Title: Bako National Park - A natural laboratory for teaching and learning about the environment
Author(s): Yee, Sze Onn & Chin, Long Fay
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Introduction

National parks are an important form of landuse. They aim at conserving, protecting and preserving the flora, fauna, landscape and scientifically interesting features as well as providing a laboratory for teaching and learning.

Bako National Park occupies 2742 hectares of a rugged sandstone peninsula in the south western region of Sarawak. The park is dominated by a sandstone plateau which averages about 100 metres above sea level. Denundation by water over long periods of time has sculptured this plateau into a distinctive landscape which offers excellent opportunities for field studies in geography and science.

Plate 1. A partial view of Bako National Park, Sarawak.
Location and Accessibility

Bako National Park is easily accessible. It is only one and a half hours by air from Singapore. The park is approximately 37 km from Kuching. The newly built Kuching-Bako road provides fast and easy access by land to Kg. Bako from where the park is reached after a 25-minute boat trip. (Figure 1)

Figure 1. Location of Bako National Park
BAKO NATIONAL PARK
(SARAWAK)

Figure 2
Within the park is a well demarcated system of trails which may be followed without difficulty or fear of getting lost. The trails lead through different vegetation types and traverse a variety of terrain. They also give access to a number of vantage points from which magnificent views of the terrain and vegetation types are obtained. (Figure 2)

In the monsoon season (November to March) travel to the park may be restricted due to rough seas and wet weather.

**Geomorphology**

Probably the most distinctive features of the park are the sandstone cliffs and rugged coast. The sandstone itself is derived from sediments deposited as a delta along an ancient coastline about 75 million years ago. Subsequently, the loose sand particles were cemented together by silica precipitated by circulating sea water. The result today is a hard strong but porous rock which has resisted erosion and towers above the landscape as vertical cliffs which are prominent in many places around the park as at Teluk Assam.

Most of the erosion caused by waves is concentrated along a horizontal zone at the base of these cliffs. As a result of erosion along this zone the cliffs have been undermined and huge sandstone blocks have broken off and fallen on to the shore. As the cliffs recede a relatively flat wave-cut platform often remains as can be seen around much of the coast. The surface of the wave-out platform is in places pitted with small circular pools which may be attributed to the solvent action of salt water.
Plate 2. Solution Pits

On vertical surfaces at the base of the cliffs and on fallen rocks an intricate feature known as honeycomb weathering can be found.

Plate 3. Honeycomb weathering on cliff face
Upon the plateau surface where bare rock is exposed broad shallow depressions or 'solution pans' are frequently encountered. Standing water collecting in tiny depressions in the sandstone surface slowly dissolve the cement (silica) in the rock thereby loosening the constituent sand particles. The accumulated sand is flushed out at each heavy rainfall. The solution pans are commonly interconnected by shallow rills or channels which follow joints or faults.

Plate 4. Solution pans on the plateau

In addition to silica, iron is readily absorbed by water percolating into the porous sandstone. When this percolating water eventually re-emerges at the plateau edges, the iron precipitates out. The result is a dark reddish brown iron skin which forms a protective cover on the older sandstone surfaces. Where iron is precipitated on relatively fresh sandstone surfaces beautiful patterns on the rock surfaces are produced.
Flora and Fauna

A large and interesting variety of plant types and habitats is found within this relatively small area. Mangrove forest and beach forest occur along the coast and in sheltered bays. The plateau is dominated by kerangas forest scrub and padang. The open scrub and padang support a remarkable assemblage of plants with many fascinating adaptations for obtaining additional nutrients.
Ant plants and the carnivorous pitcher plants (Nepenthes) are abundant on the kerangas scrub. The ant plants (Myrmecophytes) live in association with colonies of ants. The peculiar characteristics of these plants offer an insight into some fascinating aspects of the plant and animal kingdom. A study of these plants helps in understanding the extraordinary relationship which exists between plants and animals.

Plate 7. An Ant Plant
Of the animal life in the park the proboscis monkey is perhaps the most notable. Attractive silver leaf monkeys are also conspicuous in the park. For those who have an interest in birds many interesting and colourful birds can be observed. Occasionally wild pigs and mouse deer can be seen. At low tide the sea-shore and mangroves are alive with a myriad of brightly coloured crabs and ugly amphibious mudskippers.

The diversity and contrast in the flora and fauna provides teachers and students an excellent opportunity for geographical and scientific studies at first hand. Of particular interest is the way the different plant and animal species adapt to different habitats and varying ecological conditions.
Site 1: Along the Lintang Trail

1. Draw a sketch of the study area, indicating very clearly, the stunted trees, the bare tableland and the shallow depressions.

2. (a) While much of the tableland is bare, the vegetation cover is dense in parts. Suggest reasons why some parts of the tableland are covered by vegetation.
   
