From the Forest

Reflections on the Conservation Value of Research
in Gunung Palung National Park,
West Kalimantan, Indonesia

by

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I first went to the tropics in 1994 with a strong desire to help “save the rainforest.” I aspired to become a scientist who would discover important things about animals and plants, facts that would demonstrate the importance of tropical forests and the necessity
of preserving them. I wanted to make a difference. At the time I didn’t know much about tropical forests, but I had read enough to know that they were extremely complicated places and that we lacked answers to some of the most basic biological questions about how rainforests worked. I also knew that rainforests were under threat, a fact that was clear to anyone who paid even passing attention to the media. The rates of forest loss reported in the Amazon basin seemed to me inconceivable. How could areas the size of football fields be disappearing in the blink of an eye? Who was allowing this to happen? Why?

Despite grim projections about the fate of tropical forests, my first years of work there were filled with an optimism, zeal, and sense of possibility that I can vividly remember. I believed in the value of scientific research, that a deeper understanding of tropical forests and their inhabitants must help conservation. I thought my research was important and that I was helping to protect the Indonesian forests that I had come to love.

Now, years later, I question how effective I have actually been. Like many of my colleagues, helping to protect threatened forests and animals is a major justification for my work. It is, however, often uncomfortably difficult to point to clear evidence that demonstrates our contributions. In part, this is because objective assessment of the effects of conservation research is difficult; conservation threats and opportunities are highly situation specific, so we must compare the results of our activities against the unknowable outcome if we had not intervened at all. Still, by most objective measures, conservation research has generally fallen short of expectations—precious forests continue to disappear, populations of endangered species continue to shrink. It is reasonable to question what value scientists add to conservation. Do tropical forests need more scientific researchers, or would conservation be better served by training more lawyers, activists, economists, development workers, and forest rangers?

We know that research can contribute meaningfully to conservation. Intervention by dedicated scientists has almost certainly prevented populations of endangered species from extinction—Mountain Gorillas, American Bison, and Southern White Rhinoceroses are classic examples. Similarly, the day-to-day presence of researchers at field stations across the tropics is beneficial for conservation as it can facilitate law enforcement, provide alternative income to local communities, and promote awareness of the importance of biodiversity and its protection. Involvement of students in research projects can help
train the next generation of conservationists and natural resource managers. But in each of these examples, it is usually the personal commitment, social involvement, and political actions of individual scientists that make a difference, not the results of their scientific research. As important as these ancillary benefits are, many of us would like the results of our science, not merely our presence, to make a difference. This is not easy to do and I am personally far from satisfied with my own ability to ensure that the results of my field studies are directly relevant to conservation.

I am certainly not the first to question the relevance of much scientific research— at least as currently conducted— for real world conservation efforts. For recent and thoughtful discussion of this topic in an Indonesian context I commend to readers the writing of Dr. Erik Meijaard, who along with Dr. Douglas Sheil and others has eloquently made the case that researchers have not contributed to conservation nearly as effectively as we might. The goal of my essay is not to tackle these larger questions, important though they are. Instead, I choose to focus on some work in which I have been involved at Gunung Palung National Park that demonstrates ways in which basic field research might provide useful information that can assist conservation efforts.

To date, much of my research has sought answers to very simple questions about tropical forests and the animals that live in them. Why are some tropical forests more productive than others? What determines the types of animals that can live in a particular forest habitat? How do differences in the quality of forest habitats affect the animals that live in them? Although these questions are simple, they are fundamental to our understanding of the structure and function of tropical forests. They are also difficult to answer because they require study of animals in many different habitats. Comparison of results from distant study sites are difficult to interpret as they are usually confounded by differences in study period, methods, and biogeographic history. The Cabang Panti Research Station in Gunung Palung National Park, West Kalimantan, Indonesia provides a unique opportunity to overcome these limitations. Within our trail system are seven highly distinct types of tropical forest that differ substantially in their soils, drainage, elevation, plant communities, and patterns of productivity. These differences occur over the scale of a few kilometers, permitting comparison of the effects of key variables (such as plant productivity) on animal populations while controlling for others (like biological history and presence of diseases and predators). These forest types are all essentially undisturbed by humans and are still inhabited by the full set of animals
thought to have occupied them for at least the last several thousand years. Undisturbed tropical forests– especially lowland forests such as those found at Cabang Panti– are now very rare in Indonesia, and the presence of healthy animal populations and a high diversity of forest types is unparalleled. These unique qualities first attracted my friend and mentor Dr. Mark Leighton and colleagues to open Cabang Panti in the mid 1980’s and have drawn researchers to the site ever since.

