

I AM A TREE

I am a tree

So straight and free

All branches & twigs & trunk am I

But I stand alone

Bare to the bone

I am a tree

So tall & free

Who will come & stay with me?

We are the roots

From us will sprout the shoots

We dig deep & wide

Spread out on every side

Under the earth we hide

Food & water we gather it all
To help the tree stand strong & tall.

We are the leaves
we dance in the breeze

So many are we, different ones for every tree
Some long, some short, some large, some small
Some yellow, some red, some grow, some fall
we cover the branches & twigs like a screen
making a beautiful dress of green
To help the tree to breathe & dine
There's lot to be done

But for that we need the sun

we are the insects
we live on the tree

we crawl, we creep, we hop, we fly.

In cracks & hollows, some damp, some dry.
we take our fill of fruit & flower
leaf & bark
we lay our eggs & spin our cells
If you look hard you'll see our mark

we are the birds of different feathers
we flock to the tree in all kinds of
weather

we stitch or weave, or build our homes
From twigs, on branches, in trees with
holes

we coo, we caw, we chirp, we chatter

we rest, we roost, we flutter, we
patter.

we are the children

we love the tree

In village, in city, town & country

It gives us shade & fruits for free

It plays with us when we make believe

That we are a squirrel, a hawk,

Tarzan or a bee

up we go on it, one - - - two - - - three

Look at the world like a monkey!

A tree I am

So happy & free

So many friends

Are part of me

They make me a world

of colour & sound

we help each other

From sky to the ground

I was a tree
once proud & free
I lived, I grew, I got, I gave
Some rain I ^{or} brought, some soil I saved
I was a world for living things
I am now a stump, just left to dry
cut up for wood, oh now I cry
A table, a chair, a window, a door
A pencil, a paper something more
A bonfire has been lit of me
I that was a tree
once of tall & free.

NOTES FOR Will

1.3.92

(1)

① Migrate + linkage bet body + wing areas + flight energy

[Ref Peris, CM + Birkhead, P.R (1983) AVIAN ECOLOGY
Blackie, Chapman + Hall, Uda, p221

earliest obsn - 600 BC.

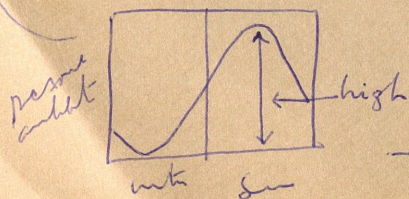
Prophet Jeremiah (in 8:7) writes: "even the stork in the heaven knows her appointed times; +, turtledove, the Swift +, Plover observe the time of their coming".

↳ later 300 BC Aristotle - ruff birds - "treads and legs people believe" "birds go under or to moon!"

- [Habitat] - Canyons - cheap to see

(4) Ants can support large no. of animals during summer
↳ productive
winter too hard - no food.

Birds of the Arctic have 3 options - migrate - not hibernate - scarce die - ✓



- spp adapts to utilize 1st resources + more out will be at a advantage

For 7 nights migrate - genetically
~~Partial migrant~~ - Born flycatcher - ^{controls} ecology is
 seasonal for food lost.
 - Perinty - with tentacles - Shikar, egg drops
 leaf walls
 7 person habitat - arthropods - large
 into sp. flock -
 1000s -

Other for 7 nights:

- (1) local - Antbirds, humbirds, flycatchers
- (2) Partial - Born flycatcher, Shikar - ♀s + young
^{the majority of nights}
- (3) Imptu - lack of food / where seen you to
you
 some years - densely canes
 predators habits/flycatchers
- (4) all-included - wights - Bhunjia partly - rain
Hindya Cross . . .

Bird - mobile X

work - busy area vs writing area

(2)

XEROX fig 9.1 p 187

definite DAVID LACK (1945)

" a regular, large scale - shift of 1 popl but
a restricted busy area + a restricted writing area "

Spp that migrate Swallows, warblers - (Int. com.)
waders + waterfowl - hard with
maritime
tropics have fewer - water birds
resident.

- South to north in latter hemisphere - fewer spp
Pegus, Skuas etc. less land birds / land area
Shearwater
Swifts part of Pomerania → Australia

Palaearctic - 589 busy birds - 40% leave for the south
Canada - 160 - a - 75% - a -

- birds do not seem to compete i resident

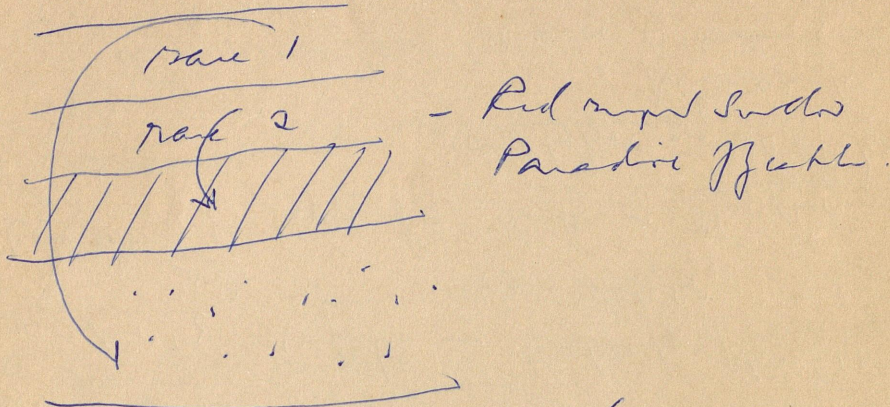
Studies in office Sept 11 one in 15 birds is
a migrant - hence competition is <

males stay close to buddy groups - easier to
 find buddy tents.
 was with birds (least waterfall) but no
social birds dig with - each captures

Comps is, the.

Leap-frog nipote.

Species X



not really compete - neither row have >
 non-buddy time + can afford great
 distance of nipote.

- in Calidrome woods - long distance nipote
 X. are non-territorial - single pair carry for
ATrip

INTERSPECIFIC

- ① DOMINANCE + INTERSP. TERRITOREALITY
- ② FEEDING SPECIALIZATION - N. American Warbler
 Lark (Jamaica)

eg negative - cost of flight < benefit of
juste bulk sum.

one roads - dimpled in the trap areas - tundra.
largely dept of water // is covered by water.

juste improve isolate > diapause > more
reason + more niches dig, big beam

- body habitus ^{for food} + food in the north -
- of food - vegetation / fats - a perhaps region
deeper water, unfeasible for body.

- The timing of flight is determined by the length of the
^{day}

- ^{of winter} Passives ~~but~~ limited by food - water
- water + stuff - food + habitat

(2) BREEDING ECOLOGY

- the act of being behind offspring to preceding
generations is 1 unit X. aspect in any animals
life.
- No relate from those off inds which produce
the largest no of offspring.

(3) Based on coming theory - 'name riches in a field of
misfits'

(6) geographical spots due to intra-esp competition . ?

Budy - 2 x. copulate

Budy early — Time of budy — budy season
rate of removal — clutch size

budy stage > additional food.

maximizing offspring — ① budy early } v. select.
 ② > clutch size } det. in.

— Budy Season : The time when a B. has
eggs or yf in nest.

For a given sp it is "the time (average)
at which each female laid its first egg"

— budy season coincides to food availability & stf
timing is difficult (ultimate factor)

— gonad development
nest build
egg lay
incubate } 3 weeks } 2 months.

— Day length is 1 > st - x. environment
(Proximate factor)

Budy — proximate — D height — last 6 hrs of
 ultimate — food availability — nest build etc.

some birds breed earlier; How?

