

Conducting Biodiversity Surveys in the Current Age of Wildlife Discovery

Lawrence R Heaney

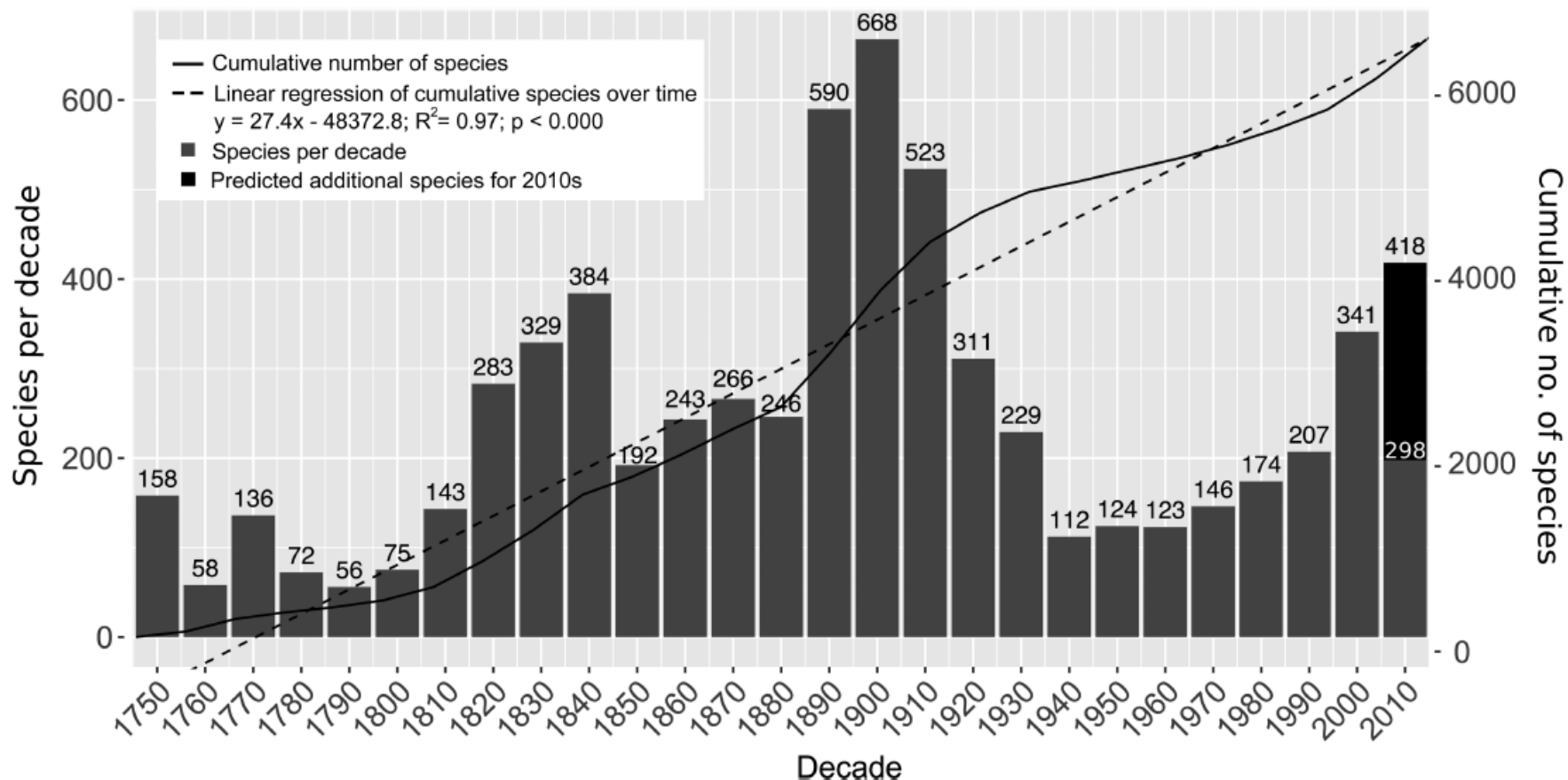
Negaunee Curator of Mammals

Field Museum of Natural History

Chicago, IL, USA

How many species of mammals are there?

CONNOR J. BURGIN,¹ JOCELYN P. COLELLA,¹ PHILIP L. KAHN, AND NATHAN S. UPHAM*



—Cumulative and decadal descriptions of taxonomically valid extant mammal species from 1758 to 15 August 2017.



