Burung walet burung berguna
Sepenuh hati mengabdi manusia
Sarang walet tinggi nilainya
Kotornya pupuk bagi flora

The swiftlet is a bird of uses,
Willing servant of mankind.
Swiftlets' nests are highly valued;
Plants are nourished by their wastes

Cintailah, Lindungilah, Lestarikanlah!
Cherish, protect and conserve them!
Jangan punahkan dari persada
Burung walet burung berguna

Puisi oleh
Fatich Marzuki

Foto oleh
Saleh Amin

"The birds that never rest"

A personal record of 60 years of collaborative research into the biology of swiftlets (Aves, Apodidae, Collocaliini)

Gathorne Cranbrook

Apodiformes, Apodidae, Collocaliini, Swiftlets. Salanganes, Salanganen

Burung layang-layang walet/walit

Swift or swallow *yan* 燕

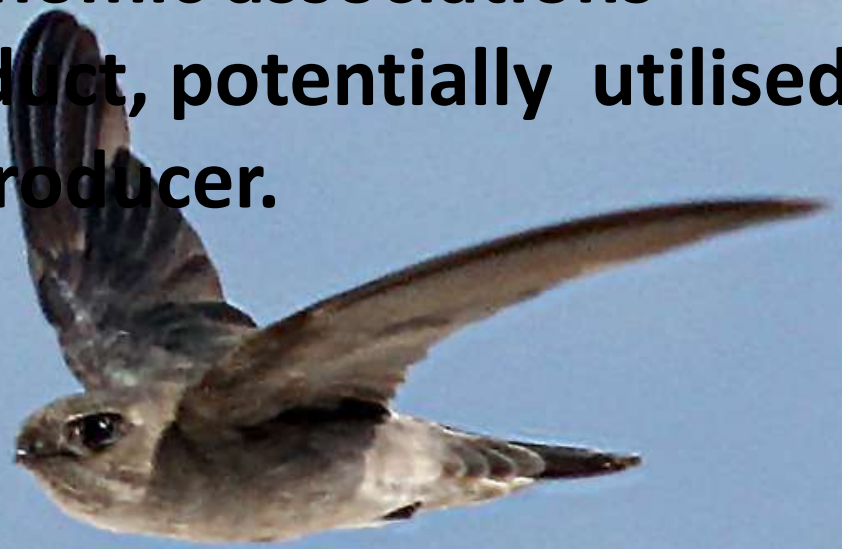
swiftlets *jin si yan* 金絲燕

edible nests *yan wo* 燕窩

•A group of birds with unIque adaptive characters, maximum diversity in S-E Asia.

•Long cultural and economic associations

•An edible animal product, potentially utilised without harm to the producer.



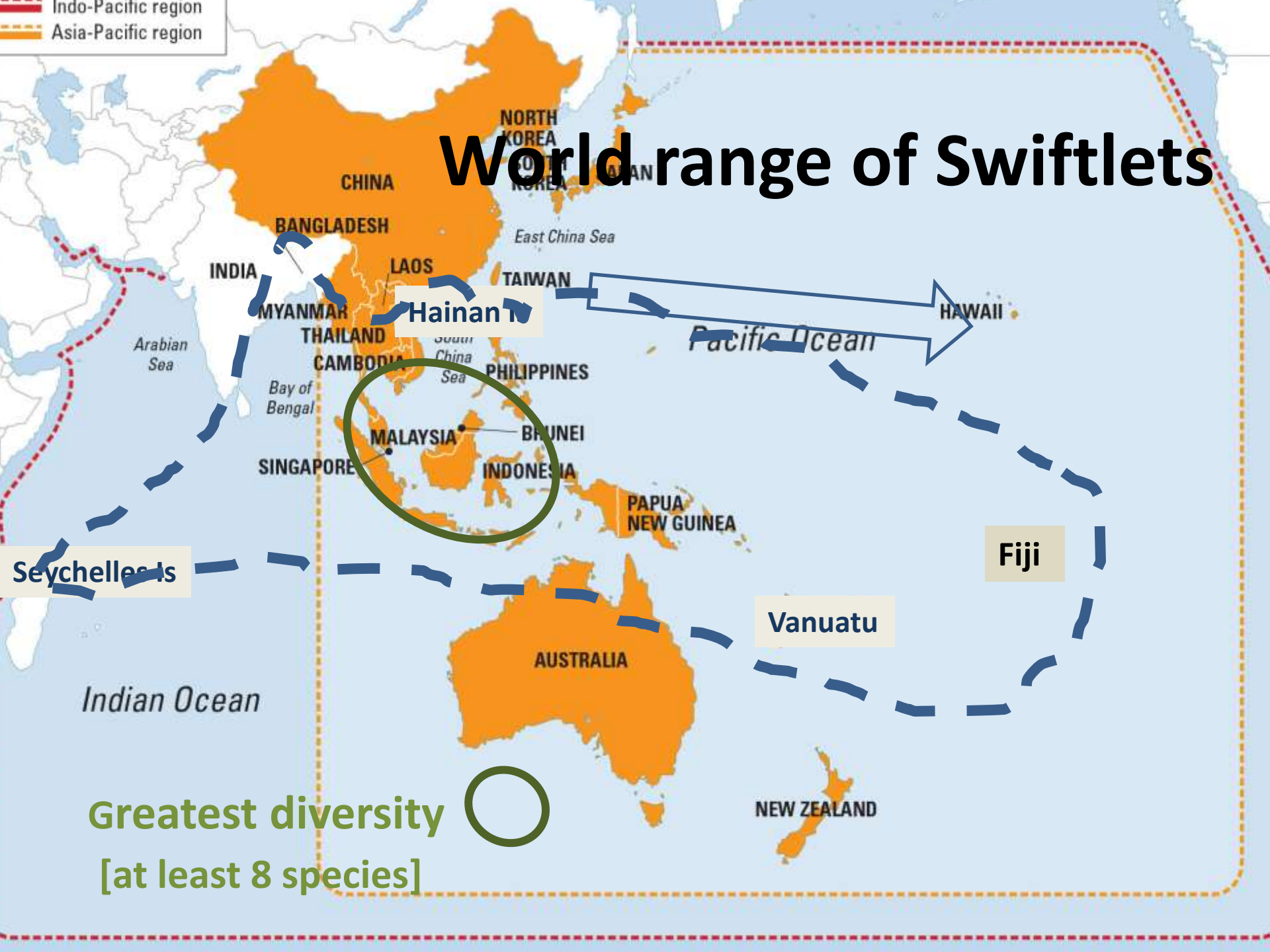
• A ‘functional’ food, protective & restorative

•Changing intensity of human/bird interaction, with surprising outcomes in mid/late 20th century

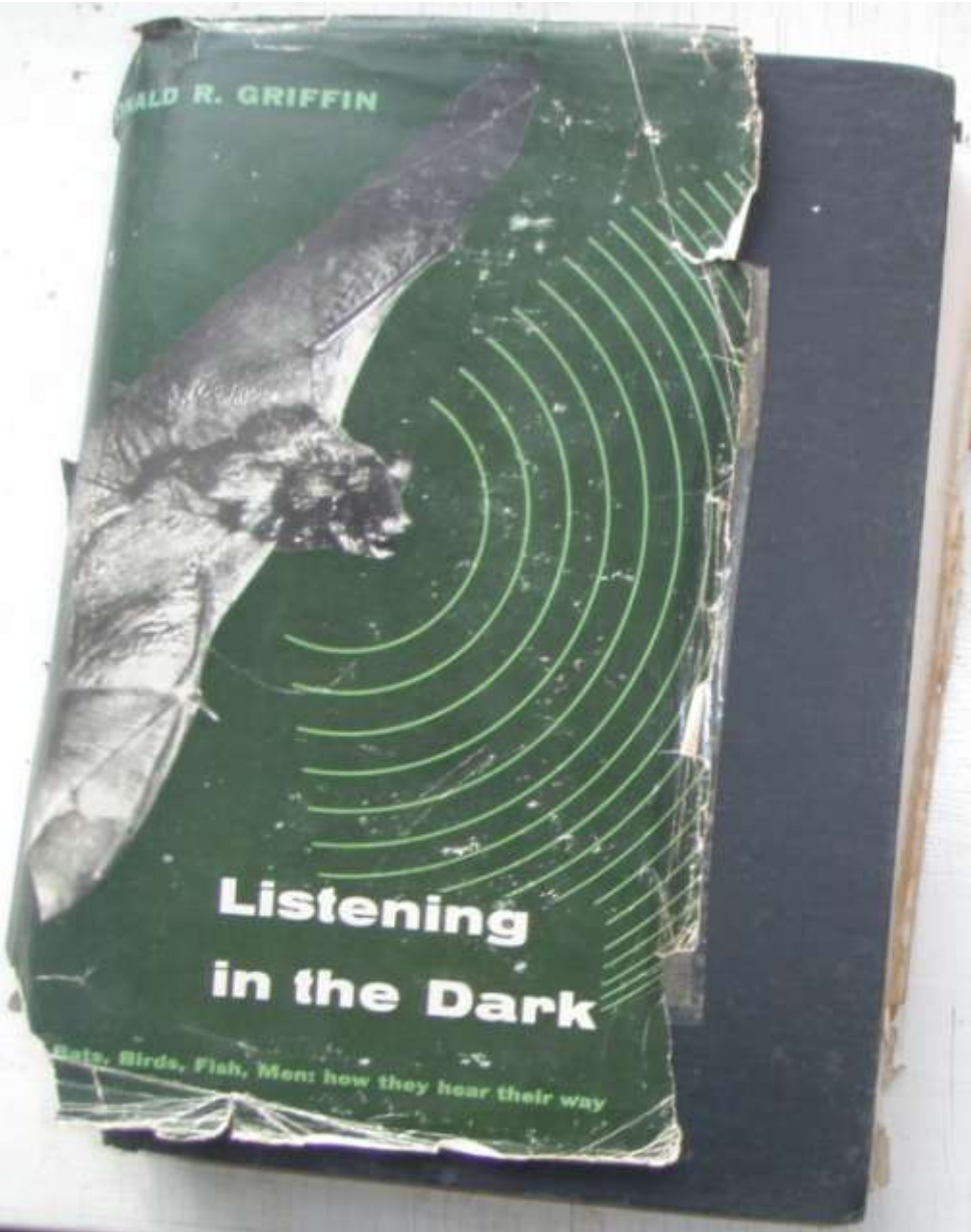
• An opportunity to use new laboratory tools to examine complex relationships

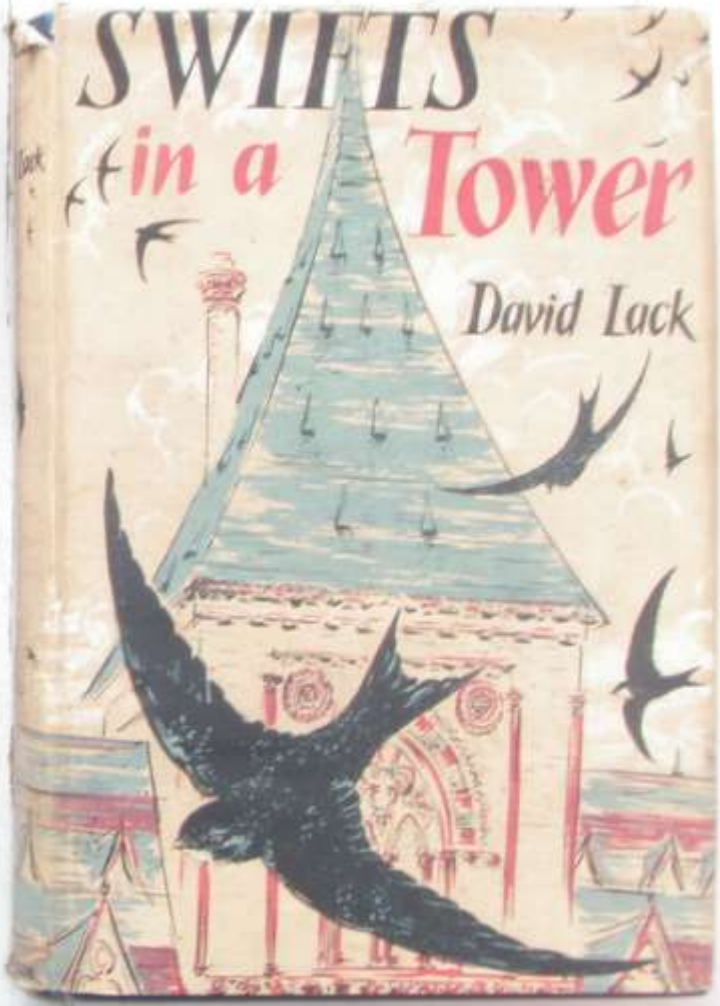
1968

GATHORNE, Earl of CRANBROOK

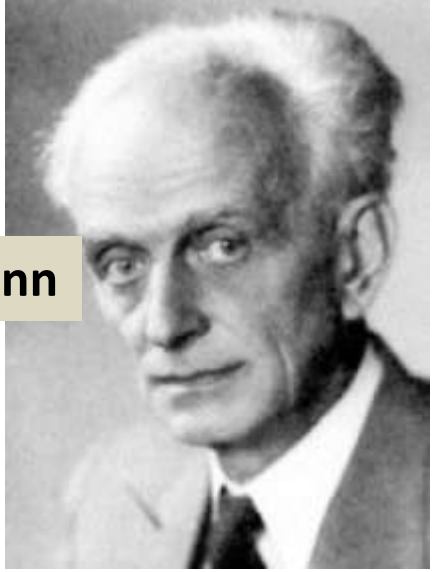

Indo-Pacific region
Asia-Pacific region
World range of Swiftlets
NORTH KOREA
CHINA
BANGLADESH
East China Sea
INDIA
LAOS
TAIWAN
MYANMAR
Hainan I
HAWAII
THAILAND
Pacific Ocean
Arabian Sea
CAMBODIA
South China Sea
PHILIPPINES
Bay of Bengal
MALAYSIA
BRUNEI
SINGAPORE
INDONESIA
PAPUA NEW GUINEA
Seychelles Is
Fiji
Vanuatu
AUSTRALIA
Indian Ocean
NEW ZEALAND
Greatest diversity
[at least 8 species]

Two influential books

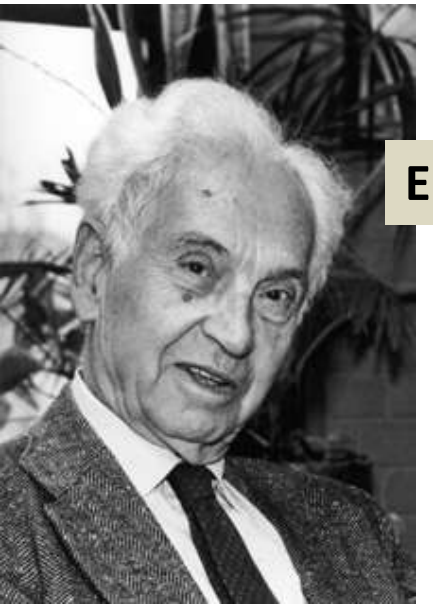




Influential contributors to regional swiftlet research (1)

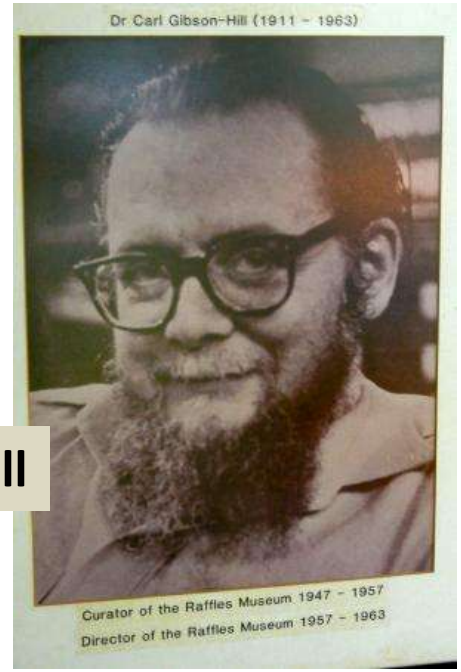


Erwin Stresemann



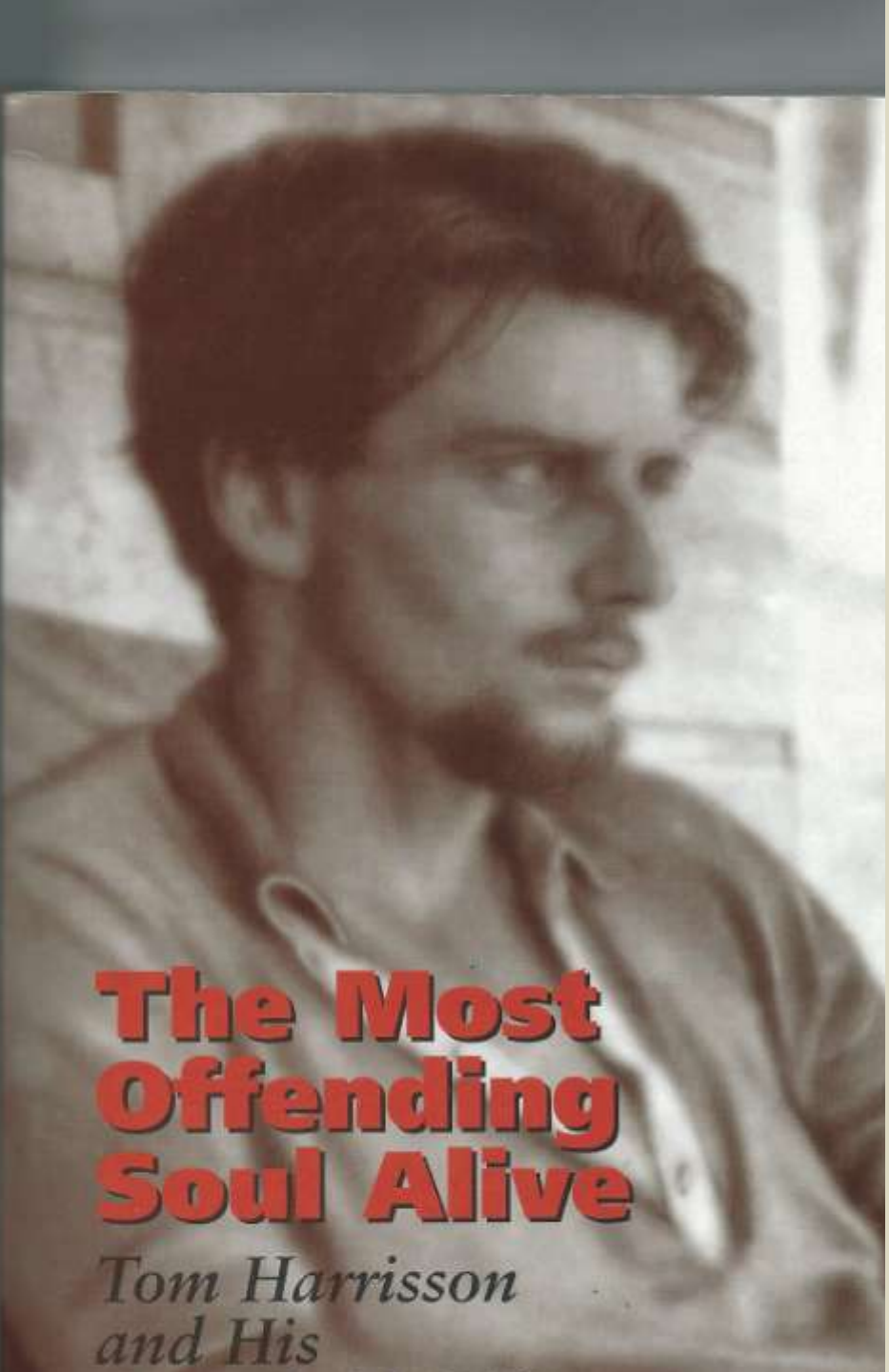
Ernst Mayr

Frederick Nutter Chasen



Carl Gibson-Hill

Soekarja Somadikarta



Personal life-changing influence:

Major Tom Harrisson: special forces 1945, Government Ethnologist 1946 & Curator, Sarawak Museum

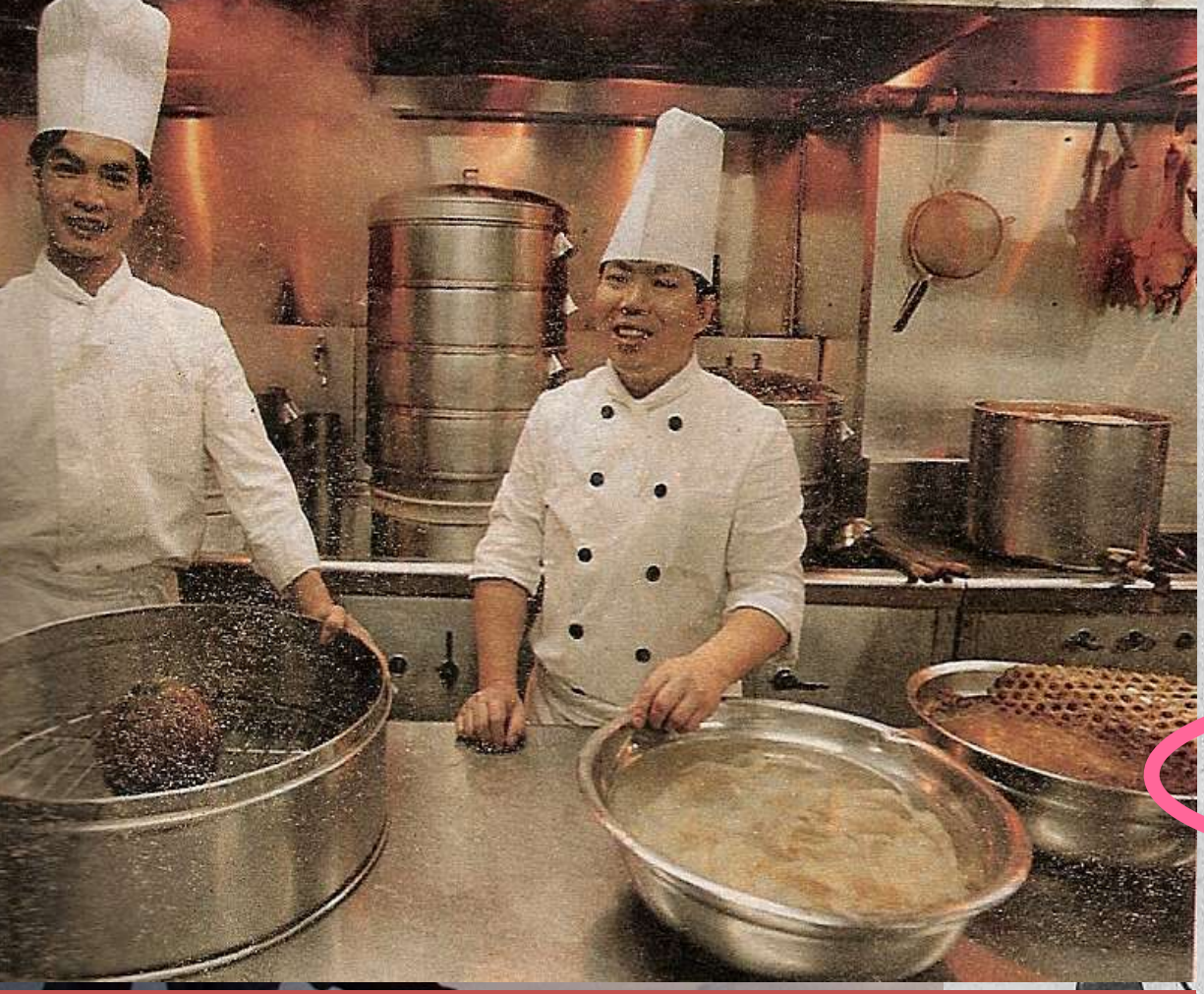
1947 - 1967

Influential people

(3) Jonny: - Vanuatu 1971

"The birds that never rest"

Historic, cultural & socio-economic importance



for 11-course Chi

Now, for the first time in Singapo
a new concept for your eating pleasu
You have a choice of 11 differe
all prepared by our top Chefs, or

HORS D'OEUVRE VARIES	什錦冷盤
BRAISED ABALONE WITH MUSHROOMS	鮑魚冬菇
SHARK'S FINS WITH CRAB MEAT	蛤肉魚翅
DEEP SEA WHOLE FISH IN SWEET & SOUR SAUCE	糖醋鱔魚
BIRD'S NEST WITH QUAIL EGGS	鵪鶉蛋燕窩
FRIED RICE (YONG CHEW STYLE)	楊州炒飯

CHINESE TEA SE

Open daily at lun

Singapura

Birds’-nest soup birds

Builders of edible nests

Unique characters

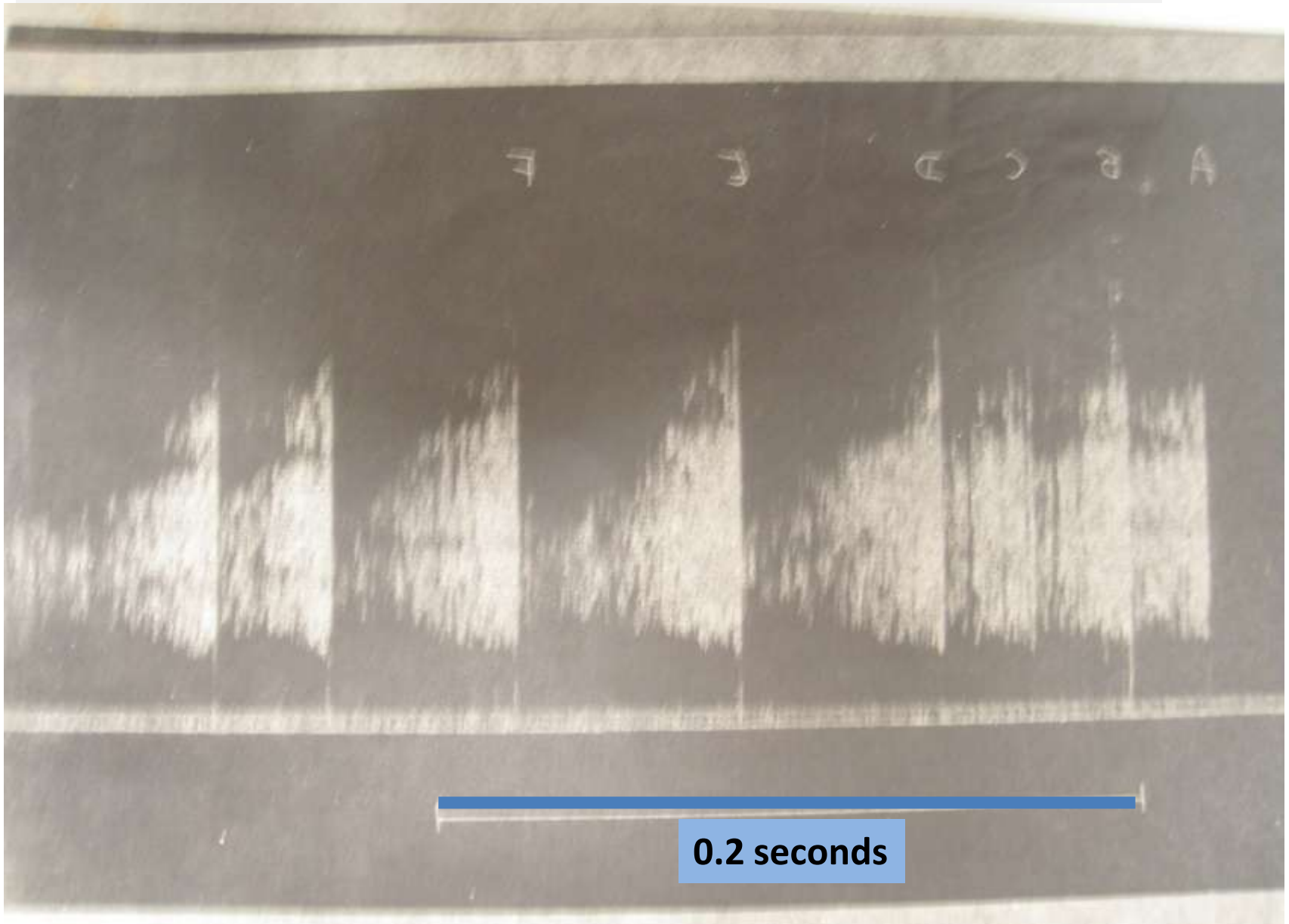
1. Echolocation

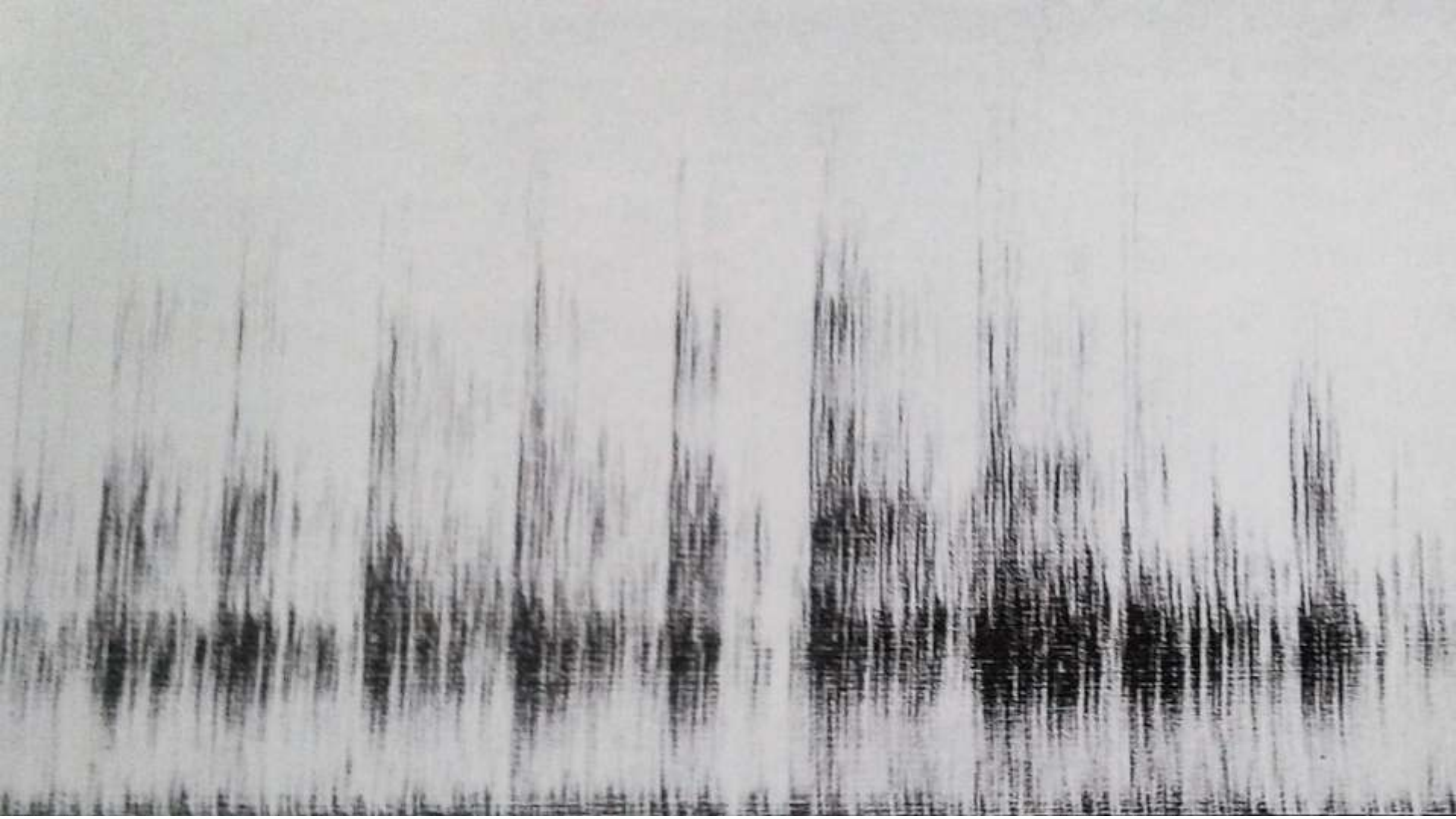
Burung walet burung berguna

The Sarawak Museum, Kuching, 1956-58

Echolocation trials in the dark room

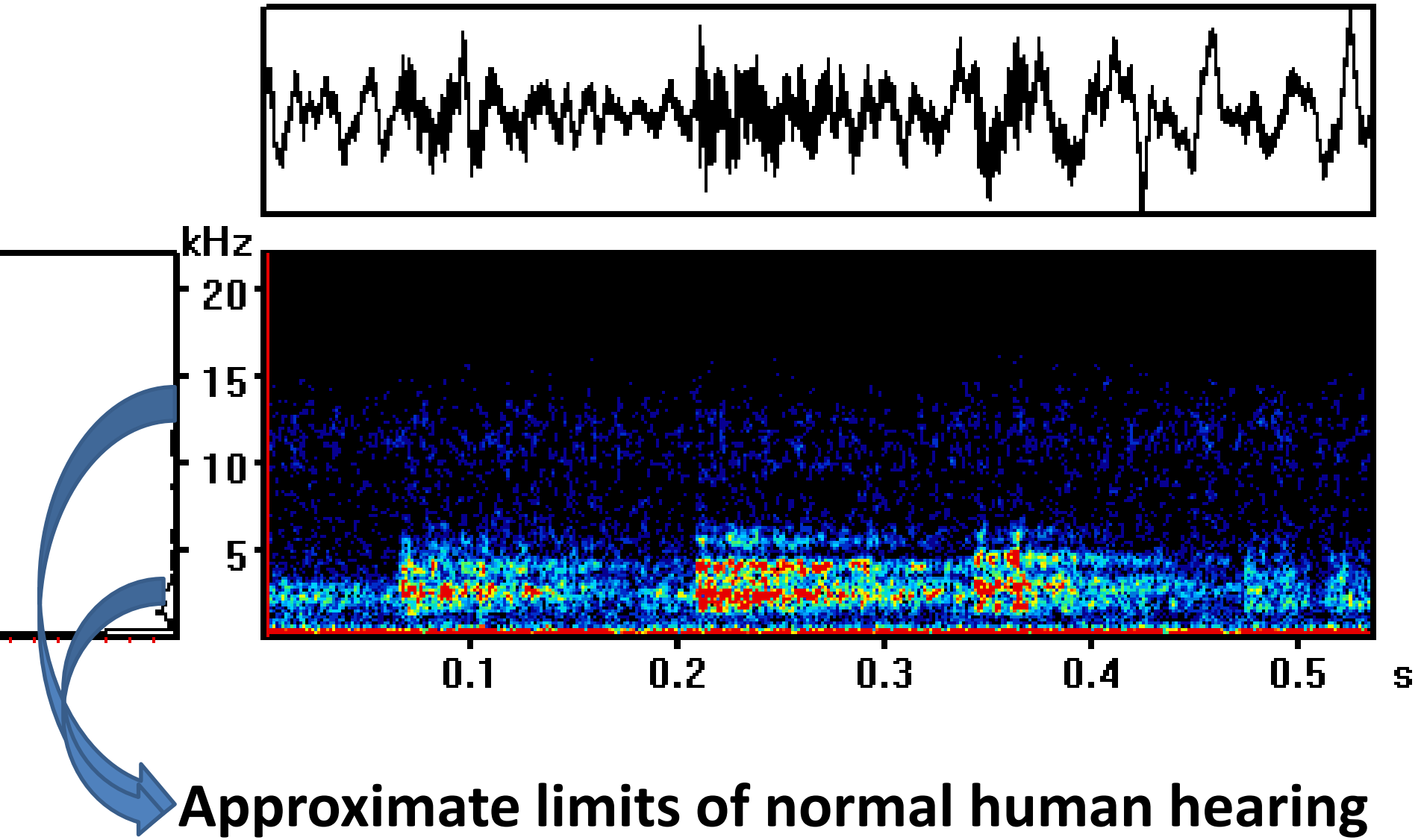
Negative of sonogram of echo-call of Black-nest swiftlet in the Sarawak Museum dark room





Sonograph of a single Black-nest Swiftlet *Aerodramus maximus lowi* flying in the dark room at the Sarawak Museum
Each click is about 2 ms, followed by fading echoes from the walls of this small space.