(6)

Body wt / chuk size:

Pupis = 1.5% orshka 10%

moths: 60%

the total = 130%

Food reqt: — body size
 \ chuk size

chuk size

Small birds related by chuk
Large birds small.

— egg laying may be advanced by 78 food availability (experimentally)

— ^{large} Central birds breed in food reserves — Snow goose
small birds — Red billed Quail — Rains.

Length of body span:

— Right brood — Mojito

— 2 / rose — Spanner, Spotted doe

determined by - ① body heat - Spotted due, Sp -
- Tropical source is
60° F.

⑦

② Availability of food - > food - Banals

③ Duration of parental care - small parents
12-14 days in nest
+ a week after -

Wading albatross
1 yr for ring check
birds attract sp. - one month feeding
7.5 in nest
3 months after
~~feeding~~ fledging

④ Cost to parents
predators, mortality
migration etc.

Food availability - egg fronts
- chicks

influenced by - geographical position - weight - body
- temperature all year in
- humidity tropics
- High altitude
human habits
bird stress
-> body. Baylon fly then
later
subis big - feb

age 7 ♀ - older female but eat more
than big for first time.

Chick size: \leftarrow 3 factors here

(8)

Pelican 3 1-2 eggs

Duck 7-12

Avil, Munt 8-18

Crow 2

Plover - 2-5

Big in body wt +
Chick size here for
above.

P6, P10, 11

Chick size is determined by

- ① If can adequately incubate - no evidence.
- ② Physiologically capable of - no.
- ③ to compensate for diff adults - stable popl - Wynne-Edwards
- ④ minimize no of small birds to maintain - alternative - lack of accept.

Alvop
P 78 fig 5.1

Chicks & food
 \leftarrow probability of each
chick being

Lack - Starlings range
bird size 5

XEROX

~~TP 187 } AVIAN ECOLOGY~~
~~78~~

~~P 120 - BIRD COMMUNITY Wrens~~

P 125 BIRD COMMUNITIES II

P 471 - HABITAT PREFERENCE

Food benefit

Europe left - clutch of 2/3 (9)

2 ideal in poor weather

as if are aerial
feds -

3 in good time.

At the rate - more success. Pits - large

clutch 8-10 eggs

< food back to size rule +

< change of survival.

Criticism

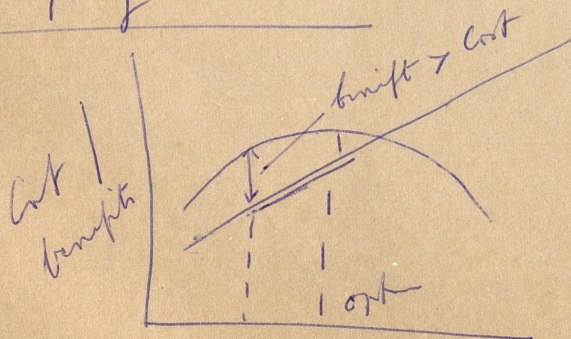
① The nest com clutch size does it - X
produce 1 largest no of surviving young

each of her it an optimum (experiments)

which is dictated by 1 local environment.

here apparently large clutch > success.

Model of birds



Charnov & Krebs

(2) Any clutch size $<$ nest volume is nest production - (10)

Passive 70-80% failure due to predation
larger birds $>$ vulnerable than smaller.

Passes (1) are hungrier - noisier

(2) more frequent visits by parent

(3) duration of lay is short for smaller
clutch have less time in

In summary
(Take it over
to p8)

(1) adult survival

(2) Production

food availability

} diff in clutch
production.

\rightarrow my input for Personal -

just w/ birds.

larger birds $>$ produce.

Lack shows that chicks - like mothers have
large clutch size

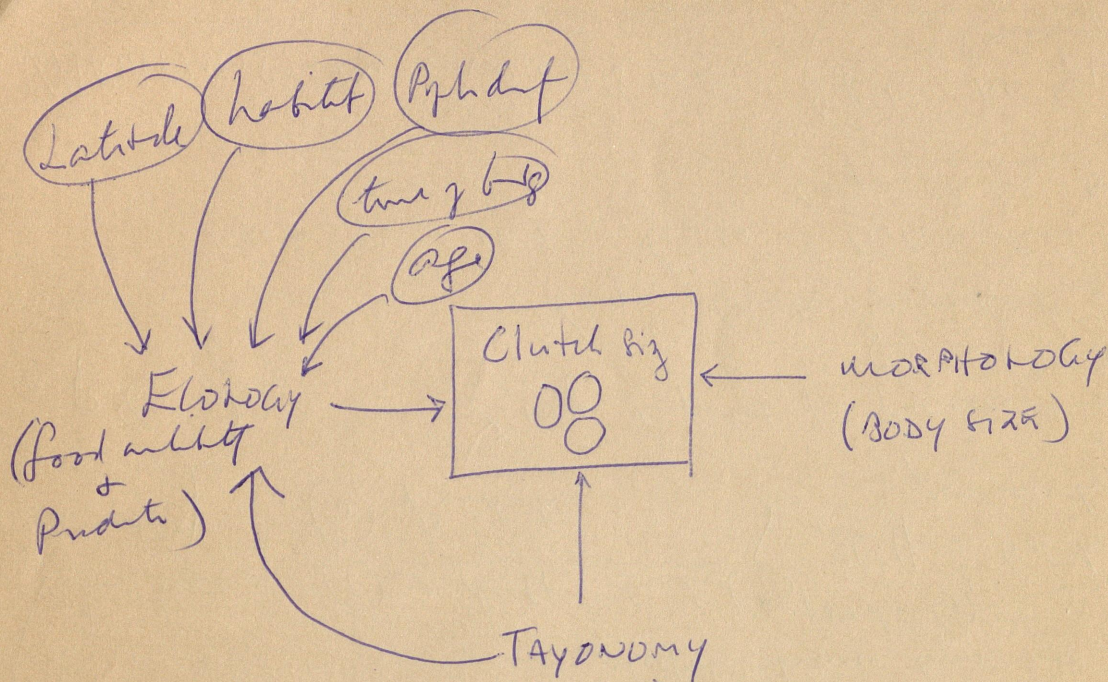
VARIATIONS IN CLUTCH SIZE.

Bfth - Ferry }
- Tawny }

Birds " can find food at close distance $>$ eggs than those that

work far away

(eg) Lyalls or Pan vs albatross, Peter
small birds of my vs meters



ANIRICIA PERIOGICAL
 Hibernation, open water

Swamp

Exhibiting &
 some inheritance

11

Other facts - ① Taxonomy

- ② body size - small birds
> egg, large eggs -
Thom under!

possible - Surface/water ratio - small eggs
by > invertible & actual
circumstances.

Energy - latitude
habitat
prey diet
time of day
age

} p8

See above

Latitude - large chicks > higher latitude
- > summer day by the field?

↓
more productivity

poles - 24 dy light at
brady.
- north poles have large
chicks & J
- south - night. - reversal?
no - > is north!

Habitat Pinned fish < the Savannah > forest

[Food per bird > 5] milk 90% of
mortality.

Perch diet:

in sp diet involves relate to ^{adult} size

- relate to < tenity & food availability

(eg) Lake bream & some spp.

Time of season

late birds < early birds

- less food
- shorter time of lay

age

of birds & other birds

- less experienced.
- late breeders - less successful - mostly nest.

