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***Short communication*** ***Ecology***

# Mesh size and bird capture rates in shasha forest reserve, ile-ife, Nigeria

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**ABSTRACT**
Few studies have been conducted to verify how mist net mesh size affects the capture rates of birds in Nigeria. This research was undertaken from 06.30 to 18.30 hours between February 2010 and January 2011 at Shasha Forest Reserve (4º20' to 4º40' E, 7º00' to 7º 10' N) near Ile-Ife in southwestern Nigeria, to verify how mesh size affects the capture rates of birds and the efficiency or otherwise of the mist nets involved. Bird species occurrence was recorded using eight nylon mist nets each of 36mm and 61mm mesh sizes in linear transects. The linear transects cuts across different vegetational types with varying degrees of human disturbance. A total of 970 birds were captured and made up of 584 (60.2%) with 36mm mesh and 386 (39.8%) with 61mm mesh. Of the 106 species mist-netted 93(87.7%) were caught by 36mm while 61mm caught 73(68.9%). The 36mm mesh net was more effective for birds with less than 200mm body length while 61mm mesh was more effective for birds with more than 250mm body length. However, both meshes were suitable for birds between 151 and 200mm long. Thirty six millimeter mesh net captured most of the birds below 20g while 61mm mesh captured was more efficient for the larger species. Both mesh sizes were effective for birds with body weights between 41.00 and 80.00g. Deployment of both nets will provide an improvement of abundance estimates for some larger species. By using only 36mm mesh nets, there may be an improvement in the capture rate of small birds and similarly 61mm mesh would substantially improve the capture rate of bigger and heavier birds.

**Key words:** Mesh size, birds, capture rates, body weight, Shasha reserve.

## INTRODUCTION

Mist nets have been used in many studies of bird populations and their results compared with other methods [1-3]. However, since far more can be learned from netting studies, a simple theory of net capture rates has been employed. Although Rappole *et al*.[4] have proposed a methodology that combines two procedures, i.e., mist nets and point counts, to produce a more accurate assessment of avian habitat use, the use of mist nets is still considered as the best assessment method to date. According to Poulin *et al*., [3], while point counts are less demanding in the field, the manipulation of netted birds allows documentation of various aspects of their biology. However, at least two factors, according to Macarthur and Macarthur [1], must be recognized in any use of mist for population estimates. First, when a bird has once been captured, marked, and released, it tends to avoid nets in the future. This tendency is more pronounced in the tropics than in the temperate regions. Hence, traditional capture – recapture methods to estimate populations cannot be used. Secondly, the population is composed of two or more parts, i.e. territorial or resident species in which the birds are continually exposed to the likelihood of capture and are almost all eventually caught, marked and released. The other aspect consists of drifting birds that seem to flow past the nest site at almost constant rate, bringing in almost everyday, new previously unmarked birds, irrespective of the number of days the nets have been in operation. Apart from this, a lot of other restrictions concerning mist-net use were listed by Remsen and Good [5].

It is not yet known how to measure with complete accuracy all the factors involved in a birds' being caught and held in a net. Such measurements as body weight, total length, width of skull and length of wings, legs, toes and claws can be taken easily but it is much more difficult to measure the stiffness of feathers and shape of the head, body, wings, legs, tail, etc.. The velocity of the bird when it hits the net and its condition (wet or dry), and the weather especially the wind. In view of this complexity, a convenient index of body size, i.e., total length of the body and body weight are chosen.

However, when mist nets are employed, the question arises as to which mesh size produces more captures per hour, since why a species cannot be sampled is its size, i.e., it can either be too small or too big to get entangled in the nets [1]. Jenni *et al*. [6], while working on capture rate efficiency of 36 mm-mesh concluded that different species and

climatic condition can provide different capture rates for 36 mm nets. In most works involving mist net captures, mesh sizes are not mentioned for Costa Rica birds [7]; for Californian birds [8] and for Brazilian birds [9].

This study presents the profiles and comparison of bird capture efficiency of mist nets with two mesh sizes (36 and 61mm) in Shasha forest reserve located in the rainforest belt of South Western Nigeria.