In Sarawak Museum darkroom: small space



Approximate limits of normal human hearing

Bogor (Buitenzorg)

Jalan Pangrango 25
Home of ‘Doc’ Kostermans

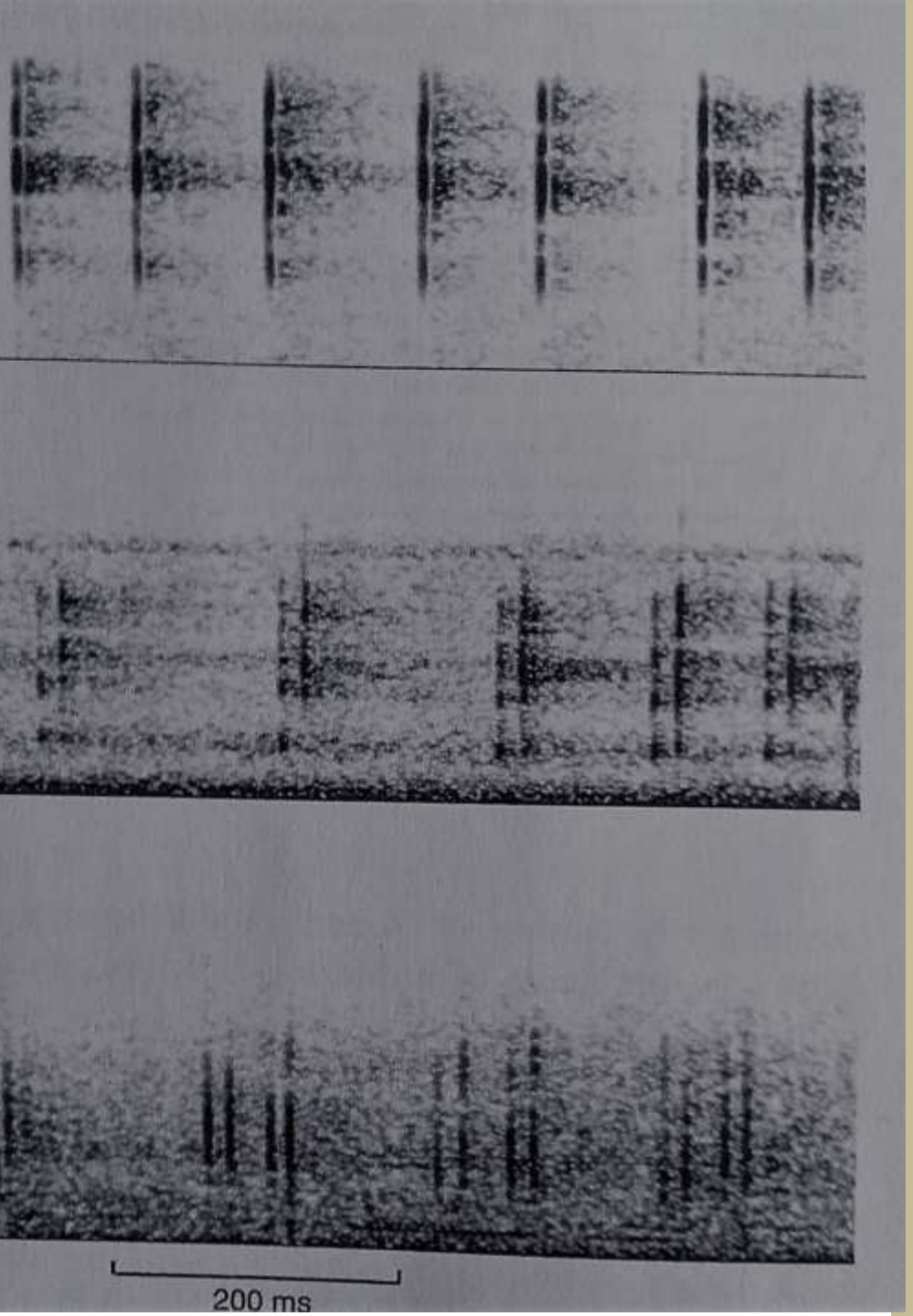
1960-61 Jajasan Siswa Lokantara sebagai ‘Ahli burung Walet’: Muzium Zoologicum


Bogor Zoological Museum

Soils Research Institute, Bogor

Illumination	*N*	*Avoid*	*Hit & turn*	*Pass thro'*	*Hit & fall*
DARKNESS	All Edible-nest Swiftlets from houses in Bogor				
1st approach	17	0	4	11	2
	%	0	23	65	12
All approaches	178	58	67	52	2
	%	23	40	30	7
LIGHT					
1st approach	17	12	0	5	0
	%	71	0	29	0
All approaches	565	477	2	86	0
	%	83	0.3	16	0

Approaches	1-5	6-10	11-15	16-20	21-25	26-30
Total	79	45	25	12	10	5
% avoid	20	31	48	42	90	40
% pass thro'	39	29	16	16	0	0
% hit & turn	38	40	36	42	10	60
Total	85	80	75	72	63	51
% avoid	89	92	88	92	78	84
% pass thro'	11	7	12	8	22	16
% hit & turn	0	1	0	0	0	0



Sonographs

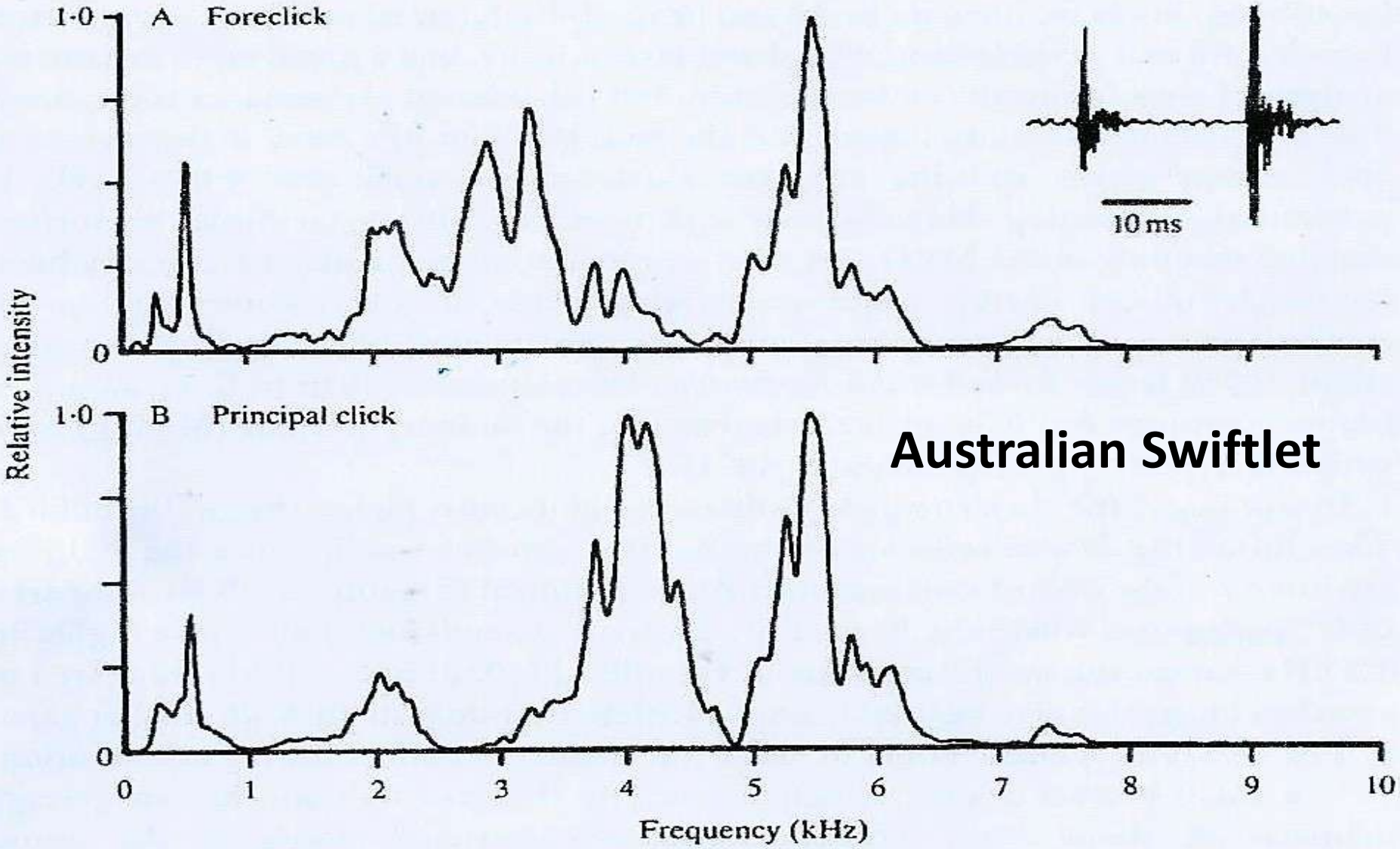
o

Aerodramus sawtelli
(single)

Aerodramus bartschi
(double)

Collocalia troglodytes
(double)

From Price Johnson & Clayton (2004)
J Avian Biol. 35: 135-143



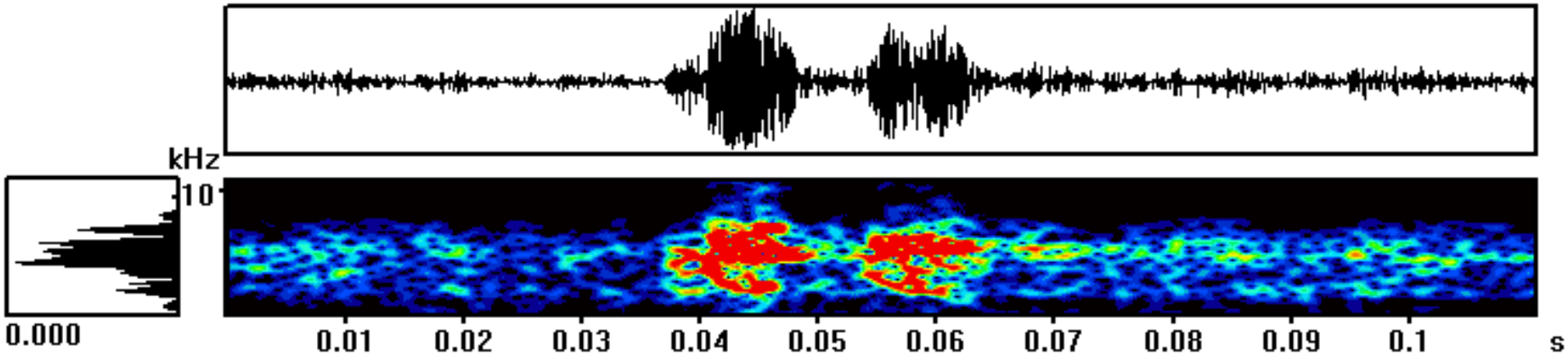
Australian Swiftlet

Fig. 3. (A,B) Energy spectra for the foreclick and principal click of an echolocation pulse of *Collocalia spodiopygia* based on fast Fourier transform (FFT) analysis. Inset: digitized waveforms of an echolocation click pair. Foreclick precedes the principal click which is larger in amplitude.

Coles, Konishi & Pettigrew (1987)

Double click of Black-nest swiftlet

recorded by Henri Thomassen



^.....^

One second

Revised classification (1972)

1. *Collocalia*
   Glossy swiftlets
2. *Aerodramus**
   Grey-brown swiftlets
3. *Hydrochous*
   Giant swiftlet

*Echolocating species

(R. K. Brooke)

Type of nest as taxonomic indicator

Burung walet burung berguna

The type of nest is a guide to taxonomy


White nests (*'vestitus'*)
Salai cave, Baram, Sarawak
Photo Lim Chan Koon

“Black” nest swiftlets
Aerodramus maximus

Mossy -nest swiftlet: *Aerodramus salanganus*
Malaysian Borneo & western Indonesia

Vegetable materials (mosses): soft, moist saliva; nest rests on ledge; 2 young

Karangbolong 7 April 1960

Dutch of next harvest : 4 yearly.

DIKI AHLI INGGERIS

Dr Lord Midway seorang zoologe dari Inggris telah datang di Kebumen dg maksud untuk menjelidiki keadaan burung ig terdapat digoa2 Karangbolong Karangduwur dan Pasir, untuk dapat memahami djenis2 burung lawet jang

Karangbolong
Kabumen
Central Java

S U R A T - K E T E R A N G A N .

Dengan ini diterangkan bahwa seorang bernama :

Nama : ....LORD MEDWAY.....

Umur : ...27...th.

Pekerdjaan : ...Zoologist (ilmu hewan)...

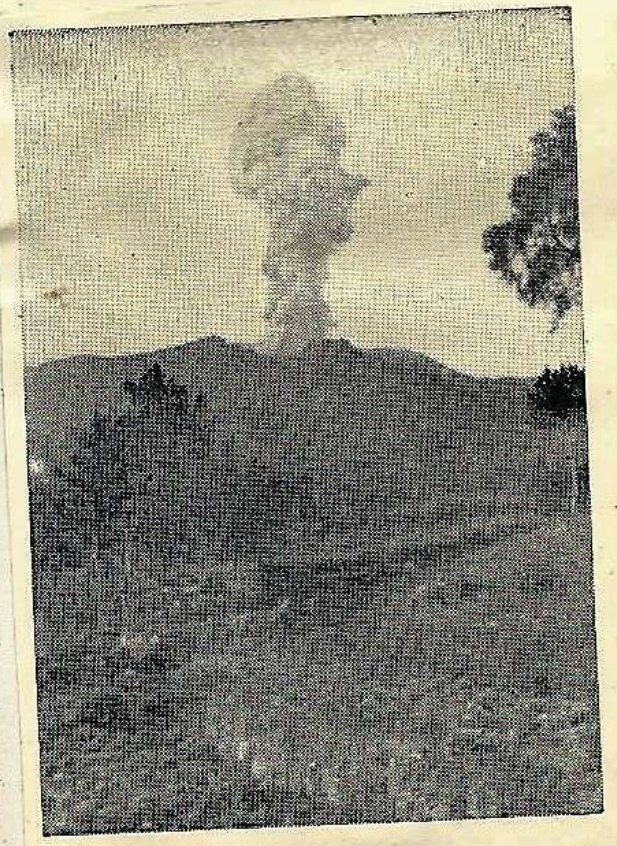
Bangsa : Inggris, telah kami beri idzin untuk memeriksa keadaan Karangbolong dan guwo2 sekitarnja guna mengetahui djenis2 burung jang ada di Guwo2 tsb.

Jang memberi idzin
Bupati Kepala Daerah Kebumen,

BUPATI KEPALA DAERAH TINGKAT II KEBUMEN

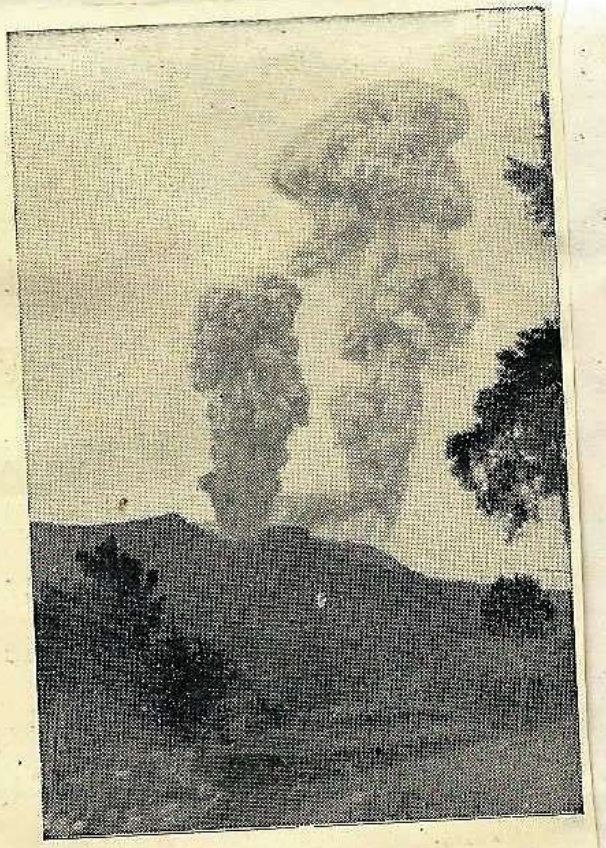
R. Soedarmo Soemohardjo).-

ZES PHASEN VAN DE UITBARSTING VAN DE GOENOENG GEDEH OP 25 JANUARI 1948.



1. Een lichtgrijze eruptie-wolk stijgt om 7.37 uur Java-Tijd snel nagenoeg loodrecht uit de Kawah Lanang omhoog. Licht gerommel is hoorbaar. Er is geen trilling van de grond voelbaar. In de beweging van de wolk dicht boven de krater zit

2. De eerste eruptie-wolk wordt met de heersende Oostenwind naar het Westen afgedreven. Een tweede eruptie-wolk, dreigend donkergrijs van de as, schiet ongeveer 1½ minuut na de eerste even snel omhoog.



3. Opvallend is de gelijke eruptiekracht, waarmee beide wolken omhoogschieten. De tweede wolk ontwikkelt zich bijna volkomen gelijkvormig aan de eerste.

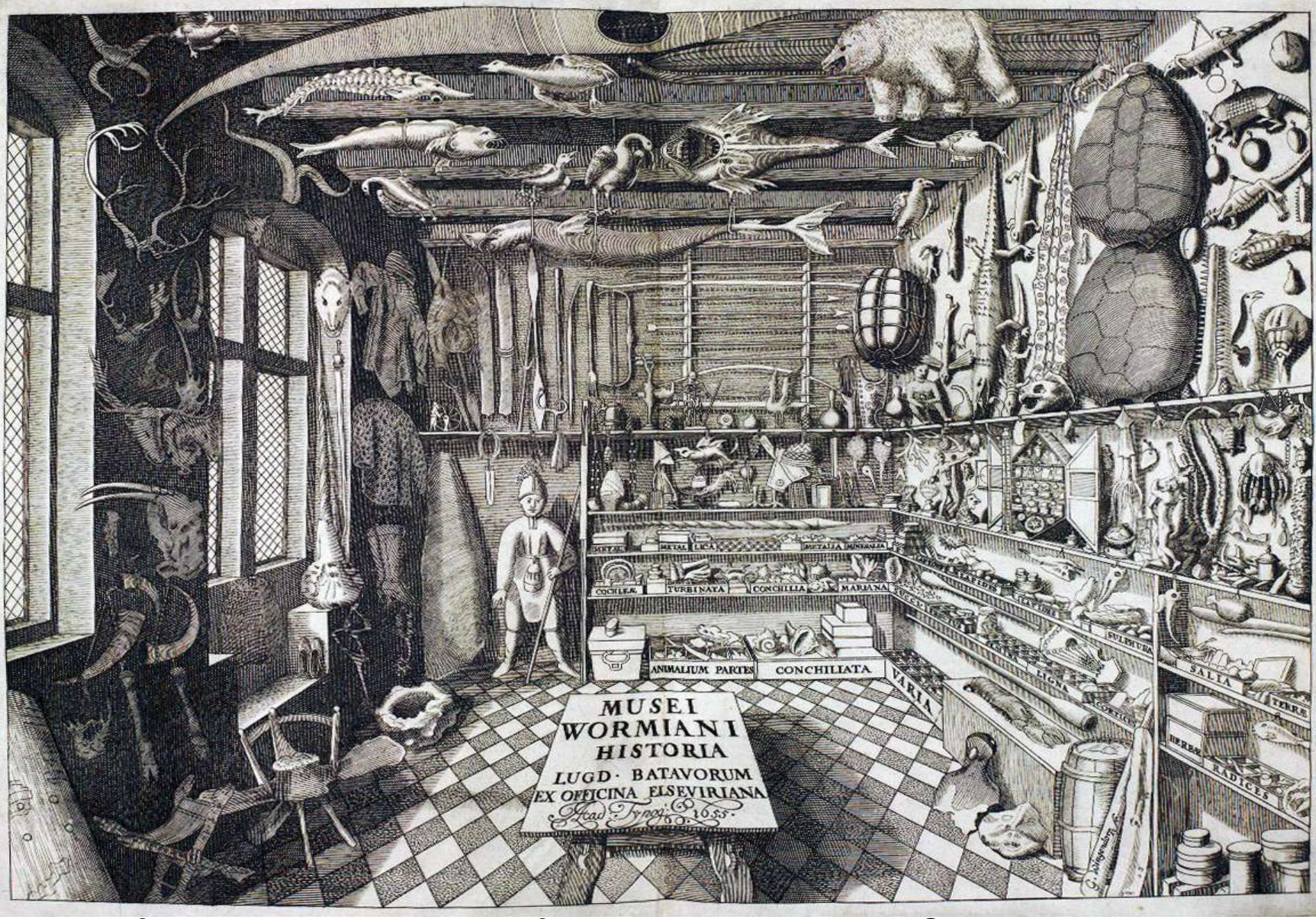
Tangkuban Perahu volcano (kawa ratu]
Home of *Aerodramus vulcanorum*

