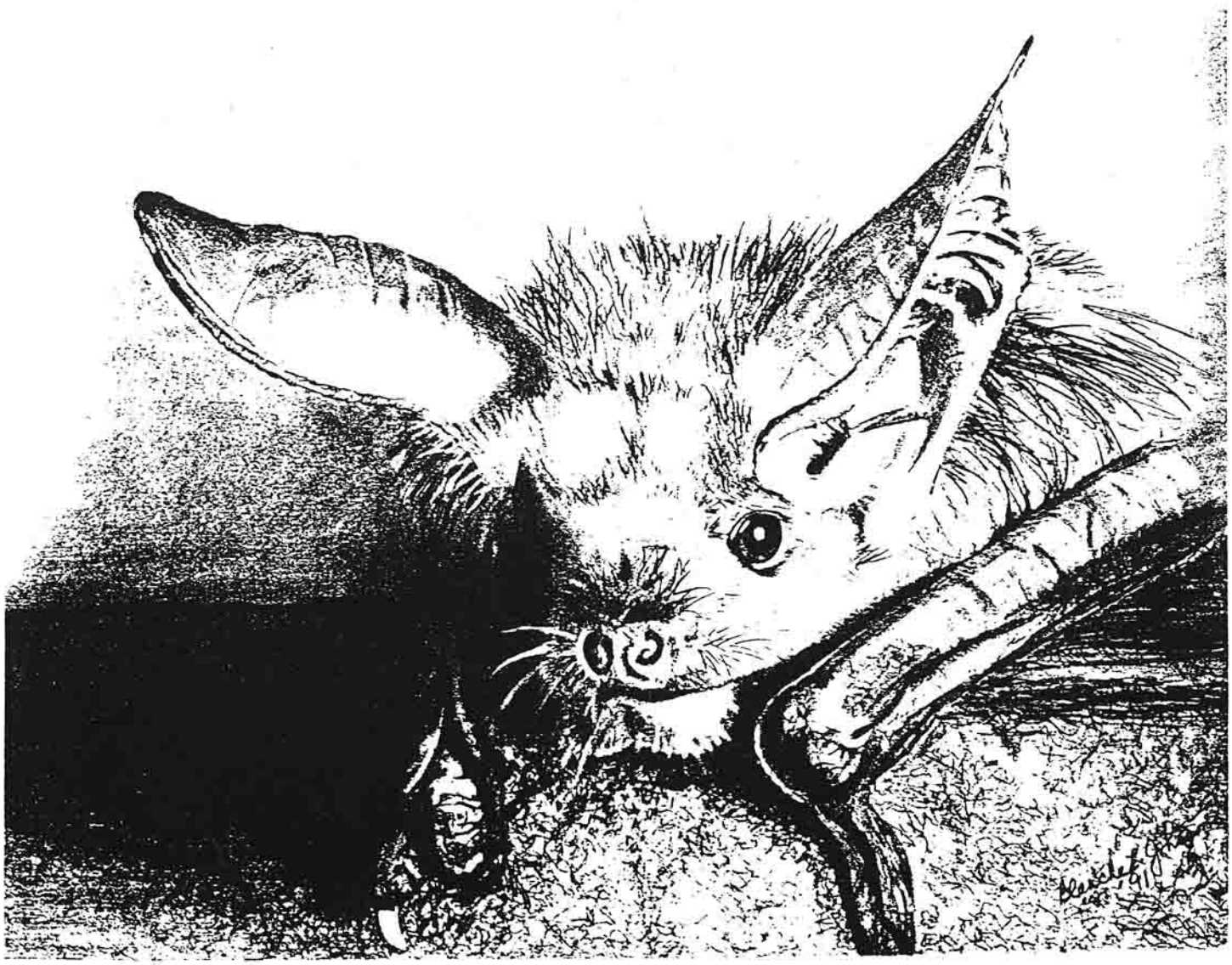
Australasian Bat Society

Newsletter

Number 4 - April 1995



INSTRUCTIONS TO AUTHORS

The Australasian Bat Society Newsletter will accept manuscripts for one of two broad sections of the Newsletter. For consistency the following guidelines should be followed:-

For Scientific Articles

1. Manuscripts should be submitted with two copies to Dr Philip Towers, School of Science and Technology, Charles Sturt University, PO Box 588, Wagga Wagga NSW 2678.

2. Manuscripts should be submitted in clear, concise English, typed with double spacing on A4 paper and free from typographical and spelling errors.

3. Papers should consist of: Title; Name and addresses of authors; Abstract (approx. 200 words); Introduction; Materials and methods; Results, Discussion and References. References should conform to the Harvard (author-date) System.

4. All pages, figures and tables should be consecutively numbered and correct orientation used throughout. Metric Units should be used throughout, and *SI* units used wherever possible.

5. "Camera ready" copy is essential for diagrams and figures, and the Newsletter does not have the facilities for photographs. Tables should be in a format suitable for reproduction on a single page.

6. Manuscripts are not being refereed routinely at this stage, although editorial amendments may be suggested and specialist opinion may be sought in some cases.

For News, Notes, Notices etc.:-

Manuscripts should be submitted with two copes to Dr Philip Towers, School of Science and Technology, Charles Sturt University, PO Box 588, Wagga Wagga NSW 2678, and be in concise English, typed with double spacing on A4 paper and free from typographical and spelling errors.

Manuscripts will usually be edited to conform to the newsletter.

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ARTICLES

Further news from the Great Northern Bat Camp by His Greyheaded Eminence President Len Poliocephalus Martin

Dear Friends and Colleagues, time continues to move on, even up here in the deep sleepy north. Flying foxes are finally protected in Queensland, although that did not stop a camp of Little Reds getting shot up in Goondiwindi shortly after the new act went into operation - the noise and smell were such a nuisance! Where have we heard that before? With the passage of time I am looking forward to the next meeting of our society, the fifth or seventh or whatever. What news of that?

With the passage of time, Your President is becoming increasingly wrinkly [should look up the scientific term for that, also "crinkly" - the botanists must have a word for it, perhaps we could have a competition] and [as may be evident from the preceding passage] increasingly rambly. So, it may not be untoward to suggest that members of our society start to consider electing a new incumbent at the next TABS meeting [what are our electoral procedures?].

Your President, as a professional biologist, became involved in the conservation issue of the Oyster Point development on the Hinchinbrook Channel. He is alleged to have been largely responsible for organising some 170 scientists to writ to Senator Faulkner about it all, so precipitating the good minister's World Heritage Intervention. Some weeks ago Your President received a write for defamation from the developer and a claim for damages therefrom; Your President will keep you informed, but he may be a bit preoccupied in the future.

