THE SIMLA BAT-BANDING PROGRAMME : 1968–1970

by O. Marcus Buchanan

Introduction.

In March, 1968, Dr. John S. Hall of the Department of Biology, Albright College, Reading, Pennsylvania, and the author jointly initiated a programme of studies on the life-histories of several species of Chiroptera on Trinidad. The primary species being studied is the common Short-tailed Fruit Bat, **Carollia perspicillata.** In this species a major portion of the field studies involve population dynamics, reproductive biology, longevity, food-habits, and homing ability. In a second species, the nectar-feeding Tailless Long-tongued Bat, **Anoura geoffroyi,** we are concentrating on food-habits, reproductive biology, population movements, and homing ability. Incidental studies of lesser scope are also being carried out on **Rhynchonycteris naso, Saccopteryx leptura, S. bilineata, Glossophaga soricina, Phyllostomus hastatus, P. discolor, Artibeus jamaicensis,** and **A. lituratus.**

A major logistic feature of these studies is a banding-and-release scheme as a means of data-gathering on population fluctuations, longevity, home-range, and homing ability. The purpose of this paper is to bring these studies to the attention of field naturalists on Trinidad; to explain the banding techniques that have been developed in the hope that they may be of value to future workers; and, to solicit the assistance of interested naturalists in reporting band-recoveries.

Bat-banding Techniques.

The ability to adequately mark and subsequently identify both individuals and populations is an essential prerequisite to these kinds of studies. Traditionally, the Chiroptera have offered many problems to the development of a suitable marking system: Paints or other pigments applied to the fur are rapidly, often within 24 hours, removed by grooming; "permanent" dyes are lost when the fur moults, Ear-tags of metal or plastic have been extensively used, but generally work their way to the perifery of the lobe and fall off in 6–12 months. Reflective adhesive plastic tapes ("Scotch-lite", etc.) applied to the forearm or ankle, have proven of value for only short-term studies, as they are rapidly chewed or pulled away. Tattoos, applied to the wing-membrane, appear reasonably permanent; but they require having the bat in hand for identity, and thus are not of value for many population study problems.

In recent years bat workers have employed ordinary bird-bands of both plastic and aluminium applied over the distal portion of the forearm. The success of these efforts has been highly variable; the long-range results, such as those demanded in the present study, have been very indifferent and generally unsatisfactory.

Our efforts in the initial year of the study were devoted primarily towards developing a satisfactory technique of bat-banding. In early 1968, Hall drew up specifications for three styles of aluminium wing bands to be used experimentally to test their relative efficiency in the field. These consisted of the following types (Figure 1.); 1) a "regular" bird-band of the U.S. Fish and Wildlife Service pattern; 2) An identical band, excepting for the edges of the slit being rounded off in an attempt to avoid abrasion at