AVIAN COMMUNITY ECOLOGY

- SP DIVERSITY
- COINDS
- COMPETITION

- Population of various spp - community. (Practical)

Ref: The Ecology of BIRD
COMMUNITIES

JOHN A. WIENS

Vol 1 + 2 (1989)

(13)

Carling Trust Pr.

COMMUNITY ECOLOGY

- identify patterns in characteristic natural
assemblages of spp, identify what has
caused these patterns, + derive laws general
by one.

Max Atwater: "any set of opinions amounting
more or less to a theory + about which it is
certainly to talk"

"^{with regard} coexistence of spp - its by time + space"

Communities can be defined by habitat - forest, etc

— " — life forms — trees/herbs

— " — Taxonomy — birds/lizards

- No one method is totally superior
 - A combination of all methods is the ideal in a hypothetical way.
 - Solution of method \rightarrow Objectives.
 - Lists of SPP - TRANSECTS / PT. COUNTS
 - PIONEER VISITS are used to divide lot 1
 - PT. CT. are better to decide ² animal trends
 - Since as it can be worked
distance / area + time are considerable
inputs / sampling for
annual trends - 500.
 - Ratio scale / obs -
Spt map \times 40 ha per.
-

Clements (1916) — discrete, repeatable assemblies 4

Yeom (1917, 1926) — random coincidences,
due to similar initial
prey.

→ Clementsian — 1940-1950 lost popularity
Yeomian → > popular → > qualitative
analysis.

This conflict did not affect birds as they
were often ~~superimposed~~ 'superimposed' on
original units defined by Clements.

1950-1960

DAVID LACK + MacARTHUR Pinker
transfer BCF.

↓
- X'ce of interspecific competition.

morphology diff but co-existence exp

↓
Bent on
Popul evolution
influenced by
Hutchinson +
Lack
He felt that
units were really
again

Competition Course (1934) Lab report.

3) POINT COUNTS (TRANSECTS at ²⁰⁰⁰ ~~2000~~ _{SPOTS})

① Pt. cts. cont. dist. a. width

→ Sp. richness + total counts

② Variable radius pt. cts. - distance estimate

③ fixed radius pt. cts. -

④ Circular plots.

— Needs several observations at 1. Same time or extreme time being.

④ Other methods

a) Captures - recaptures - mist netting
rate of recapture / number birds.

- common & clear people
- extraordinary time costly
- biased to certain species

b) indirect methods - mean of data

- Nests - Time costly.
- Tracks
- feces
- etc.

c) Aerial cts - large birds

d) drupate cts - porch trails.

MACARTHUR APPROACH

(15)

— Question + models to answer them,

- ① To do science is to search for repeated pattern, & not just accumulate facts
- ② look for generalizations
- ③ pattern of events are results of deterministic process.
- ④ 1st pattern of events results of causality
- ⑤ Events + pattern are close to equilibrium.
- ⑥ The path of event are naturally selected + here optimal
- ⑦ Insights are guided by theory - predictability
'facts must be led by theory'
- ⑧ Natural exp't - Comparisons in nature.
- ⑨ Phenomena tested in selected examples - those Exp'tal manipulable not necessary.
- ⑩ strict methodology was not adhered to though strict mathematical test was practiced.

QUESTIONS

- ① What factors determine which to build & which to build of event exp't?

variable distance in test $> 8t$ can mean

Sample

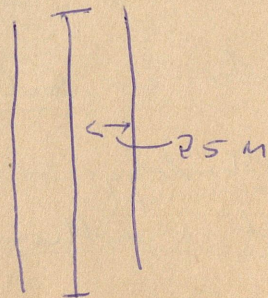
- ① bins ~ 1 line a distance $\approx p 1.0$
- ② all bins \times width ≈ 1
- ③ bins dist more in response to 1 bin
- ④ no bin is center $>$ the one
- ⑤ distance \times angle \times count \times mass
- ⑥ distance \times width \times count (when data is to be plotted)

all except ② are said to be variable

⑤ bins dist \times width of the dist estimate is variable in fact
Copy to set up.

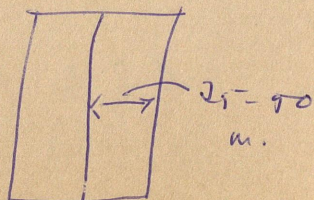
FIXED DISTANCES

(Others by line is
variable distance)



STRIP

Take as a
N.B. \times
area is
not



full length are
from next
if distance is not
not be same but be
E.g. 1, 2, 3

- ① How do diff of bird counts relate to 1 standard diff of habitat?
 - ② What happens when 2 spp compete in 1 habitat?
 - ③ What determines 1 no of spp in a habitat?
 - ④ _____ on an island? (16)
 - ⑤ _____ mainland/continent?
 - ⑥ Are the regulations in size distribution spp in counts?
 - ⑦ Are the rules // describe 1 process of diff assembly?
 - ⑧
-

CONTROVERSY: 1975

- ① COMPETITION?
 - ② ARE THERE ANY COMMUNITY PATTERNS?
 - ③ COMMUNITY EQUILIBRIUM?
 - ④ GENERALIZATIONS?
 - ⑤ DETERMINISTIC PROCESSES? CHANCE?
 - ⑥ THE ROLE OF THEORY?
 - ⑦ HOW TO DOCUMENT PATTERNS?
 - SPATIAL SCALE
 - METHODS.
-

IC Consectin florby

Wrens (1969) Goshwits.

- Sign for in flurb - with points, ~~insects~~
lie of flight + points of
only a note
a snap
- repeated ~ ~ ~
20 times

Aspects ① of flight, it moves up + flut
& right aspects the spot way.

II TRANSECTS

- line transect east distance
- Variable distance line transect
- fixed distance line transect
- steps transect / poll transect.
- > flurb the spot way.
- was outside body form
- guide + flurb are not mixed.

line transect east distance

- sign walking on a line a narrow bias -
with line. Don't want a net white
- sample all four points equally distance -
all depth.

unplan transect survey.

Spp dist - noy sps - equilibrium
 - abundance - dist - common
 - rare

Hutchinson (1959) attributes many facts to it

① Species-area relationship -

(27)

$$\begin{matrix} \text{no of spp} = S \\ \text{area} = A \end{matrix} \quad \approx \quad S \propto A$$

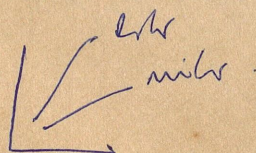
- S/A relationship is "one of the most striking facts in ecology".

1920s pl ecologists state following

- exponential model = $S = \log k + z \log A$
 k is intercept or constant
 z is the slope.

- Power function = $S = kA^z$ = $\log S = \log k + z \log A$
 seems //, with is in equilibrium:
 a good fit = equilibrium.

In theory $z = 0.25$ though in practice it
 is bet 0.15 - 0.39



mailed - 0.12 - 0.17
 Lohr - 0.30 - 0.35

the z is sensitive to size/area

4) Accurate estimate is made of μ in π of μ
in lab chart

5) Birds are empty π charts.

10 2 If spst very to bird seen
not sites of unfertilized birds, quiescent birds,
birds poorly ones in at side in tentacles, &
for those π tentacles large than the plot itself.

- But for precision - that sig π in tentacles
- it mixes up birds & floats.

How if done properly, the best estimate
of densities -

One subunit π should be 40-100 ha of ground
walk + 10-30 ha of cloud walk.