## MATERIALS AND METHODS

Eight nylon mist nets each of 36- and 61-mm were alternately spaced for twelve months (February 2010 to January 2011) in linear transects. All the nets had the same dimension (2 x 2.6m) and were operated from 06.30 to 18.30 hours in four locations. The study plots in Shasha forest reserve (4º20' to 4º40' E, 7º00' to 7º 10' N) were located in the tropical humid high forest coupled with a forest formation resulting from disturbance of the primary forest by farming and logging. The study plots were characterized by the presence of evergreen tree species of economic importance like the oil palm (*Elaeis guineensis*) the mahogany (*Khaya ivorensis* and *Khaya grandifiola*), Sapele wood (*Entadrophragma cylindricum*), iroko (*Milicia excelsa*), African walnut (*Lovoa klaineana*), Obeche (*Triplochiton scleroxylon*), Opepe (*Sacrocephalus diderrichii*), afara (*Terminalia superba*), among others that are of increasing commercial importance. The four study sites sampled four different vegetation types, with varying degrees of human disturbance, i.e. primary forest, closed-canopy tall trees, gallery forest and degraded secondary regrowth forest. Although sampling effort varied between study sites, both 36-mm and 61-mm mesh nets were always simultaneously used in equal numbers. Each bird handled, that was removed from the experimental nets, was recorded by species and mesh size in which it had been caught. At the end of the period, the number of each species was tallied for the two mesh sizes. For alternating 36- and 61-mm mesh nets, captures relative to bird length measured by means of a metal ruler and body weight measured with 50-, 100-, 300- and 1000g spring scales were determined. $Chi^2$ tests were used to check statistical significance of different capture rates and Yate's correction for continuity was used when there were only two categories in the distribution [10].

The birds were identified as previously described [11].

## RESULTS

During the 4380 net hours, 970 birds were mist-netted, made up of 584 (60.2%) with 36mm and 386 (39.8%) with 61mm. Of the 106 mist-netted species, 93 (87.7%) were caught by 36mm while 61 mm mesh caught 73(68.9%). Because of the large number of species in the series, analysis of data by body length and weight became meaningful.

Table 1 shows that 36mm mesh nets captured most of the bird species below 20g (*Alcedo quadribrachys, Muscicapa caerulescens, Nectarinia superba, Nectarinia olivacea* and *Nigrita luteifrons*). However, for some larger species, 61mm mesh size was more efficient. This is the situation with *Streptopelia semitorquata, Treron australis, Tockus hartlaubi* and *Campethera nivosa*.

For 19 species, differences in capture rates were statistically significant ($P<0.05$) and 16 species (*Apus apus, Alcedo quadribrachys, Eurystomus gularis*, *Eurystomus glaucurus, Phoeniculus bollei, Campethera nivosa, Campethera chloronota, Hylia prasina, Muscicapa caerulescens, Anthreptes collaris, Nectarinia cyanolaema, Nectarinia olivacea, Nectarinia superba, Nigrita bicolor, Nigrita fusconota and Nigrita luteifrons*) were caught more with 36mm mesh size while only three species (*Treron australis, Pitta angolensis* and *Malaconotus cruentus*) were captured more with 61mm mesh size.

The 36mm mesh nets captured birds from 48.00 to 551.00mm long with a mean of 191.29±8.71mm, while the 61mm mesh captured birds from 51 to 770mm long with a mean of 226.36±15.40mm. Both meshes were more efficient for birds with body length between 151 and 200mm (Fig. 1).

Body weights of birds captured with 36mm mesh ranged from 5.00 to 366.00g with a mean of 54.69±7.80g, while those captured with 61mm mesh ranged from 8.00 to 921.00g with a mean of 104.00±18.09g. Both mesh sizes were effective for birds with body weights between 41.00 and 80.00g even though 36mm mesh captured more birds. For birds between 81.00 and 120.00g both meshes captured almost similar number but beyond this weight range 61mm mesh was more efficient (Fig. 2).

Table 2 displays the mean number of observed but unmist-netted birds within the study area. Twelve species belonging to 6 families were recorded and they were found to be aerial in activity.

