33	22°26'13.4"	114°08'05.5"	270 confused
086		15:33	22°26'36.4"	114°08'02.0"	198 medium
087		15:43	22°26'32.7"	114°07'56.6"	180 strong
088	19 June	8:30	22°26'38.9"	114°07'55.7"	156 medium
089		9:22	22°26'47.2"	114°08'10.4"	196 weak-medium
090	21 June	11:45	22°25'59.4"	114°07'15.6"	089 strong
091		12:22	22°26'36.5"	114°08'02.1"	177 weak-medium
092		12:30	22°26'47.4"	114°08'10.6"	221 medium
094	22 June	11:41	22°26'01.7"	114°07'15.0"	137 strong
095		17:59	22°26'36.2"	114°08'02.4"	210 medium
095a		20:00	22°26'41.2"	114°07'56.0"	160
096	23 June	10:52	22°26'01.8"	114°07'05.6"	150
097	24 June	11:35	22°27'27.6"	114°08'26.7"	140
098		17:33	22°26'35.7"	114°08'02.2"	153
099		17:43	22°26'48.9"	114°08'13.4"	191
100	28 June	8:22	22°26'39.0"	114°07'55.7"	163
100a		n/r	22°25'59.1"	114°07'14.8"	081
101	29 June	16:52	22°26'12.2"	114°07'40.1"	045
102		17:03	22°26'47.3"	114°08'10.3"	186
103		17:16	22°26'29.8"	114°07'39.8"	141
104		17:25	22°26'39.1"	114°07'55.6"	204
104a	30 June	07:37	22°26'38.9"	114°07'55.7"	160
105		17:41	22°27'34.1"	114°08'45.1"	186
105a	1 July	07:30	22°26'38.9"	114°07'55.7"	150
106	2 July	10:47	22°26'11.9"	114°08'18.2"	no data
107		11:42	22°26'11.9"	114°08'16.3"	no data
108		12:11	22°26'17.6"	114°08'01.5"	no data
109	5 July	8:38	22°26'02.1"	114°07'06.9"	no data
110		10:22	22°26'02.1"	114°07'06.9"	no data
111		10:22	22°26'02.1"	114°07'06.9"	no data
112	6 July	11:35	22°27'34.0"	114°08'45.3"	244
113		12:00	22°27'48.3"	114°08'16.5"	206
114		12:25	22°26'47.4"	114°08'10.6"	181
115		15:10	22°27'34.1"	114°08'45.3"	186



### Appendix 3 – Soft Release.

(sourced directly from Wildlife International website, accessed 12 August 2011,

<http://www.wildlifeinternational.org/EN/rehab/care/release/release.html>)

“Soft release describes a gradual return to the wild whereby an animal receives support, shelter and food until it is entirely able to fend for itself. Often, a soft release takes place from a release cage or aviary on-site. The animal has spent time in the outdoor enclosure and is familiar with the sights, sounds, smells, etc. of the area and is aware of the activity of other wildlife in the area. It can return to the enclosure for food or shelter when necessary, and food and water is left outside the enclosure as well. Soft release also describes transport of the enclosure to a specific habitat and subsequent release off-site. Again, this allows the animal opportunity to become familiar with its new home. Off-site soft release is often used when introducing larger mammals to new territory, and research shows that soft-released animals have a better survival rate.”

### Contributions to this paper

TKS	principal investigator, main drafting of the paper, radio-tracking, mapping, data compilation and analysis
KCH	assistance with rearing, rehabilitation & radio-tracking
PC	rearing and rehabilitation of nestling, radio-tracking, researching ecology
AG	veterinarian examination of nestling and post-mortem
DN	assistance with radio-tracking
LF	assistance with radio-tracking
PCH	assistance with rearing, rehabilitation & radio-tracking
RCK	mapping, editorial, report compilation & design
GWJA	editorial
RG	radio-tracking

## About KFBG

Kadoorie Farm and Botanic Garden (KFBG) is situated in the rural New Territories, on the northern slopes of Tai Mo Shan, Hong Kong's highest mountain. Two steep spurs enclose its deep-set valley. Within KFBG are streams, woodlands, orchards, vegetable gardens, walking trails, live animal exhibits, floral exhibits, sustainable agriculture demonstration plots, art exhibits, a wild animal rescue centre, a native tree nursery, and, other conservation and education facilities.

In the post-war years, Hong Kong was flooded with destitute refugees. Many had traditional knowledge of crop production and livestock farming but no stock, others had land but no experience. They required support to rebuild their lives. The farm site at Pak Ngau Shek was established in 1956 as a base for livestock breeding and distribution, agricultural research, farmers training, public education and recreation. The barren slopes were terraced and planted with orchards and vegetable gardens. The development of the botanic garden began in 1963 and the plant conservation programme from 1972.

On 20th January, 1995, the Legislative Council of Hong Kong passed an Ordinance (Chapter 1156) incorporating KFBG as a non-profit corporation designated as a conservation and education centre. It is a unique public-private partnership, for while the KFBG Corporation is a public organisation, it is privately funded by the Kadoorie Foundation.

Since 1995, KFBG has been conducting a wide range of nature education, nature conservation and sustainable living programmes both on-site, and, throughout Hong Kong and South China.

In this time of severe global crisis KFBG raises awareness, undertakes rigorous science-based species conservation and ecosystem restoration, and offers new ways of thinking and living to respond to the world's problems. Hence, our work brings hope and improvement by focusing on nature conservation, sustainable living and holistic education that re-connects people with nature. By working together with the public, Governments, academia, NGOs and businesses, we can protect our common future.

Our mission is to harmonise our relationship with the environment. Our vision is a world in which people live sustainably with respect for each other and nature.