6) Total Mapping;

following class - band birds - Pointers
horn ray.

will sign type in a the area

if done at busy time - best estimate

and are complete

i.e. μ is stable on 1 π of one + two.

① of spst very.

- ① S/A but an island — area + distance
- theory of island biogeography.
- ② Habitat — > area > habitat diversity
- ③ spp difference — diff slopes for diff fauna in time
relates to fauna size
- ④ Parasitism: a random set settles a cat island
> kills a large island — > spp.

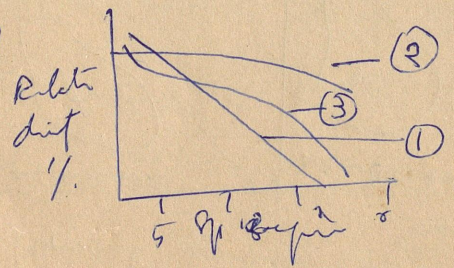
PATTERNS OF SPP ABUNDANCES

— spp differ in their abundance in communities

- ① geometric series / log series — niche preemption (Competitive)
- ②, Randomly distributed / random spec — non overlapping niches — random spec (MacArthur)
- ③ log normal — a few very common / rare spp;

1 out of 1000 about.

Figure in P120

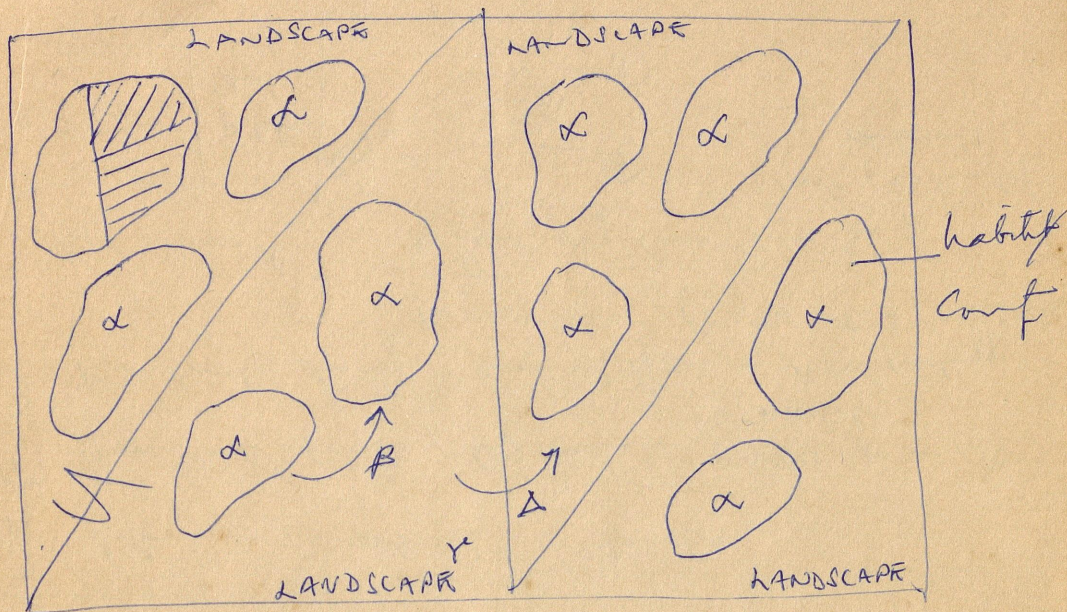


log normal = equilibrium; deviate in disturbance

REGION - ORIENTAL

Tropical

Subtropical



←→
climate / Geographic shift

List the 7 here

delete drapil

SPP DIVERSITY — S spp richness

(19)

← index — S + abun...
 $\ln p_i$ or $\ln p_i$

SHANNON-WEAVER — $-\sum p_i \ln p_i$

p_i is the proportion of i^{th} spp in a unit
is very sensitive to rare spp & Sample size

Scales of diversity:

Habitats — Continents — α — \bar{c} habitat

β — β habitat

γ — landscape

(arbitrary)

Whittaker (1977)

- ① microhabitat — \bar{c} in homogeneous community —
point diversity / internal alpha / subsample diversity
- ② intracommunity pattern — internal beta / pattern diversity
- ③ a homogeneous community / habitat — α diversity / \bar{c} habitat diversity
- ④ between habitats diversity / β diversity \bar{c} in landscape diversity
- ⑤ landscape — total — gamma diversity
- ⑥ change any climatic / geographic gradients — delta diversity
- ⑦ large geographic area — regional / equatorial diversity diversity
(see above)

- Many of these birds can be studied a count
- gull - large flocks & small flocks take care of
 > it birds / at least mostly in
 equal.

METHODS → one basic concept - ①

I MAPPING: A Process

I a) SPOT MAPPING / TERRITORY MAPPING

first (1944 Kerdeligh)

Official method of International R3 Comm
Council

- Plotting location of ind. birds on gridded maps of 1 PLT.
- Fresh spp
- Outline of cluster of species centers.
- no of chts x mean no of birds / chrt - total
 number of birds / PLT

assumptions

- 1) Popls of target spp are stable & birds stay in location from day 1 to day 2
- 2) at least one bird / territory moves around frequently enough to point up to its location.
- 3) Movement of territory boundaries are unimportant.

TROPICAL

TEMPERATE

- 1) > spp diff
- 2) greater alpha diff
- 3) > B diff

- < spp diff } forest
- < 2 diff } areas of
- < B diff } comparable size

4) Pteris ~ savanna

5) Tropical glaucous (Pteris ~ temperate forests)

6) Tropical forests & lower

> lower (apparent diff in drought not mtd)

7) < waters

> waters + wetland.

Tropical high diff (highly broad as neotropics)

- 1) > age + stability
- 2) greater structural complexity habitats
- 3) greater rates of speciation / less extinctions
- 4) more niches / more guilds
- 5) higher predation rates
- 6) narrower niches of spp - inhibition woodpiles . . .
- 7) Right party of guilds - pollinators etc . . .
- 8) unique habitat types

2) Effects of habitat

- (1) Sp. create of water
- (2) Effects of air - similar to. on but land again
- (3) Noise - stress, cicada, vehicle.
- (4) Power

3) Effects of birds :-

- 1) detectable - makes of the few; time of day; season
- 2) movement is more to down
- 3) density - opposite trends / not explain
- 4) flocking behavior - saturation / scavenging - Conf is difficult
- 5) sound / song lyrics - push of a sp. > sing from the city
HIS - all counts for.

4) Effects of weather - Birds

- 1) rain
- 2) wind
- 3) temperature
- 4) fog
- 5) low air
- 6) relative humidity

5) Effects of sky design :

- 1) site relative
- 2) distance of sites
- 3) plot size / Point lyrics
- 4) timing
- 5) direction
- 6) supply of space

HABIT — SP DIVERSITY

(21)

FHD vs BPD - MacArthur — Pugnate axes
but not in, types.

Other aspects like Tree drift etc. . . .

Canopy drift

Tree spp richness

Canopy ht
Vertical structure.

May rise faster as intercalates
but not true for entire BPSD

(es) Light — —ve

a variable canopy \rightarrow PSR —
Wght, Paan.