Philippine old-growth rain forest, 1900, 1992

HABITAT LOSS

**1900: 70% old growth forest cover
(plus 16% second growth)**

**1992: less than 8% old growth
(plus 12% second growth)**

**2020: less than 6% old growth
(plus ~ 18% second growth)**



Native Philippine Murids

“Cloud rats” - Phloeomyini

5 genera, >21 species



Crateromys schadenbergi
(and *Musseromys gulantang*)

Drawings by Velizar Simeonovski



Carpomys phaeurus



Batomys granti



Phloeomys pallidus

Native Philippine Murids

“Earthworm mice” - Chrotomyini

5 genera, >40 species



Archboldomys maximus



Chrotomys whiteheadi



Soricomys kalinga



Rhynchomys soricoides

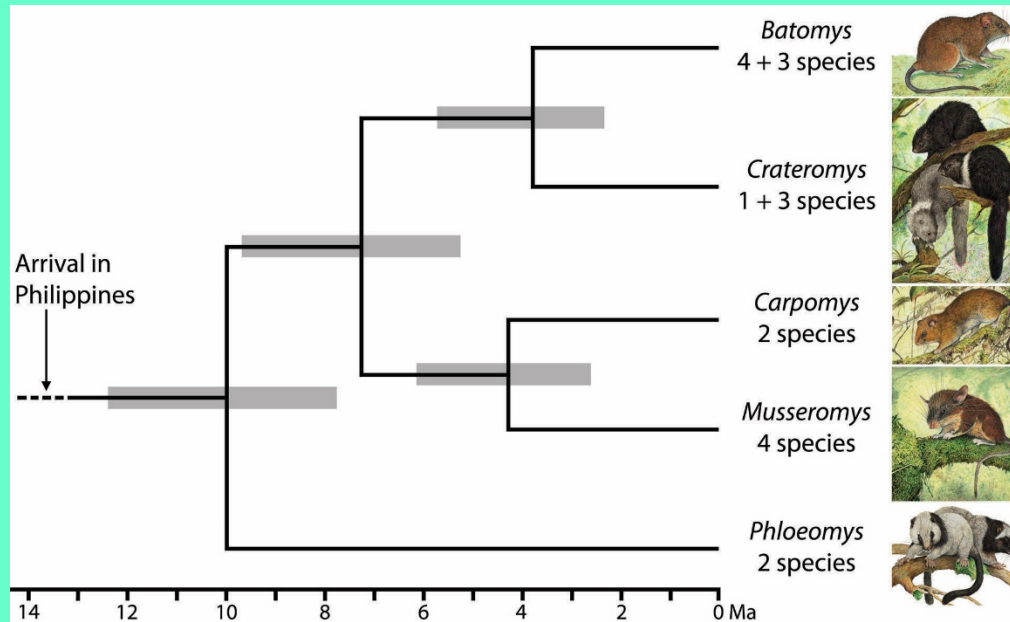


Drawings by Velizar Simeonovski



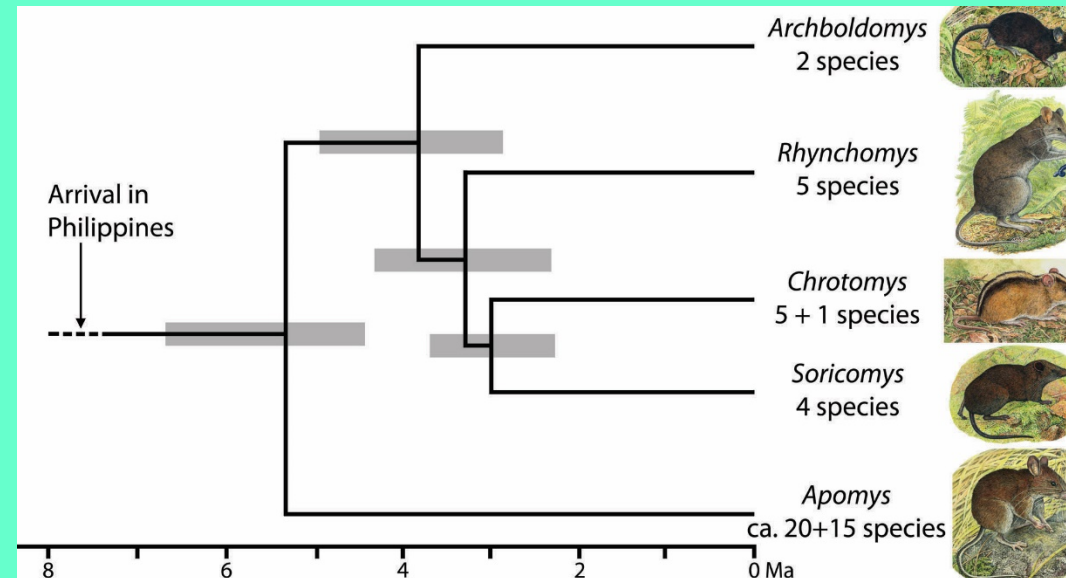
Apomys datae

Endemic Adaptive Radiations of Small Mammals on Luzon



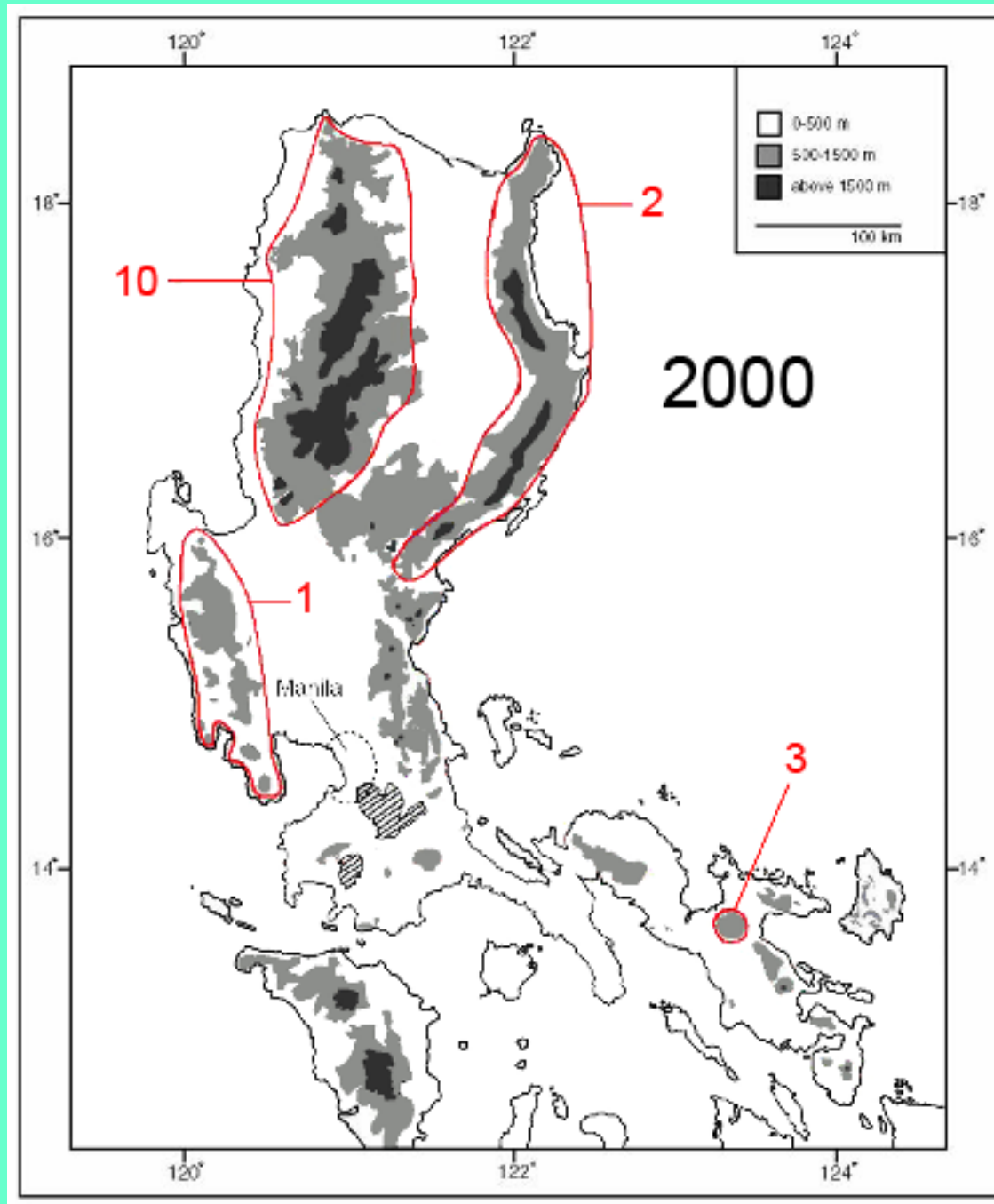
>21 cloud rats in the Philippines (15 on Luzon)