The 10th International Bat Research Conference and 25th North American Symposium on Bat Research is almost upon us [6-11 August in Boston, USA]. Your President had intended to go, but alas has decided that there are more important things to be done here. Y.P. has spare application packs if anyone needs them. Unfortunately they need to be returned by April 30th and this newsletter may not have reached you by then. However I can be contacted by FAX [07 365 1766], phone [07 365 3128 (w); 07 378 9827 (h)] or E-mail.

Yes, in the twilight of His career, Your President has finally driven onto the great information superhighway, he has been networked, he has been given his own address and is being served [or should it be serviced? (Though not in the biological sense, I hasten to add {note the masterly use of parentheses} oh spit, where's the spell check and the parenthetic sign for "thinks"?) (Thinks, "thinks" should be enclosed in bubbles, but there's no bl**dy sign for that, even with the extended AASCI whatsit")] [STOP RAMBLING] ..... I am being serviced by an electronic handmaiden called Eudora, a rejuvenated water nymph perhaps? One of the Fates? One of the Furies ... she's coming to take you away hurrah. Anyway, whatever her antecedents, it appears that, amongst other things, she can handle enclosures and deal with my friends en masse, so wackothediddleoh etc. So friends in virtual reality around the world, my e-mail address is "martin@plpk.uq.oz.au". All I need now is a bat sign for a signature. By the way, "Eudora" is actually a genius of obscure marine annelid worms - so much for my fantasies. Mind you, when you get to my age .....

You may find it hard to believe, but Your President actually entered Biology in the Pre-Genetic-Code Era [BGC] - a time when DNA was no more than an

amorphous gluey lump at the bottom of a tube. He has, for some years now, had another sort of fantasy - that of determining, in flying foxes, the genetic code for the uterine receptor molecule of the female sex-hormone oestrogen. This fantasy is tied up with the question (which got Him into flying foxes in the first place) of why, in the duplex uterus of *Pteropus* at the time of ovulation, only that horn ipsilateral to the ovulating ovary shows oestrogen-stimulated growth, while the contralateral horn remains atrophic (in *normal* mammals the whole uterus grows). Such is Your President's intense interest in this problem that it is sometimes said that He regards flying foxes as no more than aerial wombs.

Well, last Saturday [March 25] He attended a *DNA Workshop* at the University of Queensland Centre for Molecular and Cellular Biology and discovered that by the magick of the DNA Polymerase Chain Reaction [PCR] it is dead simple to isolate the DNA specific for the oestrogen receptor gene (or particular parts of it, like the bit which actually binds the hormone) and just as straightforward to work out the coding sequence of this DNA. What's more, both processes can be completed in very short times - hours not months~ So, this is one fantasy that is going to become reality, the next *TABS Newsletter* may be the first with a gene-sequence in it. Why do all this? Firstly, it will help determine if the *Pteropus* hormone receptor differs from that in other mammals in a way which would account for localised uterine growth. Secondly, it will produce more molecular data to slot into the continuing international debate over Jack Pettigrew's "Flying Primate" theory.

On a more mundane level, Your President continues to slave over a hot computer keyboard with the vast bank of data on flying-fox birth dates contributed by bat conservation groups in Townsville, Brisbane, Northern NSW and Sydney. No folks, the data has <u>not</u> disappeared into a black hole and He hopes to have the draft of a joint-author publication circulating to all those involved, not too long after this *TABS Newsletter* gets to you. Please note that records of the 1995 birth season can be easily incorporated into the data bank [nod, nod, hint, hint] and will not significantly delay the draft manuscript. The data are the best ever [and anywhere] on Megachiropteran breeding seasons and give us precise quantitative descriptions for *P. policephalus* and *P. alecto* at different latitudes on the East coast of Australia. What we still don't have is precise data for *P. alecto* at sites across the North of Australia.

We also lack data for *P. scapulatus* in that region. In *P. scapulatus* populations that migrate south through Queensland and NSW in spring and return north in autumn, the animals are approximately six months out of phase with the Greyheadeds and Blacks; they mate in November-December and give birth in April-May. However, we have no quantitative data on the precise temporal distribution of births, aside from those from a Presidential captive population. Also, there are no descriptions of the autumn-winter camps in which we presume births to take place. Our overall knowledge of *P. scapulatus* is poor, and there are many puzzles - not least of which is why they give birth in April-May when it's brass-monkey weather in Central Queensland, where winter camps have been reported.

Given the routes of the seasonal migrations of *P. Scapulatus* there is increasing concern that the species is at severe risk, if not endangered. The widespread clearing of the western slopes of Queensland and NSW, and the increasingly frequent toxic algal blooms in the water supplies, may have catastrophic effects on *P. scapulatus* populations, particularly in prolonged periods of severe drought. Remember that the species is essentially an obligate blossom feeder.

We have no idea of the overall size of this seasonally migrating population of *P. scapulatus*, its northerly range, or the

number of separate groups that make it up. We do not know what causes groups to aggregate or disaggregate. On the coast, *P. scapulatus* often move into camps occupied by the other species, but this is unpredictable. Thus they appeared in large numbers at Indooroopilly Island on the Brisbane River in November 1994 [unusually early and for the first time for several years], to give a superb spectacle for the paying guests on the 54th Wildlife Preservation Society of Queensland/ONARR Batty Boat Cruise [with Your President giving the commentary] but had moved out by early February, when Your President was out on the river in a little boat with Helen Luckhoff and a Japanese film crew making a documentary for Fiji television. From experience, Your President knows that, undisturbed, even huge camps of Little Reds may not be evident to human observers only a few hundred metres away. Thus the passage of very large numbers can easily go unnoticed, and I do mean large numbers. A few years back one of our professors of Microbiology counted a column of Little Reds flying over his hobby farm 50km west of Brisbane and reached 900,000. Yes, he could well have been out by a factor of two either way, but I believe that his count was of the correct order of magnitude.

It's when such a group decides to roost in town that the problems start, and this year has seen it happen in the town of Dalby up on the Darling Downs west of Toowoomba. Apparently the first animals arrived in November and numbers continued to build, rising abruptly in March, spreading into residential areas and causing much concern locally, with headlines in local newspapers, TV coverage etc. I have been in contact with a local member of WPSQ and hope that he may be able to organise a count of the fly-out. I have also spoken with a local farmer, Robin Burrows, who has had vast numbers literally in his backyard, causing much damage to his beloved trees, along with noise, smell etc. I've seen the damage Little Reds can do to trees - branches 6 inches or more broken from their weight, whole trees toppled over.

