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MAYR, E 1965

ANIMAL SPP & EVOLUTION

HARVARD UNIV., PRESS,
USA

pp 797

(SB)

Linnaean spp – Constancy & sharp delimitation p 13

Darwin simply denied / existence of non-arbitrary spp. p 14

– Mayr – grps of actually / potentially interbreeding natural pops which are reproductively isolated from other such grps – p 19.

Dobzansky – / largest & most inclusive reproductive community / group sexual + cross-fertilizing individuals which share a common gene pool. p 19

– Isp is also an ecological unit p 21 distinguished from others // share / same environment

– Sp is also a genetic unit consisting of large, intercommunicating gene pool,

– Sibling spp / morphologically // or identical natural pops // & reproductively isolated p 34

MAYR 1965 (cont'd)

- sibling spp are rarest in birds. p 58

- Isolation due to physical barriers leads to speciation — subsp. level.

- borders of ranges ~~of~~ both form very sharp barriers in the Tropical & subtropical zones & form effective barriers for many animals.

- Philopatric spp which have a tendency to remain where they are p 566

- White-eye Z. lateralis crossed 2000 km from Tasmania to N'zealand in 1856 & is the commonest songbird of N'zealand today.

a close relative Z. rendovae refuses to cross even small barriers* p 567

- active fliers c̄ no subsp
weak fliers > subsp } p 568

* a flight of few minutes across to nearest island in Solomon islands

fruit + nectar feeding birds > dispersal < subsp. Insectivorous birds less dispersing > subsp p 568.

– homing instinct also red. dispersal – p 569

– Habitat selection is intrinsic – p 570
> expressed in cryptically coloured animals

– Habitat selection is a conservative factor in speciation since it reduces the probability of new isolates will be established beyond the present spp border. p 571. The normal habitat of spp doesn't occur beyond the spp border.

– speciation is slower in birds than in mammals p 578

House mouse produced endemics (Mus musculus) races in 100 yrs.

– a case of speciation by fragmentation of spp that had a wide range – this is often the case – p 584

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The Linible birds

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(SB)

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ca 50% of the objects when
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Crustacea

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SCIENCE 144
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Genotype, environment, and population numbers

SCIENCE 162

1453 – 1459

(SB)

The abundance of animals is regulated by factors both internal & external to the animal. One major aspect is the genetic constitution of the population, which has often been ignored by ecological studies. Lab expts in drosophila flies show that populations of greater genetic variability have larger population size. The rate of evolution of a population being adapted to a new environment is strongly correlated with the initial amount of genetic variability in the population.

Temp, humidity, & other climatic factors affect population size. Food & place to live may jointly affect the max size that a population can reach. Finally, the biotic component of the environment affects the size of animal populations.

√EHRLICH, P.R (1961)

INTRINSIC BARRIERS TO DISPERSAL IN CHECKERSPOT BUTTERFLY

SCIENCE 154

108

(SB)

Mayr, E (1942) Systematics & origin of spp. (Columbia Univ. Press, N. York) p 240

[redacted] birds & usually quite sedentary & make little use of [redacted] dispersal potential.

✓ EHRLICH, P.R. + RAVEN, P.H. 1969

Differentiation of populations

SCIENCE 165

1227–1232.

(SA)

- Contemporary biologists think "spp" are evolutionary units held together by gene flow. (Mayr holds this view)

- In this paper the view is "spp" are not evolutionary units — any more than populations, genera etc.

- movements of individuals don't necessarily indicate gene flow

- In tropical rain forests trees of a given spp are often separated by wide distances. strong-flying selective pollinators may be helping

- In plants & animals the possibilities of gene flow betw. natural populations of most spp are sharply limited by their wide separation.

x - there seems to be no possibility that gene flow holds together its widely scattered populations.

EHRLICH & RAVEN (1969) contd.

This has been demonstrated in butterflies Euphydryas editha in California. Populations v widely scattered.

- It is unwise to view spp of seed organisms in general as a largest grp of organisms sharing a common gene pool.
- Here is evidence that at least in many cases, gene flow is of little/no significance in maintaining many of the phenetic units we call 'spp'. This is evidenced in seed spp. by maintenance in phenetic resemblance - this may be due to continued existence under similar selective regimes

(SB)

Modern evolutionary theory requires local interbreeding pops, for smaller groups that show normally called spp, as evolutionary units in seed organisms.