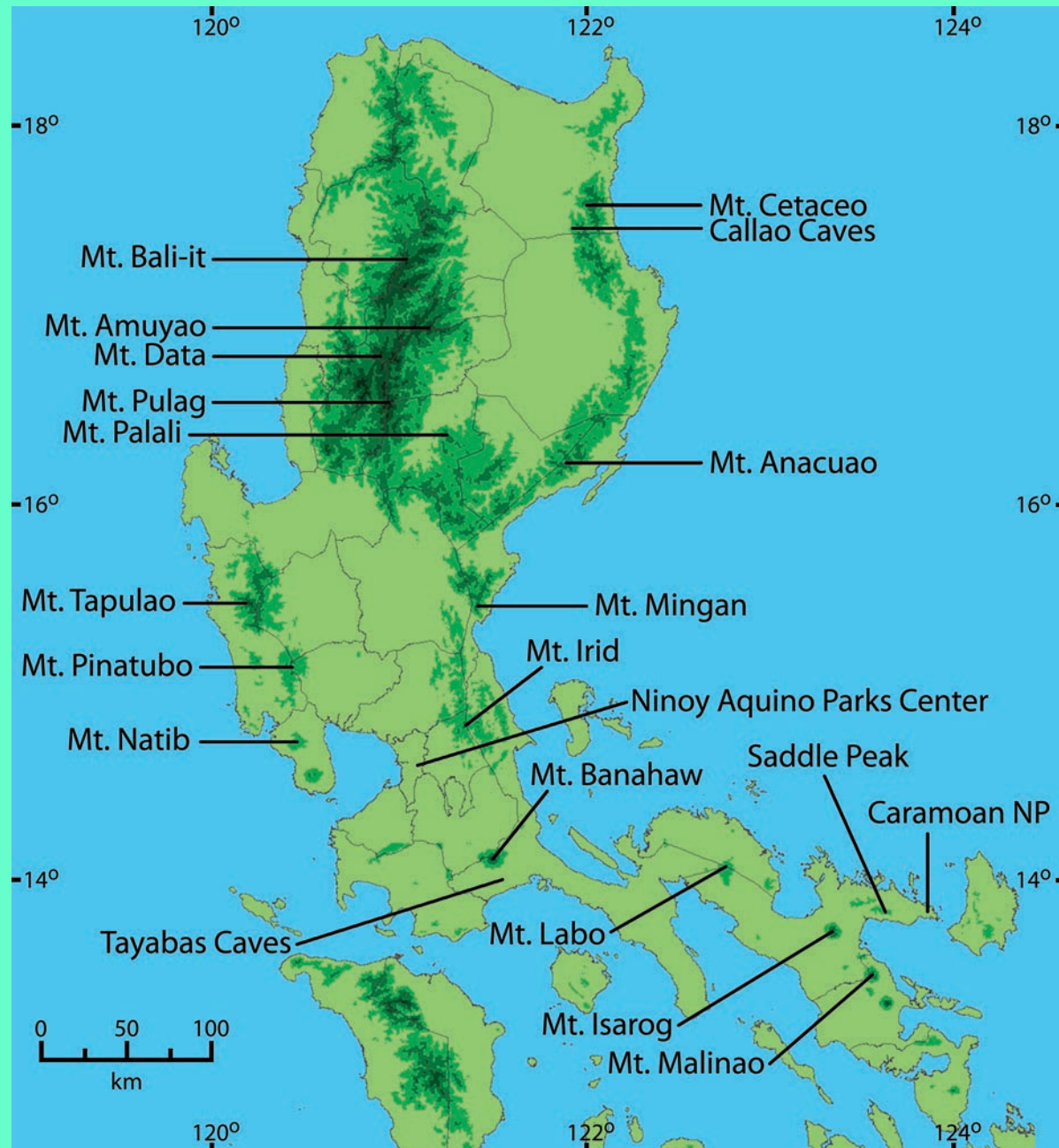
>40 earthworm mice in the Philippines (30 on Luzon)