So, I can sympathise with Robin. He doesn't want to harm the animals, but would like to see them move, or be moved on. And therein lies another problem, because we have no guaranteed non-harmful means of moving camps. In theory, the animals are on their way back north and should be moving out shortly. It is unusual to have them so far south at this time of year; usually they are all gone by the end of March. Today, April 3rd, they have moved from Robin's backyard, but large numbers remain along half a mile of creek near Dalby golf course.

But why choose to camp in town? I suggested to Robin that there was the only place where there were any trees left. However, he assures me that the creeks are well-timbered far out of town. Interestingly, when we were discussing means of shifting animals by loud noise, Robin mentioned that the bats didn't like the engine-noise of the road-train trucks changing gear as they approached the bridge - nevertheless the animals were camped there - resilient little beasties. Do they camp in town because they like to be near other primates? Gemma O'Brien suggests that it may be because the town offers a useful navigation point - rather like John Gough's flashing lights in the fruit orchards. It could just be that a small nucleus becomes habituated to the backyard fruit and they "pull" the big mobs in. Robin tells me that the animals are feeding in local state forests, and that with the recent good rains there is rich blossom available. So we ask the other question - why don't they camp in or close to their main feeding grounds? One wonders just how long they are going to hang around in Dalby. We have had a long drought and they may know something that we don't!

Your President returned from a relaxed vacation on a Barrier Reef Island [where there are no flying foxes] to be met by a very angry Helen Luckhoff of ONARR. Helen had received threats of physical

violence, linked to her backyard flying foxes, because of newspaper scare headlines linking flying foxes to transmission of Ross River Fever Virus [RRFV]. The scenario was as follows. Workers at the Queensland Institute of Medical Research had found that many species of mosquitoes around Brisbane were capable of transmitting RRFV. There were reports from elsewhere of antibody to RRFV being found in flying foxes. Large numbers of mosquitoes breed at Indooroopilly Island underneath the flying foxes, *ergo* the mosquitoes could infect the flying foxes, the flying foxes could then fly around Brisbane, be bitten by other mosquitoes, which would in turn bite humans, and thus the bats would spread RRFV far and wide. Panic.

What the report failed to mention was that many other species have been shown to have a high frequency of antibodies against RRFV: horses, cows, dogs, rodents [rats and mice] and marsupials [kangaroos, wallabies and possums] and presumably microbats - the virus is not species specific. Indeed, researchers first produced an experimental infection of RRFV from the blood of kangaroos, and marsupials have been thought to be an important reservoir of virus in the wild. There is also a very high incidence of antibodies to RRFV in humans which increases with age [overall 31.6%; 41.3% ‹ age 50; 45.8% ‹ age 60; 51.9% ‹ age 70. Phillips, DA et al (1990) *Medical Journal Australia* 152: 463-466]. What the report also did not make clear was the significance of the presence of antibodies in relation to an animal being infective, or to having developed clinical symptoms of the disease (note here the incidence of antibodies in humans!).

The presence of antibody simply indicates that an animal has been exposed to the virus and has mounted an immune response to it. Infection requires a relatively large number of virus particles to be injected into the blood (usually by a mosquito) - one particle is not enough. If the infection takes, the virus multiplies in the new host and, after an incubation period of several days, numerous virus particles appear in the blood of the host. This appearance of virus particles in the blood is termed "viraemia". It is in this phase that the host is infective, in that it can pass on the virus to further mosquitoes. Again, infection of the mosquitoes requires the passage of a relatively large number of virus particles. The host's viraemia is transient. After a few days the number of virus particles in the blood falls to undetectable levels and the host becomes essentially non-infective. It is in the later stages of the viraemia that the level of antibodies against the virus rises.

So, before we start panicking about flying foxes carrying RRFV, we need to determine:

if the mosquitoes breeding in the water actually bite the flying foxes hanging in the trees;

if the flying foxes develop viraemia [Your President is now involved with proposed experimental infection of some of the presidential animals];

if they do, do they then fly out to feed;

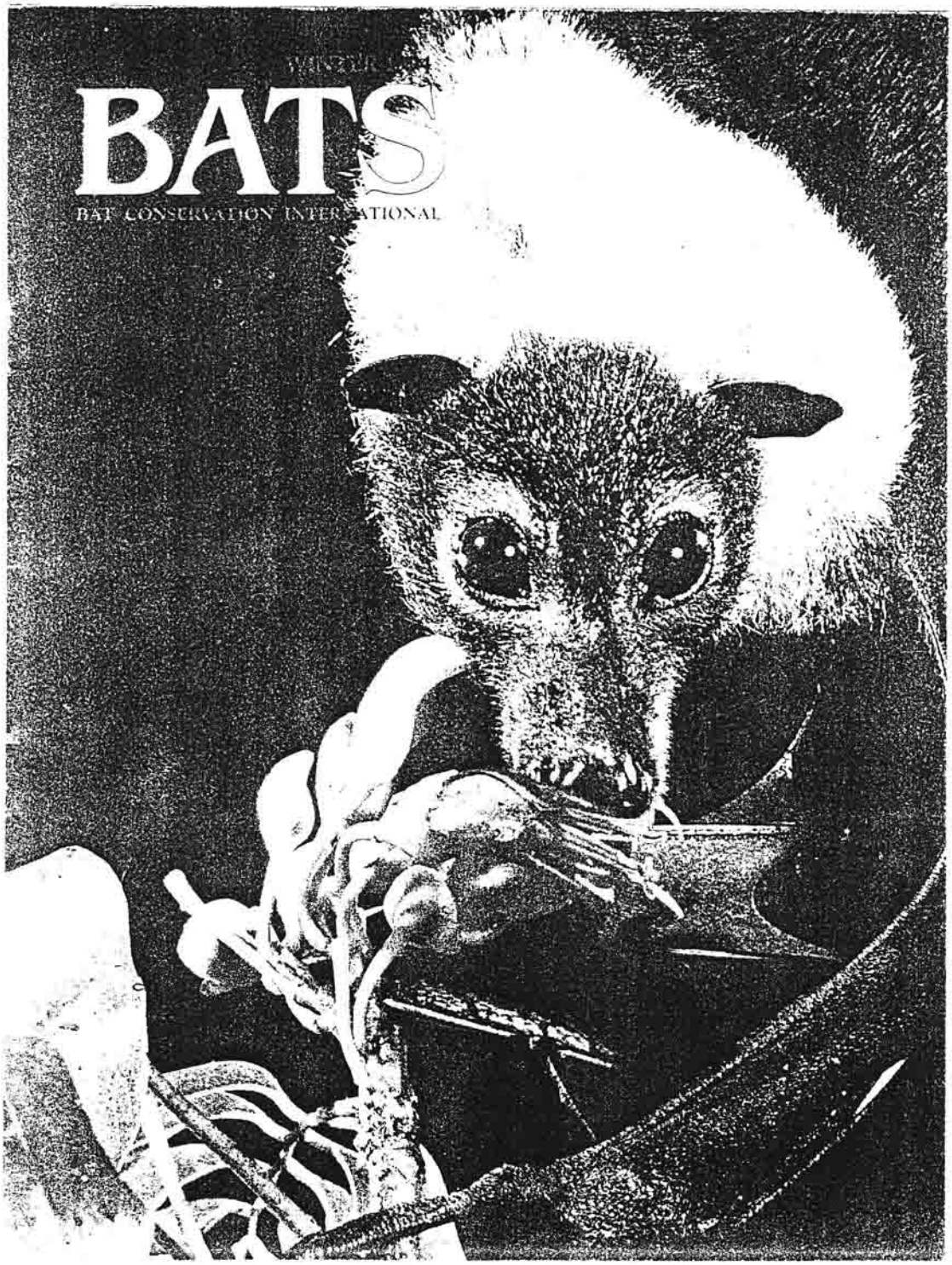
if they do, do they feed in situations where they will be bitten by mosquito species capable of transmitting RRFV.