- Pops will differentiate if they are subjected to different selective forces + will tend to remain like if they are not. For seed organisms it is the local interbreeding pops + not the spp. It is clear (evolutionary unit of Xia.

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SCIENCE 185:
27-39

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Nutmeg dispersal by tropical birds

SCIENCE 210, 925-927.

ALFREDO GUILLET & TIMOTHY M. CROWE

[FITZPATRICK INST., UNIVERSITY OF CAPE TOWN, RONDEBOSCH 7700, S. AFRICA]

1985

Patterns of distribution, abundance, extension & guild composition of water-birds in Africa.

African Journal of Ecology

23 pp 87-120

(SB)

African waterbird spp richness is > outside the tropics, exhibit a longitudinal than latitudinal gradient. Waterbird endemism is > outside the tropics.

Variance in waterbird spp richness (69% fit) explained by present day environmental variation, – abundance, length of rivers & ext of lake shore-line.
Partly due to historical factors areas with unexpectedly high spp richness – "refugia" – dry climatic phases.

Analysis of waterbird habitat availability & of 25 taxonomic, morphology, ecology & behav guilds suggest "habitat availability & qlty & 'region. factors" influ the above mentioned patterns.
– a good method for distribution.

(Conts)

ALFREDO + TIMOTHY (1985) (Cont'd)

watershed zoogeographical zones were identified using cluster analysis - Bray-Curtis similarity measure + unweighted pair-group agglomerative algorithm (Sneath + Sokal, 1973) + multidimensional scaling (Shepard, 1980). The former is useful in identifying hierarchical patterns of similarity usually employed in biogeographical studies as zones (eg subregions, provinces, districts). The latter method helps to reveal gradient ie in + between clusters thereby suggesting possible effects of abiotic factors (eg temp, rf) on distribution/dispersal patterns.

Information statistic tests (Field, 1969) were used to identify characteristic spp for each zone.

Char. spp — one generally confined to (at least 2/3rd of its recorded occurrence) & widespread within an avifaunal zone, & the limits of whose range help to delineate the boundaries of the zone.

Guild analysis — Tanzania — fly & spp.

Body mass — size (wt) classes.

Trophic — herbivore etc.

mobility — migrant, irruptive, sedentary.

Foraging beh.

veg. structure & Water habitat.

Higher fish div in Tropical America has led to more duck divers. (not consistent in Africa)

RAI, S N + PROCTOR, J

(1986)

JOURNAL OF ECOLOGY 74, 455-463

Ecological studies on four rainforests in Karnataka, India.

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RANE, U (1983)

(111)

JBNHS 80 (3) pp 638 – 639

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Robert B Lyon & Salim Ali
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Seasonal habitat selection by Birds
in the lower Colorado River valley

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Bright sunny + warm days by
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(BIOSCIENCE 11.6.87)

BRINGING BOUNDARIES TO THE PROTECTION OF NATURE RESERVES

SCHONEWALD-COX, CM & BAYLESS, JW (1986)

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THE BOUNDARY MODEL: A GEOGRAPHICAL ANALYSIS OF DESIGN & CONS. OF NATURE RES.

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clusters in association analysis

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alpha & Beta diversity.

THOMSON, J D & RUSTERHOLZ, KA
(1982)

ECOLOGY 63(2) 274-277

Overlap summary indices & the
detection of community structure.

IV

VII

THORINGTON Jr, RW; TANNENBAUM, B,
TARAK, A + RUDRAN, R (1982

Light et al eds. . . . .

Distribution Trees on Barro Colorado
Island: A fine texture analysis
pp 83 – 93

THORPE, W.H (1973)

VI

SCIENTIFIC AMERICAN 229(2):70-79

Duet-singing Birds.

VAN HORNE, B (1983)

(V)

J. WILDL. MANAGE 47(4) 893-901

Density as a misleading indicator of Habitat Qlty.

KARR, J.R (1976)

seasonality, resource availability & community dynamics in Tropical bird communities.

The American naturalist
110: 973-994.

✓SIMBERLOFF, D. & ABELE, L. G. (1976a)

Island biogeographic theory &
Conservation practice.

SCIENCE 191: 285-286

✓ DIAMOND, J.M (1976)

Island biogeography & Conservation:
strategy & limitations

SCIENCE 193 : 1027–1029

(SB)

- refuges of natural habitat in a sea of human-altered environment behave as islands for spp dependent of natural habitat.