   (b) What are the predominant types of vegetation? How has this vegetation adapted to the climatic and soil conditions?

3. (a) The plateau surface here is marked by a large number of broad shallow depressions. Mark out a small area and map the distribution of depressions in the study area. Using a measuring tape, measure the width and depth of the depressions. Record the data in the table on the next page.
(b) What are the dimensions of the smallest depression and that of the largest depression? Calculate the average width and depth of all the depressions on the padang.

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(c) Examine one depression carefully and describe the materials you find in them.

(d) What processes are involved in the formation of these depressions? Explain the processes you have identified.

5. Besides solution pans another prominent feature resulting from weathering is iron skin. This is particularly well developed in the area above Teluk Pandan Kechil. Briefly explain its origin on the basis of field evidence.

6. Observe an ant-plant. What is the nature of the relationship between the plant and the ant colony? Explain how this relationship benefits the ant-plant and the ants.
7. Examine a pitcher plant. What are its special features? How does it get its food?

**Site 2: Teluk Assam**

1. Draw a sketch of the cliffs at Teluk Assam and indicate in your field sketch, evidence of weathering on the cliff surfaces and the end products of this process.

2. Which parts of the cliff face are particularly susceptible to weathering and why?

3. Of the different weathering processes operating here, which do you think is predominant? What are its consequences?
4. Select three features that have been produced by weathering and erosion. Draw sketches of them and attempt to explain how these have been formed and the factors that may have influenced their formation.

5. The vertical surfaces and the base of cliffs frequently show evidences of honeycomb weathering. How would you explain this pattern of weathering. In what way does this type of weathering differ from that observed on the plateau surface?

6. In the area above Teluk Pandan Kechil iron in the rocks has been precipitated to form a hard layer or iron skin. The same process here has resulted in a different feature called iron ridges. Suggest reasons for the difference in the end product.
7. (a) Identify some of the species of animals that you observe.
   (i) on the beach
   (ii) in the mangroves

(b) How has each species adapted to its respective habitat?

8. (a) With the aid of the field-notes provided identify three species of mangroves in this area.
(b) How does the vegetation in Teluk Assam differ from that on the plateau?

(c) Can you account for the growth of mangroves here and its absence in Teluk Pandan Kechil?
Site 3: Beach studies at Teluk Pandan Kechil

1. On the basis of the wave characteristics would say that this a high or low energy environment?

2. With the aid of appropriate measuring equipment (prismatic compass, abney level, measuring tapes etc) construct a plan and profile of the beach. Enter the data obtained in the recording sheet provided. (Annex 1)

3. Based on your observations and recorded data comment on:
   (a) the plan of the beach
   (b) the gradient of the beach
   (c) the composition of beach material and its texture
   (d) the source of beach material

4. Compare the beach at Teluk Pandan Kechil and Teluk Assam. How and why are these two beaches different?
Annex 1

BEACH PROFILE RECORDING LIST

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Pre-Field Trip Preparations

A  Obtain entry permit from the Malaysian authorities.

B  Contact a reliable travel agent to arrange:
   (a) transport from Singapore to Kuching and from Kuching to
       the park and back.
   (b) permit to enter and stay in the park.
   (c) accommodation at Bako.

   Plan your trip well in advance. Good times to visit the park are
   the June and September vacation periods.

C  What to Bring
   1. Valid International Passport.
   2. Adequate and comfortable clothes and suitable walking
      shoes.
   3. Toiletries.
   4. Hat/cap.
   5. Insect repellent.
   6. Water bottle.
   7. Light raincoat or windbreaker.
   8. Torchlight (required for moving at night, eg. to toilet).
  10. Equipment:
      • Prismatic compasses
      • Measuring tapes
      • Abney levels
      • Strings

   Ranging poles are available from the park authorities.
D Cooking at Bako

A small canteen in the park sells basic necessities. Visitors to the park have to prepare their own meals. Provisions are obtainable at Kuching (on arrival) but they cost more than in Singapore. It would be useful to bring along some provisions from Singapore, eg.

* tea-bags * nescafe * sugar packs
* coffee-mate * biscuits * sandwich spread
* orange juice powder (Tangs) (to flavour the water at Bako which may taste awful to some)

Basic cooking utensils and cutlery are provided at the park hostels.

E Medical Supplies

A group first-aid kit with the usual supply of medicine eg. panadol, plasters should be carried along. As mosquitoes abound it would be advisable to take a course of anti-malaria tablets prior to and at the end of the trip.

F Briefing at Bako Park Headquarters

The team leader (teacher) can arrange for a briefing by the Warden at the Park Headquarters. There is an excellent display of pictures and charts of geological/geographical features as well as of the flora and fauna of the park there.

G One last point. Take nothing from the park but photographs. Leave nothing but your footprints!
Resource Materials