In the meantime, what about all those other friendly neighbourhood species living in and around our homes who might be carriers? Particularly all those other Humans? I joke not. One expert with whom I discussed the matter maintained that there was no need to postulate animal reservoirs and that the frequency of the disease in the human population was more than enough to keep it going.

Mention viruses and people panic - not unreasonable in the light of smallpox, AIDS and some of the other ooh-nasties waiting around in the fringes. So, another group affected by the RRFV

scare were workers from SEQEB [South Eastern Queensland Electric Corporation, sic!] who are frequently involved in removal of dead flying foxes from the wires and of saving living young. Understandably there was worry that handling the animals might lead to RRFV infection. I trust that the above will allay the SEQEB workers' fears.

Over the years an extremely good relationship has grown up between Brisbane ONARR [Orphan Native Animal Rear and Release] and SEQEB to the benefit of both and now with an impressive joint management plan in place for the whole of the Brisbane area plus development of special rescue techniques and equipment, Southerners please copy.



19 December 1994.

MR MATTHEW CRANE
REGISTRAR
EXHIBITED ANIMALS PROTECTION ACT
NSW AGRICULTURE
LOCKED BAG 21
ORANGE NSW 2800.

Dear Mr Crane,

Please find herewith a policy developed by the Ku-ring-gai Bat Colony Committee Inc. pertaining to the display of captive flying-foxes (Pteropus species), based on this Committee's experience with wild and captive flying-foxes over 14 years.

During this time studies have been made on the behaviour and feeding habits of a captive group of grey-headed flying-foxes and standards developed which are presented in this document.

We submit the document to the Exhibited Animals Advisory Committee in the hope that this policy be accepted as the standard for the exhibition and management of captive flying-foxes in NSW.

Yours faithfully,

Elizabeth Hartnell

ELIZABETH HARTNELL
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Ms Elizabeth Hartnell
Chairman
Ku-ring-gai Bat Colony Committee Inc.
PO Box 607
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Dear Ms Hartnell

On behalf of the Exhibited Animals Advisory Committee I have been asked to express their appreciation to the Kur-ring-gai Bat Colony Committee for drafting the Standards Recommended for the Care and Exhibition of Flying-foxes and making them available to the Committee.

The Committee considered the document to be excellent and an invaluable reference for the formulation of standards for Flying-foxes. Exhibitors have been asked to make comment by 7 May 1995.

Yours sincerely

MATTHEW CRANE
Registrar
Exhibited Animals Protection Act

20 March 1995

Sydney Office. Level 17, 157 Liverpool Street, PO Box K220 Haymarket NSW 2000. Telephone (02) 372 0100. Facsimile (02) 372 0155

STANDARDS RECOMMENDED FOR THE CARE AND EXHIBITION OF FLYING-FOXES

Prepared by

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1 PREAMBLE

The Ku-ring-gai Bat Colony Committee Inc. (KBCC) is licenced by NSW National Parks & Wildlife Service (Licence No. GL: 896) to hold flying-foxes for educational purposes, rehabilitation and release. The Committee confers with National Parks & Wildlife Service and scientists studying flying-foxes at Queensland University, Australian National University & University of NSW. Importantly KBCC works closely with veterinarians who specialise in flying-fox rehabilitation. Each year KBCC runs a rehabilitative orphan flying-fox fostercare and release program, and prior to release all animals are banded so that they can be monitored by the Australian Bird & Bat Banding Scheme.

Our experience is with Grey-headed flying-foxes (Pteropus poliocephalus) and Little Red flying-foxes (Pteropus scapulatus). KBCC conducts an extensive education program to increase public understanding of flying-foxes. This program includes seminars, publications, school and community group talks. Hand-reared flying-foxes accompany the speakers to allow the audience a close encounter. These animals are housed at Kukundi Wildlife Shelter Lane Cove National Park by agreement with NPWS. This group consists of 3 males and 7 females, all of which are handreared orphans unable to survive in the wild for a variety of reasons.

Flying-foxes are tree dwellers. They are nocturnal feeders; they return to their roost trees, forming large colonies at dawn, and spend the daylight hours sleeping, grooming, sunning their wings and socialising with the other flying-foxes. The KBCC Committee is constantly dismayed by the way flying-foxes are displayed in air conditioned caves and nocturnal houses. **Flying-foxes do not live in caves.**

All zoos and wildlife parks are important educational facilities and should exhibit flying-foxes simulating wild conditions.

A large sunny enclosure which simulates a tree top environment provides a far more suitable captive environment than a nocturnal house or air conditioned cave with reverse cycle lighting.

PART A

STANDARDS RECOMMENDED FOR THE CARE AND EXHIBITION OF FLYING-FOXES

The following information covers the housing, diet and care of captive flying-foxes which KBCC submits for acceptance as standards for the exhibition of these animals.