Unique characters

2. Edible nests

Burung walet burung berguna

The first Europeans to reach S E Asia were surprised to find an existing trade in Edible Birds' nests



Olaus Wormius: his Museum of curiosities

Georg Eberhard Rumpf
'The blind seer of Amboyna'
age 58

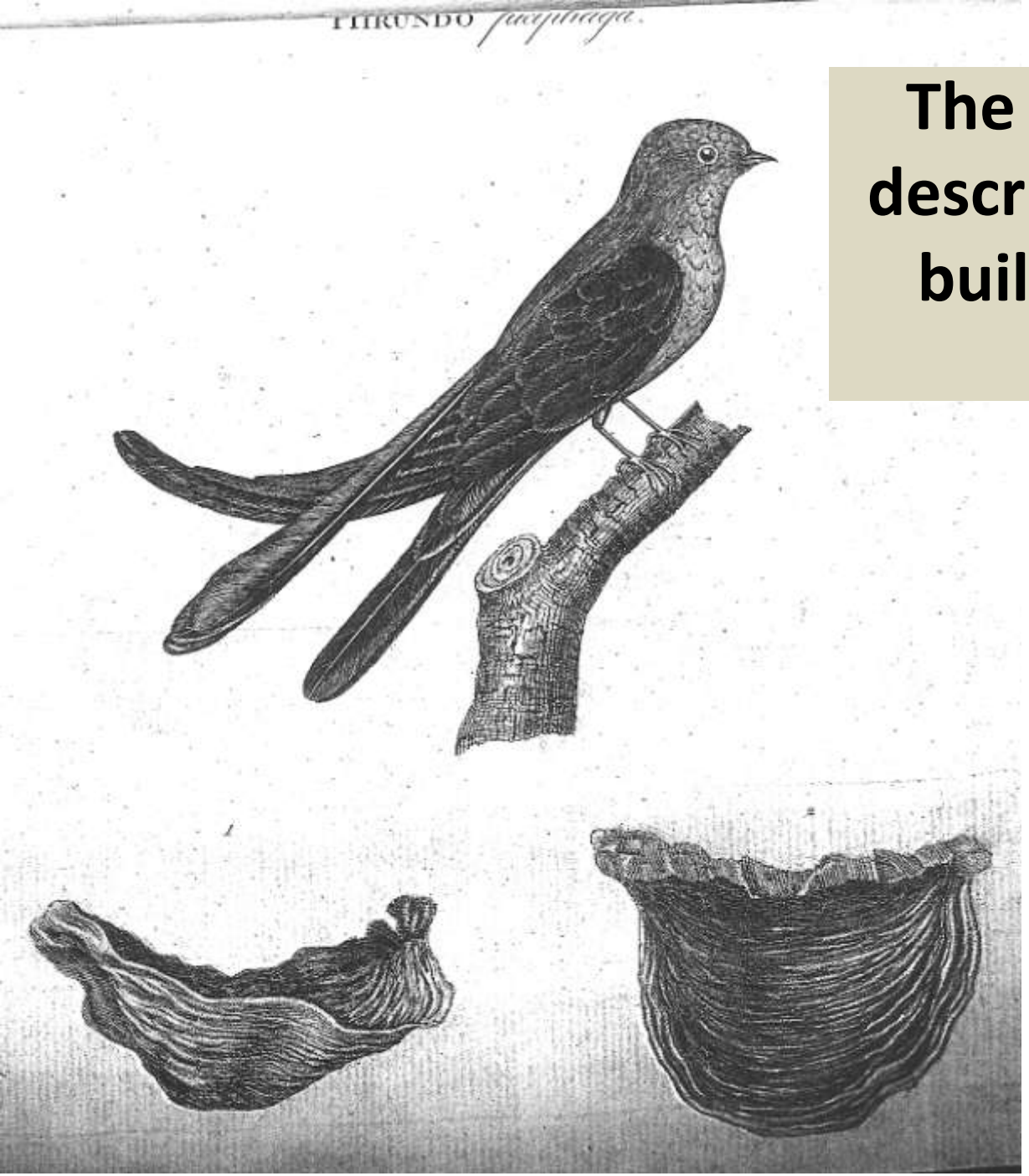
101. HIRUNDO. *Roſtrum* minimum, incurvum, ſubulatum, baſi depreſſum. *Rictus* capite amplius.

ruſtica. 1. H. rectricibus, exceptis duabus intermediis, macula alba notatis. *Fn. ſuec.* 244.
Hirundo domeſtica. *Geſn. av.* 548. *Aldr. orn. l.* 17. *c.* 6. *Jonſt. av.* 115. *t.* 42. *Will. orn.* 155. *t.* 39. *Raj. av.* 71. *n.* 1. *Alb. av.* 1. *p.* 43. *t.* 45. *Friſch. av. t.* 18. *f.* 1.
Habitat in Europæ *domibus intra tectum.*
ruſtica & urbica autumno demergitur, vereque emergit.

eſculenta. 2. H. rectricibus omnibus macula alba notatis.
Hirundo nidis edulibus. *Bont. jav.* 66. *Raj. av.* 72.
Capus marina. *Rumph. herb.* 6. *p.* 183. *t.* 75. *f.* 4. *Olear. muſ.* 25. *t.* 14. *f.* 2. 6.
Habitat in China *ad ripas, nidis gelatinoſis eſculentis.*

Syst. Nat,1758 p.101 Aves Passeres

Hirundines *in aëre piſcantur inſecta.*



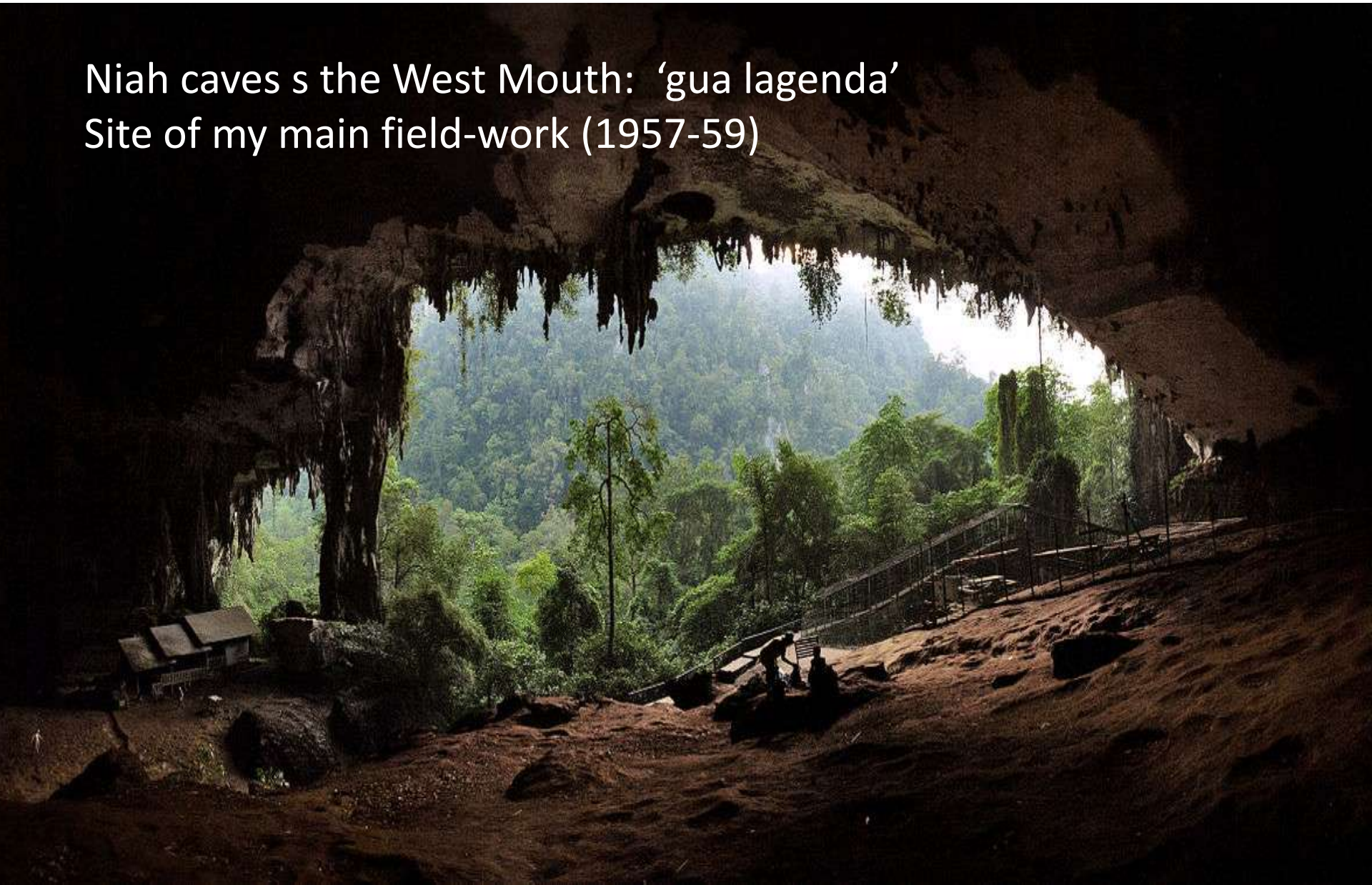
The earliest scientific description of a swiftlet building the “white” edible nest

Hirundo fuciphaga
Thunberg 1812

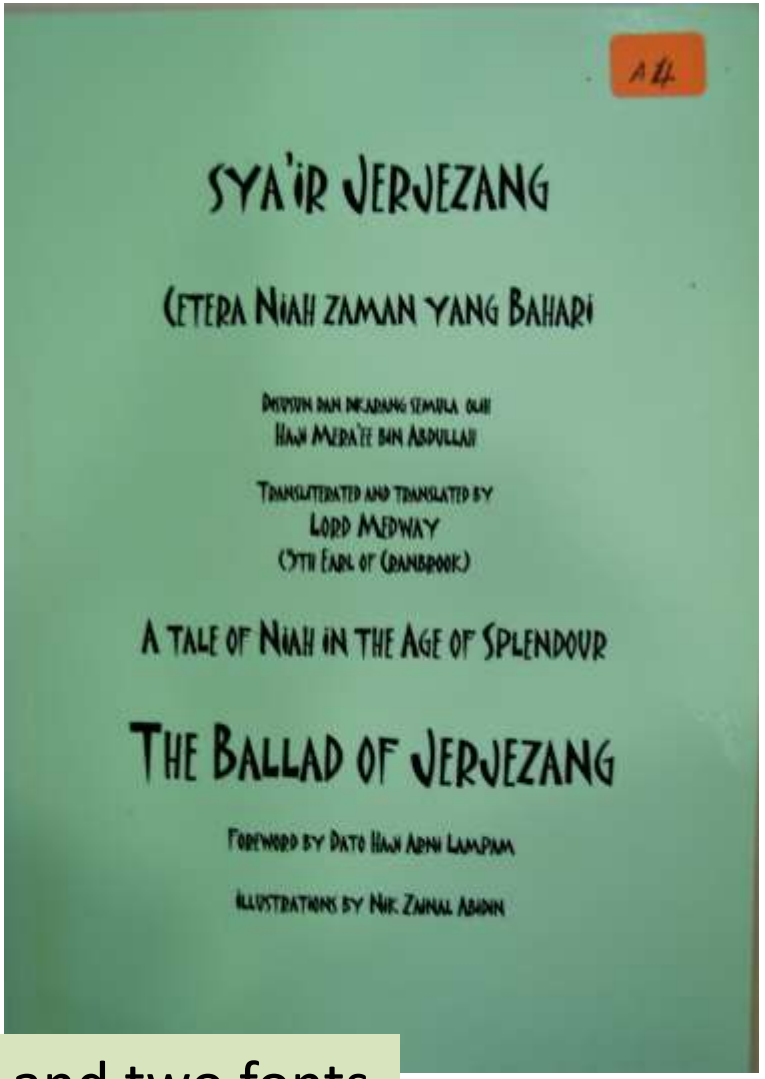
Collected in Java

1777: C.P. Thunberg collected edible-nests & swiftlets from Cheraton cave

Niah caves: excavated 1954 – 65



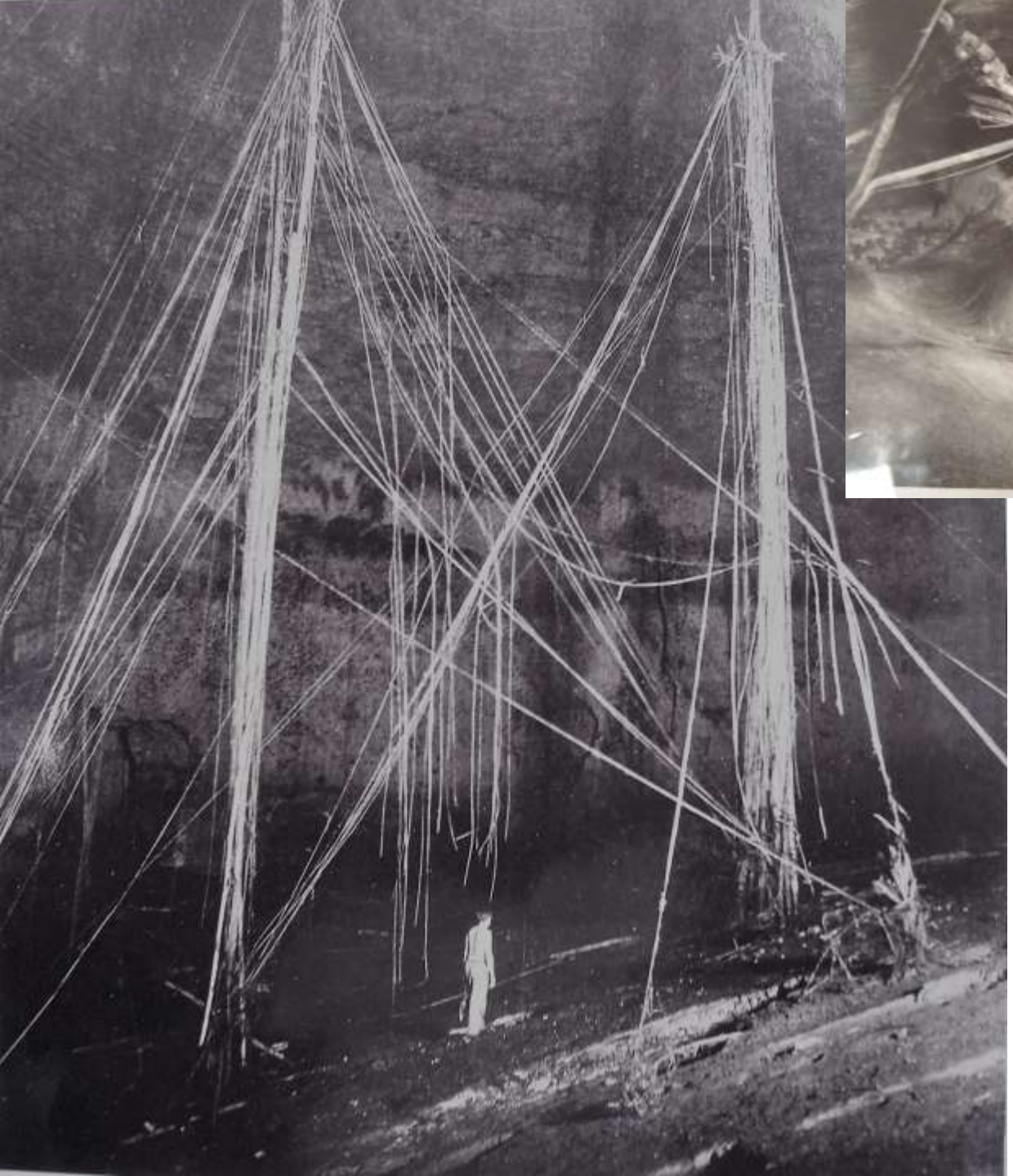
The legends of the Kg Niah community, descended from the Penan discoverers of the caves and the nests at Niah



A book with two fronts and two fonts

This huge cave was home to 1.5 M "Black" nest swiftlets *Aerodramus maximus*

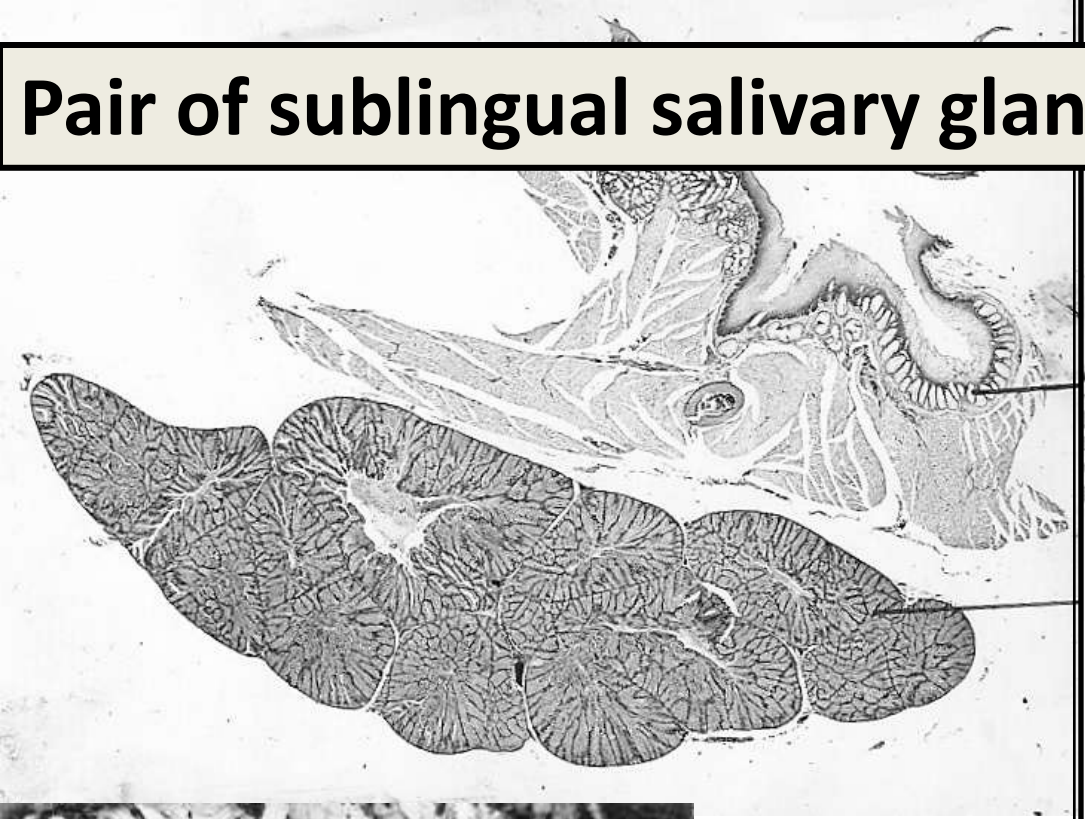
Hinggap dipinggir sarang.. . .. dengan gigih mengeluarkan liur keramat

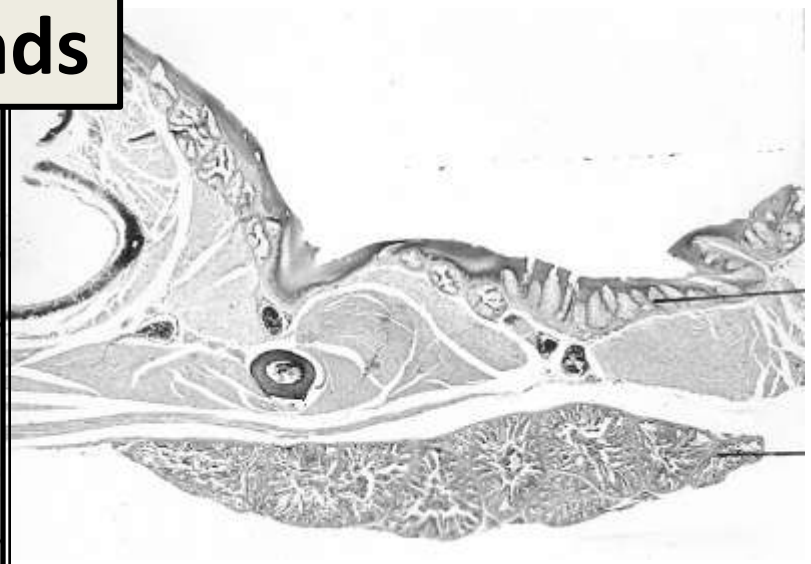


The cave interior was full of climbing apparatus. Practised nest-collector JOHARI b. Daud was my indispensible guide and assistant.