**Table 1:** Systematic list of bird species and number of captures (without recaptures) mist-netted in Shasha Forest Reserve, Ile-Ife, with 36- and 61-mm mesh, with mean body weight (g) and mean total length (mm)

| Common name | Family/species | Mean | | Mist net mesh size | | Total captures |
|---|---|---|---|---|---|---|
| | | Mean weight (g) | Total length (mm) | 36mm | 61mm | |
| | **Phasianidae** | | | | | |
| Latham's Francolin | *Francolinus lathami* | 254.5 | 228.6 | 0 | 5 | 5 |
| Ahanta Francolin | *Francolinus ahantensis* | 510.1 | 314.8 | 0 | 2 | 2 |
| | **Columbidae** | | | | | |
| Grey Wood Pigeon | *Columba unicincta* | 423.4 | 406.4 | 0 | 5 | 5 |
| Red-eyed Dove | *Streptopelia semitorquata* | 196.2 | 330.2 | 6 | 11 | 17 |
| Green Fruit-pigeon | Treron australis | 210.3 | 279.4 | 3 | 16 | 19 |
| Blue-headed Dove | *Turtur brehmeri* | 133.1 | 254.0 | 1 | 4 | 5 |
| Tambourine Dove | Turtur tympanistria | 196.3 | 330.2 | 2 | 9 | 11 |
| | **Musophagidae** | | | | | |
| Blue Plaintain-eater | *Corythaeola cristata* | 903.0 | 762.0 | 0 | 1 | 1 |
| Verreaux's Tauraco | *Tauraco macrorhynchus* | 246.0 | 431.8 | 0 | 2 | 2 |
| Green-Crested Tauraco | *Tauraco persa* | 248.4 | 431.6 | 1 | 2 | 3 |
| | **Cuculidae** | | | | | |
| Black-throated Coucal | *Centropus leucogaster* | 293.0 | 355.6 | 1 | 5 | 6 |
| Senegal Coucal | *Centropus senegalensis* | 291.0 | 355.6 | 0 | 2 | 2 |
| Didric Cuckoo | *Chrysococcyx caprius* | 36.7 | 190.5 | 18 | 13 | 31 |
| Emerald Cuckoo | *Chrysococcyx cupreus* | 38.2 | 228.6 | 4 | 0 | 4 |
| Black Cuckoo | *Cuculus clamosus* | 82.0 | 304.8 | 2 | 3 | 5 |
| | **Caprimulgidae** | | | | | |
| Black-shouldered Nightjar | *Caprimulgus pectroralis* | 45.6 | 228.6 | 1 | 1 | 2 |
| | **Apodidae** | | | | | |
| European Swift. | *Apus apus* | 41.8 | 167.1 | 9 | 1 | 10 |
| Cassin's spine-tailed Swift | *Chaetura cassini* | 51.0 | 152.4 | 0 | 2 | 2 |
| Ussher's spine-tailed Swift | *Chaetura ussheri* | 55.0 | 139.7 | 0 | 1 | 1 |
| | **Trogonidae** | | | | | |
| Narina Trogon | *Apaloderma narina* | 62.3 | 304.8 | 0 | 1 | 1 |
| | **Alcedinidae** | | | | | |
| Shining-blue kingfisher | *Alcedo quadribrachys* | 15.0 | 190.5 | 21 | 3 | 24 |
| Red-headed Dwarf Kingfisher | *Ceyx lecontei* | 10.5 | 101.6 | 6 | 1 | 7 |
| Pigmy Kingfisher | *Ceyx picta* | 10.0 | 139.7 | 2 | 0 | 2 |
| Chocolate-backed Kingfisher | *Halcyon badia* | 52.6 | 203.2 | 8 | 2 | 10 |
