



**Consultancy for**

*Pilot study of resource use of sago by Penan community - survey in Long Si'ang for the development of Concept Paper on Sustainable Forest Management and Feasibility Study for Forest Management Certification for Kubaan-Puak FMU*

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**STRATEGIC DOCUMENT**

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## 1.0 Introduction

The Heart of Borneo (HoB) Initiative is a trilateral program of cooperation between the three countries that are, or have states, located on Borneo: Malaysia, Indonesia and Brunei. The Initiative recognizes the unique value of the Heart of Borneo (the main part of the island where forests remain intact) and commits the three countries to cooperate to conserve the region's natural capital for the benefit of its people. A variety of land uses has, in part, affected the ability of local communities who live in this area (mostly Penan) to gain a livelihood from the forest and has also caused landscape fragmentation resulting in wildlife being marooned in protected areas and isolated habitats. The traditional staple food of the Penan of Sarawak is starch extracted from the wild sago palm, *Eugeissona utilis*, and their traditional protein source is wild meat hunted using blowpipes and darts poisoned with the latex of *takjem* (*Antiaris toxicaria*) trees. The Kubaan-Puak area is located between two major Protected Areas (PAs), the Gunung Mulu and Pulong Tau National Parks. Penan communities have settled in the area and continue to seek their livelihood from the wild sago found there. The area is also critical as if the forest there were sustainably managed the area could function as a HoB wildlife corridor connecting the two PAs and thus help restore landscape connectivity for biodiversity conservation and ecosystems protection. WWF Malaysia therefore supported a consultancy to develop a methodology to look into the occurrence and use of the Penan community's staple, which occurs in groves or *birai*, and *takjem*, chiefly in the Ba Temaron area but also in the Ba Saru and Ba Eh areas of the Kubaan-Puak area. The findings are necessary for the subsequent identification of sago *birai* and *takjem* resources important to the Penan community in potential logging areas.

## 2.0 Objectives

As itemised in the TOR (Appendix 8), the Consultancy objectives are:

- (i) To develop a methodology suitable for studying hunting-gathering communities who are spread out over a large area, with focus on the resources of sago (*Eugeissona utilis*) and *takjem* (*Antiaris toxicaria*), and
- (ii) To develop an assessment protocol for quantifying resources of sago and *takjem*, leading towards supporting community development and conservation plans that are appropriate to their needs and include sustainable use of forests.

### 3.0 Understanding the habit and development of *Eugeissonautilis*

The habit (growth form) of *Eugeissona* is similar to that of the related true sago palm (*Metroxylon sagu*) (Figure 1) whose native habitat is tropical lowland swamps.

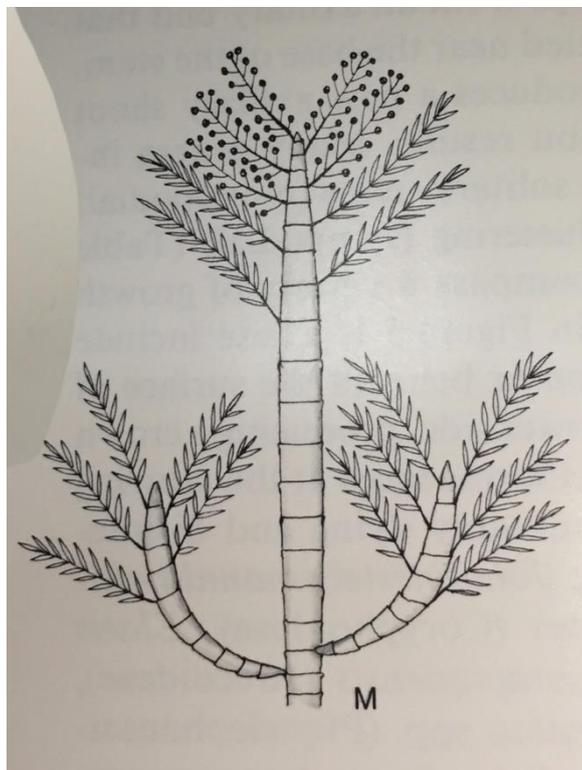


Figure 1: Diagram of habit of *Metroxylonsagu* (p. 4 in Uhl&Dransfield 1987)

The following features of *Eugeissona utilis*, significant from the point of view of its habit, regeneration and use by local communities in Sarawak, are taken from Uhl & Dransfield's (1987) description:

- basal branching (it is a clustering palm so individual stems can be harvested and the clump will continue to grow)
- stem sheaths spiny, stem borne on stilt roots (making the stems a challenge to harvest)
- Shoot hapaxanthic (short reproductive phase terminates a prolonged vegetative phase and then the shoot dies) (so starch is extracted before the plant uses it up to produce a flowering shoot)
- Stem cortex (outer layer) hard, pith soft with abundant starch deposition before flowering
- Inflorescence (flowering shoot) erect, terminal, branched (the developmental stage reached by the inflorescence indicates whether a stem contains starch)
- Pollen copious, dull purple (also used as a foodstuff)
- Fruit ovoid, beaked, covered with scales (can be used to plant sago palms)

Inside the palm stem is the immature terminal bud or palm cabbage (*sin uvut*) - initially comprising immature leaves and eventually the immature inflorescence.

#### 4.0 The study area

The consultancy was carried out in the Penan village (*kampung*) of Long Si'ang and in the community's resource area. Guides / informants, headed by the Long Si'ang village headman (*Tuai Kampung* or TK), Asai Berat, and porters from Long Si'ang, were engaged to contribute information and facilitate the fieldwork (Map 1(Appendix 7); Appendix 2).

#### 5.0 Penan(Long Si'ang) terms for, use and management of wild sago

##### 5.1 Terms for wild sago habit, distribution and products

TK Asai defined the following terms:

<i>Pu'un uvut</i>	A single wild sago cluster comprising 'mother' shoot and 5 – 30+ side shoots; a good <i>pu'un uvut</i> has at least 10 good stems. The palm initially has no stilt roots but develops them 2-3 months after seed germination
<i>Petapik</i>	Another stem grows alongside and in synchrony with the first stem
<i>Birai</i>	Area with a number of <i>pu'un uvut</i> growing together. A <i>birai</i> may have >50 <i>pu'un uvut</i> but one with >30 is considered good
<i>Livoh</i>	Area with 10-20 <i>pu'un uvut</i> , i.e. a poor area for sago
<i>Purat</i>	<i>Pu'un uvut</i> is distant from the next <i>pu'un uvut</i>
<i>Petipun</i>	Area with 20 – 50 <i>pu'un uvut</i> or a concentration of <i>takjem</i> trees or other species
<i>Apo</i>	Starch (like flour), whether dried or smoked or not. Also refers to pollen
<i>Kenesak</i>	Starch that has been dried or smoked
<i>Tevikap</i>	<i>Pu'un uvut</i> from which one can extract <i>apo</i>
<i>Tesa</i>	A poor <i>birai</i> with about 3-10 <i>pu'un uvut</i>

Further terms were added during the second field trip (7 – 16 Oct 2015) resulting in a more complete list (Table 1).

## 5.2 Basic procedure to harvest wild sago

According to TK Asai, men will go with a couple of friends, not as a community. On the first day they cut stem(s), split and cut them into sections (*lompong*) 40-50 cm long. One good stem may be enough. They process the pulp, tread out (*metik*) the starch and continue the next day. After a couple of days they bring the ladies to help *metik*. They dry the sago by smoking it on the third day and fourth day too if there is a lot. Good sago can be dried in one hour. They want to be able to finish the process in two to three days but some families process sago in one day. They take the sago back wet, using a rattan mat, and dry it under the sun.

They use the dried sago as needed by mixing with hot water or making various types of cakes (e.g. *sigo*, *dokong*) with cooking oil. They also harvest wild sago palm cabbage as a vegetable by cutting a suitable shoot above the third leaf from the base. This takes 15 minutes. The palm cabbage can be eaten raw or cooked.

Sago starch from *uvut* (*Eugeissona utilis*), *jakah* (*Arenga undulatifolia*) and *nyivung* (*Oncosperma horridum*) is available year round. If wild boar is available *sin uvut* is taken as a vegetable to mix with the pork. During a fruit season the Long Si'ang Penan harvest only enough *apo* to keep as stock.

Other *uvut* products eaten by Penan (Long Si'ang): the fruit (split in half and the jelly-like endosperm eaten); the purple pollen (*apo*); edible sago worms (*su'ut*) that develop in cut stems after a weevil has laid eggs.