2 CAPTIVE MANAGEMENT AIM

To exhibit a contented healthy group of flying-foxes which will live a long time and function as a small colony with social interactions similar to wild flying-foxes and will need minimal replacements.

3 THE CAPTIVE GROUP

3.1 Captive groups of native fauna are displayed to afford the public an opportunity to see species which they are unlikely to meet in the wild and to learn about their habits and interaction with their environment. Therefore life for captive flying-foxes should be as natural as possible to achieve the best educational result, and ensure that injury and illness in these animals is minimised.

3.2 Recent radiotracking research has shown that grey-headed flying-foxes are capable of flying up to 100 kilometres a night. It is the opinion of the KBCC that **no adult wild flying-foxes should be retained as part of an exhibition group.** This is borne out by the behaviour of rehabilitating wild flying-foxes. If their injuries are such that rehabilitation and release is not an option then these animals should be humanely euthanased.

3.3 The only animals which should be added to a captive group are hand-reared orphans which have sustained injuries which would prevent their survival on release in the wild.

3.4 From the education point of view grossly mutilated or deformed animals should not be displayed as part of a captive group. For example, in captivity female flying-foxes can cope without a thumb provided the male to female ratio reduces competition; however a female with offspring must have two thumbs to adequately care for her infant.

3.5 Flying-foxes are social animals and live in large colonies, therefore no animal must be exhibited alone.

3.6 An appropriate mix of gender and age for captivity and similar to that in their natural state is important. A suitable gender mix is one male to 3 to 4 females. A hierarchy is established both among the males and among the females in the harem.

4 HOUSING

4.1 General

Flying-foxes are more active at night because they feed at night. During the day they nap, interact socially, groom, sun their wings, and while inverting flying-foxes urinate and defecate. All these behaviours are fascinating for the public to witness.

4.1.1 Sunny Enclosures

Flying-foxes ideally are displayed in large wire mesh enclosures which are open to the weather, contain roost trees and/or branches for climbing and roosting. They need protection from wind, sun, vandals, predators and bush fires.

4.1.2 Advantages

The advantages of exhibiting flying-foxes this way and not in nocturnal houses are as follows:

- The animals are easily seen in the daylight, the colours and texture of their fur and wings is appreciated, and the public's fears about these animals are allayed.
- Hand-reared, non-releasable, healthy flying-foxes continue to be easy to handle and interact with the public.
- Improved health, fungal and respiratory infections are reduced due to sunlight.
- No expense of artificial lighting and heating.
- Cleaning cages is easier; after hosing, the floor dries quickly in the open air.
- Interpretative signs are easily read.

4.1.3 Nocturnal Houses

Nocturnal houses should only be used to exhibit animals which in the wild are completely inactive and remain hidden during daylight hours. Such animals include possums, microbats (insectivorous bats), and blossom bats.

However some Australian mammals, although nocturnal feeders, remain visible and active during the day, such animals are kangaroos, wallabies and flying-foxes. It is never contemplated that kangaroos and wallabies should be housed in nocturnal houses, why flying-foxes?

4.2 Enclosure Design

KBCC designed their enclosure in two sections, with a door between, which allows easy removal of flying-foxes. The enclosure must be sited for maximum sun and allowing protection from the wind. The latter can be provided by screening vegetation outside the cage and/or shadecloth.

i. **Basking Area:** Roof height is 4 metres. This allows for flight and basking in sun and shade, and includes small trees, branches, cosmetic vegetation with woodchip, leaf mulch or native ground cover species. Roofing is not necessary.

   During the summer months, **detachable sun shades** (eg. shade cloth) are positioned over the basking area to provide adequate shade for all the animals. These are removed in Autumn to provide maximum sunlight in Winter. Sprinkling with a hose in above 30°C temperatures for relief from heat, particularly if the humidity is low, is recommended.

ii. **Feeding Area:** Can be closed off from the basking area. Roof height of 1900mm allows animals to be easily removed from the enclosure by staff. Open to sunlight, except for some roofed shelter which is used by the animals in very bad weather.

5.2 General Requirements

It is impossible to feed flying-foxes on their **natural foods (ie. nectar, pollen and rainforest fruits**) in captivity except for occasional treats of branches of blossom or fruits.

The commercially available foods recommended are apples with smaller amounts of pears, stonefruit, melon and grapes (but NOT citrus) plus a powdered flying-fox protein supplement. Fruits as fibrous as banana are of limited nutritional value because only a small proportion of its volume is digested.

Flying-foxes need to be fed freshly chopped food in the evening. Size of chopped fruit can be large enough that the animal can hold it with its foot without dropping the piece (medium apple cut into 8 pieces). If the pieces are too large the fruit will be dropped with the resultant wastage.

Generally a captive flying-fox's diet consists of 2/3 apple and 1/3 other fruit (pear, melon, stonefruit, grapes) plus high protein supplement (formulated for flying-foxes).

This diet produces a more formed stool than in the wild where a natural stool is a 'splat' containing a small amount of solid material.

5.3 Captive Flying-Fox Diet

The KBCC has, over the last 6 years, observed that flying-foxes held in captivity have an annual weight cycle. The animals drop weight during Autumn and gain weight during Spring. This may vary in other climatic regions.

Mature Grey-headed flying-fox males weigh around 1000 grams from December to April and might drop to 800 grams in Winter.

Mature Grey-headed flying-fox females weigh from 600 to 900 grams over the year, they do not have as large a weight change as the males.

See Appendix 2 for graph of weight fluctuations.

The diet should be changed gradually from Winter diet to Summer diet.

DIET PER GREY-HEADED FLYING-FOX:

	FRUIT	WOMBAROO HIGH PROTEIN SUPPLEMENT
Summer diet:	350 gram	7 gram
Gradual change to Winter diet	350 gram	8 gram
	350 gram	10 gram
	375 gram	10 gram
Winter diet:	375 gram	10 gram
Gradual change to Summer diet	350 gram	10 gram
	350 gram	8 gram
	350 gram	7 gram

Pregnant and lactating females require additional protein in their diet.

Wombaroo food products have developed a set of reference tables. These booklets and their products are available from:

WOMBAROO FOOD PRODUCTS
P.O BOX 151
GLEN OSMOND SA 5064 **08 379 1339**

HELEN GEORGE (NSW agent)
'THE CEDARS'
MOSS VALE ROAD
BEAUMONT NSW 2577 **044 651 328**

Wombaroo Food Products are manufactured in Adelaide; contact Wombaroo for information about your local State Wombaroo distributor.