View at the top of the jungle ladder
Numbered nests at Niah cave (1957)

Pair of sublingual salivary glands

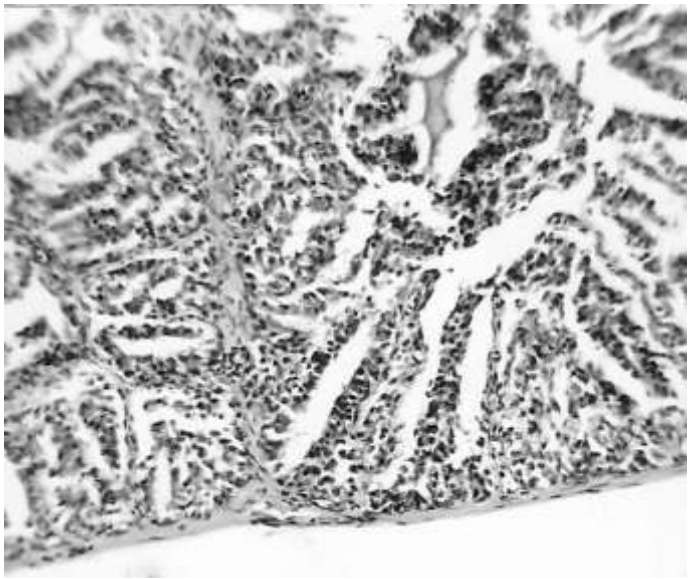




Inactive gland

Active gland

[nest-building]



Niah cave: Black-nest Swiftlets' Breeding season Sept-April		
	Males	Females
Breeding cycle	***Testes seasonally hypertrophic***	***Oviduct seasonally hypertrophic***
Salivary glands	***Seasonally hypertrophic***	***Seasonally hypertrophic***
	Remain hypertrophic during nest-building	***Degenerate during egg production***
Nest-building	***Observed to be more assiduous nest-builder***	***Lesser nest-building activity***

Home processing


Sharp young eyes for the final stages

Grey-rumped swiftlet, *A. inexpectatus germani,*
Mantanani Besar Is, Sabah

Grey-rumped swiftlet: Perhentian Is, east coast of Peninsular Malaysia

Grey-rumped swiftlets

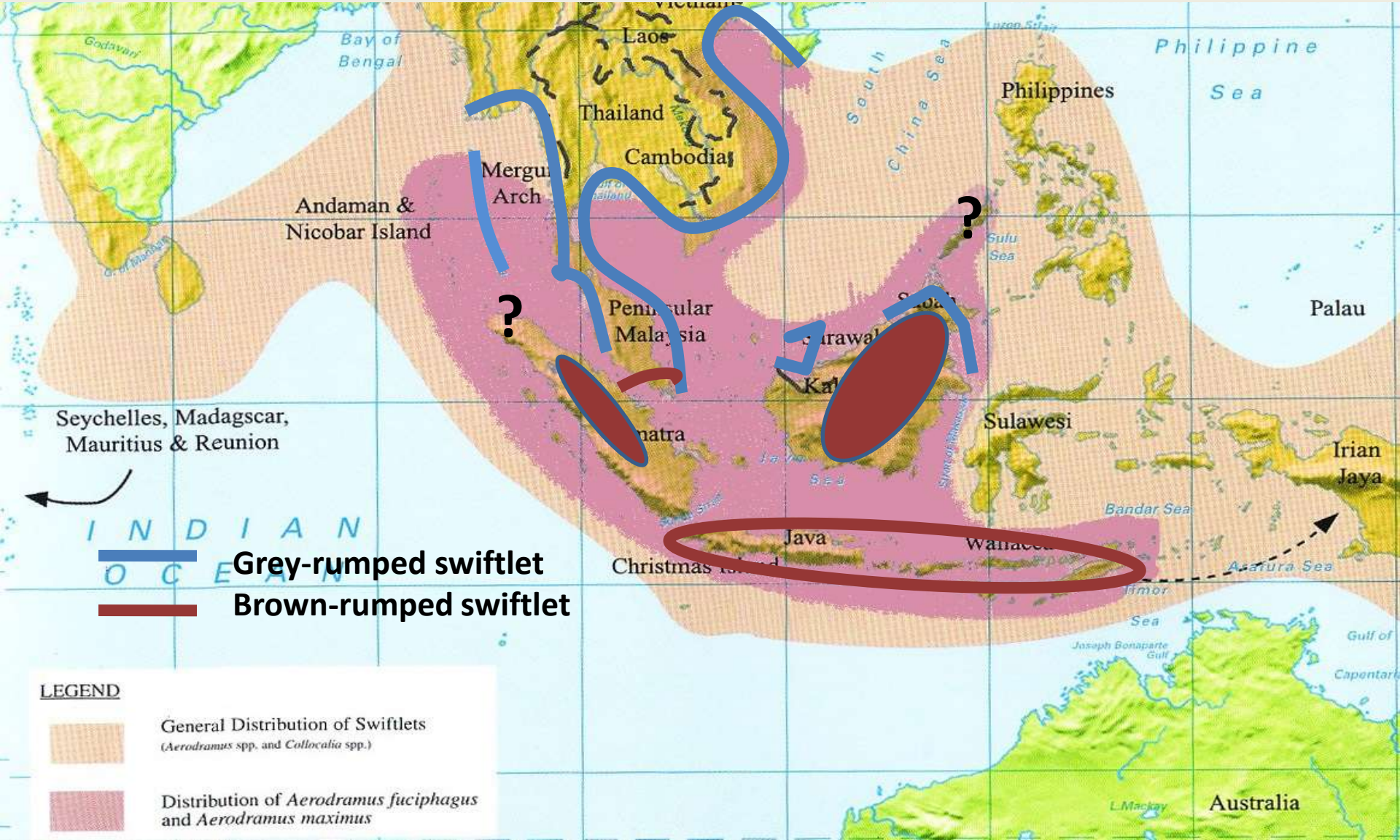
Berhala island, Sandakan (N. E. Borneo)

Mantanani Is., N W Borneo

F. N. Chasen's specimens (1931)in LKC NHM

F. N. Chasen's skins of white nest swiftlets from inland cave (Tapadong) North Borneo (1930-31) in LCK NHM

Careful re-examination of museum skin collections, and new field-work, have shown that there are two species of wild white-nest swiftlets, separated by range & behaviour




In Java, mossy nest swiftlets also occur in caves with white edible nests
'Stresemann's Error '
Rump dark, same colour as Back. No white bases to small feathers of the back

(Not) *Aerodramus amechanus* Oberholser (Anamba Is, Indonesia)

Brown-rumpedwhite-nest swiftlets from Sarawak (1957) *Aerodramus fuciphagus vestitus*

‘White’ nest swiftlet from Karangduwur cave, Kebumen, Jateng (1961)

Rump slightly paler than back, but no dark shaft streaks.

Concealed white bases to small feathers of the back

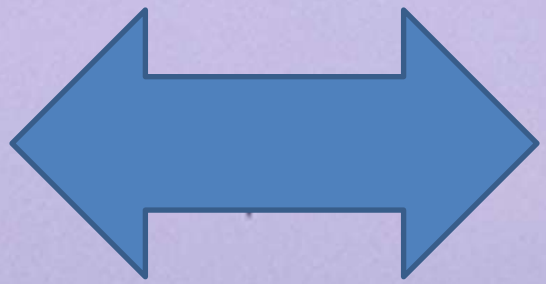
Unique characters

3. ‘House-farming’

Burung walet burung berguna

During the 20th century 'House –farming"

has emerged as the newest domestication of economic value



Birds **People**

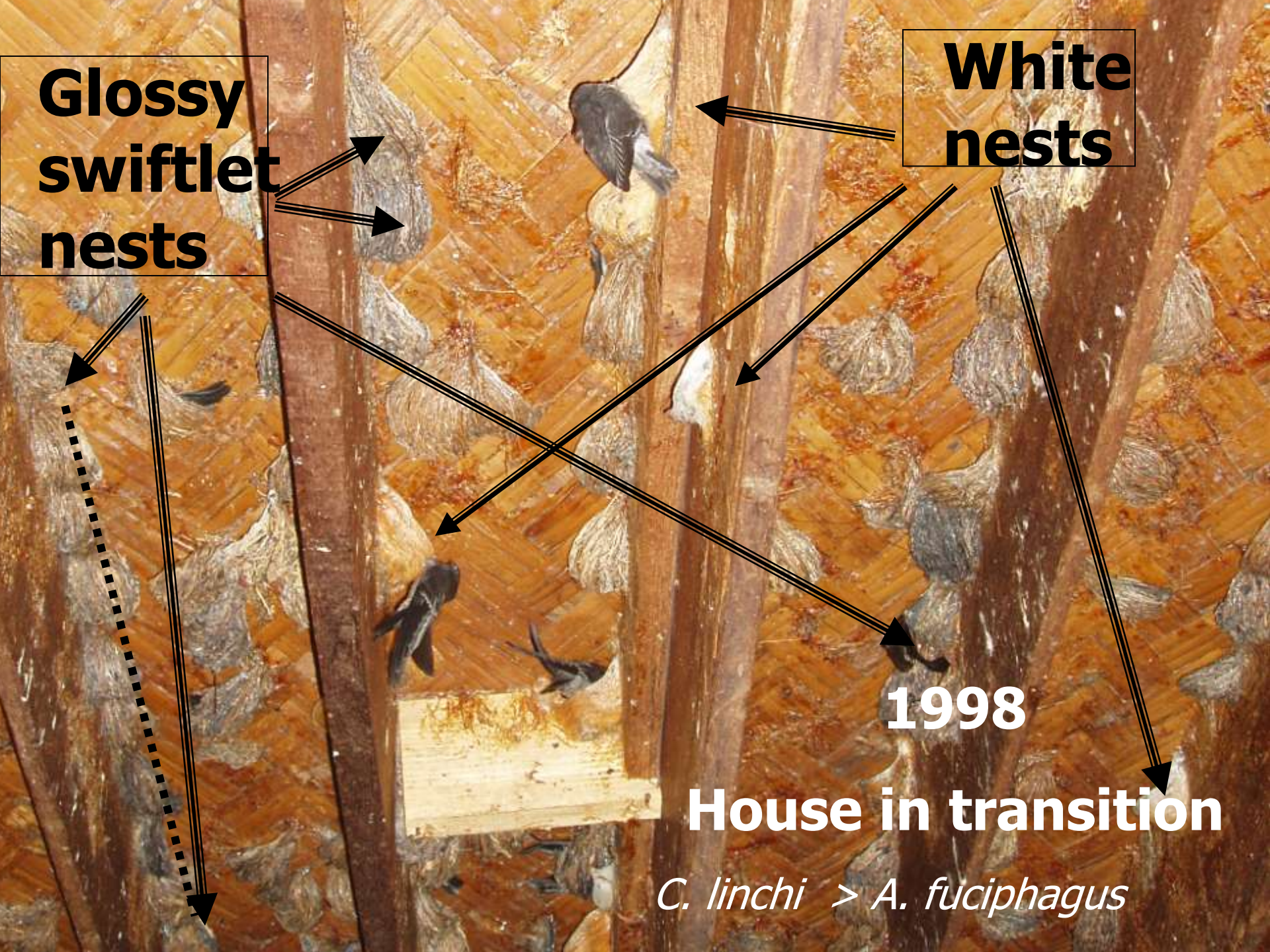

It began with the birds entering houses
Earliest records of white-nest swiftlets nesting in houses: Java, ~1880.
Aerodramus fuciphagus

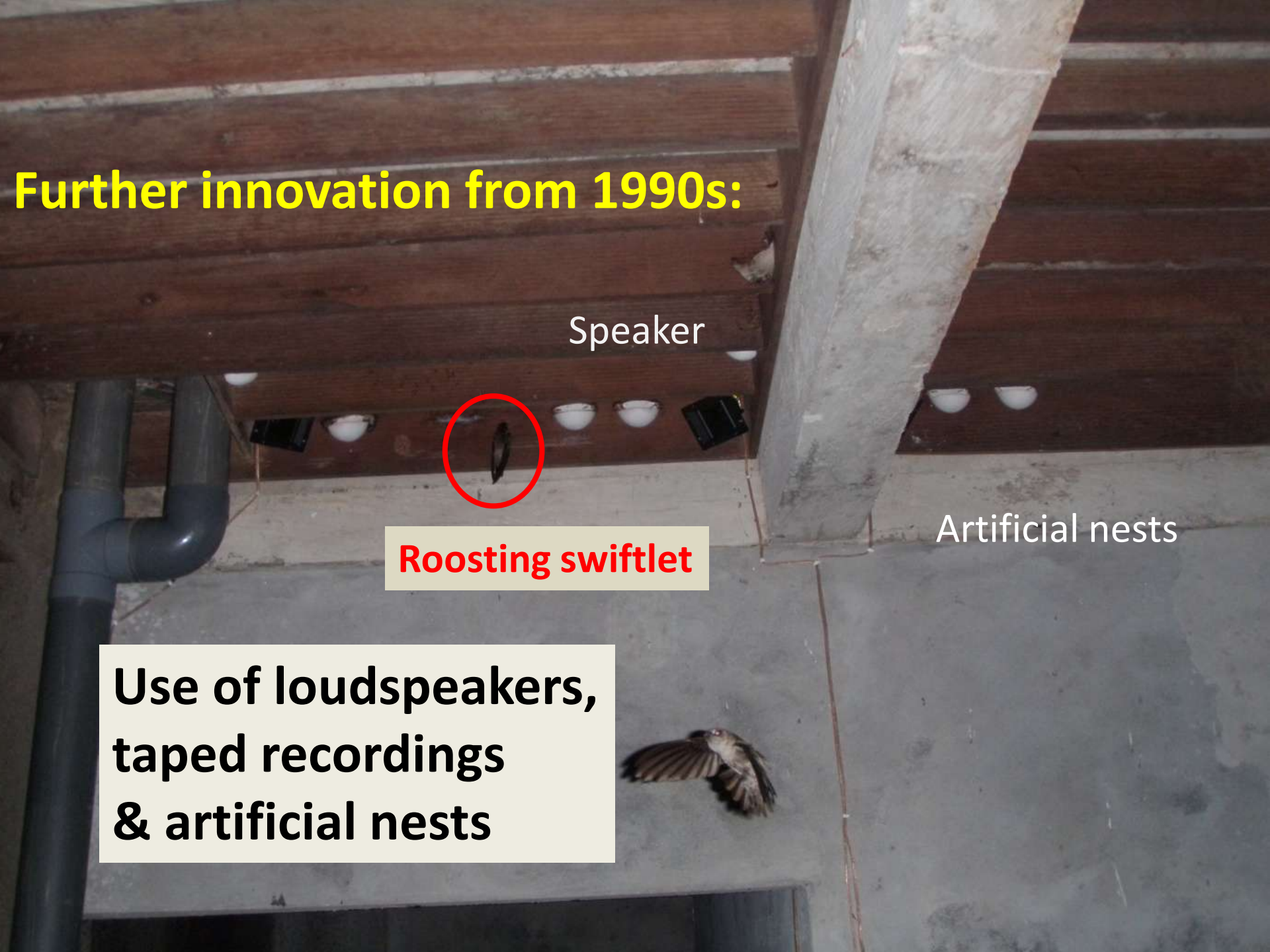
Interior modifcations (1960+)

Use of rafters

Key development of 1970-90s, in Java

Eggs for transfer to nests of glossy swiftlet


Glossy swiftlet nests
White nests
1998
House in transition
C. linchi > A. fuciphagus


Further innovation from 1990s:
Speaker
Roosting swiftlet
Artificial nests
Use of loudspeakers,
taped recordings
& artificial nests


NB. Nestling, with
Pale fringes to flight
feathers

Small house farm in Lombok, started by egg transfer from Surabaya, about 1999

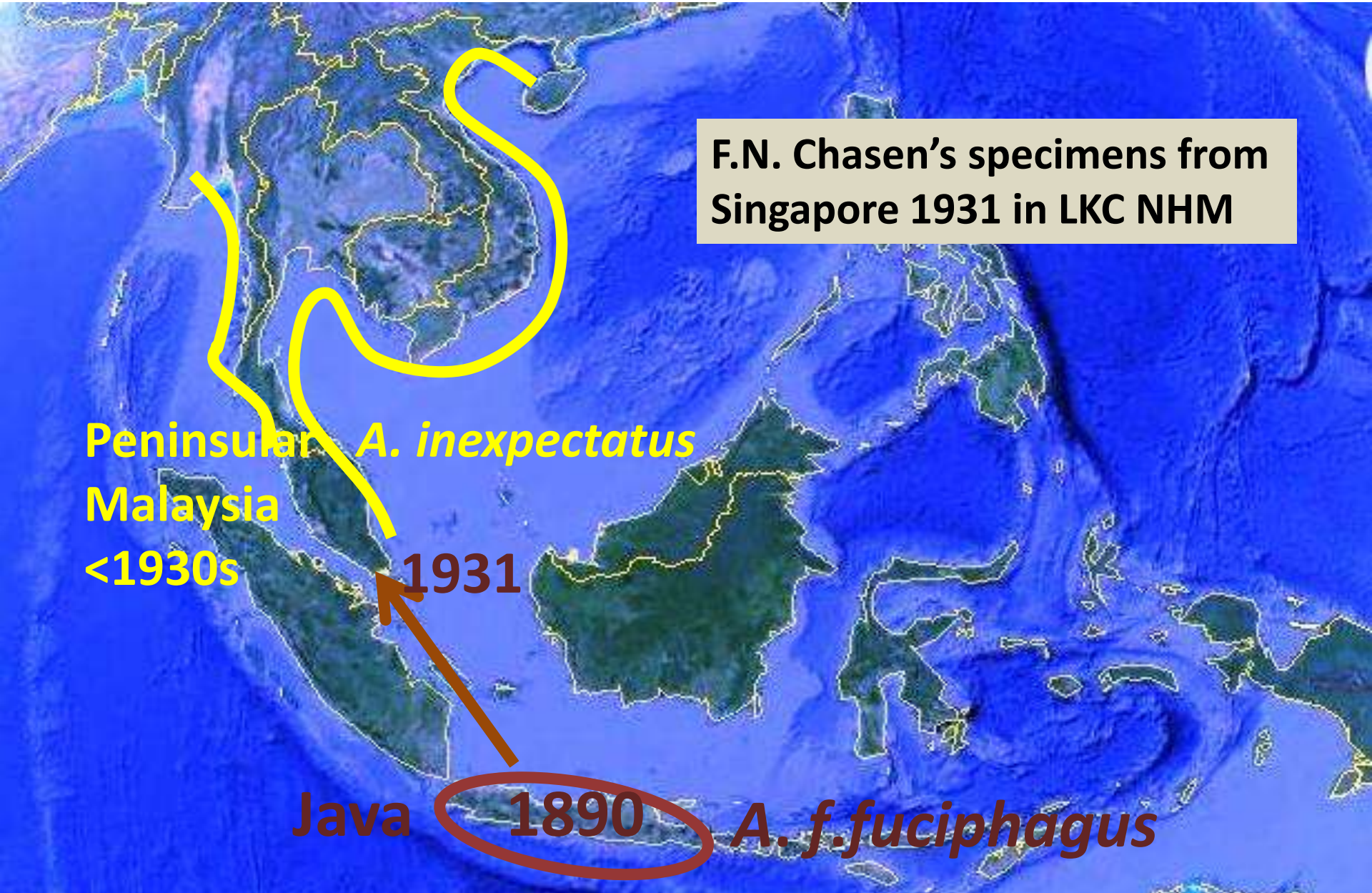
(2013)

Ampenan, Lombok:
‘Swiftlet city’
(2013)

Often fortress-like, ‘house-farms’ now abound throughout S E A


Also in rural areas
East Kalimantan (2006)

Two potential origins of house-farm birds



Dated spread of house-farm birds

A new domestication ?