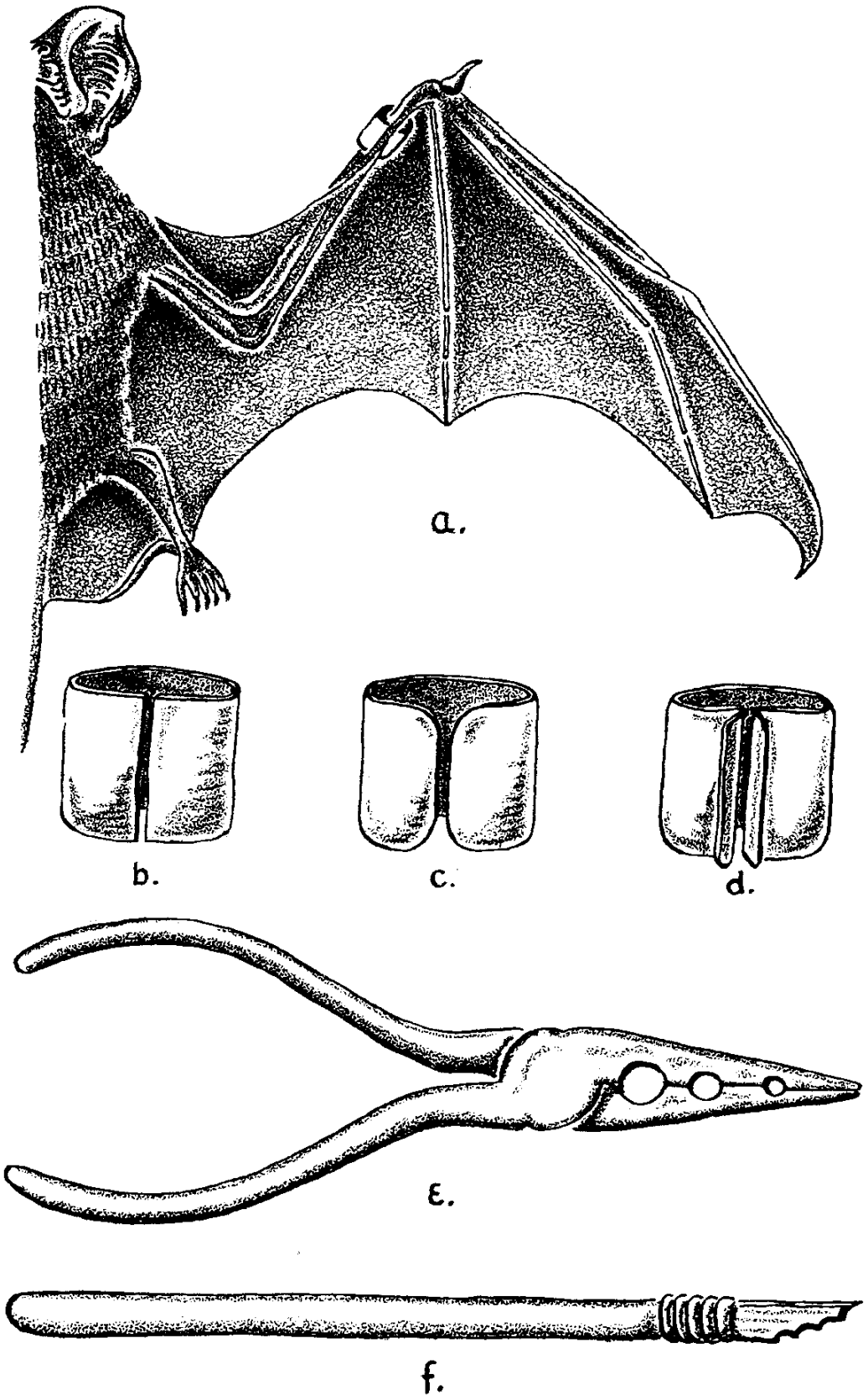

Figure 1. a.: Molossus ssp. with forearm band. Note band pass through fold with antebrachial membrane. **b.–d. Band** styles—regular-l band; rounded-edge band; lipped band. **e.**: Crimping pliers for anod bands. **f.**:: Knife for slitting antebrachial membrane.

this point; and, 3) A special lipped band, the lips of which would grab the wing-membrane when crimped, and thus attempt to obviate sliding and consequent ripping. Six thousand of these bands were manufactured in three different sizes (3, 5, and 7 mm O.D.); each band was stamped with the legend "SIMLA TRINIDAD," and the bands were serially numbered. These bands were applied to the forearm of the bat, as indicated in Figure 1. Ordinarily (but not invariably), males were banded on the right forearm and females on the left, in order to distinguish sexes in the field without actually examining the bat in hand.

During the initial banding period, March, 1968, 436 **Carollia perspicillata,** 242 **Anoura geoffroyi,** 213 **Phyllostomus discolor,** 54 **P. hastatus,** and 82 **Micronycteris nicefori** were netted at known permanent or semi-permanent roosts of these species, banded, and released **in situ.**

Results of the Banding-Technique Studies.