- Simberloff & Abele --
  argue "the application of Island biogeographic theory to conservation practice is premature & based on insufficiently validated theory. . . .

- they say "several small refuges may contain > spp than a single large refuge of equivalent area.

CONNELL, J. H. (1978)

DIVERSITY IN TROPICAL RAIN FORESTS AND CORAL REEFS.

SCIENCE 199, 1302-1310

SIMBERLOFF, D. & ABELE L.G. (1976)

Island biogeography & conservation:
strategy & limitations

SCIENCE 193 : 1032

✓ TER BORGH, J (1976)

Island biogeography of

Cormorants: strategy of

limitation

SCIENCE 193: 1029–1030

✓

WHITCOMB, R.F., LYNCH, J.F.
OPLER, P.A., + ROBBINS, C.S.
(1976)

Lyme borreliosis + ecosystem:
strategy + limitations

SCIENCE 193: 1030-1032

WITTIG, R & K.-R. SCHREIBER (1983)

a quick method for assessing the size of open spaces in towns for urban nature conservation.

BIOLOGICAL CONSERVATION

26 (1) pp 57-64

WARD, S.D & EVANS, D.F (1976)

Conservation assessment of British limestone pavement based on floristic criteria

BIOLOGICAL CONSERVATION

9, 217–233

PETERKEN, G.F (1974)

a method for assessing woodland flora for ~~woodland~~ conservation using indicator spp.

BIOLOGICAL CONSERVATION
6, 239 - 245

MARGULES, C + USHER, M.B (1981)

Criteria used in assessing wildlife conservation potential: a review.

BIOLOGICAL CONSERVATION

21, 79-109

OPDAM, P, RIJSDIJK, G & HUSTINGS, F
(1985)

Bird communities in small woods in
an agricultural landscape: effects of area
& isolation

Biological Conservation 34
pp 333–352
(SB)

1 size of habitat patches may affect 1 presence of species, since patch size is related to pop size & 1 rec by to extinction rate.

NILSSON, S.G. (1979)

Effect of forest management on the breeding bird community in southern Sweden.

BIOLOGICAL CONSERVATION

16 : 135 - 143

DIAMOND, J.M (1975)

The Island dilemma: lessons of modern biogeographic studies for design of natural reserves.

BIOLOGL CONSVN

7: 129-146

BURGER, J (1981)

The effect of human activity on birds at a coastal bay.

BIOL. CONSERV.

21: 231–241

DIAMOND, J.M + MAY, R.M. (1977)

Species Turnover Rate on Islands:

Dependence on Census Interval

SCIENCE 197

266 - 270

LEVIN, S.A (1974)

Dispersion & population interactions

AM. NAT 108, 207-228

CONNOR, E.F & McCOY, E.D. (1979)

The statistics & biology of the species-area relationship.

AMERICAN NATURALIST

113: 791–833.

PIELOU, E.C. 1966,

Shannon's formula as a measure of specific diversity: its use and misuse

AM. NAT. 100:-463-465

- "diversity is equated to the amount of uncertainty [illegible] existing regarding the species of an individual selected at random from a population."
- [illegible] species [illegible] + [illegible] > many even [illegible] distribution, [illegible] > uncertainty + hence > diversity.

PRESTON, F. W. (1962)

The canonical distribution of commonness and rarity

ECOLOGY 43

185 – 215,

410 – 432.

WILLSON, M.F. (1974)

Avian community organization & habitat structure

ECOLOGY 55: 1017-1029

TERBORGH, J & J. S. WESKE, 1969

Colonization of suitable habitat by Painted Bunting

ECOLOGY 50: 765-782

TERBORGH, J (1977)

Bird spp diversity on an
Andean elevation gradient

ECOLOGY 58
1007 - 1019

MEENTS, J. K.; RICE, J.; ANDERSON, R. W. & OHMART, R. D. (1983)

Nonlinear relationships between birds & vegetation.

ECOLOGY 64(5)

pp 1022-1027

MACARTHUR, R.H. & HORN, H.S (1969)

Foliage profiles by vertical measurements

ECOLOGY 50: 802-804

ANDERSON, S. H & H. H. SHUGART (1974)

Habitat selection of breeding birds in an East Tennessee deciduous forest.