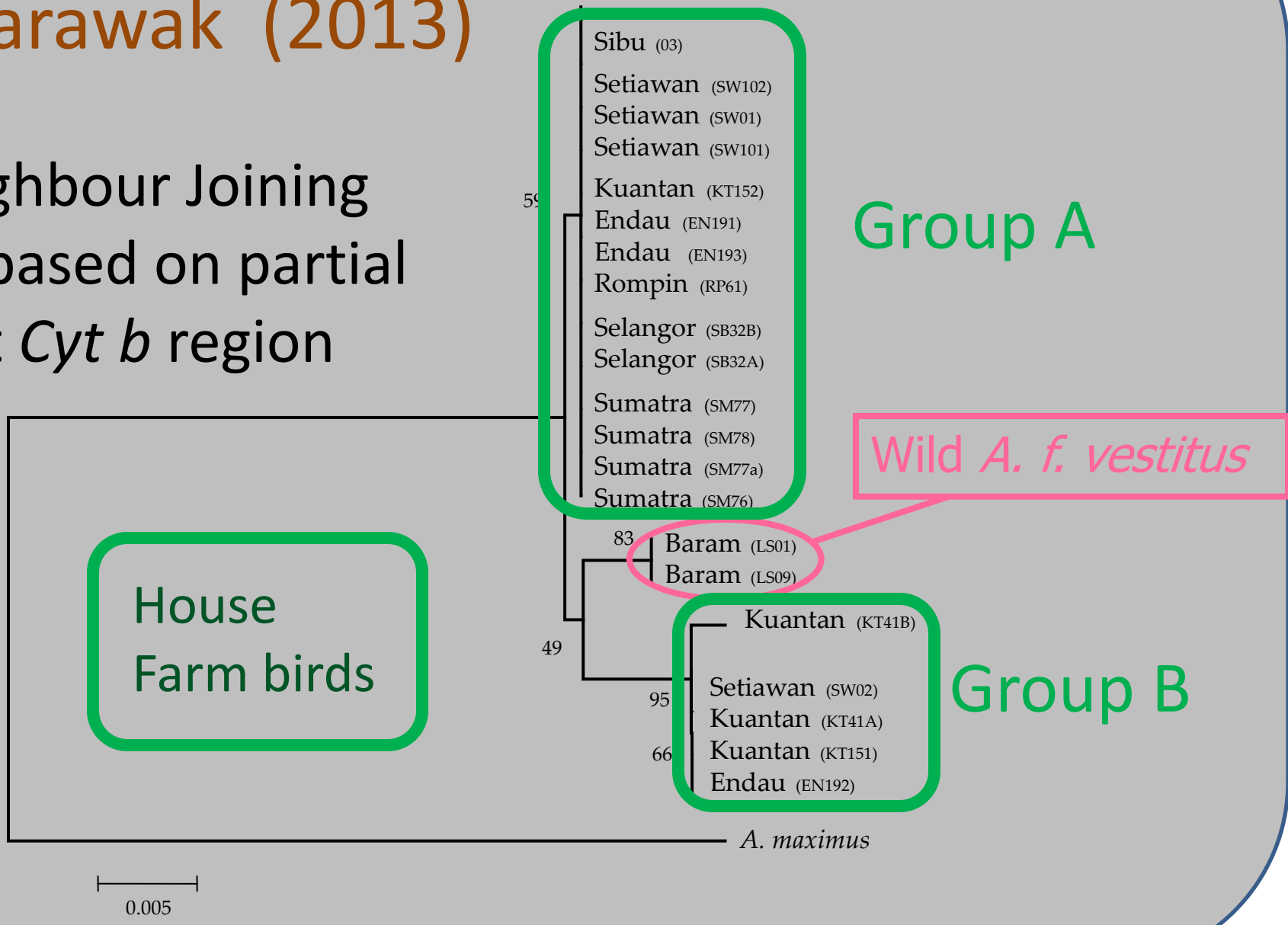
- It is evident that house-reared swiftlets are imprinted on buildings as potential nest sites.
- There is (so far) no evidence (e.g., Sabah, Perak) that house-type birds have colonised local caves.
- Therefore, behaviourally they seem to constitute a new ‘domestic’ form of swiftlet.
- .

Genetic procedures now offer new means to test the relations between wild and ‘domestic’ birds

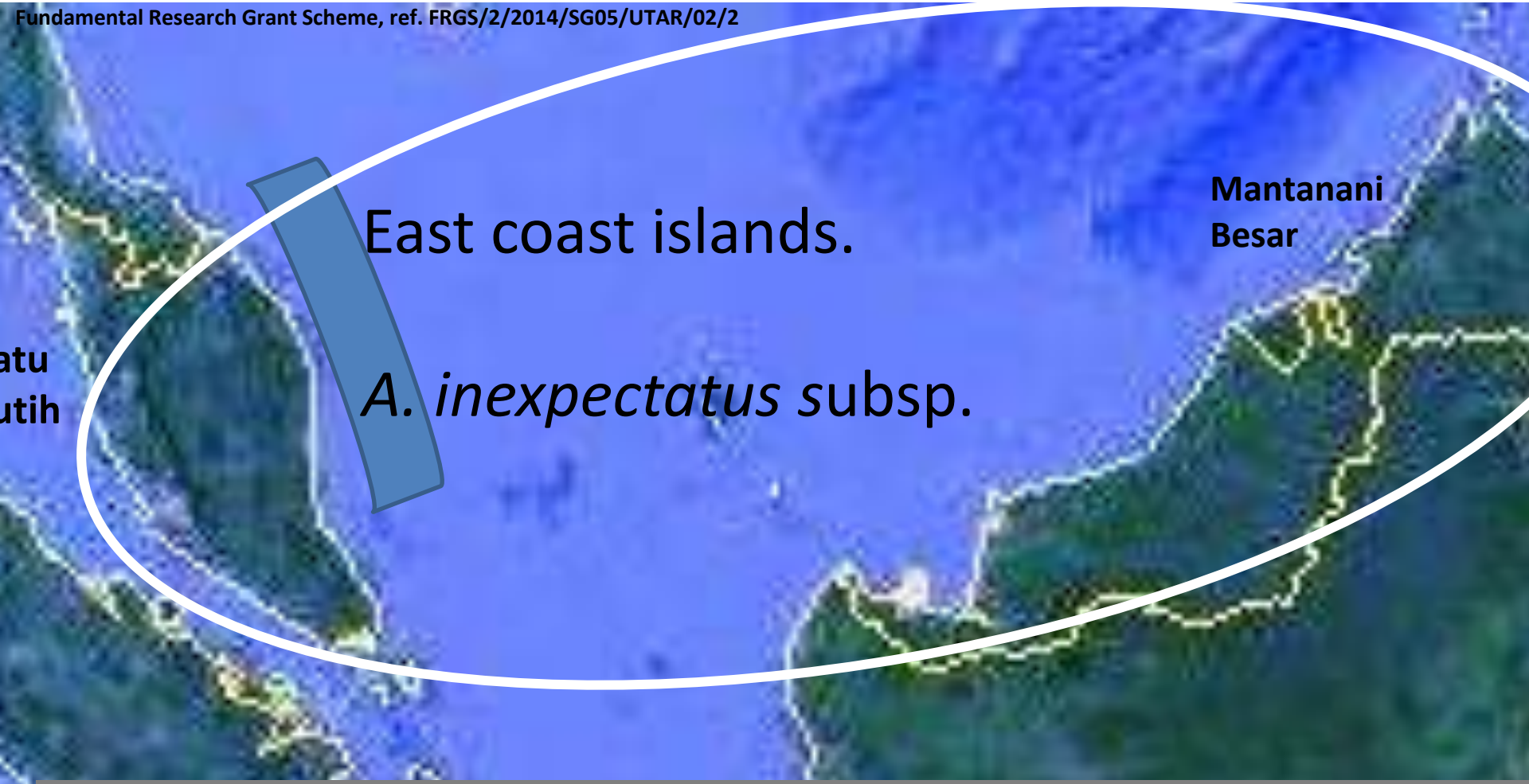
Geneticists at UTAR & Micropathology h\ve obtained DNA from feather bases
We pluck one primary feather from each wing
If we find recent casualties, we take tissue

House-farm swiftlets: E-W from Sumatra to Sarawak (2013)

Neighbour Joining Tree based on partial Mt *Cyt b* region



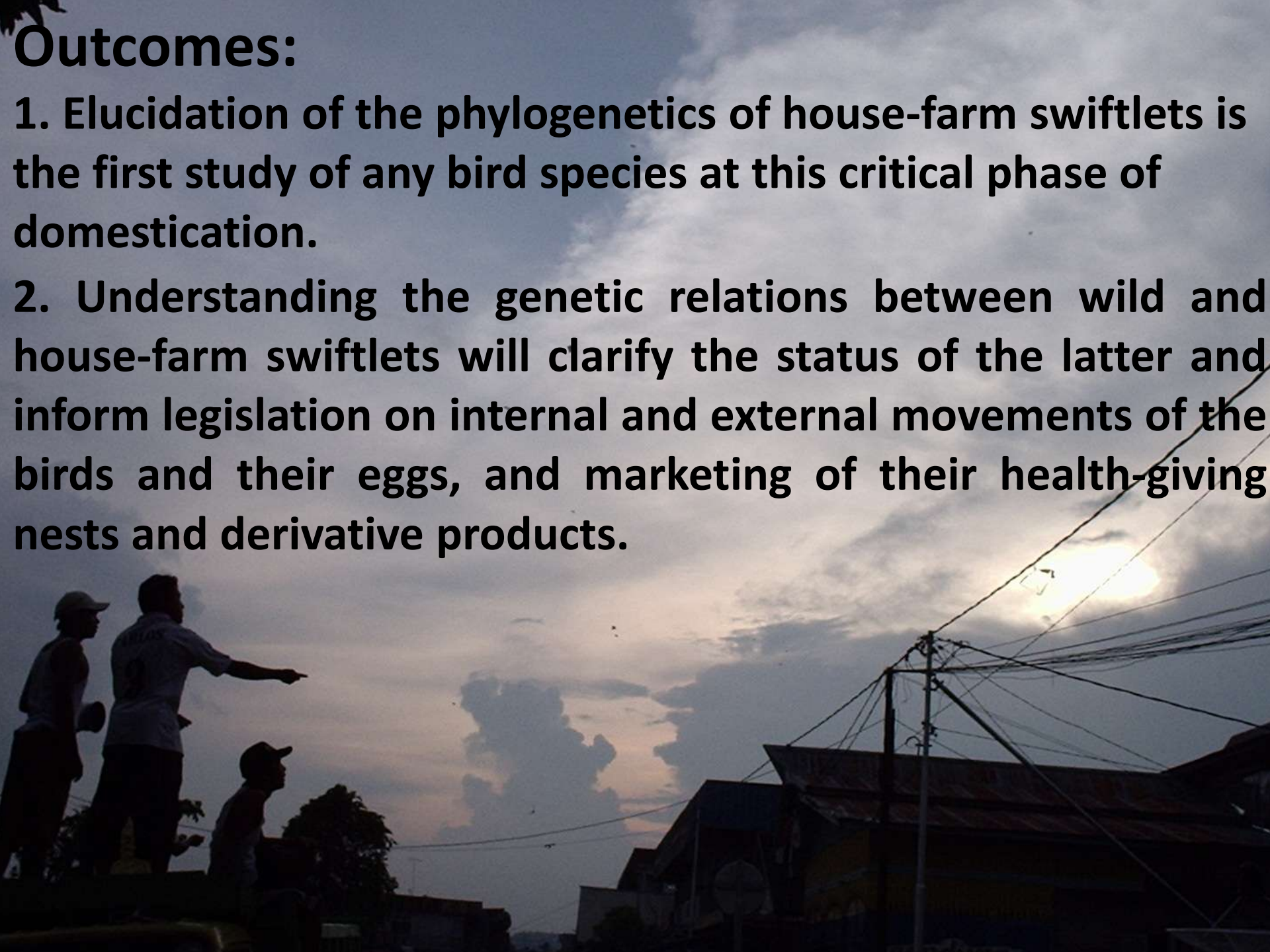

Wild A. f. vestitus
Group B
Group A



1. Genetic resources of house-farmed white- nest swiftlets in Malaysia

Fundamental Research Grant Scheme, ref. FRGS/2/2014 /SG05/UTAR/02/2 with Micropathology, UK

At the owner's request we collected samples at a bird-house, Cacaban, Banten, Java (2014)



Outcomes:

1. Elucidation of the phylogenetics of house-farm swiftlets is the first study of any bird species at this critical phase of domestication.

2. Understanding the genetic relations between wild and house-farm swiftlets will clarify the status of the latter and inform legislation on internal and external movements of the birds and their eggs, and marketing of their health-giving nests and derivative products.

Outstanding issues

- Is the present high rate of increase in house-farmed birds sustainable ?
- If there is over-exploitation of the food resource, could this place a local or regional limit on the populations ?
- Are house-farmed swiftlets competing for resources with other bird species of similar habit, e.g., migratory swallows *Hirundo rustica* ?

Swallows and Swiftlets: Assessing potential competitive interactions

Outcomes

3. Managed, selective breeding of house-farmed birds could improve the stock, e.g., female fecundity, nest weight or quality, & disease resistance

These objectives are important for house-farm owners and managers, and for all persons involved in the edible-nest industry.

CO-OPERATIVE RESEARCH BY UTAR, NUS AND MICROPATHOLOGY CAN BE THE BASIS FOR NEW UNDERSTANDING

In the scenario of this newest domestication, with the backing of sound husbandry and good science, rational planning can ensure the sustainable management of this important biological resource.

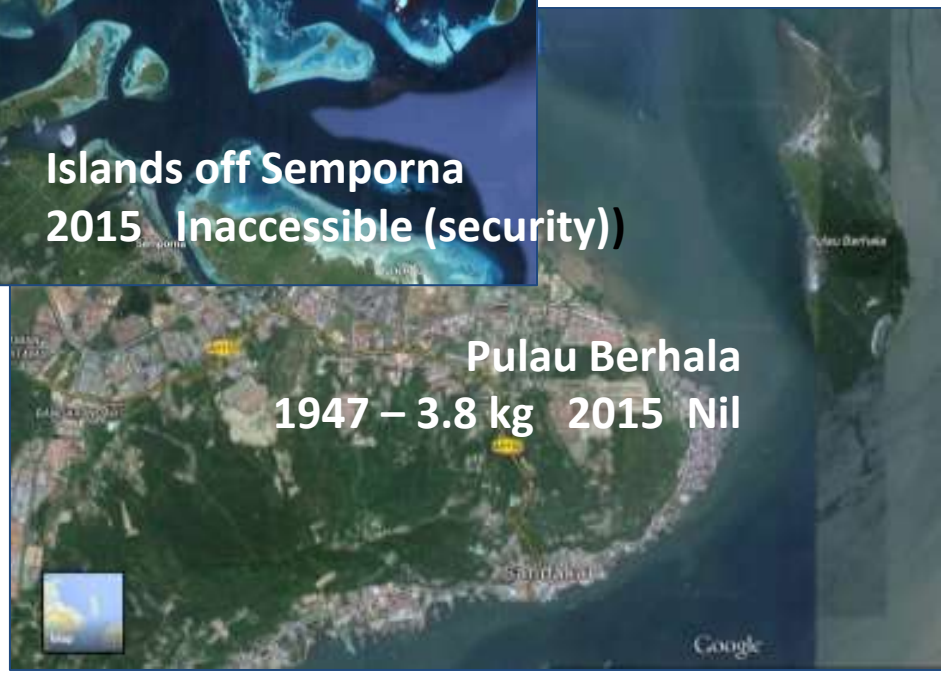
A brief account of the present state of birds'-nest caves and the conservation status of edible-nest swiftlets in Sabah.

Saul Mallinson, Hester Odgers, Chin Chiwon and Earl of Cranbrook

Pulau Mantanani Besar
1947-1964 17-40 kg
2015 SIX nests only

Fig. 1 Mantanani Island

Islands off Semporna
2015 Inaccessible (security))



Pulau Berhala
1947 – 3.8 kg 2015 Nil

Batu Mandi
1048-1951 >50 kg, 2015 NIL

Disastrous decline in colonies of Grey-rumped swiftlets, *Aerodramus inexpectatus germani*

House-farming has not saved wild populations by substituting for natural cave sources of nests in trade.