## 5.3 Factors taken into account when choosing *birai* and sago stems to harvest

- Location of *birai*: Must be near a stream. If too far from a stream the sago is difficult to process. The stream should have no waterfall, banks that are not too steep and clean, not muddy, water to facilitate processing. If the stream is muddy (i) one cannot see if all the sago has been extracted and (ii) the sago itself gets muddy. Sometimes the Penan cut the bark off the stems and float sections down the river to near the road, i.e. not they are not pulped at the location where they are cut.
- Size of *birai*: A *birai* should be extensive (i.e. 30-50 (-100) clusters), rich in stems (i.e. 12-20 big stems in one *pu'un uvut* though sometimes three or only one will be harvested for starch) and also have stems that can be harvested for palm cabbage.
- Wild sago stems (*uvut*) that are suitable to be cut for starch extraction:

- Belong to particular types known as *balau* (a big but hard-to-find type with usable stem 3.5-5 m tall (excluding the first 60 cm where it is cut); *odong* (stem c. 3.5 m); or *la'or* (stem very short, less than 1.5 m when fruiting but still used for sago extraction). From the description given, these types appear to be genotypes as they were said to grow together. The type known as *uvut ti'ap* is too small and cannot be used. *Uvut maleng* is a tall but thin (*si'it*) type.
- Grow in particular habitats. *Uvut baa'* grows near the river and has a soft stem soft and white starch with few bubbles when processed. *Uvut paya* occurs on hills and has a long stem. If the stem is very long then the starch is not good. On processing, it is reddish and produces a lot of bubbles. An *uvut paya* cluster remains true to type and will never change for the better. *Pu'un uvut* that grow in a stony place may be short and just have leaves but no fruit.
- Reach good dimensions (termed '*subur*' i.e. large stem diameter, tall (not short), may be soft enough to cut with a *parang* rather than an axe).
- Have well spread or opened out leaves and broad, rough, dark green, not fine, smooth, bright green leaflets.
- Have leaf sheaths still attached to the stem and not already fallen off (the development of the latter is too far advanced and they are no good for starch). The leaf scars (*berbukun*) on the stem must not be more than 7.7-10 (-12.5) cm apart.
- Must test positive for starch and the starch must be good. The test, known as '*nat lala*', involves removal of some bark of a standing stem at about one m from the ground; piercing the stem for about 2.5 cm to remove some pith which is chopped up with an axe and squeezed between finger and thumb (add water if too dry). Traces of white starch on finger and thumb reveal the presence of starch in the stem. If the pith is yellow-red and when extracted in water the starch is red and has many bubbles, this indicates a poor type of starch known as *rutuk*. *Rutuk* does not dry properly and cannot be smoked but is granular and becomes stone hard when water is added (if one wants to use it, do not dry it). In a *birai* there is sure to be a *rutuk* stem. It is a type and is avoided – one takes a stem from elsewhere in the *birai*.
- Must be free from, or at least recovered from insect attack. A big weevil (*besunga*) may attack a stem as follows: fly in to a stem at the *sin uvut* stage, pierce the end leaf of palm cabbage and lay eggs and eat it. There is more than one kind of *besunga*. *Ngigot* is the condition when there are larvae inside the palm cabbage. If the weevil only pierces about 5 cm from the surface, the condition known as *pogok* ensues - the

hole closes up and the shoot grows again but leaves produced after this only grow 30-60 (-120) cm long and look as if they have been cut off and the plant does not fruit. If the *besunga* bores right into the palm cabbage the whole shoot wilts and dies. After *ngigot* the stem goes hard and black for about 60 cm (known as *bolo balei*). When harvesting, this part is thrown away but the rest can still be used for starch extraction. Yellow to red leaves (not green) are a sign of insect attack. Such attacks often happen. *Ngigot* affects *pu'un uvut* that have not been cut or have been cut less. TK Asai thinks it is worth considering doing something about this disease.