ECOLOGY 55: 828-837

JOHNSTON, D.W & ODUM, E.P (1956)

Breeding bird population in relation to plant succession on the Piedmont of Georgia

ECOLOGY

37. 50-62

AMBUEL, B & TEMPLE, S.A (1983)

Area-dependent changes in the bird community & vegetation of Southern Wisconsin forests.

ECOLOGY 64(5)

pp 1057-1068

TOMOFF, C.S. (1974)

Avian spp diversity in desert scrub

ECOLOGY 55: 396-403

ROTH, R.R., (1976)

spatial heterogeneity & bird species diversity

ECOLOGY 57:773–782.

MAC ARTHUR, R H, DIAMOND, J. M &
KARR, J.R (1972)

Density compensation in Island faunas

ECOLOGY: 53: 330-342

Mac ARTHUR, R.H & Mac Arthur, J.W.
(1961)

On bird species diversity

ECOLOGY 42: 594-598

Discredited by (in Tropics)

Cody 1985
Pearson 1975
Orians 1969
Lanjy 1974

GAUCH, H. G. Jr & G. B. CHASE (1974)

Fitting the Gaussian curve to

Ecological data.

ECOLOGY 55: 1377–1381

HAIRSTON, N.G. (1959)

species abundance + community organization.

ECOLOGY 40: 404-416

HECK, K. L. Jr., G. VAN BELLE, & D. SIMBERLOFF (1975)

Explicit calculation of the rarefaction diversity measurement & the determination of sufficient sample size.

ECOLOGY 56: 1459-1461

HOLMES, R.T., R.E. BONNEY, Jr. & S.W. PACALA (1979)

Guild structure of the Hubbard Brook bird community: a multivariate approach.

ECOLOGY 60: 512-520.

ORIANS, G. H. (1969)

The number of bird species in some tropical forests. Ecology 50

783 - 801

PRESTON, F.W (1948)

The commonness, and rarity, of species

ECOLOGY 29; 254-283

PRESTON, F. W. (1960)

Time + space and the variation in species

ECOLOGY 41: 611-627.

DIAMOND, J.M (1973),

Distributional Ecology of New Guinea birds

SCIENCE, 179 759-769.

PEARSON, D.L (1977)

A Pantropical Comparison of bird community structure on six lowland forest sites.

CONDOR 79: 232-244

ABER, JD (1979)

ECOLOGY 60(1) 18-23

II

foliage-height profiles & succession in northern hardwood forests.

VII

ABUGOV, R (1982)

ECOLOGY 63(2) 289-293

Typ limit & phasing of disturbance.

ANDERSON, DR, LAAKE, JL, CRAIN, BR & BURNHAM, KP (1979)

J. WILDL. MANAGE 43(1) 70-78

Guidelines for line transect sampling of Biological populations.

BASTEDO, J.D, NELSON, J.G & THEBERGE, J.B (1984)

Ecologic approach to Resource Survey & Planning for environmentally significant Areas: The ABC method

ENVNMTL MANGT 8(2)
125-134

BERRY, J. K (1986)

J. OF FORESTRY 84: 39-43

LEARNING COMPUTER ASSTD

MAP ANALYSIS

BLOUIN, MS + CONNOR, EF (1985) (I)

BIOLOGICAL CONSERVATION 32 271-288

Is there a best shape for Nature Reserves?

BOCK, CE & RICKLEFS, RE (1983) (V)

AM. NAT 122 pp 275–299

Range size & local abundance
some North American songbirds:
A positive correlation.

BRIAND, F (1983)

IV

ECOLOGY 64 (2) 253-263

Environmental control of food web structure.

BROWN, JH (1984)

AM NAT 124 (2) 255-279

On the relationship between abundance + distribution of species.

ARTHUR A. ALLEN (1961)

The book of bird life

D. van Nostrand Co., Inc.

Princeton, N. Jersey

No 396

J. L. PETERS + SUCCESSORS (1931 – 72)

Checklist of birds of world

Volumes I – VII, IX, X, XII – XV

(Harvard Univ. Press + Mus. Comp. Zool., Cambridge, Mass.)

HOWARD, R & MOORE, A (1980)

A complete checklist of
birds of world

Oxford Univ Press
Oxford pp 701

VAN TYNE, J & BERGER, A. J

(1976) 2nd edn.