Cintailah, Lindungilah, Lestarikanlah!
Cherish, protect and conserve them!
Jangan punahkan dari persada
Do not expell them from their perch

Acknowledgements

UTAR: Dr Goh Wei Lim, Vincent Siew

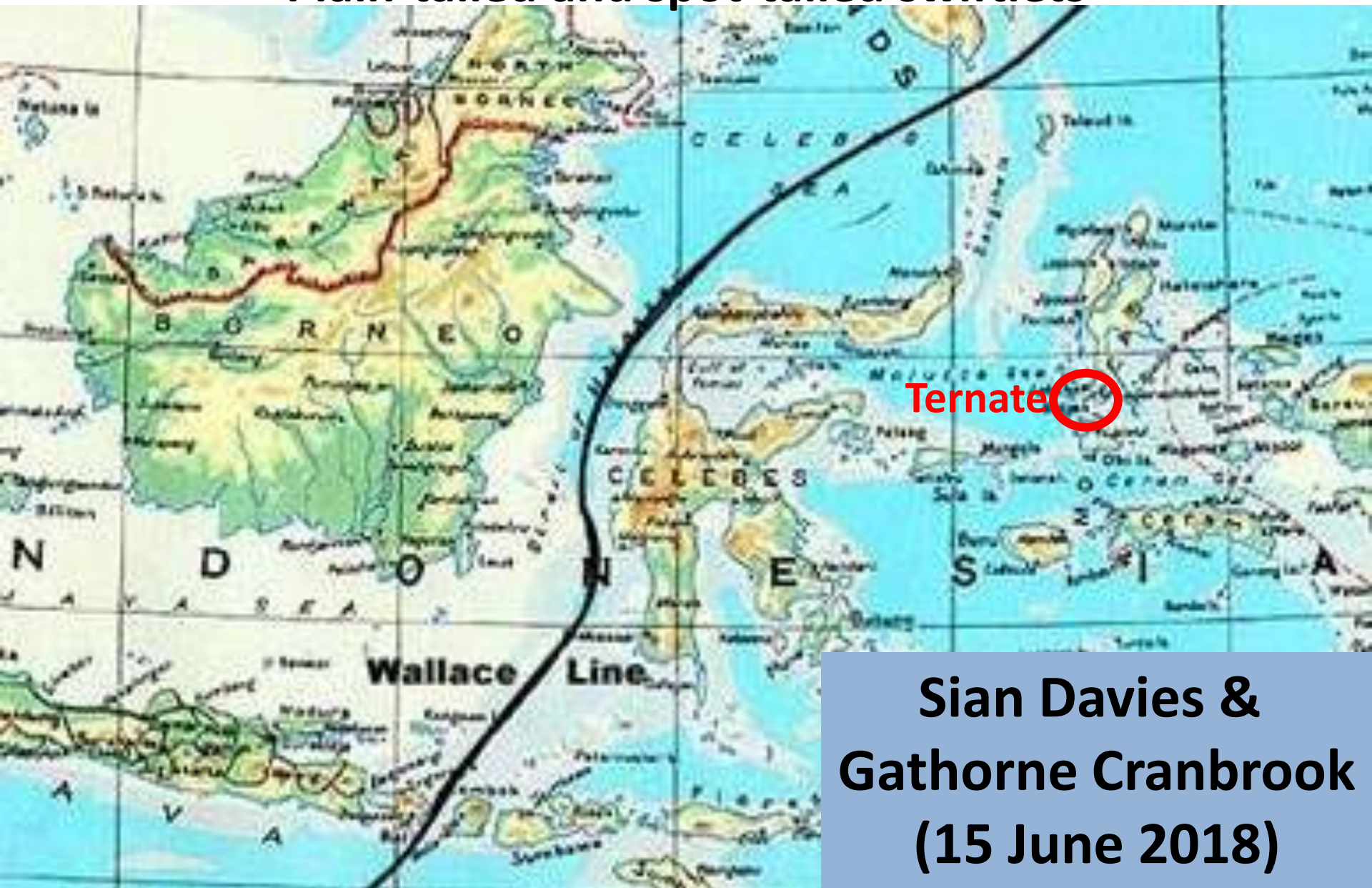
Micropathology: Dr Colin Fink, Dr Sarah Ball, Dr Sian Davies

University of Malaya: M. Saiful Mansor, M. Rasul Abdul Halim

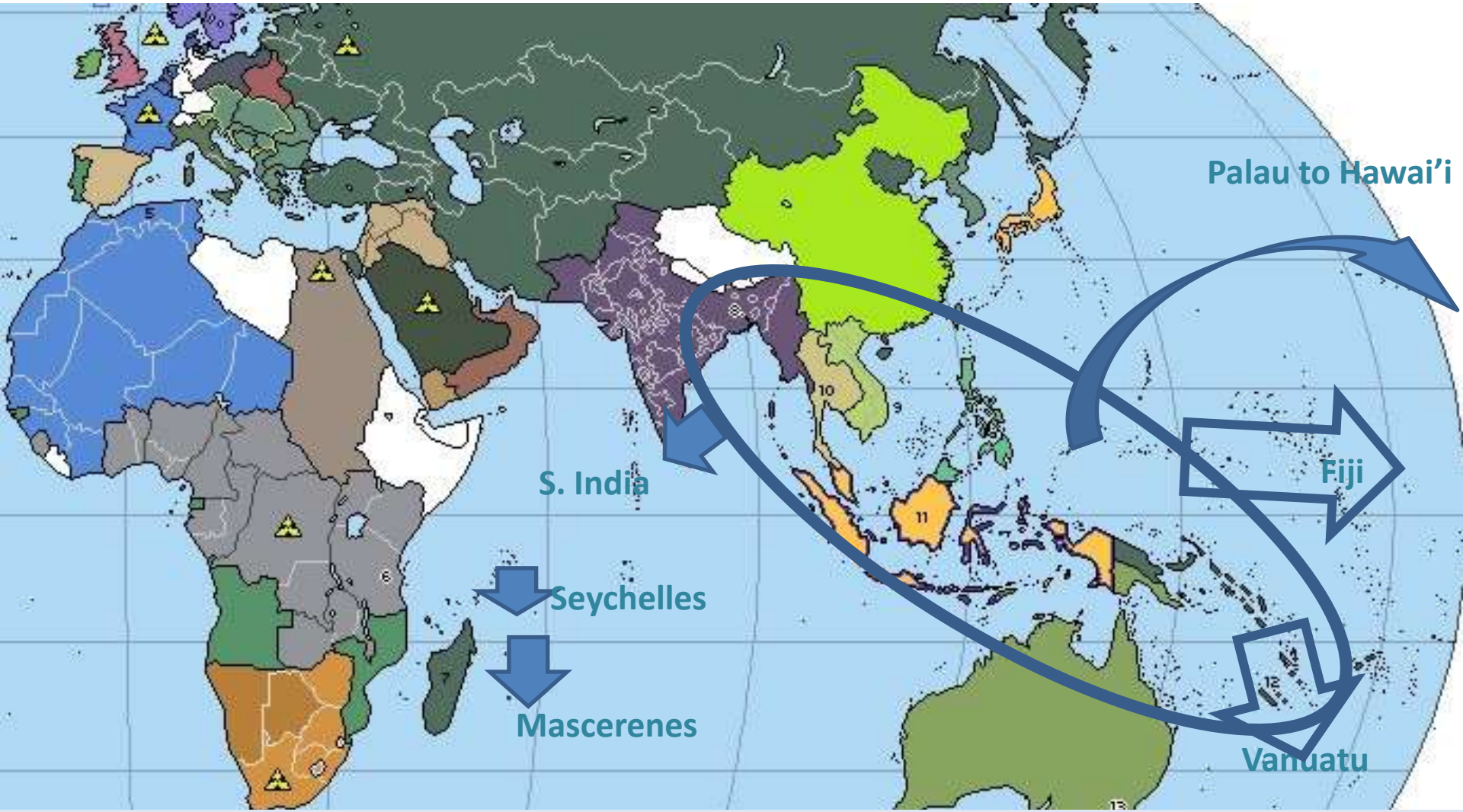
Dr Boedi Mranata, Anton Hoo, Johanes Siegfried, Dr Charles M U Leh, Dr Tan Boon Siong, Dr Lim Chan Koon, Alan Speck and many others including many house-farm owners or managers .

East of Wallace's Line: Clarity through sequencing

Plain-tailed and spot-tailed swiftlets



Sian Davies &
Gathorne Cranbrook
(15 June 2018)



World distribution of swiftlets, Collocaliini
Island-hoppers of the Indo-Pacific

Glossy / White-bellied Swiftlets
(*Collocalia esculenta* gp)
GLOBAL DISTRIBUTION

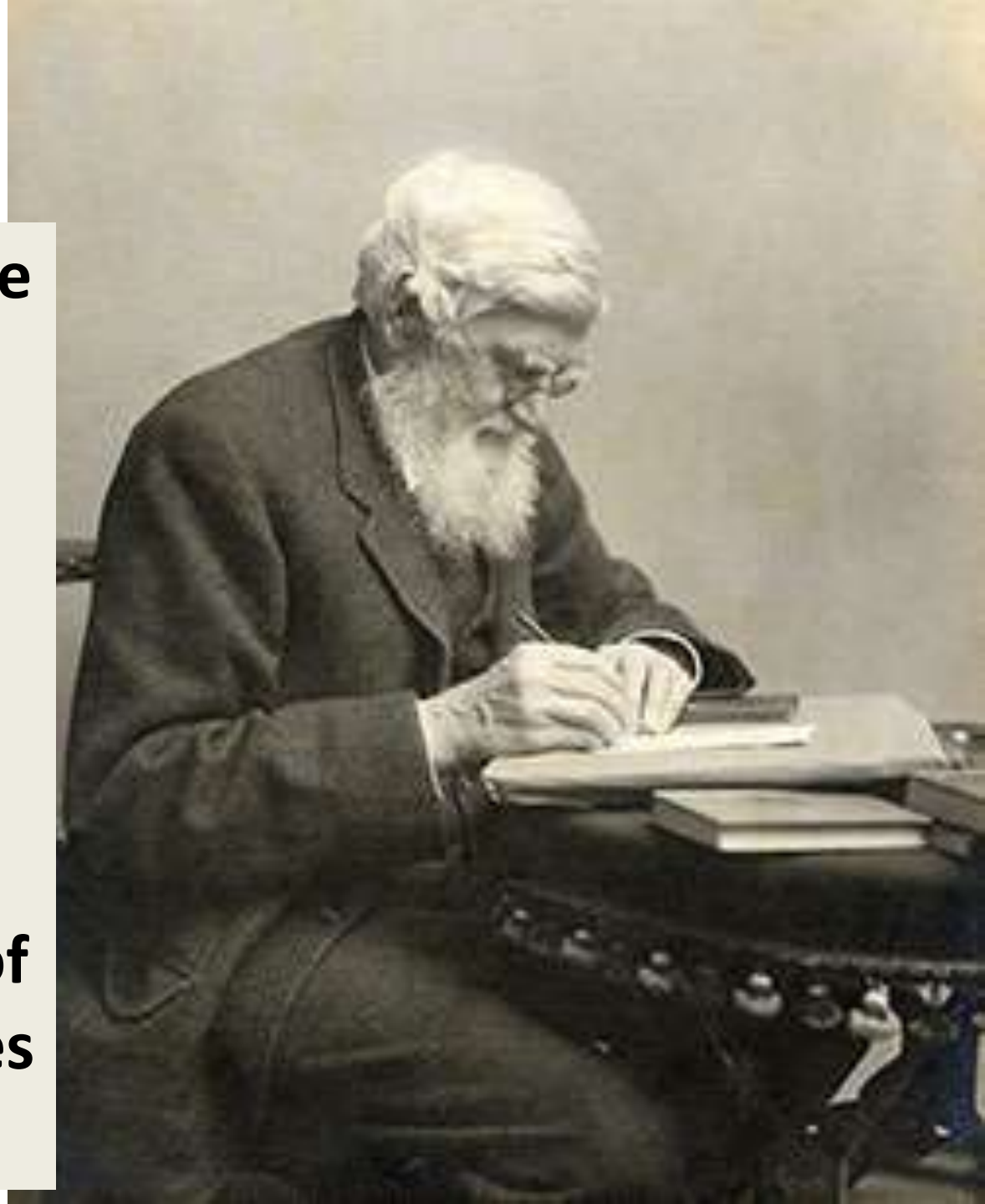
All glossy swiftlets build bracket-shaped nests from strands of vegetable material, bound together by salivary cement

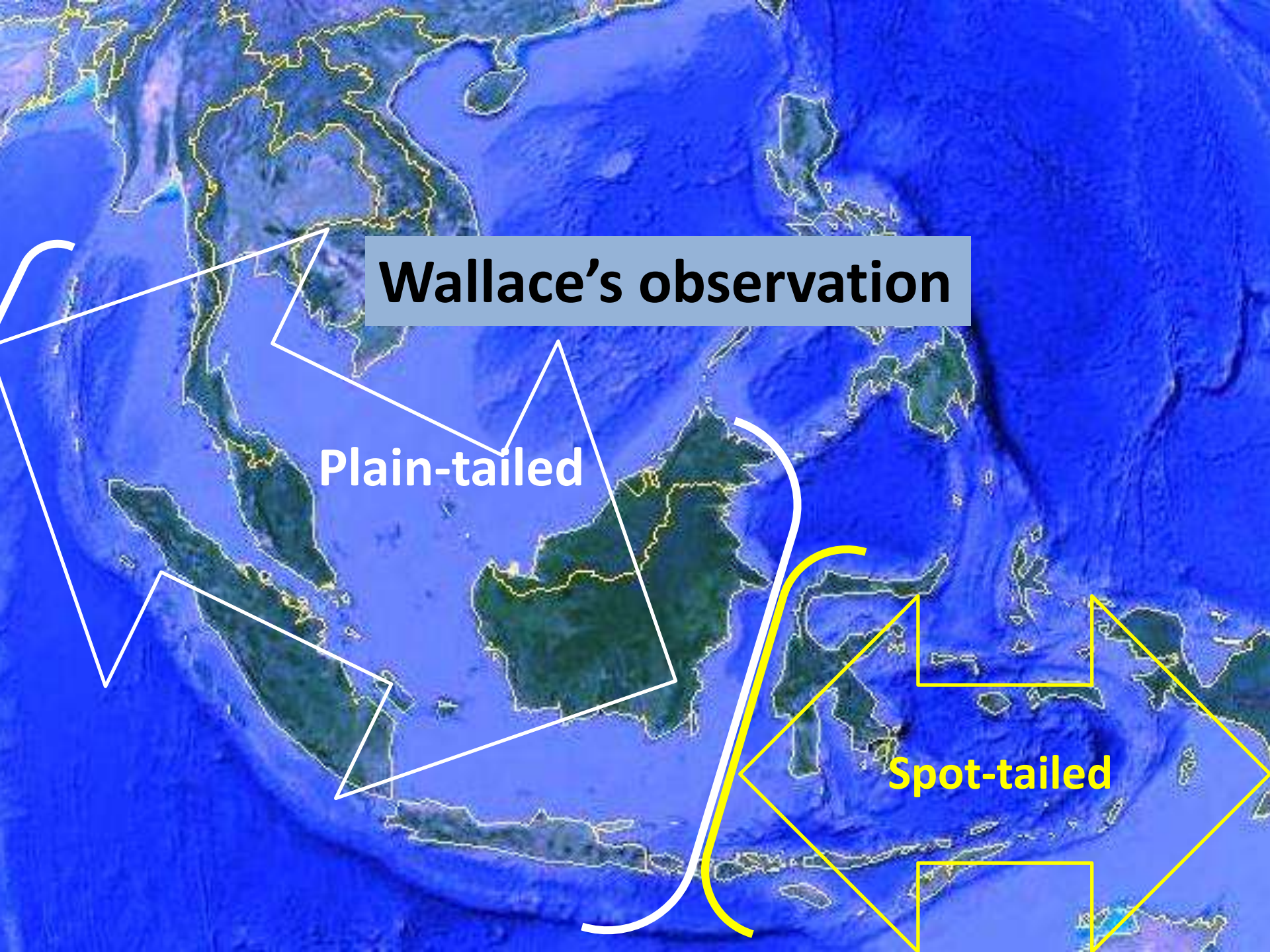
Alfred Russel Wallace

1823-1913

FRS (1893),
OM (1905)

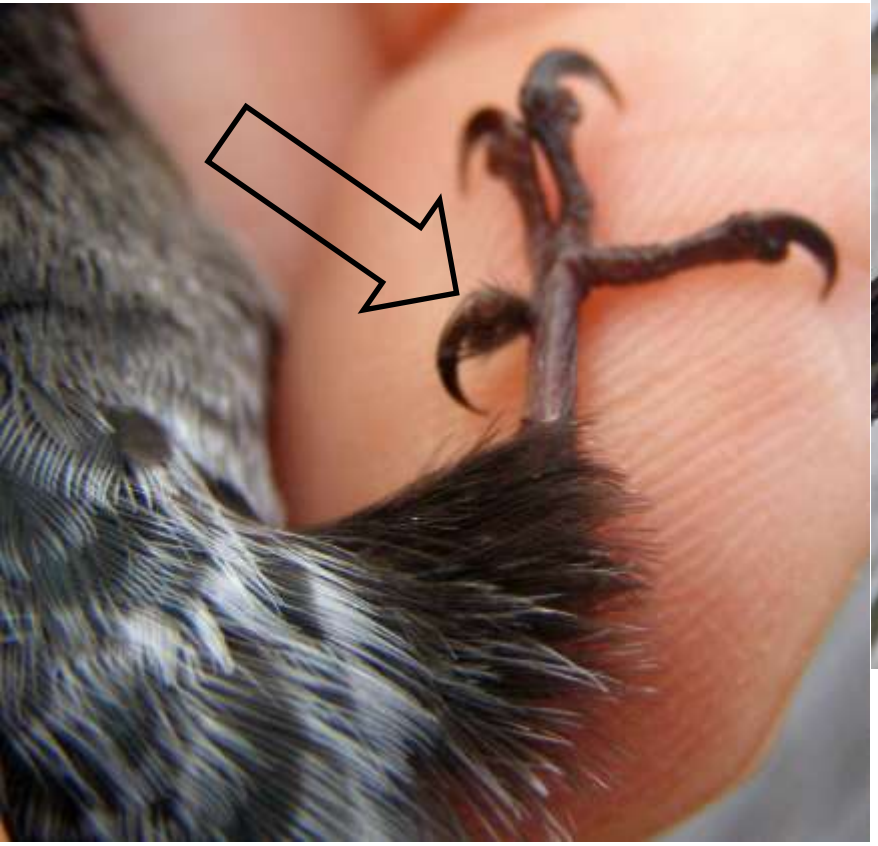
1864: "..a synopsis of the described species of *Collocalia*