**28 species of native
non-volant mammals
on Luzon in 2000**

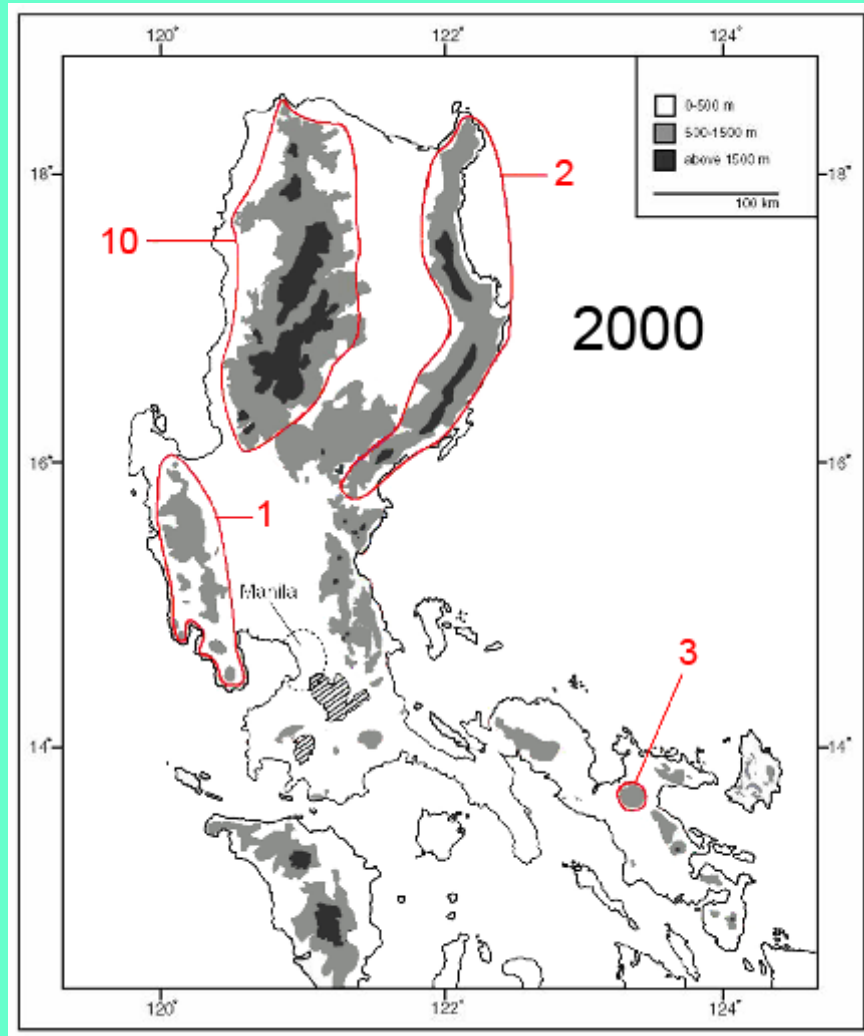
20 endemics - 71%





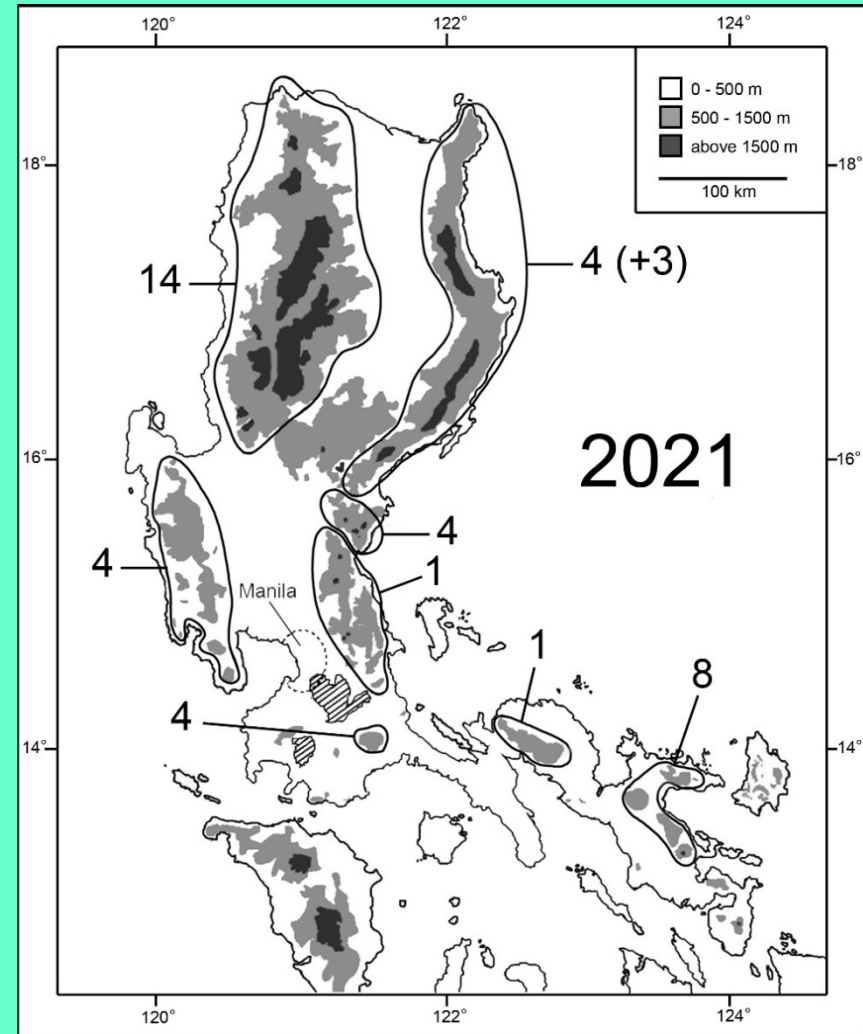
**Intensive
survey areas,
2000-2012
(ca. 37 team-months)**

100% increase in native non-volant mammals in ca. 20 years



28 species of native non-volant mammals on Luzon

20 Luzon endemics (71%)



56 species of native non-volant mammals on Luzon

52 Luzon endemics (93%)

THE PHILIPPINE STAR

TRUTH SHALL PREVAIL

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P15 MM

Camiguin yields new parrot, mouse species

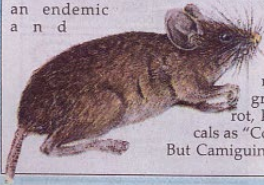
A brightly plumaged parrot and a long-tailed forest mouse unique to the Philippines have been discovered in the vanishing rainforest of a tiny tropical island, US-based researchers said yesterday.

Camiguin, a volcanic island off the coast of northern Mindanao, is a treasure trove for fauna, and already had an endemic species of rodent frog before the discovery of the rusty brown mouse and the green hanging parrot, known among locals as "Colasisi."

But Camiguin's wildlife was at risk from deforestation, researchers, writing in *Fieldiana: Zoology*, a scientific journal published by the Chicago-based Field Museum of Natural History, warned.

"Knowing that at least 54 species of birds and at least 24 species of mammals live on Camiguin and that some of these animals are found nowhere else on earth, makes us realize how important this island is," said Lawrence Heaney, curator of mammals at the Field Museum.

"For these animals to survive, Turn to Page 6



Camiguin yields

we've got to save the dwindling forests where they live."