James & Wain in Nairobi for 11

BPD was not light \rightarrow canopy ht.
 \rightarrow PSR
 \rightarrow Tree drift

Max drift was in Conifers —

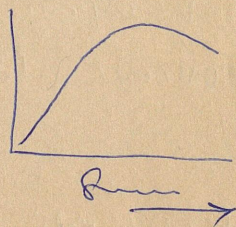
SP DIVERSITY infer

by ① Successional stage BPD

② seasonal

③ Some post-islands

④ History — Pleistocene glaciates



ASSEMBLY RULES. DIAMOND
(1975)
(ISLANDS)

- MANY POSSIBLE COMBINATIONS OF SPA IN NATURE BUT ONLY A FEW REALLY EXIST.
- PERMISSIBLE COMBINATIONS - RESIST INVADERS THAT WOULD TRANSFORM THEM INTO A FORBIDDEN COMBINATION
- A STABLE COMBINATION ON LARGE SPA RICH ISLAND MAY BE UNSTABLE ON A SMALL SPA POOR ISLAND
- ON A SMALL ^{OR} SPA POOR ISLAND A COMBINATION MAY RESIST INVADERS IT WOULD BE INCORPORATED ON LARGER ^{OR} MORE SPA RICH ISLANDS
- SOME PAIRS OF SPA NEVER COEXIST EITHER BY THEMSELVES OR AS PART OF A LARGER COMBINATION
- SOME PAIRS OF SPA THAT FORM AN UNSTABLE COMBINATION BY THEMSELVES MAY FORM PART OF A STABLE LARGER COMBINATION
- SOME COMBINATIONS THAT ARE COMPOSED ENTIRELY OF STABLE COMBINATIONS ARE THEMSELVES UNSTABLE.

Max Marm - JAKSIC (1981)

c) Survival prob / Habitat suitability -

one / > App
assumes if all spp are equally detectable in all
hab.

d) Densit. dopt. resid. dist. effects

Dist. dist.; Inter-specific - counts - Thanks to empty faeces.

e) App. densit. :- it assumes that ^{rel. densit. of} all spp are equally
means = 1 same ratio scale.

3. CONFUSERS - Total count / absolute

Special cases as with bsp b/s

$D = N/A$ D is dist. N total b/s A area.

pts is num of b/s / 40 ha \approx 100 ans.

a) Appl. fluctu. :- Appl. dynamics

b) Trophic dynamics :- energy flow

BIASES IN COUNTING

① effects of sound :- a) anxiety - vocal / activity +

b) distraction - fatigue / motivation

c) response -

d) habit -

e) no. of sound.

* b/s rj at 3-6 kHz

freq of tone above 40 failed to

met 1 20-dB
etc

Guilds ^{MaMahon -} JAKSIC (1981)

(23)

Count guilds
(area taxa)

assembly guilds
(\bar{c} in taxa)

General aspects

guilds classify as the subjects
- self diff - network, interaction, origin, time.

21 studies bet 1971 + 1986 (15 yrs)

Diet = D - 21

Body size = B - 12

Long tract = L - 16

Residency = R - 4

Nest site = N - 2

body size = S - 2

Long tract = V - 1

Rest tract = P - 1

Habitat = H - 1

a priori
first year
1618

a posteriori
grey bowl
in statistics

\bar{c} in guild: - differs in the world }
- time of day
throughout - lat & forest

Asst guilds - varies in altitude, habitat - gradient
(eg) mixed forest & open forest edge forest.

SCALES OF ABUNDANCE

- ① NOMINAL - PRESENCE/ABSENCE
- ② ORDINAL - RANK THEM - COMMON/RARE (Least X)
- ③ RATIO - RELATIVE ABUNDANCE -
A is 70% as abundant as B...
(Assume all pop are equally detectable)
- ④ ABSOLUTE - Total count / corrected counts to a known coefficient.
Possible of a total - trap chains

X: STUDY OBJECTIVE → CHOOSE APPROP. METHOD

- ① LISTS - Nominal scale - *Project, pop with no + by % source*
 - ② COUNTS - ENUMERATION OF BIRDS \bar{x} AND PROBAB (Ratio scale)
 - a) Small Popls fresh - *on a pop* - *Count is not upl.*
 - b) Scarc - *same // detect is eq of all from*
- Notes:*
 - Better (circled around counts)
 - % of birds/cats (large no of sites)
 - Confiscatory - more reliable & cheaper (pop with drift H' results variable)

RIGHT (1957) (Cantel 1962) 2 in a few others.

COMPETITION
1:1
difference - no system + Cantel 1962

- mainly adyt habit

↓
Parula photo

123 (51%) of 1 white capped birds
on parula in same part of 1 mile.

COUNTING TECHNIQUES

BIRD COUNTS — PRESENCE - ABSENCE
ABUNDANCE/DENSITY

- DENSITY EST. NOT OFTEN NECESSARY — COSTLY
- MOST METHODS USED FOR DENSITY EST. INADEQT FOR STUDY

BIRCH (1957) Comb 1 abn 2 in a box defn.

COMPETITION — EXPLOITATION — FREE ACCESS
— INTERFERENCE — ACCESS DENIED
— SOME INDUS OUTSIDE

Criteria criteria for establishing 1 sp. of comp.

- ① The usual pattern = hypothesis/Prag (most common)
- ② Sp. not overlap if not, part comp.
- ③ Intersp. compete in 1 sp. leads to niche broking
(4) Bits of sp. of comp.
- ④ No one of more by one sp. not affect, available to other sp.
- ⑤ One or more sp. not be - of affect
- ⑥ Alternative hypothesis to be tested, if not explained.

FIELD TESTS

(25)

- ① CIRCUMSTANTIAL EVIDENCE
- ② MORPHOLOGICAL EVIDENCE
- ③ DISTRIBUTIONAL EVIDENCE
- ④ NICHE OVERLAP
- ⑤ NICHE SHIFTS & DENSITY COMPENSATION
- ⑥ AGGRESSIVE INTERACTIONS

(Xerox) pg 3.8 / p 125

(ASSEMBLY ROOMS
HERE)

Red date bird 1600 - 1980 (EXTINCT)

- 30% Habitat loss
 - 91% into egg* } all three self
 - 25% human take } effort, time, etc.
- * large - into s

Chlorophanes

- 80% habitat —> set in Tropics - Neotropical + Oriental
- 44% human take
- 35% into egg
- 12% other factors

Habitat: Forest decline - Hydroelectric project.
Fog forest - water gaps / plantations.
Mudflats - water depth / forest decline / Estuarine depth.

DRINKING WITH IT

PROXIMATE FACTORS

- ① > Percent water intake — more rapid
- > capture by & release
- > Survival by > food
- > Survival by entirely natural means

Ultimate factors

- Control unity
- Control other limit factors - predict etc., genetic control

HABITAT SELECTION

man as limit - similar space habith

later - Parasites - Spots - Copious sp

Determinants of Habitats; Habitat "Spatially continuous vegetation types" ^{as opposed to}
① mobility $\left\{ \begin{array}{l} \text{body} \\ \text{food} \\ \text{intensity} \end{array} \right.$
② species size / loc
③ larger than plot +
④ is physiologically distributed
in the habitat types"

detours determined by ① morphology

- alternately } ① behavior
 } ② ability to find food
 } ③ shelter

- Proximity - ① structural features of landscape
 - ② food / water availability
 - ③ presence of other spp.

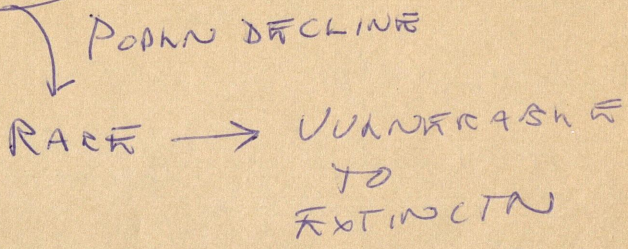
Habitats - fragg substrates

Habitat selection - for energy + shelter

- ① adaptation - bill length diff in tits (Parus major)
 - longer + decider forest always!