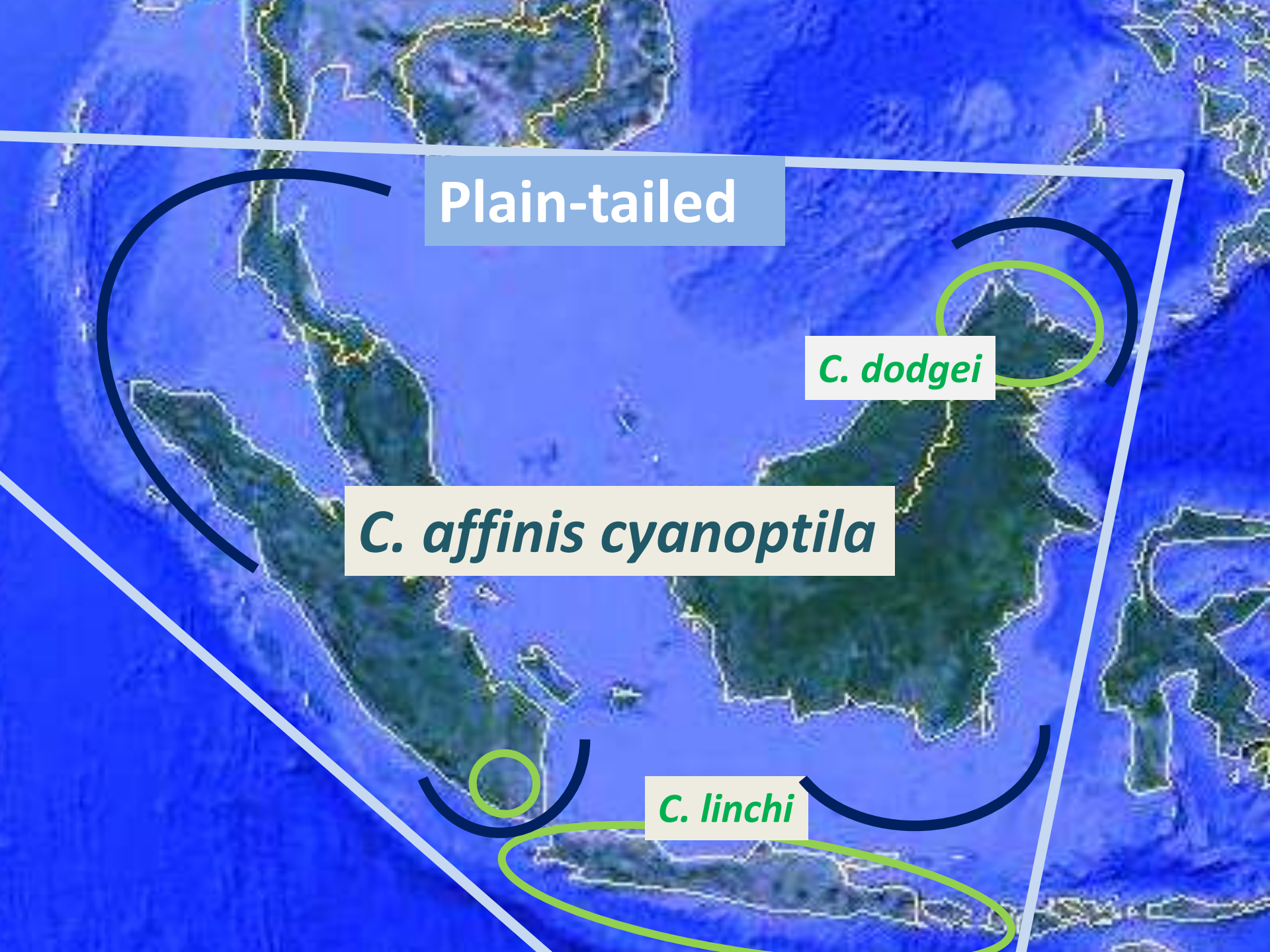


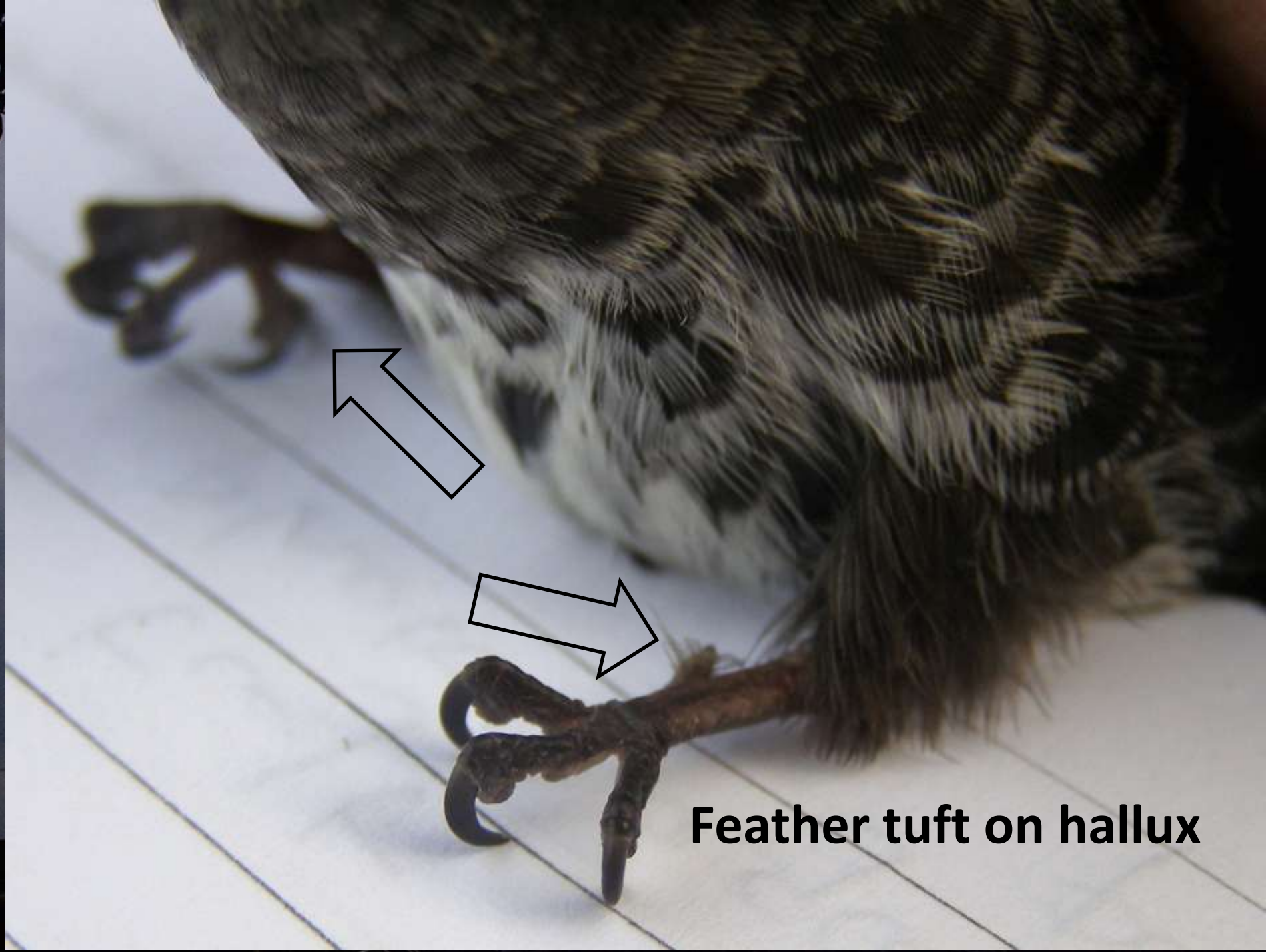

Wallace’s observation
Plain-tailed
Spot-tailed

Among plain-tailed group, Somadikarta (1982) recognised blue-glossed species with a minute feather-tuft on hind toe (*Collocalia affinis)* vs. green-glossed, no toe-tuft (*C. linchi)*

Feather tuft on hallux



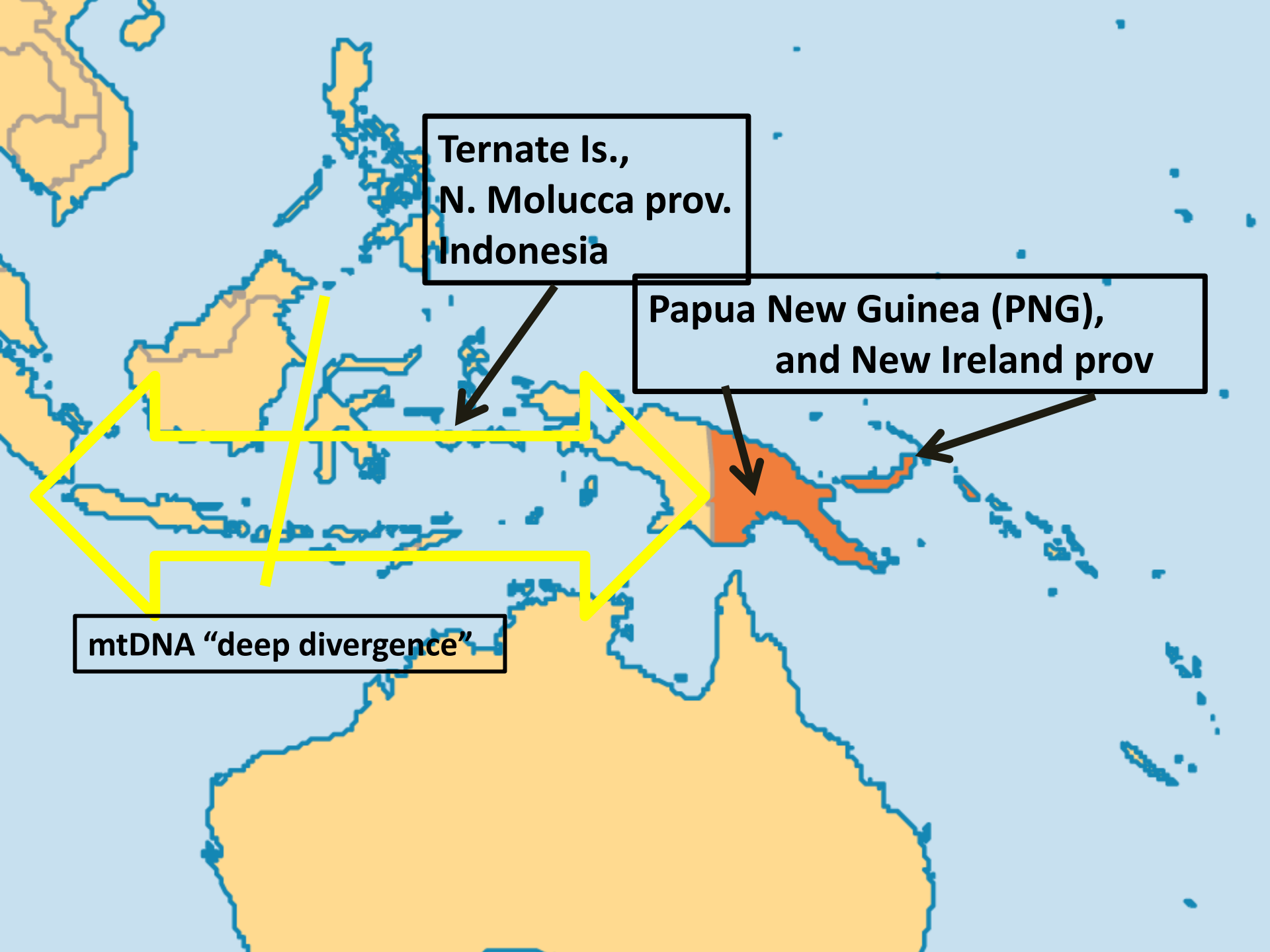

Plain-tailed
C. dodgei
C. affinis cyanoptila
C. linchi


Feather tuft on hallux

C. K. Lim (1994): among the blue-glossed group, there is an age- and wear-related change from greenish (fresh) to blue (worn).

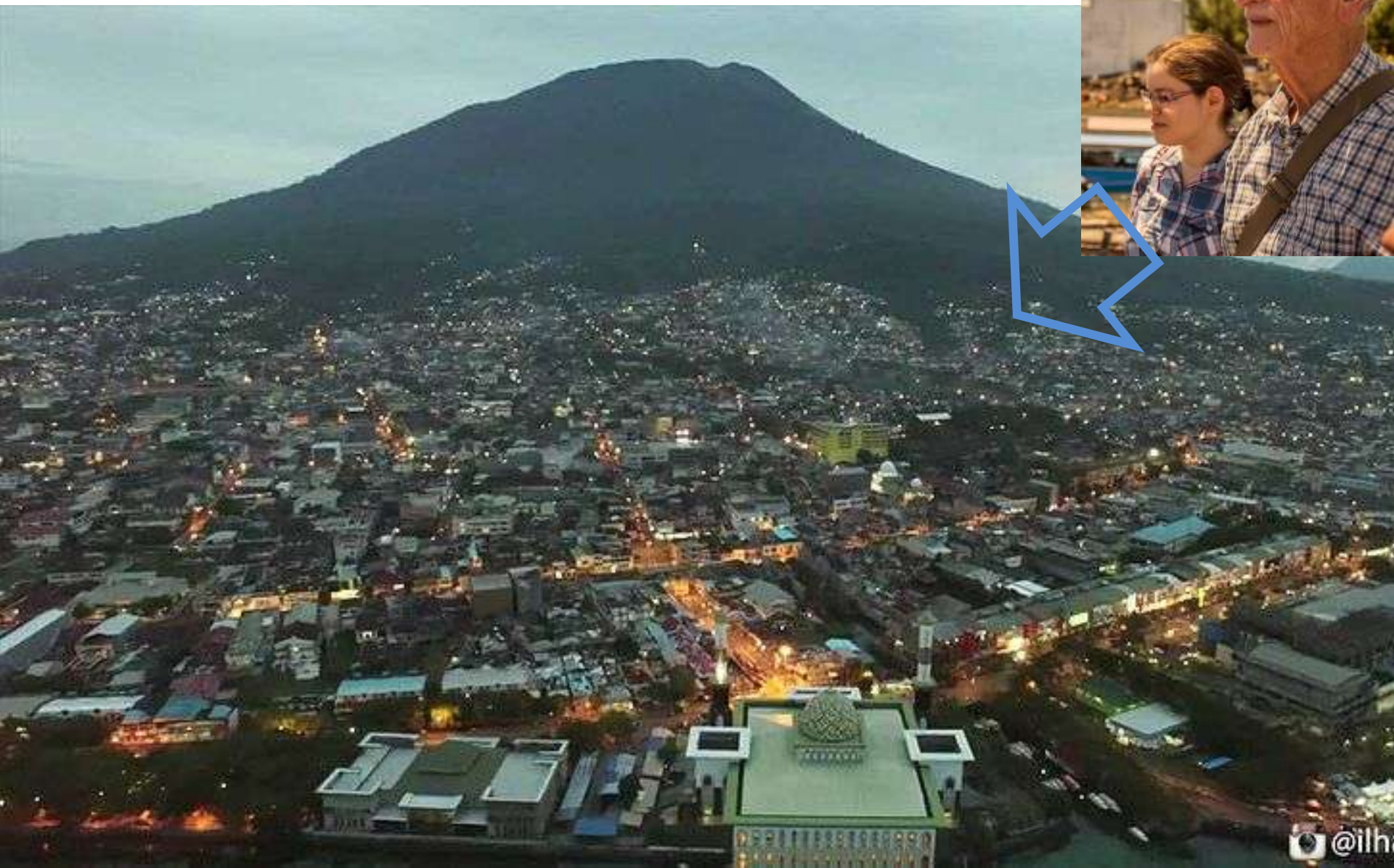
F. Rheindt *et al*. (2017): based on mtDNA sequences, there is a "deep divergence" (4.7 – 8.6%) between clades west and east of Wallace's line.

C. esculenta spilura of North Moluccas province, Indonesia: intensely blue-glossed, 75% tuft on hallux, all with white in tail but spots may be reduced or smudged.


Ternate Is.,
N. Molucca prov.
Indonesia
Papua New Guinea (PNG),
and New Ireland prov
mtDNA “deep divergence”

Ternate island, volcano and city

Capital of North Moluccas province



Bridge on the road to Mt Gamalama

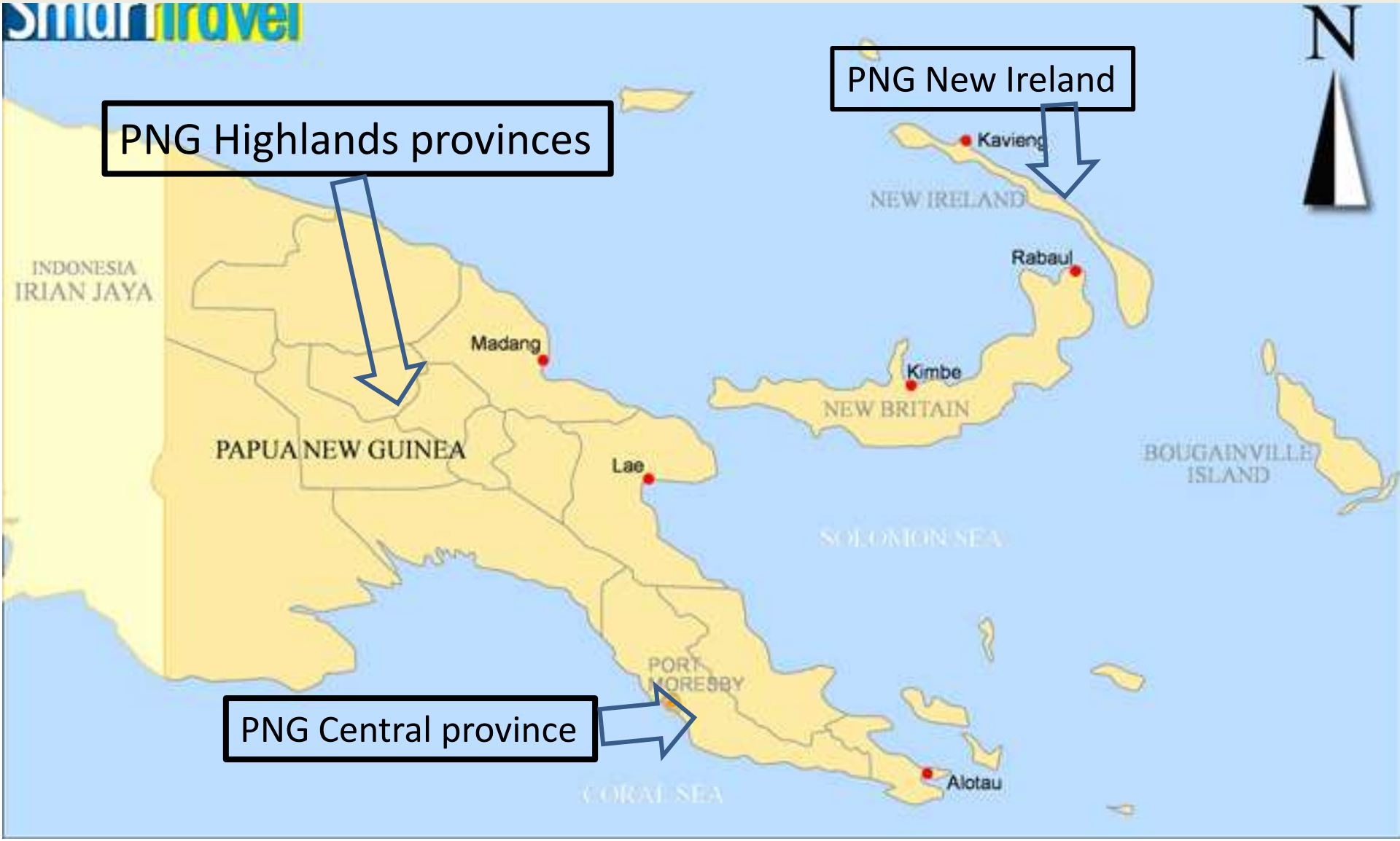
We set a mist-net, dropped in over the side of the bridge, and at once caught 4 swiftlets

All were brightly blue-glossed

Two were plain-tailed

Two had large white spots on the concealed (inner) vanes of tail feathers

First submission reviewed by M. Tarburton



In PNG & New Ireland, 350 birds handled: 3 (0.86%) plain-tailed; remainder had variable-sized spots on inner vanes of 1 – 4 tail feathers (M. Tarburton)