| | **Meropidae** | | | | | |
| Blue-headed Bee-eater | *Merops muelleri* | 28.3 | 152.4 | 5 | 5 | 10 |
| | **Coracidae** | | | | | |
| Broad-billed Roller | *Eurystomus glaucurus* | 14.8 | 254.0 | 6 | 0 | 6 |
| Blue-throated Roller | *Eurystomus gularis* | 16.4 | 254.3 | 7 | 1 | 8 |
| | **Upupidae** | | | | | |
| Buff-headed Wood-Hoopoe | *Phoeniculus bollei* | 66.5 | 330.2 | 11 | 3 | 14 |
| | **Bucerotidae** | | | | | |
| Blue-billed Dwarf Hornbill | *Tockus camurus* | 112.6 | 381.0 | 2 | 9 | 11 |
| Black and white tailed Hornbill | *Tockus fasciatus* | 278.0 | 533.4 | 2 | 7 | 9 |
| Black Dwarf Hornbill | *Tockus hartlaubi* | 118.0 | 381.0 | 16 | 22 | 38 |
| White-crested Hornbill | *Tropicranus albocristatus* | 297.0 | 762.0 | 0 | 3 | 3 |
| | **Capitonidae** | | | | | |
| Naked-faced Barbet | *Gymnobucco calvus* | 50.1 | 203.2 | 5 | 9 | 14 |
| Bristle-mosed Barbet | *Gymnobucco peli* | 52.0 | 201.8 | 6 | 11 | 17 |
| Red-rumped Tinker-bird | *Pogoniulus atro-flavus* | 18.0 | 181.9 | 2 | 0 | 2 |
| Lemon-rumped Tinker-bird | *Pogoniulus bilineatus* | 13.1 | 188.8 | 1 | 1 | 2 |
| Speckled Tinker-bird | *Pogoniulus scolopaceus* | 16.3 | 190.5 | 6 | 2 | 8 |
| Yellow-throated Tinker-bird | *Pogoniulus subsuiphureus* | 47.1 | 191.1 | 4 | 5 | 9 |
| Yellow-billed Barbet | *Trachyphonus purpuratus* | 86.5 | 193.3 | 3 | 1 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Indicatoridae** | | | | | |
| Lyre-tailed Honey-guide | *Melichneutes robustus* | 600.1 | 246.7 | 0 | 1 | 1 |
| Cassin's Sharp-billed Honey-guide | *Prodotiscus insignis* | 38.6 | 177.8 | 1 | 1 | 2 |
| | **Picidae** | | | | | |
| Brown-eared Woodpecker | *Campethera caroli* | 322.1 | 175.2 | 31 | 41 | 72 |
| Buff-spotted Woodpecker | *Campethera nivosa* | 42.5 | 152.4 | 17 | 0 | 17 |
| Fire-bellied Woodpecker | *Mesopicos pyrrhogaster* | 70.0 | 244.3 | 34 | 25 | 59 |
| Pigmy Woodpecker | *Verreauxia africana* | 5.9 | 76.2 | 1 | 0 | 1 |
| | **Eurylamidae** | | | | | |
| Rufous-sided Broadbill | *Smithornis rufolateralis* | 29.3 | 127.0 | 13 | 6 | 19 |
| | **Pittidae** | | | | | |
| Angola Pitta | *Pitta angolensis* | 36.4 | 174.8 | 3 | 11 | 14 |
| | **Laniidae** | | | | | |
| Black-shouldered Puff-back shrike | *Dryoscopus senegalensis* | 11.6 | 165.1 | 2 | 0 | 2 |
| Fiery-breasted Bush-shrike | *Malaconotus cruentus* | 70.2 | 251.4 | 3 | 14 | 17 |