PROCESS

SPECIES



POPULATION DECLINE

PROXIMATE CAUSE

ULTIMATE CAUSE

- reduce rate of recruitment (1)
- " " survival (2)
- reduce in both (3)

recruitment

- (1) reduce in reproductive birds - woodpecker, no ability of nest hole.
- (2) reduce in clutch / brood size - egg damage in birds of prey.
- (3) reduce in reproduction success - nest predation / suffocation

Other factors

Age structure of males }
 Sex ratio - excess loss of males / ♀s.

ULTIMATE CAUSES - Natural disturbance
 - Human.

Habitat loss

① Conif status + dynamics

(27)

habitat is + substrate - > growth

② Urban:

more from park - > conifer deer forest.

Habitat plots + species

- Hilly + heath - forest specialists but not
- lowland + heath - unstable - estuaries -
- disturbance + habitat - > sub ^{low} _{high} ^{low} _{high} -
- large trees high altitudes - insects
- diversity

KNOWLEDGE

① HABITAT TRACKING + RANGE EXTENS - CATTLE RANGE LACKS . . .

② BREEDING vs WINTERING -

diffs have to be accounted in time

- ① Morphology
- ② Behavior
- ③ Physiology

Workshop

In relation large winged adults of migrants } possible
discovery in forest. } select!
Copy & clip

③ EXOTIC HADS - PINE, FRAGMANTS, URBAN

fungus	woodpecker (no)	omnivore/insect
	Mammals of	Squirrel/deer/hare
		- fungus

Flora Society

— Sites (54% of 240 in 130 are always).

— Geographical regions

— Palearctic	—	21	(9%)
Neartic	—	20	(8%)
<u>Mesotropical</u>	—	47	(20%)
Ethiopian	—	5	(2%)
Oriental	—	12	(5%)
Antarctic	—	21	(9%)

of the 110 Continental sites

TUNDRA 5 (5%)

TEMP FORESTS 19 (17%)

GRASSLAND/SCRUB 31 (28%) * This ...
 'w' also
 'P' also

Dents 4 (4%)

Tropical forest 43 (39%)

Agentic/prairie 25 (23%)

Shrub > is in tropical forest.

1966 8 (17%), 1979 43 (39%)

LOCAL FACTORS

(28)

- ① SITE FIDELITY — LEAF WARDERS WINTERING
BIRDS RETURNING TO BREEDING
GROUND
 - ② SEX DIFF — BIRDS OF PREY
— WINTERING PINTAILS — ♂♂
 - ③ Popln drift: > popln > health & etc.
 - ④ FOOD AVAILABILITY —
 - ⑤ COMPETING CONCERNERS
-

HABITAT FEATURES

- ① FEEDING SITES — WOODPECKERS
- ② PERCH SITES — ROOF PEEY
- ③ NEST SITES — WEAVERS
- ④ HOLE-NESTING — HORNBILLS
- ⑤ PREDATION — EDGES
- ⑥ ROOSTING — COMMUNAL

PSITTACIDAE 9%

COLUMBIDAE 5%

- 1) Water birds - Pteroclididae 16%
Sulidae 11%
Fregatidae 20%

Of the 92 spp that were entered before
1600 + 1980 93% were water birds.

X Small rph + ze

- 2) Protests to scarce habitats - Lakes etc.

Podicipedidae 15%

Hematopodidae 25%

Coridae 40%

- 3) Birds hunted by man -

(Gulls) Gann 40%

Phenice 11%

Ardeidae 9%

Columbidae 5%

Ciconiidae 12%

Muridae 9%

Anatidae 6%

Otididae 4%

- 4) Points in forest

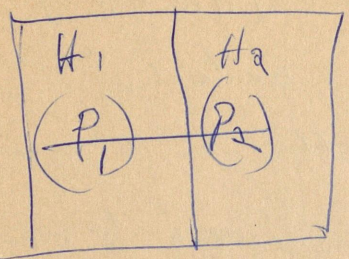
Ris of Py

Accipitridae 4%

Falconidae 2%

Pelecanidae 12%

THEORY: BROWNE & OPTIM. FOR. THEORY (29)



Patch ent.

H₂ if $\text{Fitness}_2 / \text{Fitness}_1 > 1 + \frac{t_3}{t_2}$
 time spent early 1 $\frac{\text{hab}_1}{\text{P}_1}$ / $\frac{\text{P}_2}{\text{P}_1}$
 spent = habit 2

Assumes:

- ① Constant environment in the landscape
- ② The sp has perfect knowledge of the reward / cost structure of the land.
- ③ no infinite number of other options for the sp.

MARGALEK & VAN DER VEKENDIEN THEOREM - QUITTING TIME

Patch(i) returns \approx average return from ^{all} other patches (including total time).

ENDANGERED: EXTINCTION is HIGHLY PROBABLE
 RED DATA BOOK - 1981 lists 240 spp of birds in
 it was 106 in 1966 - rate has double in 15 yrs.

TAXONOMIC SURVEY OF ENDANGERED BIRDS

(Red data book)

- 4 Types of birds
- 1) taxa endemic to islands.
 - 2) taxa restricted to scarce habitats.
 - 3) taxa highly affected by human
 actions.
 - Phongs, butch, etc.
 clear & interfere
 - 4) taxa in danger of local extinction
 for this - Pept.

large
body size

240 spp analyzed (61 families)

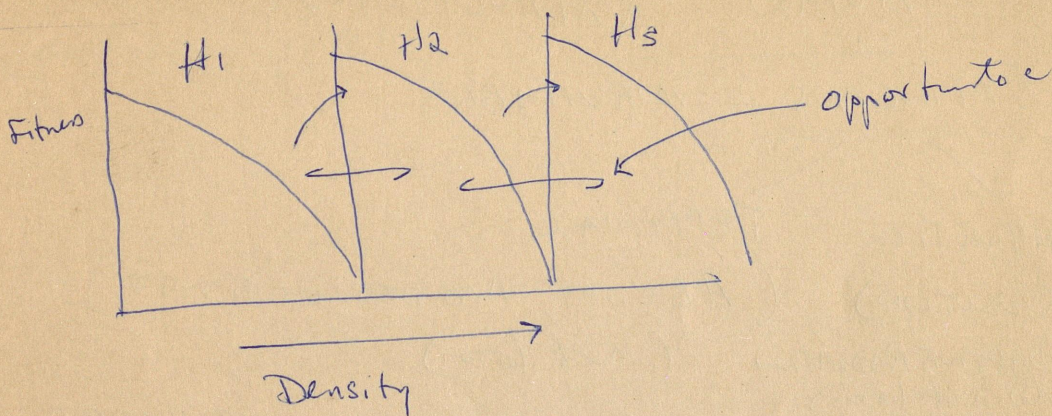
- Extrinsic take - 44%
- Introduced spp - 35%
- Habitat loss - 82%
- Plum - 18%