Fundamentals of Ornithology

John Wiley & Sons

N. York

pp 808

WALLACE, G. J (1963) 2nd edn

An Intro. to Ornithology.

The Macmillan Co.,
N. York

pp 491

PEET, R.K. (1974)

The measurement of species diversity

ANNUAL REV. OF ECOLOGY & SYSTEMATICS 5: 285 – 307

FRANÇOIS BOURLIÉRE (1983)

Animal spp diversity in Tropical forests

In: Tropical Rain forest Ecosystems

(Ed) GOLLEY, F.B.

ELSEVIER SCI. PUBLISHING COMPANY, Amsterdam

pp 381

(SB)

diversity is a complex community phenomenon, not just a "number" which can be completely "explained" c one / another ~~completely~~ hypothesis

— Terborgh (1977)

spp richness is always correlated
c indices taking into accnt rel.
abundance.

- different divisit as a result
  of structural heterogenit

- Contrary to what happens in
Temp latitudes, I expect
correlation but of high complexity
& no. of bird spp has not been
found in lowland tropical
rain forest (see Orians
1969, Lovejoy 1974 & Pearson
1975)

- Within the limits of a continent
or even within a same large forest
block, spp richness can vary a great
deal according to past history of
existing area — refuge theory.

— Physiographical factors affect D'

— altitude — "Island effect"

GRAINGER, A. (1983)

Improving the monitoring of deforestation in the humid Tropics. TROPICAL RAIN FORESTS: ECOLOGY AND MANAGEMENT (Ed. SUTTON, S.L., WHITMORE, T.C., & CHADWICK, A.C.)) Blackwell scientific Publications. Oxford pp 387 - 395

(see behind)

Areas of Tropical moist forests in 1980 &
average rates of annual deforestation
1970–80

India 16739 × 10^3 ha Total

48 × 10^3 ha /yr.

GODLEY, F.B (1983)

Introduction In: Tropical Rain Forest Ecosystem

(Ed) Godley, F.B

pp 381

ELSEVIER SCIENTIFIC

PUBLISHING COMPANY

Amsterdam

(SB)

- 16 m sq km of potential tropical closed forest lands (world)

Converted to other uses @ 200,000 sqkm/yr. (Myers 1979, see Myers N (1979) The sinking ark. Pergamon press, Oxford)

- National Academy of Sciences USA — says 11 of 1/8th of 1% of known animals in the Tropics have been counted & described

IUCN (1980)

WORLD CONSVN STRATEGY

International Union for the Conserv
of Nature + Natural resources /
United Nations Environmental
Program / WWF. GLAND
SWITZERLAND

SIMBERLOFF, D (1982 a)

Big advantages of small refuges.

NAT. HIST 91 (4) 6-14

SNEATH, P.H.A + SOKAL, R.R (1973)

Numerical Taxonomy

W.H. Freeman,
San Francisco

QUINN II, T.J. & GALLUCCI, V.F (V)

ECOLOGY 61(2) 293-302 (1980)

Parametric models for line-
transect estimates of abundance.

CURRENT ORNITHOLOGY

— STANLEY A. TEMPLE —

The Problem of Avian Extinctions

pp 453 – 485

"Extinction is / inevitable fate of every bird sp // has ever lived or will ever live" p 454

Phyletic extinction – a parental sp replaced by another sp

Terminal – no derivative spp but come to an end.

Taxonomic status of Endangered birds

– Taxa // & endemic to islands
– " " " narrow / confined to scarce habitats
– Taxa " " particularly sought out by human economies
– " " " depend on easily disturbed food chains

families c 10 % / > of 1in spp
end. should be considered esp
> sensitive
families c high % of 1in spp
endangered include - Procellariidae
Anatidae, Fregatidae, Rallidae
these r island forms
Island spp r > ~~[illegible]~~ Vulnerable.

bet 1600 - 1980 92 spp of birds
extinct. 92 % of 1se - Island.

- normally ig have small popl size
even when best condns. Small poplns
r always vulnerable than large popln.
Stochastic event - Human,
Catastrophe - affect - nos, genetic
composition, skewed sex ratio, age
structure
Specialised habitats - end. Podicipedidae
Haematopodidae, Gruidae, Rallidae
Human pressure -
Phasianidae, Gruidae, Psittacidae
disturbed food chain - Vulture
Grebes x introd fish
predators.