![Cabang Panti Research Station](image)

Cabang Panti Research Station

The field methods my research team and I employ to answer simple questions like those posed above are likewise rather simple. They entail two components: 1) describing and monitoring each of the forest types and 2) determining how animal populations are affected by variation in the forest across space and through time. We use a series of botanical plots to assess the types of plants in each forest type and measure their productivity over time. There are ten plots in each of the seven forest types, and each month we visit every one of the more than 6,000 plants in these plots to determine
whether they are flowering or fruiting. This provides us with a sensitive measure of spatial and temporal changes in plant food availability for animals. We monitor animal populations and their diets by walking standardized four kilometer survey walks in each of the seven forest types four times per month, and conduct more detailed observations on target primate species to better understand their behavior, diets, and demography. Below I briefly describe two ways that these data can produce non-obvious insights that can meaningfully inform our efforts to conserve threatened species. The examples relate to two non-human primate species, both of which are endangered and serve crucial roles in maintaining the healthy functioning of Indonesian tropical forests.

The first study addresses movements of Bornean orangutan (Pongo pygmaeus wurmbii) populations among the seven forest types at Cabang Panti. The study is ongoing, and is being funded in part by a generous contribution from the Orangutan Conservancy. Although data collection is still underway, some interesting patterns have begun to
emerge from our first four years of study. Using data from our vertebrate survey walks we can calculate the number of orangutans in each of the seven forest types each month, and compare the distribution of orangutans to the measures of food availability derived from our botanical plots. The number of orangutans in each forest type varies dramatically from month to month (from zero to more than twelve individuals per square kilometer), which reflects both the movement of individuals into and out of the study site and how the orangutans within the study site are distributing themselves among the different habitats. This wide variation is remarkable, but even more interesting is how much the relative importance of different forest types varies over time. Six of the seven forest types have each housed more than 90% of the entire study site’s population for a period of at least a month. In a particularly notable example, during one three month period 75% of all orangutans found in the study site were found in the peat swamp forest. These dramatic shifts seem to be well explained by variation in food availability across the gradient of forest types. Orangutans appear to prefer to spend time in the lowland forest habitats (freshwater swamps, alluvial forests, and low elevation forest on sandstone and granite soils), and the number of orangutans found there per month is well predicted by the amount of food present during that period. The other forest types, the upland forests and especially the peat swamp forests, are used as fall-back habitats– orangutans go there when times are bad in the lowlands. In other words, orangutans migrate across the complex habitat landscape to buffer themselves against spatial and temporal variation in plant food availability.
At even this relatively preliminary stage in the analysis, our results suggest a number of important lessons for orangutan conservation. First, all forest types contribute to maintaining the orangutan population at Gunung Palung and are therefore worthy of protection. Even the montane forest, which is normally largely devoid of orangutans, housed the entire orangutan population in our study site during one of the months in our sample. Second, peat swamp forests are especially important for orangutan preservation because they provide sustenance during lean periods when food is unavailable in
their preferred lowland forests. Indonesian peat swamps are at great risk, both due to forest fires and the fact that they contain a number of prized timber species that attract loggers. Their status as orangutan fallback habitats provides added incentive for their protection. A final lesson, related to the first two, is that the absence of orangutans from an area during certain periods does not necessarily imply that the area is irrelevant for orangutan conservation. During one period of more than four months we did not observe any orangutans in the peat swamp forest, even though we know this habitat is likely crucial for their long-term viability at Gunung Palung. Conversely, if a short study were conducted in the peat swamp during this time that aimed to assess the importance of this forest type for orangutans it would conclude precisely the wrong thing: that peat swamp forest is unimportant for the orangutans at Gunung Palung. This is dangerous and disconcerting, especially when one considers that some major conservation groups have strongly advocated using rapid surveys to assess an area’s conservation importance.
The second study examined the demography and population ecology of Bornean White-Bearded Gibbons (*Hylobates ablibarbis*). As part of my dissertation research, I lived at Cabang Panti for two years, gathering detailed data on the quality of the seven forest types for gibbons and examining how this variation in habitat quality affected the 33 gibbon groups that I was monitoring. Some of these groups had territories in high quality forests, while others lived in much poorer quality habitats. The montane forests appeared to be particularly low quality, and I noticed that at high elevations gibbon groups tended to be smaller than in the lowlands, and contain very few infants. I wondered what the long-term consequences of these patterns might be and created a simple mathematical model to examine the demography of gibbon populations at Cabang
Panti. The results were striking, showing that groups living high on the mountain were not reproducing enough to maintain a viable population there. The clear implication was that the montane forest was inadequate to support gibbons and that the only reason they persist there is because of emigration from the high quality lowland forests, where gibbons were reproducing well.