The roosts of the above species of bats were periodically visited during the following year, and evidence of band-wear, abrasions, and other artifacts noted. These observations clearly indicated that the effectiveness of banding was not due so much to the style of the band used, as to the method of application of the band.

Most Neotropical bats have a distinct antebrachial membrane, and the ordinary application af a band over the distal portion of the forearm tends to compress this membrane. Further, it was noted in captive controls that in its initial attempts to remove the band, the bat tended to tug the band towards its body, thus even further collapsing the ante-brachial membrane. This resulted in abrasion, and often the development of callosities or infections of the forearm. Clearly, the collapsing of the antebrachial membrane affects the flight characteristics of the bat to some extent.

This problem was surmounted very simply by fashioning a small knife from a bit of broken razor-blade, the width of which was adjusted to be approximately the width of the band being used. At the point of attachment of the band, the antebrachial membrane is punctured with the knife immediately prior to the application of the band, and the band is crimped into place through this slot. The closure of the band rests on both sides of the wing-membrane, but it is not essential or desirable for that membrane to be penetrated. The knife is shown in Figure 1.

The degree of defacing of bat-bands by chewing is both species and individually determined. The defacing of bands by large, vigorous species such as **Phyllostomus discolor** and **P. hastatus** was in some cases extreme: Total defacing occurred within the first month of banding in some individuals. Not all individuals of these species do so, however, and we are occasionally finding individuals banded as long as 30 months with perfectly legible bands. In **Carollia perspicillata,** defacing is highly variable according to the individual bat. If **Carollia** engages in band-chewing, it ordinarily commences to do so immediately after being banded. In **Carollia,** approximately 75% of plain aluminium bands remain legible after 12 months; at the end of 24 months, approximately 55% are completely legible, ca 10% are partially-legible, and 35% illegible. Third year studies have not been completed.

Not surprisingly, the insect-and-fruit-eating **Micronycteris nicefori**, a small species, and the nectar-feeding **Anoura geoffroyi**, show practically no band-wear by chewing after 30 months. Chewing is more evident in **Micronycteris** than in **Anoura**, but in neither species have bands been defaced to the point of illegibility. **Anoura geoffroyi**, in particular among all of the species studied, is an extremely amenable bat for banding studies: Not only is band-wear practically non-existent, but there have been no cases of irritation or infection in bats banded by the above detailed technique.

Experiments With Colour-Banding.

The use of mono-colour aluminium bands makes in-hand inspection of bats necessary in any study in which individuals must be identified from within a group of banded bats. Accordingly, in January, 1969, a portion of the remaining aluminium bands were colour-anodised in the following colours: Red, Blue, Green, Yellow ("Gold"), and Black. The black colour-bands have been used exclusively for marking captive individuals under observation, and not for banding-and-release studies. The remaining four colours, plus the regular aluminium colour, are readily distinguished at distances of up to 15 metres under ordinary head-lamp or hand-torch illumination, and at even greater distances under more powerful illumination. Anodised from the original band-series, these bands all have the "SIMLA TRINIDAD" annotation as well as the serial numbers stamped upon them.

Colour-anodised bands rapidly proved superior to plain aluminium bands, not only because of the availability of several colours, but by increased long-term legibility. Plain aluminium is comparatively soft, and ultimate defacing of these bands by the larger and/or more vigorous species (**Phyllostomus** and **Carollia**) has been indicated above. In the colour-anodising process, however, the surface of the aluminium is tempered, or hardened, to a much greater degree than the plain aluminium surface. Colour-band recoveries on **Carollia perspicillata** after 18 months (January 1969–July 1970) produced no instance of defacing, although scratches on some bands attested to the efforts of the bats.

The only apparent disadvantage to colour-anodised bands over plain aluminium is purely a logistic one. The harder nature of the band makes hand-crimping a large number of bands difficult. This is surmounted by grinding a pair of plain, long-nosed pliers with three sets of holes equal to the outside diameters of the closed bands (Figure 1.).

Experiments With Plastic Bands.