RICHARD F. JOHNSTON (1986) (Ed)

CURRENT ORNITHOLOGY

VOL 3

PLENUM PRESS,
N. YORK. Pp 523

MICHAEL L. MORRISON — BIRD POPLNS AS
INDICATORS OF ENVIRONMENTAL
CHANGE — pp 429–451

(SB)

Indicator spp concept —
I' is defined — "an organism /
ecologl constituent so strictly associated
i particula environmental conditions
ll its presence is indicative of /
existence of ise conditions".

— / absolute amt of area
available to a popln defines
its max. geographic distribn
+ all else considered equal,
determines / max no., in /
popln.
— Joint types + reflects in
/ structure of bird communities, but ...
birds + not used in classifying
joint types — bird popln +
in changes probably seldom
useful in monitoring such
environmental variables which
can also be directly measured
using physical + chemical methods.
— a host of non-habitat-related
factors may also directly influence
bird populations.

MAYR, ERNST (1969)

Principles of Systematic Zoology.

McGraw-Hill Book Co.,
N. York.
pp 428

A biol sp is (1) a reproductive
community (2) an ecol unit +
(3) a genetic unit p 26

ssp = 2/> subsp + called
polytypic ssp p 37

sigh - monotypic

— subsp. A subsp is an
aggregate of phenotypically like individuals
of sp, inhabiting a geographic subdivision of range of a sp, +
differing taxonomically from other
pops of sp - p 41

FIELD, J. G (1969)

On the use of information statistics in numerical classification of heterogeneous systems

J. ECOL. 57
(565 - 569)

ARRHENIUS, O (1921)

species + area.

JOURNAL OF ECOLOGY

9, 95-99

FORD, E.D + NEWBOULD, P.J (1971)

The leaf canopy of a coppiced deciduous woodland

JOURNAL OF ECOLOGY

59: 843–862.

FISHER, R.A; CORBET, A.S + WILLIAMS C.B., (1943)

The relation between the number of species + the number of individuals in a random sample of an animal population.

JOURNAL OF ANIMAL ECOLOGY

12: 42-58

JOHNSTON (1986) CURRENT ORNITHO. (contd)

1 ~~qty~~ qnty of habitat available rltv gross ltd to 1 geographic range & nos. of a popln.

regardless of 1 amt of habitat available & 1 scale at which " habitat is measured, birds can't maintain healthy poplns if 1 habitat is not of sufficient qlty. .X.

<u>qlty refs</u> to — any characteristic of a habitat " is essential in some way to birds but doesn't concern 1 actual area/ amt of habitat available.

— Birds respond to weather conditions over time.

— changes in waterfowl activity in response to ~~hunty~~ hunting.

Birds can't be used to indicate
// a specific activity is taking
place. Rather, birds only indicate
// a change has occurred in p 438

LLOYD, M & R.J. GHELARDI (1964)

A table for calculating the "equitability" component of spp diversity

J. ANIM. ECOL.

33: 217–225

(55)

small samples from a random dispersed multispecies assemblage tend to have a higher proportion of rare spp. than are present in the entire assemblage

FAGER, E. W. (1972)

Diversity: a sampling study

AMERICAN NATURALIST

106: 293–310.

(*)

(SB)

— J.H. CONNELL, AUSTRALIAN FORESTS

Trees 30 cm GBH (unpublished)

- in about 80% of the cases rarefaction <u>overestimates</u> the no of spp in smaller samples.

- <u>Simpson's index</u> — is the probability that 2 indivs selected from a sample will be of the same sp.
$= \sum_{s} \hat{\lambda}$ distribution of indivs among the spp.

<u>Shannon-Wiener index</u> — the max value for a given no of spp will be $\ln S$ — when N/s is an integer.

<u>scaling of indices</u> — to compare diff samples of diff N + S

i.e., $\frac{(\text{Calculated} - \text{minimum})}{(\text{maximum} - \text{minimum})}$

if 1.0 = the most
0.0 = the least.

— Standard deviation is also a measure of evenness — giving the weight

- (contd) -

FAGER, E. W (1972)
(cont'd)

& the values depart most from 1 mean.

scaled SD = $\frac{(\text{mean} - \text{calculated})}{(\text{max} - \text{min})}$

i.e. 0.0 — 1.0.

(This is done to correct for the 'going the wrong way'. For more skew the SD will be most)

NM a new index — based on no. of 'moves' it would have to be made to convert observed distribution with any spp into an even one.