GRUIDAE - 40%
 PHASIANIDAE - 11%

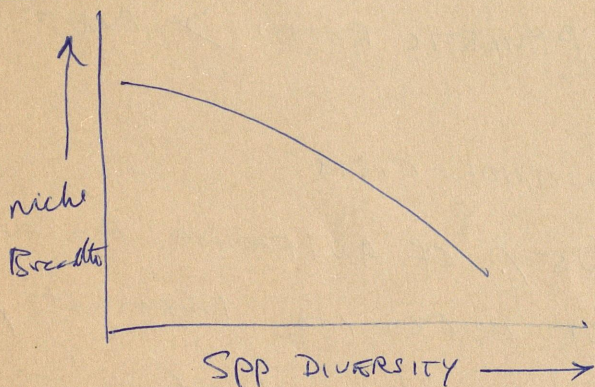
CICCOPTIDAE 12%
 ALCEDIDAE 2%
 ACCIPITRIDAE 4%
 FALCONIDAE 3%
 OTIDAE 4%
 Theropoda 9%
 Anser 6%

DENSITY DEPENDENCE & HABITAT SELECTION

30



COMPETITION : CODY



POPULATION CONSEQUENCES

OPTIMAL HABITAT ^{influences} → POPULATION → RANGE
(REVERSE OF DENSITY VS HAB SELECTION)

AVIAN EXTINCTIONS

EXTINCTNS → INEVITABLE

PHYNETIC
(EVOLUTION)

TERMINAL

ADAPTIVE RADIATION
(NO NET LOSS)

(ABRUPT, NO DESCENDANTS)
(NET LOSS)

EVOLUTION + EXTINCTION HAS HAPPENED

OUR PRESENT AVIFAUNA

(TERM. EXT)

PHYNETIC EXTN > NET LOSS

↓
CONCERN TO ORNITHOLOGISTS

PREISTOCENE - 25% OF AVIFAUNA EXTINCT

DURING THE PAST 10,000 yrs 1 extinct / 83 yrs.

{ Rate has ↑ since 1680 - Dodo...
one ext. / 4 yrs !

92 spp lost since 1680.

Predict - one ext. / 6 months ! This century.

Rate of adapt / Predict is ↑

Habitat choice - am-big night / entire (31)

from pg 7 p 471

ultimate - a sp. can in a range of habitats

proximal - the close to habitat to its surroundings.

Factors -
Intrinsic - ^{inherent} local - food, predators etc.
Extrinsic - large scale - distance, weather

Habitat choice etc by

- ① Geography - where they are
- ② instinct (inherent)
- ③ Experience
- ④ Age & sex (diff. a geographical scale)

Phenotypically INTRINSIC FACTORS
① for non bird - food 2nd - x. on hab microhabitat

FOOD IS NON RANDOMLY DISTRIBUTED IN SPACE

② BET HAS TYPES: - POPULATION SIZE OF SP.

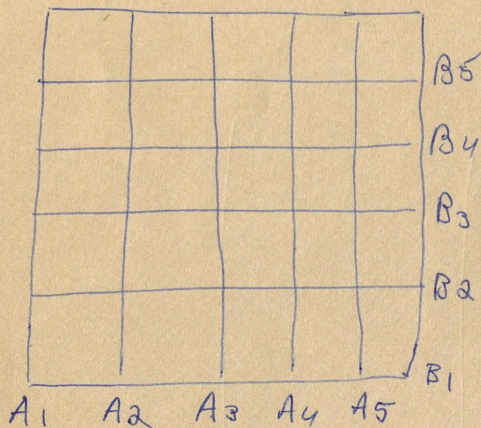
③ DETERMINED BY MIGRATION ROUTES

(FIG HERE)

30.8.91

Research Program of BK Math:

- 1) Transit - Attikattu Trail
2) 500 m x 500 m Plot -



1 ha grids.

- Tree density estimate - ≥ 30 cm Girth
- Canopy - 30% / ha.
- number of bottom trees
- Peppercorn per 10 trees
- Indicate - Palms etc.
- dominant spp.
- Cover 25 ha area & north.
- Transit - by night - by 100 m walk.

rainfall 600 - 5000 mm
dry for 2 - 7 mths

- dry dec - Dec
- 5 yrs
- 1000
- 5000

Savanna in Africa - 13000 yrs before

Man - just, drought + < RH

Palms uplift - 5 million y BP like Africa et.
(Pliocene).

Amphibians in the Man:

Rhacophorus pleurostictus }
Bufo melanostictus }

22.7.91

F.A. This job

slides Oralis deppii (slide) Mexico 1914
 inter
Pibombina semidecandra (Melastomaceae)
 Brazil (1919)
Sprucea compta (Panicum).

SEMINAR ON
 CONSERVATION & ECOLOGICAL MANAGEMENT OF THE WGHATS
 THROUGH LAND USE PLANNING

KODAIKANAL 4, 5 & 6 MARCH 1988. - I PANNI HILLS
 CONSERVATION COUNCIL.

MS VIJAYARAGHAVAN - THE PANNI HILLS -
 A SITUATION REPORT.

[see BIOLOGICAL CHANGES AT KODAIKANAL
 same time 1949-1974; Fr. KM MATTHEW, SJ]

Upper Panni - 1800 - 2500m

Lower Panni - 1000 - 1500m

DR V.M. MEHER-HONJI - THE PANNI HILLS:
 CLIMATE & VEGETATION

26 climatic zones
 18 veg types.

Chrysanthemum - Pyrethrum drug with Wz II

1942 - Major ~~Wick~~ Willis for Africa.

Geranium: 1954 Phombopu for oil

Aldo: 1922-1957 (Nepal)

Fodder: Pennisetum, Brachiaria, Fragaria, Lolium
Bambusa, Phalaris (grass)

Woods: Lantana (1858) Common
1887 Pest.

The Mexico blue flower (Aquatic
houstonianum) - 1890 by
Master of 1890 R.R. John M. Jameson.

The Mexico white flower (Trypaena glabra)
1890.

Yellow Brown. Sarothamnus Scoparium (W. Europe)

Goose Ulex europaeus Com.

- Fraxinus karinskianus

Amacacia Australia - 1867 (Kodak, 1867)

1906 Just dept

+ 1915 33 3/4 of Conifer in W. district.

Pines - 370 ha.

disaster - fire - 1920 ^{by shepherds} 3 days / 217 ha
killed 95000 trees

Cyclone 6th Aug 1930 - 30,000 trees

fire 1940 14 ha of trees.

Fruit trees: Major Partridge - Bomby Aug

F. globularis (blue pin) 1852

Same Went copy - joint - large scale

1877 to chain the mark?

+ keep tree of input

Seeds for article F. Barbier 1887

40 hectares.

1925 - Anglade - 40 sq - W. district

Tree 60m tall

Archives: - 1864 but = failure

Fruit trees: Pear, Apple & Peach etc.

Peach - 1857

Pear - 1870

Ch... - Pinett dis with with

EXOTIC FLORA — EUROPEAN

X. 1830 onwards

// Same heart shape has the name out of 500.

Bryant Park
Botanical Society } oldest existing tree.

Wattle scrub + large scale.

Acacia — *decurvens*
— *dealbata* } since 1960 +
— *nearnii* } after 1948 when African
— *melissima* } supply was stopped.

X. 1965 Madras State reserves 20, 320 tons of bark.

A Washington was in Kodakal 1919...
Wattle put into by Sir Vrekerige in 1867
large scale since ~~1866~~ 1883.