- Must have reached a certain stage in flower or fruit development:

Table 1: Wild sago pre-flowering, flowering and fruiting stages and product quality

Name of Stage*	Features	Product information
<i>Sahin uvut</i>	Pre-flowering stage. 1 or 2 stems.	Can only take palm cabbage.
<i>Sipak</i>	Pre-flowering stage. >2 stems.	Can take palm cabbage; no <i>apo</i> .
<i>Ngebosor</i>	Pre-flowering stage.	Can take palm cabbage or <i>apo</i> .
<i>Sin uvut</i>	Pre-flowering stage.	Palm cabbage is bitter.
<i>Sepelit pa'ong</i>	Fertile stage. The palm cabbage has become an immature inflorescence.	Best for <i>apo</i> and palm cabbage.
<i>Bu'an dalem</i>	Fertile stage. The fruit is developing but not visible	Can only take <i>apo</i> .
<i>Ngeletang</i>	Fertile stage. Stem is big, the shoot is big and long, fruit stalks visible but fruit not yet visible.	Best for <i>apo</i> .
<i>Buah bala</i>	Fertile stage. Fruit short and red.	Best for <i>apo</i> .
<i>Buah/uvut iko baya</i>	Fertile stage. Fruit and fruit stalks short, stem big.	Best for <i>apo</i> .
<i>Buah ngemurah</i>	Fertile stage. Fruit red, as long and a bit bigger than the little finger or a chillie.	Best for <i>apo</i> ; fruit can be eaten.
<i>Buah nyerangap</i>	Fertile stage. Fruit red; a bit bigger and longer than the little finger or a chillie.	Best for <i>apo</i> .
<i>Buahpegak</i>	Fertile stage. <i>Apo</i> (pollen) lost from 'fruit'	Best for <i>apo</i> .
<i>Uluu piket/nevangah 1</i>	Fertile stage. Fruit small, as big as the small toe.	Can take <i>apo</i> .
<i>Uluu daran / nevangah 2</i>	Fertile stage. Fruit bigger.	Can take <i>apo</i> .
<i>Nevangah 3</i>	Fertile stage. Bigger fruit and can be eaten	Can take <i>apo</i> .
<i>Ngugau</i>	Palm is old, Fruits big, all fallen, ready to germinate	Cannot take <i>apo</i> .
<i>Ngengor</i>	Whole cluster cut / clear cut.	Cannot take <i>apo</i> .

\*Penan (Long Si'ang)

### 6.0 *Pu'un uvut* habitat

According to TK Asai, *pu'un uvut* occurs on hill tops, foothills and by the river but not in swamp forest, where there is no *jakah* either but there is *anau*, *iman*, *balau* (**Error! Reference source not found.**). *Pu'un uvut* needs some tree cover. Different habitats were associated with different palm habits (near the river *uvut baa'*; on hills *uvut paya*).

During this fieldwork and subsequent fieldwork carried out during October, *pu'un uvut* was observed to grow nearly always in areas with (shale<sup>1</sup>) rocks, nearly always on loam soil, often with a shallow litter layer (< 5 cm) but sometimes with litter > 10 cm deep, on slopes ranging from 30<sup>0</sup> - 70<sup>0</sup> but mostly at least 40<sup>0</sup>, facing (aspect) all eight principal points of the compass but more commonly North-east and also East at elevations ranging from 296 – 714 m. Palms observed right by the river were on steep slopes.

Uhl & Dransfield (1987) note that: *E. utilis* 'usually seem(s) to be associated with poor soils with abundant humus; they are particularly conspicuous on scarp faces or sharp ridgetops'.

### 7.0 *Birai* used by Long Si'ang Penan

The Long Si'ang Penan currently selects the next *birai* to harvest by:

- Going to one that one already knows is good and is close (easy to get to). TK Asai remembers particular *birai* and goes to places that always have good *birai* and where he knows the river is good.
- Checking on *birai* while hunting (if still too young to extract *apo* they just take *sin uvut*).
- Checking on *birai* that have not been cut for several years.

TK Asai considers *pu'un uvut* to be plentiful both near and far from Long Si'ang. He goes to harvest them at Ba Temaron, Ba Eh, Ba Senubung, Ba Jekau, Ba Pahe, BaJakau and also in the Ba Marong area. He says there is a lot on Bukit Pelemau.

### 8.0 Penan (Long Si'ang) management, sustainability and planting of *pu'un uvut*

- Logging companies damaged wild sago *birai* in the 1980s and 90s but the *birai* have regenerated since. (Balung Malin: *birai* spoilt in accessible places in Ba Temaron and Ba A'eh, but still left in inaccessible places).

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<sup>1</sup> Types of rock observed during the survey were shale and sandstone along the logging road to Kem Rawoot and in Ba Temaron river bed, where there was also sandstone with some quartz veins.