$NM = \left[N(S+1)/2\right] - \Sigma R_i n_i$

('it assumes spp ranked in order of abundance)

An even distribution regns 0 moves & an extreme skew distribution regns most moves.
This also goes the 'wrong' way.

∴ scaling is necessary.
scaling as in SD.

Simpson's index is less sensitive.
None of the indices would have been markedly affected by missing or finding all 1 rarer spp.

Prediction by rarefaction is misleading as it frequently overestimates the number of spp that would actually be obtained by random sampling from a community as defined by a large sample.

Overestimate is a fn of both the distribution of nos. of indivs per spp & amount of aggregation w/in spp.

For rarefaction to apply assume
(1) spp & indivs randomly distributed — clumps of same size
(2) distribution of indivs among spp must be very nearly the same
(3) > no. of indivs must always be accompanied by > no. of spp.

HAFFER, JÜRGEN (1974)

AVIAN SPECIATION IN TROPICAL SOUTH AMERICA

(Publication of the Nuttall Ornithological Club, No. 14) Cambridge, Massachusetts.

X. LEIN, MR (1972) A Graphic comparison of avifaunas Syst. Zool. 21: 135-150

X. Bennett, C.F. (1968) Human influences on the zoogeography of Panama Ibero-Americana 51: 1-112.

Amazonia* (S. S. America)

930 spp excluding waterbirds.

650 – true forest birds

ē most swallows, swifts, changing spp, kingfishers.

409 ~~[illegible]~~ endemic spp.

60 — — genera.

[* includes Guyana]

AMAZONIA

Upper

E. Ecuador

SE. Colombia

LOWER

E. Peru

E. Bolivia

CENTRAL

Guianas

S. Venezuela

NE Brazil

Pará

Haffer

p 121 – 177

STUDIES IN AVIAN BIOLOGY
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BERKELEY, CA 94720 USA

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CAMERON B. KEPLER

— FOREST BIRD COMMUNITIES OF THE HAWAIIAN ISLANDS: THEIR DYNAMICS, ECOLOGY & CONSERVATION

STUDIES IN AVIAN BIOLOGY
NO. 9 A publication of the Cooper Ornithological Society, USA
1986.

J. of Natural History (3 copies)

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British Museum (Nat Hist)
Cromwell Road
London, SW7 5BD UK

J. of ETHNOBIOLOGY

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(2 copies of ms sent | about 250 mss.

The Ecology of a tropical forest: seasonal rhythms & long-term changes

(ed) — Leigh, E.G. jr, Rand, AS & Windsor, DM (1982) Smithsonian Instn press. Washington DC

Foster, RB & Brokaw, NVL p 67-81

Structure & History of vegetation of BCI

1900 - 2000 stems > 2.5 cm dbh/ha in old forest & 2600 - 2700 in young

160, > 20 cm dbh/ha old

170 —.— young forest.

Phenology of Rw[illegible] in Panama forest, BCI, Cabeza, H, Cuadros, & lists of trees & shrubs [illegible]

BCI; a 5 ha plot: 20 cm dbh [illegible]
83 - 94% 56 > [illegible]

Zetek - 23 - 24 (1973)

1963 - Drayton 4-5.

- edge of island - Drayton ridge

Snyder - Molino - 2 - 4.

- Drayton - Pearson, Conrad - Zetek - Amo.

- winds from the west.

Old forest - 300-400 yrs of young c. 100 yrs

Map p78 | Both BCI & Gigante - Swamps

SIMBERLOFF D, (1972)

Properties of the rarefaction diversity measurement

AMERICAN NATURALIST

106. 414–418.

E.O. WILLIS p 205-225

Resident birds use young forest > (& also 1 lake shore)

on BCI - [50% of resident forest birds < 10m range [illegible] in forest]

[ECOLOGICAL ROLES OF MIGRATORY & RESIDENT BIRDS ON BCI, PANAMA]

BCI -> common eaters in forest

Migrants & > common in young forest. peak October.

> forest sp & 77/165 insectivores

Biomass of Resident birds on lake & clearings is > (62.1 : 145.4) greater than in forest X.

[Census yrs of intensive study - 165 sp]

41 - old forest (Residents) 30 lake shore

71 - young forest; 10 marsh, the rest misc.

