

## EFFECT OF COOL WEATHER UPON A RAIN FOREST AND ITS INHABITANTS

*H. Elliott McClure\**

### SUMMARY

During the period 21 Dec. 1973 to 5 Jan. 1974 the animals of the tropical rain forest at Khao Yai National Park, Thailand were subject to extremely cold weather. A continuous NE wind, day and night, brought nightly temperatures down to 42°F and day temperatures to 70°F. Birds, and mammals responded to this by seeking sheltered valleys or deep forest and altered their feeding habits. Insects, especially butterflies, became less evident and remained quiet. No mortality was noted but the animals showed evident discomfort to the unusual cold and exposure.

Many years ago I stood by the side of a duck pond in Japan when an earthquake struck (McCLURE, 1956 in *Auk* 35: 456); now I was in a tropical rain forest during the coldest weather in 40 years. Both fortuitous instances gave an insight into adjustments made by wildlife to an unusual natural phenomenon. This is a report about the effects of the cold weather.

Khao Yai National Park, Thailand's largest National Park, lies at  $c 14.20^{\circ}\text{N} \times c 101.20^{\circ}\text{E}$ , with an area of 2100 sq.km. of forested mountains from 600 to 1500 meters. Its forests include tropical rain forests or Broadleaved Evergreens dominated by several species of Dipterocarpaceae, tropical deciduous and dry dipterocarp associations known as monsoon forests. The Park flora and fauna includes true representatives of the tropical biota. Mean annual rainfall is about 4000 mm. (150 inches), falling mainly from May into October. Coolest period is during the dry season with usual early morning temperatures in the 60s (16°C) during December or January. During the period 21 Dec. 1973 to 5 Jan 74 a cold NE wind blew bringing the nightly temperatures as low as 42°F (6°C) and mid-day temperatures in the 70s (21°C). Wind was strong enough to blow tile roofs and glass windows off of the exposed tourist

---

\* SEATO Medical Research Laboratory, APO, San Francisco, Calif. 96346.



cabins. To the forest inhabitants this was the bitterest weather ever experienced. Only the elephants might have been exposed to a similar cold nearly 40 years before.

Observations were made at the peak of this cold, from 24-31 Dec. 73, during which the wind blew almost continuously day and night. A hundred species of birds and 12 species of mammals were observed during this period. It is necessary to cite the usual conditions of animal distribution in December for comparison with the unusual. Studies had been made in the same period, late December or early January, in 1968, 69, 70, 72. Plants could hardly respond so quickly to the change, but it was noted that flowering of *Bombax* sp. and *Erythrina* sp. was delayed somewhat. This reduced the food supplies of the Hair-crested Drongo (*Dicrurus hottentottus*)

#### Animal sounds

October is the usual ebb of bird and insect calls. These pick up slowly until there is much singing in December. The average number of species heard during this month was 39 with 7 calls per bird per hour. The most insistent songsters are barbets of three species, two species of babblers, a tree partridge, and others. A partial list follows:

Species	Number Heard	
	1 hour 1970	7 days 1973
Humes Barbet, <i>Megalaima incognita</i>	15	0
Green-eared Barbet, <i>Megalaima faiostrica</i>	8	0
Yellow-breasted Tit Babbler, <i>Macronus gularis</i>	6	2
Abbott's Jungle Babbler, <i>Trichastoma abbotti</i>	1	0
Red-capped Babbler, <i>Pellorneum ruficeps</i>	1	0
White-headed Laughing Thrush, <i>Garrulax leucolophus</i>	7	7
Green-legged Tree Partridge, <i>Arborophila charltoni</i>	5	3
Jungle Fowl, <i>Gallus gallus</i>	3	0
Pygmy Owlet, <i>Glaucidium brodiei</i>	11	0
Great Hornbill, <i>Buceros bicornis</i>	11	0
Swinhoes White-throated Bulbul, <i>Criniger pallidus</i>	9	10
Hill Myna, <i>Gracula religiosa</i>	8	4
Other bird species calling	27	9
White-handed Gibbon, <i>Hylobates lar</i>	5	3

A similar quantitative analysis of insect calls was not attempted but they too were reduced. Among the 13 species of vertebrates that should have been calling only half vocalized at all and the amount was only 5% of what could have been considered normal.

### Effects upon the Birds

Although 100 species were located during the week, the immediate impression was "What has happened to the birds?" A standard one mile census route along a road through the forest has been used on each visit to the park; about 120 tallies being made during seven years. Early morning counts in December have averaged as follows :

	1970	1972	1973
Number Species	50	42	46
Number Individuals	719	238	197
Number Observations	4	1	2
Birds per Observation	180	238	98

In 1973 several species were present but in greatly reduced numbers. After three days of searching it was found that the birds had gathered along streams in steep valleys in the lee of hills. During the dry season insects tend to concentrate along the damper stream valleys and with the added protection against the wind the birds had gathered here in unlikely associations or groups (not feeding flocks) including :

Large Racquet-tailed Drongo	<i>Dicrurus paradiseus</i>
Chestnut-naped Scimitar Babbler	<i>Pomatorhinus schisticeps</i>
Bamboo Green Woodpecker	<i>Picus vittatus</i>
Lesser Yellow-Naped Woodpecker	<i>Picus chlorolophus</i>
Greater Green-Billed Malkoha	<i>Phaenicophaeus tristis</i>
Bronze Drongo	<i>Dicrurus aeneus</i>
Orange-breasted Trogon	<i>Harpactes oreskios</i>
Green Hunting Crow	<i>Cissa chinensis</i>

Walking along the streamside or flitting above it :

Grey-headed thrush	<i>Turdus obscurus</i>
Emerald Dove	<i>Chalcophaps indica</i>
Long-tailed Ground Thrush	<i>Zoothera dixonii</i>



Orange-breasted Flycatcher	<i>Muscicapa dumetoria</i>
Blue Whistling Thrush	<i>Myophonus coeruleus</i>
Slaty-backed Forktail	<i>Enicurus schistaceus</i>
Siberian Blue Robin	<i>Erithacus cyane</i>
Red-breasted Flycatcher	<i>Muscicapa parva</i>
Grey-headed Flycatcher	<i>Culicicapa ceylonensis</i>

These are not the usual species found so closely packed in this habitat. An afternoon walk might flush out an occasional one of several of these species. So the birds had sought the dense forest and the lee of hills, same as they would have in this temperate zone. This could be expected of the Siberian Blue Robin or the Grey-headed Thrush which had had experience with such things. I suspect the other species simply gravitated there while trying to avoid the cold wind.