A diverse archipelago of more than 7,000 islands, the Philippines hosts a wealth of endemic flora and fauna but more than 70 percent of its original forests have been destroyed.

Camiguin was once almost entirely covered by rain forest but by 2001, only 18 percent was still forested due to logging, agriculture and human settlement. Half of the island, a popular diving destination known also for its lanzones festival in October, is covered with coconut plantations.

Camiguin's forests are not only necessary to protect endangered wildlife, such as the two newly discovered endemic species. They are also essential for the ecotourism that provides much of the island's income. In addition, the forests provide ecological support for the coral reefs surrounding the

island that require low levels of runoff and siltation.

The new species of parrot was known to locals because of its value in the pet trade. The bird's throat and thighs are bright blue and the top of its head and tail are brilliant scarlet-orange.

Males and females have identical plumage, which is quite unusual in this group of parrot, and researchers gave it a new name—*Loriculus camiguinensis*, or Camiguin hanging parrot.

"If we did not have a series of specimens from Camiguin and an additional series of hanging parrots from other Philippine islands, we probably would have assumed that the single bird that prompted our investigation was just odd looking, and we would not have been able to recognize it as distinctive," said John Bates, curator of birds and chairman of zoology at the Field Museum, and a co-author of one of the *Fieldiana* reports.

One of *L. camiguinensis*' characteristics that was low to identi-

fying it as a new species is the fact that its plumage is relatively dull compared to other Philippine hanging parrots. This is consistent with the documented tendency for some isolated bird populations to lose bright plumage, the authors of the *Fieldiana* report noted.

Little is known about the new species, spurring interest in the scientific and conservation community to establish the size of its population.

After learning about the *Fieldiana* manuscript, Thomas Arndt, a German parrot enthusiast, made a trip to Camiguin to look for these birds. He photographed the parrots and is preparing a publication about his findings.

The mouse, discovered high on the steep slopes of one of the island's volcanoes, was new to locals. The rusty-brown rodent, known as *Apomys camiguinensis*, has large eyes and ears and feeds mostly on insects and seeds.

The description is based on mice captured on Camiguin during a biological survey conducted in the mid-1990s by Heaney and Blue Takemura Jr., director of

the Terrestrial Ecosystems Project of the Haribon Foundation, a Philippine conservation non-government organization based in Manila, and co-author of several reports.

In 2002, Heaney, Tabaranza and Eric Rickart, of the Utah Museum of Natural History, described a different species of forest-living rodent, *Bullimus gamay*, from Mt. Timpopo, the same mountain where the new mouse was collected.

A frog (*Oreophryne nana*) named in 1967 had been thought to be the only vertebrate restricted to the island prior to the surveys by Heaney and Tabaranza.

"Very few states in the United States, and few countries in Europe, have four endemic species of vertebrates, making it clear why tiny Camiguin island is deserving of international attention," Heaney said in a dispatch from Haribon Foundation. "And it is almost certain that other organisms on Camiguin are also endemic; they just have not been studied yet." — Pantaleon

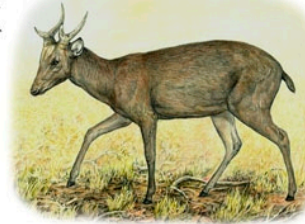
Mammals of Mt. Banahaw-San Cristobal National Park



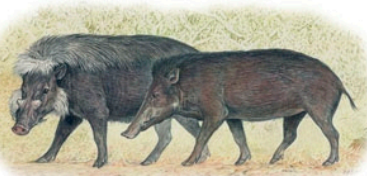
Macaca fascicularis
Long-tailed macaque



Paradoxurus hermaphroditus
Common palm civet



Cervus mariannus
Philippine brown deer



Sus philippensis
Philippine warty pig
(male and female)