ALLEN KRAST + EUGENE S. MORTON - (Ed) 1980

MIGRANT BIRDS IN THE NEOTROPICS : ECOLOGY, BEHAVIOUR, DISTRIBUTION, AND CONSERVATION

— SMITHSONIAN INSTITUTION PRESS, WASHINGTON D.C.

WALLACE, G.J. (1963)

An Introduction to Amphibology

2nd ed.

MacMillan Co., N York

Apr 4 91

orders & fls follow

Wetmore, A (1960) a classification for the birds of the world.

Smithsonian Misc. coll.

vol 139: 11: 1-37

(p 387—
wallace)

LEIGHTON, M & LEIGHTON D.R. (1983)

Vertebrate responses to fruiting seasonality within a Bornean rain forest: TROPICAL RAINFOREST: ECOLOGY & MANAGEMENT (Ed. SUTTON, S.L., WHITMORE, T.C. & CHADWICK A.C.) pp 181-196

Blackwell Scientific publications. Oxford.

(see below)

Lipid rich capsular fruits
– Myristica, Dysoxylum, Aglaia, Macaranga;
Lipid rich drupaceous fruits – Polyalthia
sugar rich berries – Ficus, Rubiaceae
Melastomaceae etc.

Birds " eat lipid rich fruits –
hornbills, <u>Ducula</u> <u>aenea</u>, <u>D.</u> <u>badia</u>
hill mynas, barbets (Megalaima spp)
sugar-rich fruits (smaller bodied)
Fairy Blue bird, bulbuls, Dicaeum
flowerpeckers.

- seed predators – <u>Treron</u> pigeons
Lorikeet. Pigeons > on seed + flesh of ripe figs.
- hornbills breed in January – May
during period of fruit availability only.
- birds " emigrate ē shortage of fruits
hornbills, Imperial pigeons, hill mynas
- hornbills rely more on Meliaceae + Myristicaceae
- barbets + Treron pigeons > on
figs.

PRESTON, F.W (1980)

Non canonical distribution of commonness & rarity

ECOLOGY 61(1)
88-97

(*)

(SB)

- In the tropics the distribn of birds is log normal.

- The total no of spp present in a universe is $N = \sqrt{2\pi}\, no\, \sigma$ Theoretically where 'no' is the height of mode in a truncated log normal distribn. σ standard deviate (see Gauch & Chase 1974)

- In tropics > spp < indb
  Temp > indb < spp.

- no of indb = $(no \text{ of spp})^4$

$\sqrt[4]{no \text{ of indb}} = spp$ see Preston (1979).

- canonical distribns & equilibrium states.

PRICE, T (1981)

The Ecology of the greenish warbler *Phylloscopus trochiloides* in its winter quarters.

IBIS 123(2)

pp 131-144

(*)

(I)

RAFE, R.W; USHER, M.B, JEFFERSON, R.G

(1985)

JOURNAL OF APPLIED ECOLOGY 22, 327-335

Birds on Reserves: The influence of Area & Habitat on species Richness.

Leighton & Leighton (1983) Contd.

- the sizes of hornbill grps is influenced by the distribution of the fruit patches — Meliaceae & Myrtaceae.

- frugivorous birds are nomadic

LOVEJOY, T. E 1974

Bird diversity + abundance in
Amazon forest communities

LIVING BIRD

13: 127–191

✓ KARR, J.R., SCHEMSKE, D.W., and BROKAW, N. (1982)

Temporal variation in the understory bird community in a Tropical Forest. Ecology of a Tropical Forest: Seasonal Rhythms & Long-term Changes (Ed. by E.G. Leigh, A.S. Rand, & D.H. Windsor) pp 441-453. Smithsonian Press Washington DC. USA.

GOODMAN, D. (1975)

The theory of diversity-stability relationships in ecology.

QUARTERLY REVIEW OF BIOLOGY

50: 237-266

DIEDERIKS, R (1979)

S.G.P. SACLANT Graphics Package user manual.

University of Cape Town,

CAPE TOWN.

— a computer program which fits an approximate contour surface to a set of data points using least square polynomial analysis.

SMEDES, G.W & HURD, L.E (1981)

An empirical test of community stability: resistance of a forbing community to a biological pest-forming disturbance.

ECOLOGY 62

1561 – 1572.

HUSTON, M (1979)

A general hypothesis of species diversity

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