See Appendix 3 for Constituents of Wombaroo Flying-fox milk replacer (formulated from an analysis of flying-fox milk) and high protein supplement (specially formulated for flying-foxes), so that other products can be compared for their nutritional value.

5.4 Fibre

Do not feed vegetables, pellets or cereals.

Furthermore, it is best **not** to feed food such as apple puree or banana because the fibre is not easily separated from the juice content. Too much fibre has been known to cause bowel prolapse.

5.5 Provide **native blossom** when available, also advisable as an educational aspect for the public. **See Appendix 4 for the list of flying-fox native food trees.**

6 CAPTIVE MANAGEMENT

6.1 Hygiene

The feeding area floor must be cleaned daily. The enclosure brackets, branches, and hessian bags replaced as necessary.

In the basking area the branches need to be replaced as necessary, and the mulch on the floor raked regularly and removed as necessary.

Uncontaminated fresh food and water must be provided daily.

6.2 Identification

Each flying-fox should be individually identified in the enclosure using a colour band on the flying-fox's thumb.

6.3 Monthly Weighing

Captive flying-foxes should be weighed monthly. By observing a decrease or increase of the average weight of the overall group, we can either increase or decrease the diet.

Recording weights graphically is an easy way to observe changes. A drastic decrease in weight in a particular animal may indicate illness, ie. pneumonia or victimisation by others in the group.

See Appendix 2 for Graphs of Flying-fox Seasonal Weight Fluctuations

6.4 Handling for Examination

Any flying-fox found hanging low or behaving in an unusual manner in the enclosure may either be injured or sick.

An animal may be removed easily from the feeding area. Approach quietly, wrap the animal quickly and firmly in a towel, covering its head (flying-foxes have strong jaws and sharp teeth), unhook the hind limbs and allow them to grasp the towel. Place the animal gently in a covered cage suitable for either observation or transport.

Flying-foxes **do not require a general anaesthetic** for a physical examination or for transport. Provided the head is kept covered and held firmly, the wings and body can be easily examined.

Weigh the animal wrapped in a towel of known weight.

6.5 Isolation for Treatment

An indication of an unwell animal is that it will hang very low in the cage, be lethargic and lose appetite, and will eventually lose fur on the chest.

Flying-foxes are social animals; therefore any animals requiring isolation because of sickness or injury will recover more quickly if they can have the company of another flying-fox. It may be sufficient to keep a flying-fox in an adjoining cage to the sick animal. However, they should rejoin the flying-fox group in the enclosure as soon as possible.

Solitary confinement of a flying-fox including the stress of its illness/injury and boredom will cause frustration and anxiety which can result in the animal self-mutilating.

6.6 Introducing New Flying-Foxes

Sub-adults should not be introduced to the captive group as they suffer undue sexual harassment. They should be caged separately as a small group until 2 years old. If they are continually handled these animals, particularly females, make ideal education animals.

i It is best to introduce new flying-foxes to the group in late Winter and Spring when flying-foxes are least sexually active and not so territorial.

ii New members should be introduced as a group, eg. one male and two or three females which have already established a rapport.

iii Juvenile females less than 2 years old will be unduly harassed by mature males.

6.7 Flying-Fox Species Differences

These standards and conditions of captive management provide for the basic needs of flying-fox species. In northern NSW wild grey-headed flying-foxes (Pteropus poliocephalus) and black flying-foxes (Pteropus alecto) often occupy the same camp sites. Their diet and biology are very similar. Both species mate in Autumn and the young are born in Spring. Therefore captive groups of mixed species cohabit successfully.

However, Little Red flying-foxes (Pteropus scapulatus) are primarily nectar-pollen feeders with a much smaller proportion of fruit in their diet. They are very nomadic in following food sources and often do not return to a district for many years. They mate in Spring and give birth in Autumn.

Much less scientific study has been done on these animals. KBCC experience with a small group of wild Little Red flying-foxes is that these animals require a different diet and appear to be sensitive to cold weather. They were temperamental and nervous. It is the KBCC opinion that the highly strung nature of these animals would suggest they would be unsuitable for exhibition.

6.8 Breeding in Captivity

Flying-foxes are not a rare or endangered species; therefore captive breeding is not required scientifically. Gestation is 6 months, and lactation about 6 months. Healthy young can be separated from their mothers in January and introduced to other orphans being prepared for release.

Please contact a Wildlife Care Group licensed to rehabilitate flying-foxes if release is the preferred option.

Mother-reared young in captivity do not receive the same amount of handling as orphan hand-reared, so the juveniles are much more difficult to handle for examination and are unsuitable for 'close encounter education programs'.

KBCC has found that vasectomies allow normal mating behaviour to be observed without resulting in pregnancies which interrupt the education program. Pregnancy and birth necessitate the removal of the female from the education program.

Footnote: The hand-rearing/release program has 4 stages:

i With fostercarer from milk fed to weaned and flying.

ii Creche introduction to other flying-foxes, breaking bond with humans.

iii Release cage close to colony, introduction to wild flying-foxes.

iv Release with support feeding available on outside of cage.

6.9 Record Keeping

Records for flying-foxes should be kept on an individual basis in a form which can be quickly and easily examined, analysed and compared with those kept

by other establishments.

The records for flying-foxes should be kept on an individual basis in a form which can be quickly and easily examined, analysed and compared with those kept by other establishments.

The records should provide at least the following information for each individual:

a. Correct scientific name, common name, individual identification, and personal name and any distinctive markings.

b. Details of the origin of the animal, the location of the wild population.

c. The dates of acquisition and disposal, with details of circumstances and addresses.

d. The date or estimated date of birth.

e. Clinical data, including results of physical examination by a qualified veterinarian (with acknowledged flying-fox experience) and details and date of any treatment given, together with results of .routine health examinations.

f. Breeding and details of any offspring.

g. The date of death and the results of the post mortem examination.

Animals moving to new locations must be accompanied by copies of all records relevant to those animals.

All documents and other information pertaining to each animal from previous locations must be kept safely.

Species identification shall be made by a suitably qualified person and the records shall state who was responsible for the species identification.

Report provided annually to Exhibited Animals Protection Unit.

6.10 Transport

Transport cages should always be placed on tables or shelves well above ground level.

Short-Term

Flying-foxes can be transported individually **for a short period** or several animals together, in wire cages measuring at least 460mm high x 615mm long x 360mm wide. One end is hinged and opens completely as a door. The cages must have removable, leakproof metal drop trays fitted at the base. Sides and top must be of stout wire mesh of 2mm to 3mm diameter (so that the undersurface of the flying-foxes' claws are not damaged) and be fitted with light hessian or cotton covers (eg. two-dog cages made by Mascot Wire Works).