There were striking differences in the actions of individual species:

**Hornbills:** Hornbills have large wing surfaces to support their heavy bodies (a Great Hornbill weighs 6 to 7 pounds) and the feathers are harsh and brittle. Of the three species present the Wreathed Hornbill (*Rhyticeros undulatus*) is the strongest flyer. They move above the forest in a steady flap from place to place. The Great Hornbill (*Buceros bicornis*) flies only between trees or clumps of trees with wing beats and glides. The small Pied Hornbill (*Anthracoceros albirostris*) is a rapid flyer from tree to tree. The average number seen in previous studies in December had been 30, 54, and 15 respectively. During this week only 8, 3 and 3. None were seen attempting to fly. They remained deep in the forest clinging dejectedly to swaying tree tops and feeding on fruit lower in the canopy.

**Drongos:** Drongos (*Dicrurus* spp.) normally inhabit the upper canopy and hawk insects in the corridors beneath the canopy or along streams and roads. In December the Hair-Crested Drongo, *Dicrurus hottentottus*, moves into the Park in great numbers to harvest the nectar from blooming *Erythrina* and *Bombax* trees. They were present but had to disperse for other foods as these species were delayed. The Ashy Drongo, *Dicrurus leucophaeus*, was seen hopping among the blades of waving *Imperata* grass in open fields catching insects. Bronzed, *D. aeneus*,



Black, *D. adsimilis*, Lesser Racquet-tailed, *D. remifer*, Greater Racquet-tailed, *D. paradiseus* all were seen feeding in shrubs or along the edge on the lee side of forest patches.

**Bee-eaters:** Also birds of the open country and aerial feeders two species should have been present, Bay-headed, *Merops leschenaulti*, and Blue-tailed, *M. philippinus*. A flock of 200 or more Bayheaded tried to roost each night in the dense crown of a lone tree exposed to the wind. Clustered within it they managed to stand the cold but many lost their footing and were blown out. They gave this roost up by the 8th day of wind. During the day they could be found as individuals in the lee of forests hawking insects at the edge of the lallang fields. Only 17 Blue-tails were seen in a week, 70 less than the number seen in three days in 1970.

**Flycatchers:** The concentrations of flycatchers along sheltered streams yielded several species not recorded before the park or rarely encountered. These, and those that were seen in the deep forest, were hawking insects at the shrub level which is normal. However, insect flight, because of reduced temperature, was less than normal and many flycatchers responded by hopping on the ground or through the shrubs to ferret out the insects. *M. banyumas*, *M. dumetoria*, *M. parva*, and *C. ceylonensis* were all noted doing this.

The most striking reaction among the flycatchers was that of the Verditer Flycatcher, *M. thalassina*. This is normally a deep forest species seen high in the canopy crown where it nests at the bases of clumps of ferns or epiphytes. Now they were seen outside of the forest, in its lee hawking insects out over the grass or actually clinging the swaying grass and feeding like a warbler. Five were seen in this bizarre activity.

**Woodpeckers:** Woodpeckers apparently were not disturbed by the wind and cold. The noisy Great Slaty Woodpecker, *Mulleripicus pulverulentus*, put on an aerial and vociferous display at an area called Khlong Khithao for several hours one morning. Other woodpeckers also were acting normally.



The bituminous surfaced road through the park seemed very attractive. It may have been the result of absorbing warmth with the subsequent result of increased insect activity but this was not evident to our eyes. However the roads seem to have a special attraction. Emerald Doves, *Chalcophaps indica*, which commonly feed on seeds or grit by the road were numerous, 15 feeding along a two mile stretch. The Orange-headed Thrush, *Zoothera citrina* (first record for the park) was also a roadside feeder. Common Shama's *Copsychus malabaricus*, which are usually very shy were scratching in roadside debris like the Jungle Fowl, *Gallus gallus*, that were with them, neither flying until approached within a few feet.

#### Effect on the Mammals

The response of the mammals was similar to that of the birds; they sought sheltered forest. Very few came out on the lallang fields after dark and none during the day. The elephants, *Elephas maximus*, (30 of them), Gaur, *Bos gaurus*, (4 or 6), and Sambar deer, *Cervus unicolor*, (several) went to a swampy well-protected patch of forest which is their usual haunt but not in such a concentration. Gibbons, *Hylobates* spp. did not sing and only one or two families vocalized during the week. They rarely come to the ground yet one *H. lar* was seen on the road taking a sunbath and enjoying the heat of the tar surface. Pig-tailed Macaques, *Macaca nemestrina*, were seen along the road but this is usual.

#### Invertebrates

During the dry season butterflies of many species gather to drink at the edges of small pools by the major streams. These concentrations were completely absent and numbers of butterflies seen in the forest were fewer. Sweepings were made of the shrubs and lower foliage in both floodplain and upland forests. The number and kinds of insects and other arthropods present appeared to be normal, but I did not have any reference bases for I had not taken such samples in previous years.