As with the orangutan population study, this simple demographic result has important implications for conservation of gibbons at Gunung Palung. First, it clearly shows that gibbons inhabit forests that cannot support them in the long term, meaning that a rapid survey conducted at Gunung Palung would erroneously suggest that the montane forest is good gibbon habitat. This is, of course, the converse of the third lesson derived from the study I describe above: in the orangutan study, the absence of animals did not mean that a habitat was unimportant; here, the presence of animals does not necessarily mean that a habitat is important. Second, because lowland, source forests are being disproportionately lost due to logging, fire, and agricultural encroachment, the conservation status of gibbons at Gunung Palung is worse than it appears. As lowland forests are being lost, those concerned about gibbon conservation might find consolation in the knowledge that gibbons can be found high atop the mountain, well away from most forest destruction. In reality, however, since the montane forests cannot themselves support gibbons, gibbon populations there would likely go extinct if lowland forests were lost— even if the montane forest itself were never logged.

The final implication is more subtle, but no less important. Those of us interested in maintaining populations of threatened animals frequently use computer simulations known as Population Viability Analyses to assess the anticipated outcomes of various threats and management alternatives. We make every effort to inform our models using data from wild populations on birth rates, death rates, abundance, and so forth. This seems like good practice— using real data is, after all, desirable. The problem is that most long-term studies are conducted in the best quality habitats, where vital population parameters likely indicate “best case scenarios.” It is understandable that scientists want to study in places where they will see the largest number of animals, but if we use information gathered at such sites in our models we are likely using estimates of crucial parameters that are overly optimistic and not representative of many, perhaps most, places that our study species occupy. This would lead to biased and dangerously optimistic conclusions about, for example, the chances of population persistence or a
species’ ability to rebound from habitat degradation.

In closing, I return to the personal question that I implied at the outset: has conservation at Gunung Palung been meaningfully advanced by my scientific research? Of course I would like to think so, although I am not at all sure that it has. Conservationists— or, more specifically, scientists involved in conservation— are often portrayed as pessimists. According to the stereotype, we tend to focus on bad news rather than good news, threats rather than opportunities, failures rather than successes. It is hard not to be acutely aware of the perilous state of nature conservation in much of the tropics and the uphill struggle required to achieve even modest goals. But in reality, most of us are, at heart, optimists. We believe that small groups of committed people can make a difference. We can envision a future in which the needs of wildlife and the needs of humanity are not seen as competing goals. We place great hope in the burgeoning indigenous conservation movements across the tropics. If we didn’t believe these things, we would have given up long ago. But optimism is not the same thing as demonstrable success, and I still wrestle with the question of how best to make a real difference.

At present I try to take some comfort in the knowledge that the results and lessons for conservation I discussed here would not have emerged without ongoing, continuous monitoring of primate populations and their habitats over a period of many years at Cabang Panti. This emphasizes the importance of long-term research, at Gunung Palung and elsewhere. There is still much that we need to know that only extended field studies can tell us. This has always been true, but in an era of rapid climate change and unprecedented human alteration of the environment the need for field studies conducted over periods of many years has never been greater. Only the long-term perspective of such studies can adequately document the effects of climatic and environmental change on tropical forests and the cascading effects on the species that inhabit them. In recent years, shrinking research funding and decreased political enthusiasm (at least in Indonesia) have made the protection and support of established research sites harder than ever. These challenges mean that hard work is needed to keep these valuable resources open and functioning. In the end, perhaps my best contribution will simply be having had a hand in keeping our research station viable.
Dr. Andy Marshall is an ecologist, conservation biologist and evolutionary anthropologist who works primarily on primates and tropical rain forests. For the past sixteen years, he has mainly focused on research and conservation in Indonesia, where he has conducted more than sixty months of fieldwork. Andy is currently an Associate Professor in the Department of Anthropology at the University of California, Davis. He and Dr. Cheryl Knott co-direct the Cabang Panti Research Station in collaboration with the Gunung Palung National Park Bureau. He would like to take this opportunity to express heartfelt thanks to his long-term field staff and sources of research funding (especially The Orangutan Conservancy, The Leakey Foundation, The Hellman...
Foundation, and UC Davis).

Article written by Andrew J. Marshall January 2012/OC

Edit by Tom

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