| Many-coloured Bush-shrike | *Malaconotus multicolor* | 53.2 | 228.6 | 1 | 0 | 1 |
| Red-billed shrike | *Prionops caniceps* | 51.1 | 203.2 | 4 | 8 | 12 |
| | **Oriolidae** | | | | | |
| Black-headed Oriole | *Oriolus brachyrhynchus* | 46.4 | 254.2 | 4 | 1 | 5 |
| Black-winged Oriole | *Oriolus nigripennis* | 38.7 | 236.7 | 3 | 1 | 4 |
| | **Dicruridae** | | | | | |
| Shining Drongo | *Dicrurus atripennis* | 48.3 | 227.6 | 1 | 0 | 1 |
| | **Campephagidae** | | | | | |
| Blue Cuckoo-shrike | *Coracina azurea* | 22.0 | 215.9 | 2 | 1 | 3 |
| | **Covidae** | | | | | |
| Bare-headed Rock-fowl | *Picathartes gymnocephalus* | 355.6 | 431.8 | 1 | 2 | 3 |
| | **Pycnonotidae** | | | | | |
| Little Grey Bulbul | *Andropadus gracilis* | 21.6 | 167.8 | 21 | 14 | 35 |
| Yellow-whiskered bulbul | *Andropadus latirostris* | 25.2 | 152.4 | 6 | 2 | 8 |
| Little Green Bulbul | *Andropadus virens* | 24.7 | 155.1 | 1 | 0 | 1 |
| Honey-guide Bulbul | *Baeopogon indicator* | 48.1 | 271.4 | 4 | 5 | 9 |
| Green-tailed Bristle-bill | *Bleda eximia* | 48.3 | 52.7 | 9 | 9 | 18 |
| Bristle-bill | *Bleda syndactyla* | 46.0 | 173.6 | 4 | 5 | 9 |
| Bearded Bulbul | *Criniger barbatus* | 44.4 | 167.2 | 1 | 1 | 2 |
| White-bearded Bulbul | *Criniger calurus* | 32.1 | 127.8 | 3 | 1 | 4 |
| West African Nicator | *Nicator chloris* | 38.2 | 164.8 | 3 | 0 | 3 |
| Lesser icterine Greenbul | *Phyllastrephus icterinus* | 20.8 | 165.1 | 21 | 16 | 37 |
| | **Turdidae** | | | | | |
| Fire-crest Alethe | *Alethe diademata* | 32.0 | 203.2 | 6 | 1 | 7 |
| Forest Scrub-robin | *Cercotrichas leucosticta* | 24.0 | 165.1 | 1 | 0 | 1 |
| White-tailed Ant-thrush | *Neocossyhus poensis* | 57.1 | 214.9 | 2 | 3 | 5 |
| Forest Robin | *Stiphrornis erythrothorax* | 15.2 | 127.0 | 11 | 1 | 12 |
| Fraser's Rusty Thrush | *Stizorhina frazeri* | 38.7 | 201.1 | 1 | 2 | 3 |
| | **Timalidae** | | | | | |
| Capuchin Babbler | *Phyllanthus atripennis* | 28.0 | 241.3 | 6 | 8 | 14 |
| Brown Akalat | *Malacocincla fulvescens* | 37.1 | 215.8 | 2 | 0 | 2 |
| | **Sylviidae** | | | | | |
| Stream Warbler | *Bathmocercus cerviniventris* | 16.4 | 127.0 | 2 | 0 | 2 |
| Green-backed Camaroptera | *Camaroptera chloronota* | 11.2 | 114.3 | 10 | 3 | 13 |
| Yellow-browed Camaroptera | *Camaroptera superciliaris* | 8.1 | 111.2 | 8 | 4 | 12 |
| Green Hylia | *Hylia prasina* | 12.1 | 114.2 | 7 | 0 | 7 |