Viverra zibetha
Malay civet



Phloeomys cumingi
Southern Luzon giant cloud rat



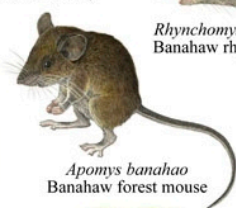
Rhynchomys banahao
Banahaw rhynchomys



Apomys magnus
Lowland Banahaw forest mouse



Musseromys gulantang
Banahaw gulantang



Apomys banahao
Banahaw forest mouse



Crocidura grayi
Luzon shrew



Rhinolophus arcuatus
Arcuate horseshoe bat



Myotis rufopictus
Orange-fingered myotis



Bullimus luzonicus
Luzon bullimus



Coelops hirsutus
Philippine tailless roundleaf bat



Pipistrellus javanicus
Javan pipistrelle



Hipposideros obscurus
Philippine forest roundleaf bat



Megaderma spasma
Common Asian ghost bat



Apomys microdon
Small Luzon forest mouse



Pteropus vampyrus
Large flying fox



Ptenochirus jagori
Greater musky fruit bat



Rousettus amplexicaudatus
Common rousette



Cynopterus brachyotis
Common short-nosed fruit bat



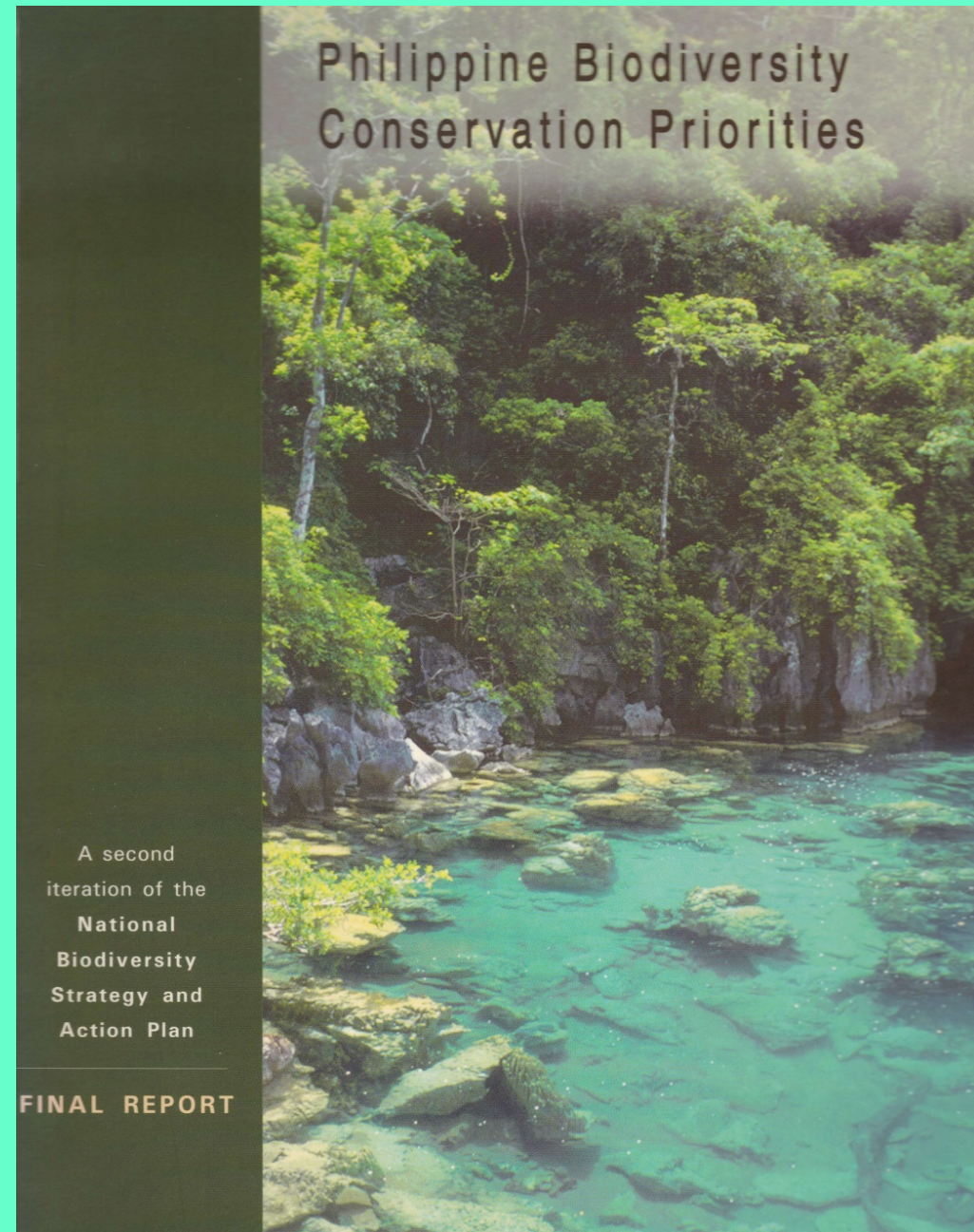
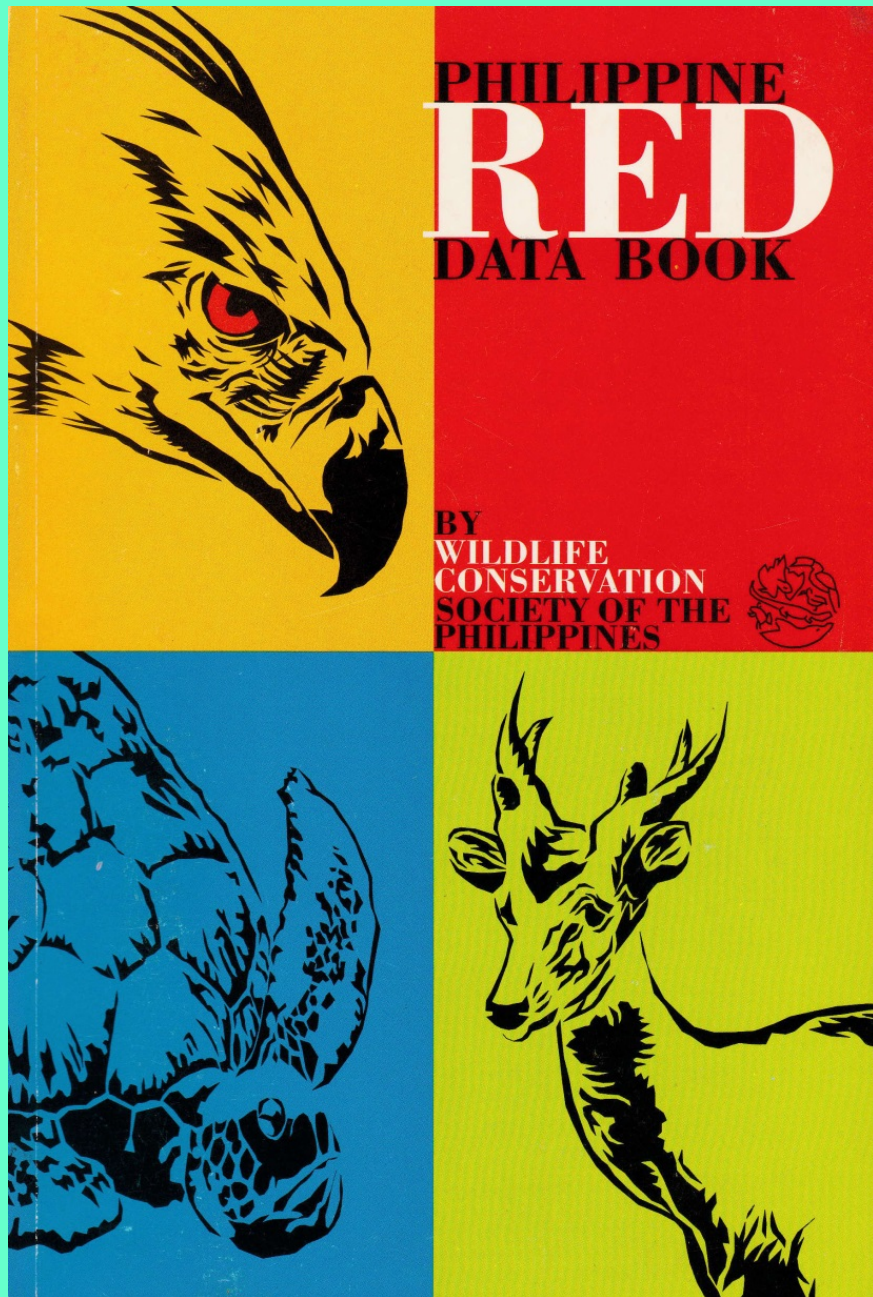
Otopterus cartilagonodus
Luzon pygmy fruit bat