- Rights to sago: The people of Long Si'ang have their own designated area for harvesting, as do the people of Ba Selulong (also known as Ba Puak) (Map 1 (Appendx 7); Appendix 8). TK Asai considers the *birai* in the Long Si'ang area to be in satisfactory condition. There is also enough *pu'un uvut* in the Ba Selulong area but the Ba Selulong people not only go into their area but also into Sg Temaron and Kem Rawoot (in the area designated for Long Si'ang). TK Asai advises them not to take sago just anyhow in the Long Si'ang area. Locals will know who took the *pu'un* carelessly, just as they know who has been hunting in their area from the blowpipe darts that they find.
- It is a Penan convention not to cut stems till the *pu'un* has fruits and *apo*.
- One must take stems carefully and not damage the rest of the *pu'un uvut*, not taking one good stem from here, another from there and not wasting (*ngeburah*).
- One may not cut absolutely everything but take only what one needs (*Be' amok tebung ngeraring*).
- Others may leave a sign indicating whether one can cut the *pu'un uvut* or not (e.g. two sticks crossed means do not disturb - one may not take this). The Penan uses many signs.
- One good stem is enough in a place that has been left for a few months and has good *uvut*.
- If an area is good, two or three families can use the *birai* and it will not be finished in two or three months. Regarding planting of *uvut*: TK Asai has planted about five *pu'un* at the roadside for *sin uvut* and for leaves used for the plug of the blowpipe dart (*peluru*); Wong Berat has planted four or five around Long Si'ang but growth has been unsatisfactorily slow. Others have also planted sago here (we observed a two- year-old plant on clay on flat terrain). TK Asai says *uvut* can grow on flat land or slopes but does not do well on sand and kerangas areas are not good for *birai*. In a good place it can grow fast and can be used for *sin uvut*. Planting material must have a good and fast growing shoot (*ngibosor*) not a hard shoot (*ngeletang*). Plant where a tree has been cut down and burnt. Performance: thorns, leaf sheath (*sepakan*) and stem bark (*ipak*) should look green - if red, the plant is not doing well; leaf sheaths should be opening up. At Long Lama *uvut* has been planted for 25-30 years before flowering.
- Our survey (September 2015) showed *pu'un uvut* apparently overcut in two of the six *birai* visited, namely *birai* No. 1 (Tokong Batang Tanyit, Ba Temaron) and *birai* No. 4 (Tokong Kosong, ulu Ba Si'ang) (Map 2, Appendix 7). Most of the *birai* had been

cut by both Long Si'ang people (their area) and also Ba Selulong people (outside their area). The October survey showed all the *birai* recorded to be sustainable.

## 9.0 Information on *takjem* (*Antiaris toxicaria*)

### 9.1 From the literature

Go (2000) (paraphrased) describes *Antiaris toxicaria* (Moraceae) as a buttressed tree to 50 m tall and 100 cm diameter ( $\emptyset$ ) with greyish-white, smooth to slightly fissured, lenticellate-pustulate bark. The sap is creamy white to yellowish brown, turning dirty brown on exposure. The tree occurs from lowland to lower montane forests up to 1,500 m altitude, often near streams. The poisonous components of the latex are cardiac glycosides which arrest the heart beat. In Sarawak, the sap is tapped by making diagonal slashes on the bark and is used to prepare arrow and dart poison.

### 9.2 From local informants

According to TK Asai, *takjem* (*Antiaris toxicaria*) can be the diameter of a gas cylinder (c.33 cm) or get as big as a *tapang*<sup>2</sup> (*Koompassia excelsa*) tree (e.g. a tree he knows across the Tutoh river from Long Si'ang). He knows one which maybe 160 cm diameter. There is a tall type and a short type the leaves of which differ. Both types have poisonous latex. *Takjem* is found in every area. There are a lot in Long Si'ang area. Many have not yet been marked on the mind map or topographical map of the Long Si'ang area<sup>3</sup>. *Takjem* may be concentrated in an area (*petipun*). There is a lot at Sg Temaron and about 30 trees in the Long Si'ang area. There used to be a lot around the Tutoh area.

The first person to find a tree gains ownership rights to it. If one finds a tree that has not yet been tapped, one can test how potent the sap is by placing one or two drops on one's skin for few seconds and then washing it away. A 25 cm  $\emptyset$  tree is too small to be tapped.