| Olive Longbill | *Macrosphenus concolor* | 14.3 | 118.1 | 1 | 0 | 1 |
| Tit-Hylia | *Pholidornis rushiae* | 13.8 | 76.2 | 4 | 0 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Muscicapidae** | | | | | |
| Dusky Flycatcher | *Artomyias fulginosa* | 11.6 | 121.4 | 8 | 4 | 12 |
| Grey-headed Puff-back Flycatcher | *Batis minima* | 10.4 | 114.1 | 5 | 0 | 5 |
| Chestnut-capped Flycatcher | *Erythrocercus mccalli* | 7.0 | 101.6 | 1 | 0 | 1 |
| White-browed Forest Flycatcher | *Fraseria cinerascens* | 44.3 | 177.3 | 4 | 1 | 5 |
| Fraser's Forest Flycatcher | *Fraseria ocreata* | 41.8 | 174.8 | 1 | 0 | 1 |
| White-eyed Flycatcher | *Muscicapa caerulescens* | 14.0 | 127.0 | 18 | 0 | 18 |
| Blissett's Wattle-eye | *Platysteira blissetti* | 9.8 | 88.9 | 2 | 0 | 2 |
| Chestnut Wattle-eye | *Platysteira castanea* | 12.0 | 101.6 | 1 | 0 | 1 |
| White-spotted Wattle-eye | *Platysteira tonsa* | 8.8 | 101.5 | 4 | 0 | 4 |
| Red-bellied Paradise Flycatcher | *Terpsiphone rifiventer* | 15.0 | 114.3 | 4 | 1 | 5 |
| Blue-headed Crested Flycatcher | *Trochocercus nitens* | 12.1 | 152.4 | 1 | 0 | 1 |
| | **Nectarinidae** | | | | | |
| Collared Sunbird | *Anthreptes collaris* | 8.1 | 101.6 | 7 | 0 | 7 |
| Grey-chinned Sunbird | *Anthreptes rectirostris* | 8.0 | 153.3 | 6 | 0 | 6 |
| Blue-throated Brown Sunbird | *Nectarinia cyanolaema* | 8.0 | 53.4 | 10 | 1 | 11 |
| Olive Sunbird | *Nectarinia olivacea* | 9.2 | 139.7 | 13 | 1 | 14 |
| Superb Sunbird | *Nectarinia superba* | 9.8 | 161.2 | 14 | 0 | 14 |
| | **Ploceidae** | | | | | |
| Blue-billed Malimbe | *Malimbus nitens* | 33.0 | 190.6 | 13 | 5 | 18 |
| Red-headed Malimbe | *Malimbus rubricollis* | 28.6 | 183.4 | 6 | 6 | 12 |
| Maxwell's Black Weaver | *Ploceus albinucha* | 20.6 | 165.4 | 1 | 0 | 1 |
| Spectacled Weaver | *Ploceus nigricollis* | 20.6 | 166.2 | 7 | 5 | 12 |
| Yellow-mantled Weaver | *Ploceus tricolor* | 24.2 | 175.8 | 3 | 0 | 3 |
| | **Estrildinidae** | | | | | |
| Chestnut-breasted Negro-finch | *Nigrita bicolor* | 11.0 | 114.3 | 13 | 2 | 15 |
| White-breasted Negro-finch | *Nigrita fusconota* | 9.6 | 101.6 | 8 | 1 | 9 |
| Pale-fronted Negro-finch | *Nigrita luteifrons* | 9.5 | 114.3 | 12 | 0 | 12 |
| Blue-billed Weaver | *Spermophaga haematina* | 18.0 | 152.4 | 6 | 1 | 7 |
| | **Total number of captures** | | | **584** | **386** | **970** |
| | **Total number of species** | | | **93** | **73** | **-** |