1919 Kurupita plant (40 km) destroyed by fire in
1920.

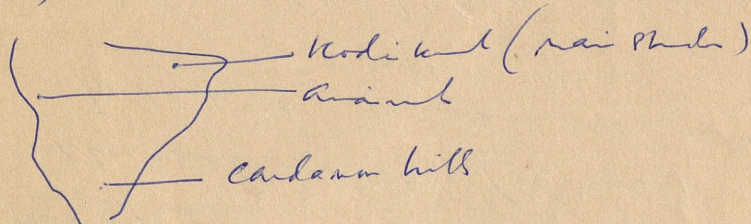
X. 1958 - 1965 2513 - 4755 ha in Palnis.

Acacia retusa — 1870

Coniferae *Cedrus deodara* 1892
Cryptomeria japonica }
Cupressus *Spp* }

Scam

- 1) Su-nant - Dy + AK ^{ground} gud ^{forest}.
- 2) Wan Scam - April - June E show +
Wt on ('Scam')
- 3) SW run - June - Sept (L. rei)
- 4) NE run - Oct - Nov. 1/2 and rainfall.



Hilly since 1821 AS Ward (Lt.) Survey
 (British Officer) Pahi hills - Published 1837
 by Robert Wright* - "MEMOIR DESCRIPTIVE OF
 THE VURRAGHERRY & KUNNANDEVAN MOUNTAINS"

* B. Scint, first botanical record 1837.

RH Addons 1858 (vegetable of Kodakud)

X Fern of S'Idi (1873)

PF Fyom (1877-1948) Presiding Collyer Mahr

"Fern of S'Idi Hill station"

SACRED HEART COLLEGE

20.7.91

ARCHIVES KODAIKANAL
(established 1895)

K. M. MATTHEW One Khasi Plaza of
Kodaikanal, Palni Hills

- Record of Artistic Survey of Sites, Vol 20:1
1969

Kodaikanal 2200 m $10^{\circ}12' + 10^{\circ}15' N$
 $77^{\circ}26' + 77^{\circ}33' E$

Palni 1002 yk upper + lower Palni Hills.
grasses - Palnis - Periakulam.

pond 2506 m Vembadi

lake made in 1863. (a mark is a stone)

Kodaikanal lowest man in Sumner's Rep.
highest man in world

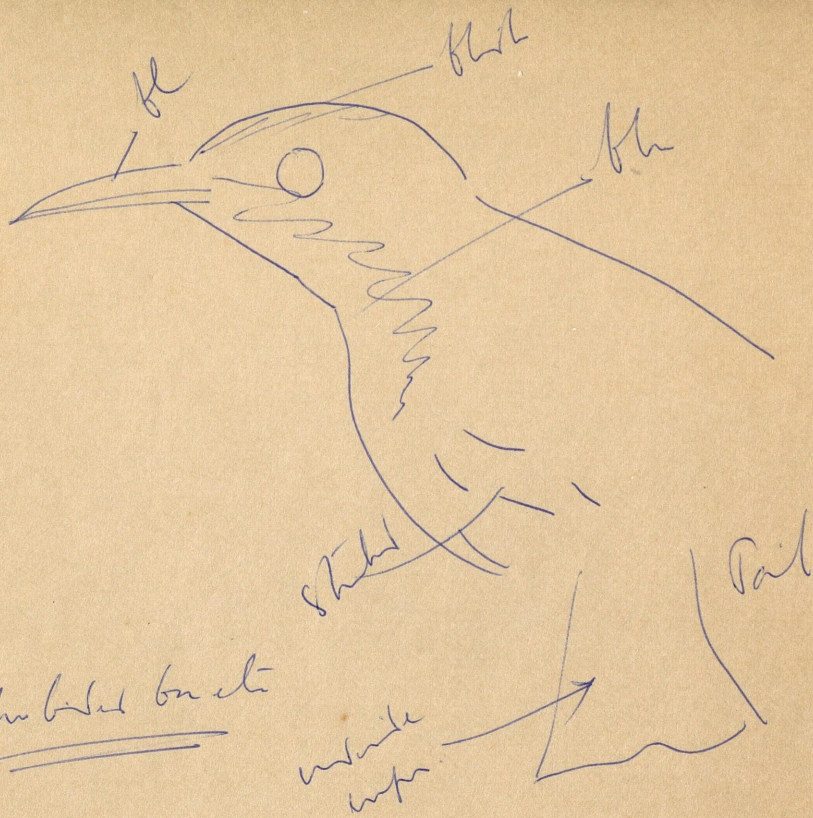
Jan - max $17.3^{\circ} C$ of coldest. least $5.3^{\circ} C$
min $7.3^{\circ} C$

SW + NE mon.

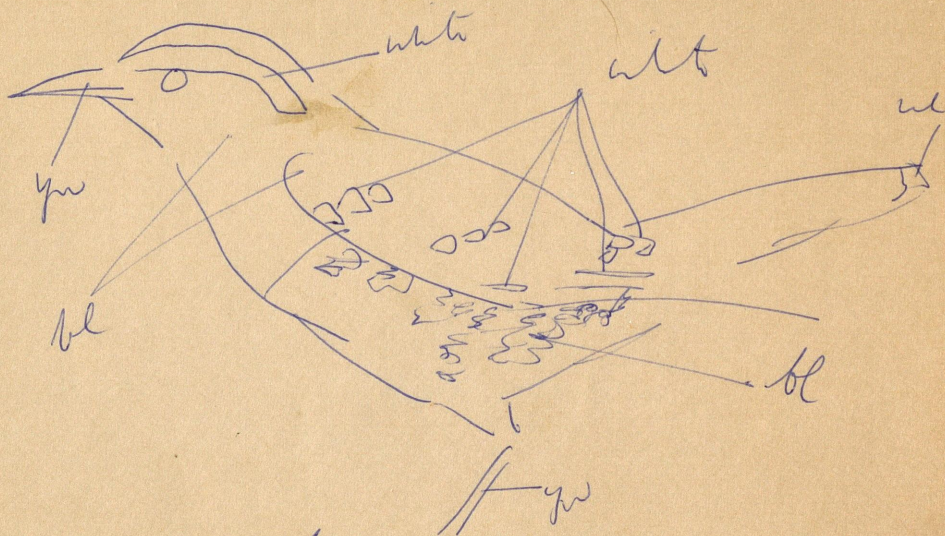
annual rainfall 1670 mm

dry with $\bar{e} < 10$ cm rainfall
Dec, Jan, Feb.

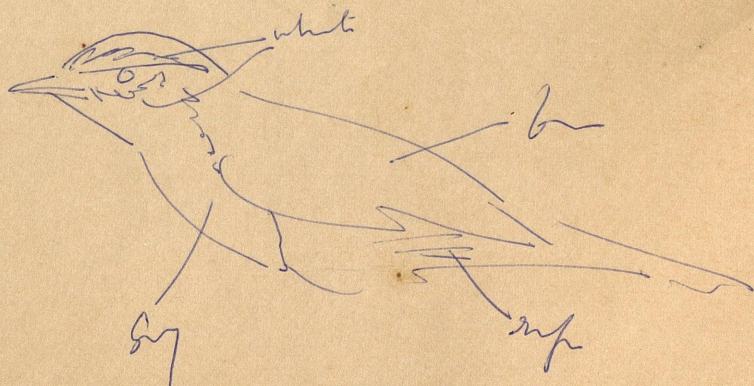
RH 8.30 hs 47-91* Numb %
17.30 hs 64* - 95 - -
mark.



Phainopepla 19.7.91



Pied-billed Grebe



W.B. Longley Park.

Workshop on
MEDICINAL PLANTS CONSERVATION AREAS

Kemmannagundi, Chikmagalur District.

26-4-91 to 29-4-91