Prior to the present programme, some experimentation was done with plastic ("celluloid") colour-bands, both numbered and plain, and of the ordinary readily-available form used by ornithologists and aviculturists. These bands were applied variously to **Phyllostomus hastatus, P. discolor, Carollia perspicillata, Artibeus jamaicensis, A. lituratus, Anoura geoffroyi,** and **Glossophaga soricina,** under both captive and free conditions.

Plastic bands proved to be remarkably resistant to chewing by bats. This is difficult to explain, except that the irritation or "awareness" by and of these bands may be less than in the case of aluminium bands. However, plastic bands recovered in the field after periods of 9 to 12

months showed a serious and unfortunate propensity of eventually allowing the skin of the forearm to grow over the band, thus obliterating it. This is much more pronounced in the larger fruit-eating species, **Phyllostomus** and **Artibeus;** it occurs frequently in **Carollia perspicillata** (ca. 15% after the first year of banding); but, it apparently does not occur in the nectar-feeding **Anoura geoffroyi** and **Glossophaga soricina.**

We have no evidence of these phenomena occurring when aluminum bands are used, despite 2½ years of observation. I can only conclude that there is a skin-rejection factor in the nature of the aluminium which prevents skin-growth on its surface.

Species of Bats Banded and Total Numbers, 1968–1969.

During the first two years of the study, 2,315 individual bats comprising 18 species were banded and released in the field. This number does not include bats banded for purely observational studies under captive conditions and not subsequently released with bands attached.

The banding programme consisted of two parts : 1) Systematic banding of populations in more or less permanent roosts; and, 2) Random banding activities. In the former category, 1,243 **Carollia perspicillata,** 488 **Anoura geoffroyi,** 222 **Phyllostomus discolor,** 84 **Micronycteris nicefori,** 84 **Molossus major,** 55 **Phyllostomus hastatus,** and 52 **Chilonycteris rubiginosa,** were banded. The balance of bands applied (87) were on randomly netted and released **Natalus tumidirostris, Glossophaga coricina, Rhynchonycteris naso, Saccopteryx leptura, S. bilineata, Artibeus jamaicensis, A. lituratus, Mormoops megalophylla, Vampyrops helleri,** and **Uroderma bilobatum.** Totals for 1970 are not yet in hand.

Permanent records of these banding activities, including source of individuals, point of release, date, band-style and number, colour, and sex, are maintained at the William Beebe Tropical Research Station, Simla.

Reporting of Band Recoveries.

A significant part of these studies will ultimately depend upon the recording of recapture data on banded individuals. Much information of value can be secured by interested naturalists who happen to find banded bats. If the bat is secured in hand, the following information should be noted : 1) Species (if known); 2) Date; 3) Locality; 4) Conditions under which the recovery was made; and, 5) Number and colour of the band. If the bat is alive, it should be released at the point of capture. Otherwise, the band should be removed and forwarded with the above information to the author at Simla. In response, the observer will be forwarded with data on the individual bat concerned, including the site of original capture and banding, date of banding, age (if known), and other pertinent information.

Summary.

The Simla Bat-Banding Programme, 1968–1970, consisted of the following stages:

1) An experimental phase oriented around selecting a suitable bat-banding technique. Most of the activities of 1968.

2) Systematic banding of known permanent or semi-permanent roosts of **Carollia perspicillata, Anoura geoffroyi, Phyllostomus discolor,**

P. hastatus, Micronycteris nicefori, Molossus major, and **Chilony rubiginosa.** Follow-up studies on banding-success, reproduction, ments, homing ability, and other factors in the life-history. 1969 and to date.

A successful banding-technique was developed for Neotropical using aluminium bands. The superiority of anodised over plain alum bands was demonstrated. Plastic bands were shown to have serious with some species, although apparently satisfactory on others.

A planned recapture programme was instituted in 1969, supplemented by banding of new individuals from roosts, and is continuing at present.

New York Zoological Society, William Beebe Tropical Research Station, Simla, Arima Valley.