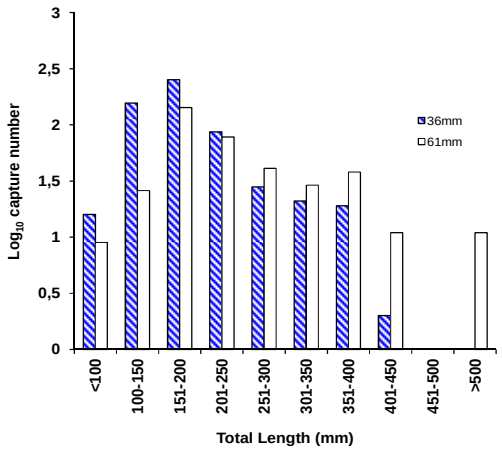


**Figure 1:** Bird's total length (mm) and logarithm of number captured with 36mm and 61mm mist nets

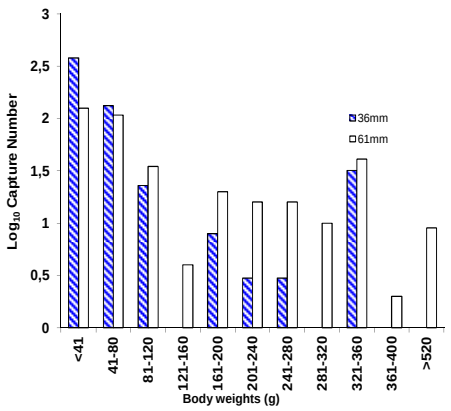


**Figure 2:** Bird's body weight and logarithm of number captured with 36mm and 61 mm mist nets

**Table 2:** Mean number of observed but not mist-netted birds in Shasha Forest Reserve, Ile-Ife.

| Common Name | Family/Species | Mean Number |
|---|---|---|
| | **Accipitridae** | |
| West African River Eagle | *Haliaetus vocifer* | 7 |
| Bat Hawk | *Macheiramphus alcinus* | 18 |
| Black kite | *Milvus migrans* | 11 |
| | **Bucerotidae** | |
| Brown-cheeked Hornbill | *Bycanistes cylindricus* | 3 |
| Piping hornbill | *Bycanistes fistulator* | 2 |
| Black-casqued Hornbill | *Ceratogymna atrata* | 3 |
| | **Capitonidae** | |
| Tooth-billed barbet | *Lybius bidentatus* | 9 |
| Hairy-breasted toothbill | *Lybius hirsutus* | 16 |
| | **Picidae** | |
| Green-backed Woodpecker | *Campethera cailliautii* | 23 |
| | **Pycnonotidae** | |
| Simple leaf-love | *Chlorocichla simplex* | 6 |
| Spotted Bulbul | *Ixonotus guttatus* | 2 |
| | **Muscicapidae** | |
| Dusky Blue Flycatcher | *Muscicapa comitata* | 3 |

## DISCUSSION

The demonstration that mist nets are an effective means of assessing population of birds has encouraged their widespread introduction to various parts of the world. However, there are major operational difficulties in ensuring that mistnets with appropriate mesh sizes are used.

O'Oconnor [12] suggested that mist nets do not sample juvenile and adult equally in the same geographical area. This discrepancy was confirmed by Nur and Geuper [13] who stated that among Wren tits, the physical area sampled by nets varied among age classes. The results presented here imply that the area sampled by mist nets may differ for adults of different species, but in all cases the efficiency with which the nets monitor local population trends decreases with distance from nets. Mist-netting can give reliable information on trends in capture rates of local population for several species on species by species basis.

It is interesting to note that body length and weight of birds are related to mesh size capture rates but Jenni *et al*., [6] indicate that body weight and cranium size are more useful measures than total body length alone for determining capture rates. So a combination of total body length and weight would provide a more meaningful capture rates. Hence, there is a dividing line between relative efficiencies of the two mesh types. There is no overlap and no group of birds in which, statistically significant, equal numbers were caught in both mesh sizes. It was expected, of course, that the smaller mesh would catch more smaller birds, and vice-versa, but the statistical analysis showed what a surprising difference mesh size actually made. The effects of the two types of nets was also seen in the total catch of 584 (60.2%) for the 36mm mesh, versus 386 (39.8%) for 61mm for mesh. This difference is also most statistically significant ($P<0.01$). The statements of Jenni *et al*. [6] and Remsen and Good [5] that behavioural differences leading to differences in capture probability are more pronounced when comparing different species than when comparing within species was also displayed in this study.

Although, this study was restricted to mist-netted birds, there were other observed birds not netted. The reason for a species not being caught may be due to the fact that its foraging activity was largely confined to the forest canopy and rarely descended to the level of the nets, which reached 2.6 metres above the ground. Some predominantly canopy species were nevertheless caught, but were netted much less often in relation to their abundance than were species that regularly used the understory. A few other bird species could also not be caught because they were either large enough to break out of or avoid entanglement in the nets or aerial in activity like that Bat Hawk (*Macheiramphus alcinus*), Black Kite (*Milvus migrans*) and West African River Eagle (*Haliaetus vocifer*). This observation buttressed the reports of Diamond [14] in New Guinea and Terborgh and Weske [15] in Peru who

labeled some birds as "uncatchable" because of being confined to the canopy.

If the two mist nets are deployed simultaneously and systematically, and if the results are interpreted on a species by species basis, this will provide an improvement of abundance estimates for some larger species. By using only 36mm mesh mist nets there may be an increase in the capture rate, particularly when there is a greater density of small birds as observed in tropical forest understories. For bigger and heavier bird species, the 61mm mesh would substantially improve the capture rate. The result has equally shown that banders who wish to catch the broadest possible range of bird species should use several mesh sizes in their net lanes. The proportionate numbers of each mesh will be determined by the size composition of the particular fauna. Researchers interested in general population surveys would equally use a variety of net types but those concentrating on single species should use the most efficient mesh size for that species from already existing data base. It is hoped that similar studies would be conducted with other mesh sizes so that banders and field Ornithologists would have information available on the comparative efficiencies of birds caught in 36 and 61mm mesh nets.

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