This cage allows the flying-fox to fully stretch one wing at a time. The smaller one-dog cage can be used for short trips.

Long-Term

Suitable food and water should be available to the animals in transit if longer than 4 hours. (See Captive Flying-fox Diet 5.3).

The cage should be clearly labelled, eg. 'FLYING-FOX', 'LIVE ANIMAL', 'HANDLE WITH CARE', 'THIS WAY UP', together with feeding or watering instructions for en route.

Also attach to outside of cage an envelope with details of consignment showing consignor's name, address and telephone number, the consignee's name, address and telephone number; the date of dispatch, the number of flying-foxes dispatched, the common name and the scientific name of the species enclosed.

Stress during Transport

Flying-foxes must not be subjected to temperatures greater than 35 degrees as they can suffer heat stress, or less than 10 degrees Celsius, during the trip.

It is preferable if the flying-foxes can be accompanied by a person familiar with the animals being transported except during air transport.

Flying-foxes can be stressed by unfamiliar noises and smells.

Time from caging to destination must be minimised.

7 COMMON PROBLEMS IN CAPTIVITY

Familiarity with humans and tolerance of life in an enclosure is not evident in wild flying-foxes and it is cruel to subject them to captivity.

No wild flying-foxes should become part of a captive group, only unreleasable, healthy, hand-raised orphans should be captive animals.

Note: All wild, injured and orphaned flying-foxes handed in by the public should be referred to Ku-ring-gai Bat Colony Committee or similar licenced wildlife group for rehabilitation and release.

7.1 Weight Loss as a Diagnostic Tool

Weighing flying-foxes on a monthly basis will alert staff to possible health problems. If an animal loses more than 80 grams from one month to the next, the animal should be closely observed.

7.2 Respiratory Problems

Flying-foxes can develop respiratory infections following extreme weather conditions. Subjecting these animals to unnatural air-conditioned environments such as caves/nocturnal houses will also predispose them to respiratory infections. Treatment is with Amoxil. For adult animals an antibiotic injection is given followed by a course of oral Amoxil.

Baby flying-foxes can inhale milk during artificial feeding which can induce pneumonia. Treatment is also with Amoxil.

7.3 Dehydration

Dehydration is often a problem for sick animals with respiratory and other infections. Intraperitoneal and subcutaneous injections may be given to adult flying-foxes by a veterinarian. Electrolyte replacers are useful in cases of mild dehydration.

Flying-foxes brought in by the public are usually suffering some level of dehydration. Give water to drink.

7.4 Fungal Infections

Flying-foxes spread secretions from neck glands over their wings when grooming. Fungal infections of the wing membranes can occur in captive animals that are unable to invert to urinate or because they are unable to spread their wings in sunshine as they would normally do in roost trees.

Infection appears as a whitish colouring, has an odour, and is treated with Panalog ointment. If left untreated the condition will cause the animal great discomfort and eventually lead to its death.

Fungal infections can occur in orphan baby flying-foxes' wing membranes if they are not thoroughly cleaned and dried after feeding, washing, or urination/defecation.

7.5 Wing Holes and Abrasions

Wing membranes that have abrasions or holes smaller than the size of a 20 cent piece may heal; however, animals with large unhealed, weeping membranes or wings with large holes and tears, will have difficulty wrapping and flying, and should be euthanased.

7.6 Victimisation

Unlike flying-foxes in their natural state, captive animals cannot escape their tormentors. If victimisation of one animal occurs, it may be prevented from feeding by more aggressive animals, and forced to feed on fruit dropped on the ground, thus the victimised animal will lose condition.

Placing additional feeding buckets away from 'marked territories' may give the victim a chance to feed properly. Hessian bags or other dividers can provide visual protection from other more aggressive flying-foxes.

8 STAFF/EDUCATION

8.1 Staff/Educational Officers

Staff should be educated about the ecological merits and habits of flying-foxes so that the animals are cared for properly and so that correct information about these animals is given to the public.

If there is more than one staff carer/feeder, it is advisable to check that all individuals are aware of feeding changes that may apply, and that they also understand the behavioural variations of particular animals.

8.2 Harassment by Public

Sufficient numbers of experienced staff must be in attendance to protect flying-foxes from abuse and harassment when on public display. Flying-foxes must not be fed chips, confectionary, ice-cream by visitors.

8.3 Signs

The purpose of exhibiting flying-foxes is to educate people about these native mammals. Therefore signs should provide correct information on their biology, their habits and the important ecological role they perform in pollination and seed dispersal in native forests. Flying-foxes serve as a prime illustration of the interdependency of plants and animals in a natural ecosystem.

The public should be discouraged from feeding the animals by appropriate signage and by staff supervision.

PART B

9 COMMON PROBLEMS OF WILD FLYING-FOXES SURRENDERED FOR REHABILITATION

This section is included because the public often take injured animals to wildlife parks. It lists the most common injuries encountered and the recommended treatment. The KBCC most strongly recommends that, unless the animal can be rehabilitated for release back into the wild, it should be euthanased.

As stated already, wild adult flying-foxes do not make satisfactory exhibition animals.

Release of rehabilitated adult flying-foxes should be at the edge of an occupied colony, preferably early in the day.

9.1 Obtain as much information as possible regarding the location and the circumstances surrounding the injury.

9.2 Dehydration

For wild juvenile and adult flying-foxes, **see Part A 7.3 DEHYDRATION.**

Dehydration is the most common problem for orphan flying-foxes. Boiled water is given orally (using eye-dropper or syringe fitted with a flying-fox teat) for mild dehydration. Severely dehydrated infants require professionally administered intraperitoneal fluids.

Orphaned infant flying-foxes need special care by a trained and NPWS licenced fostercarer, because it is a skilled and time-consuming occupation. To be successful it must mirror the development of mother-reared young.

Correct feeding (Womberoo flying-fox milk replacer), heating (baby bats do not thermoregulate for the first 4 weeks of life), and growth management are essential for their survival and successful release. **See Footnote Part A 6.8.**

In the Sydney region the rescue, rehabilitation and release of orphaned flying-foxes is co-ordinated by KBCC in co-operation with Wildlife Information & Rescue Service (WIRES).