Macroglossus minimus
Dagger-toothed flower bat



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Philippine National Parks Impacted by Discoveries of Mammals (as of 2020)

A. Parks strongly influenced by discoveries of mammals:

1. Mt. Guiting-guiting NP, Sibuyan	4
2. Camiguin Volcanoes NP	2
3. Dinagat and Siargao Prot. Landscape	4
4. Zambales Mountains, Luzon	5
5. Mt. Hamiguitan, Mindanao	2

B. Parks that received enhanced attention:

6. Balbalasang-Balbalan NP, Luzon	1
7. Mt. Isarog NP, Luzon	2
8. Mt. Kitanglad NP, Mindanao	3
9. Mt. Banahaw NP, Luzon	4
10. Balinsasayao Twin Lakes NP, Negros	1
11. Mt. Data NP, Luzon	-7
12. Mt. Pulag NP, Luzon	2
13. Northern Sierra Madre NP, Luzon	2
14. Callao Caves Protected Landscape	(+3)
15. Mt. Calavite NP, Mindoro	1
16. Mt. Iglit-Baco NP, Mindoro	2

C. In the works:

17. Mt. Anacuaao, Luzon	2
18. Mingan Mountains, Luzon	4
19. Mt. Amuyao, Luzon	1
20. Mt. Irid, Luzon	2
21. Mt. Labo, Luzon	1
22. Mt. Halcon, Mindoro	1
23. Mt. Kampalili, Mindanao	3

Challenges to the Process of Discovery

Part 1: Institutional Animal Care and Use

Committee questions

- *“What species will be the target of your research, how many do you propose to collect, and how abundant are they?”*
- **By definition**, we do not know what species we will encounter. A major purpose of the research is to discover new species and obtain the first information on distribution, evolutionary history, and ecology.

Challenges to the Process of Discovery

Part 2: Respecting practices in other countries

- Policies and procedures legally required by other countries can conflict with those of the US
- Cultural practices of people in remote, tribal areas must be respected

- 40-50 previously unrecognized species of mammals are discovered each year, and the numbers are increasing
- Information about geographic patterns of diversity and ecology is essential to conducting successful conservation
- Flexibility is necessary for this research to proceed, while maintaining high standards for animal care and use