It is important that healthy, rehabilitated juveniles are released back into the wild. These animals are banded through the Australian Bird & Bat Banding Scheme, Canberra so their movements can be monitored as part of long-term research on flying-fox population and migration.

9.3 Fractures

Pinning of fractures is not advisable because lack of mobility and arthritis in the joint are very real problems for flying-foxes. Flying-foxes need to be flexible to wrap their wings around their bodies to protect themselves from rain and cold, and to fly and move easily around an aviary.

Any flying-foxes with severe fractures (which may develop osteomyelitis) and/or spinal injuries should be euthanased.

9.4 Thumbs

Flying-foxes' thumbs are important for climbing, grasping and grooming. As long as the rest of the joint is mobile, an injured thumb that becomes rigid is still useful. A flying-fox that is minus a thumb will find existence very difficult, thumbs are used by females in the birthing position and by males in establishing their status in a colony (in sparring matches). Therefore wild flying-foxes without a thumb should be euthanased.

In captivity female flying-foxes can cope without a thumb provided the male to female ratio reduces competition; however, a female with offspring must have two thumbs to adequately care for her infant.

9.5 Net Entanglement

There may be no obvious damage to wing membranes at first; however, any animal caught in netting must be observed in an aviary for several weeks. Often it takes this time for the full effect of the bruising and impaired circulation to become apparent. Large parts of the wing membrane may shrivel and slough off, leaving the flying-fox unable to fly.

Wing membrane holes smaller than the size of a 20 cent piece usually heal; however, animals with large unhealed wing membrane holes will have difficulty wrapping and flying and should be euthanased.

9.6 Buckshot

Flying-foxes shot in orchards will suffer blood loss, wing membrane and internal injuries and would require veterinarian attention urgently.

9.7 Electrocution

Electrocution is nearly always fatal for an adult, although some survive for some hours suffering excruciating pain and burns. These animals require urgent veterinarian attention and should be euthanased.

From October through to January female flying-foxes carrying young often rest on power lines and are electrocuted. If approached diplomatically, the Electricity Authority, responsible for the area, will retrieve the dead mother and baby. Infant flying-foxes can survive for several days on their dead mothers but become severely dehydrated and are often fly-blown, so their eyes, ears, wing pits need to be checked for maggots. Infants may sustain burns to mouth and may be unable to suck effectively.

10 ASSISTANCE

Assistance in assessing injured flying-foxes brought to zoos or wildlife parks by members of the public, is always available from **KBCC or other licenced wildlife care groups** in your locality. Any animals with the problems described above require an informed assessment, and wild flying-foxes should not be added to the zoo/wildlife park's captive animal group.

Ku-ring-gai Bat Colony Committee Inc., P.O. Box 607, Gordon, NSW 2072.

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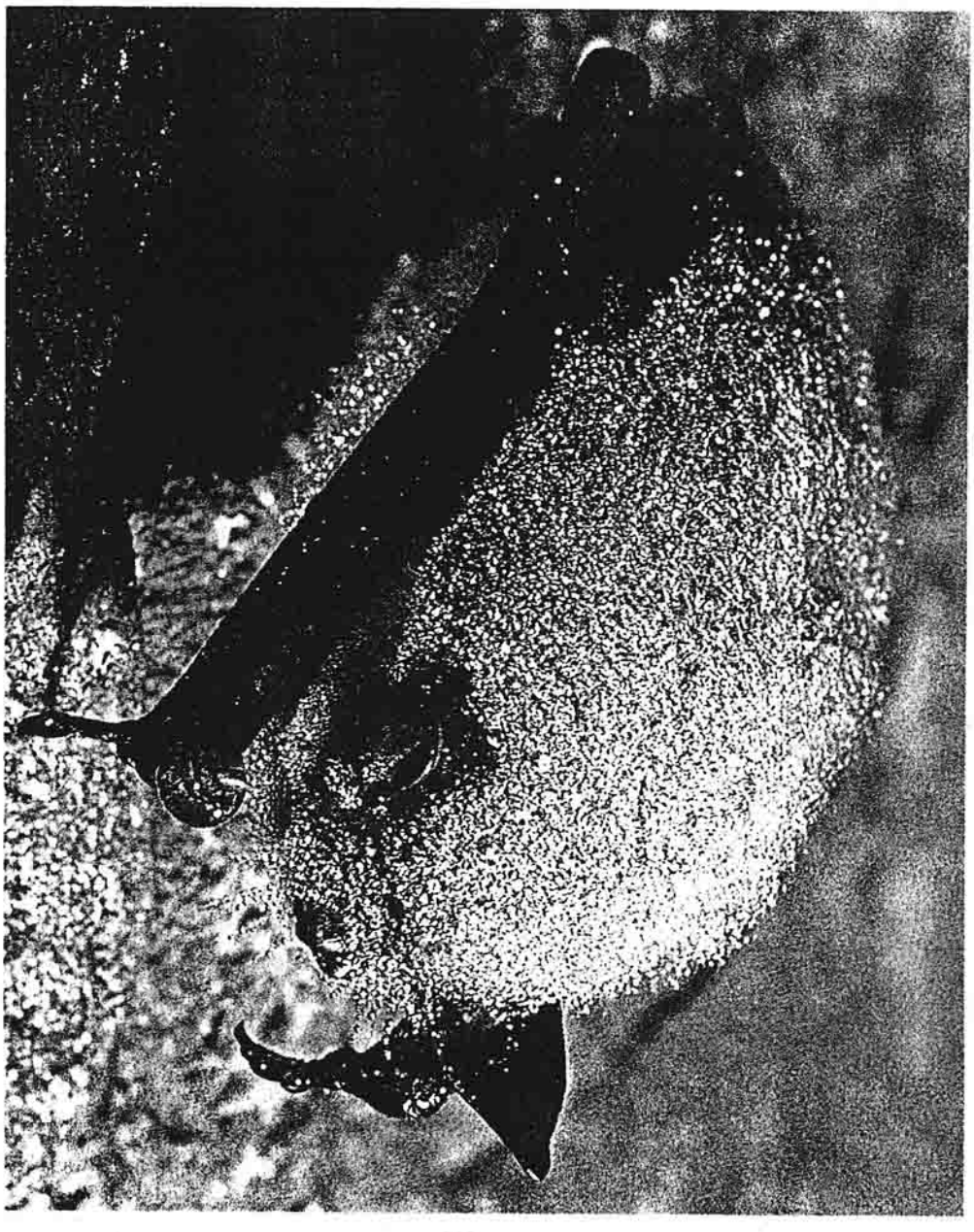
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