The bark is tapped by making neat, diagonal overlapping cuts (Figure 2) and collecting the latex in a 500 ml water bottle. A full bottle may last a hunter three to four months. Once one has tapped a tree, one has to find a different tree to collect *takjem* from and leave the bark of the tapped tree to heal before taking *takjem* again. Therefore, there needs to be a big population of *takjem* trees. The next tapping, after the bark has healed, must be from a part of

<sup>2</sup> Ding Hou (2000) describes *tapang* (*Koompassia excelsa*) as reaching 270 cm  $\emptyset$

<sup>3</sup> TK Asai marked on the map on 13 Sept. 12 more *takjem* trees he knows especially in our area of interest and indicated those that have extra potent poison (circle round the dot).

the tree where the bark has never been tapped before. Sometimes wood and rattan frames are built alongside a tree to reach areas that have not previously been tapped. Someone else can take the sap but must do so carefully. Many people know all the local *takjem* trees. *Takjem* trees are marked by the local community when loggers are around so that they will not be felled.

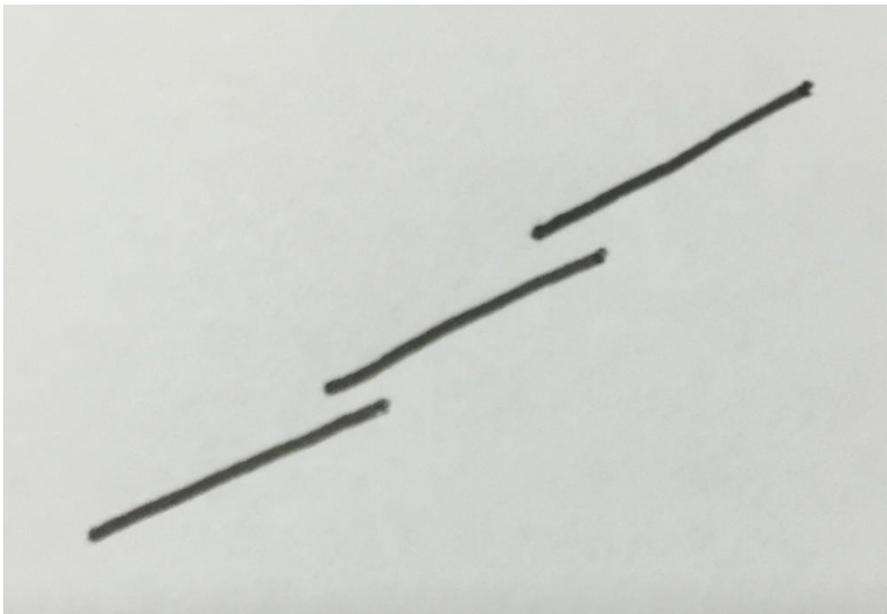


Figure 2: Proper arrangement of cuts when tapping a *takjem* tree

The potency of the poison varies from tree to tree. TK Asai and others know which the potent ones are from their good size or height and many tapping marks. Latex from some types does not need to be mixed with other ingredients and that from other types does. If TK Asai found one big and one small tree he would mix poison from them both.

Currently the *takjem* trees around here are still in good condition. They may or may not have tapping marks. They are not planted because there are so many around.

To process the latex into blowpipe dart poison, place it in a 'box' made by folding a *Licuala* (*daun-daun*) leaf fastened with wood sticks. Place in water and bring slowly to the point where it is starting to boil (do not boil strongly), or smoke slowly above fire. Additional ingredients for the poison include (i) sap from another *takjem* tree, (ii) 'long' (an aroid species (Araceae) with a pink leaf under surface that grows beside or on stones in a stream; the stem or root is grated into the cooking poison mixture); (iii) *tua*, a tree or climber (*akar*) with two leaves; (iv) tongkat ali (*Eurycoma longifolia*, Simaroubaceae) shoots. *Takjem sinuai*

has as many as 100 ingredients, including cobra venom. Once one has made the mixture one try it out for hunting to find whether it is good or not. If the dart poison is very strong, one cannot suck the dart back up the blowpipe. Young people these days may not know how to mix poison ingredients.

There are various plant antidotes to *takjem* poison, including *getimang* (*Diospyros* sp., Ebenaceae), *bekela*, *lakar sevului puan* and *ketubang*, about which there is a taboo.

### 9.3 Summary of features of *takjem* trees inventoried

The seven trees evaluated during the September and October surveys (Map 2, Appendix 7) ranged in diameter from 26 – 159 cm; est. height from 13 – 28 m and were found on 30°-55° slopes (from top) on various aspects and elevations ranging from 253 - 572 m, always in rocky (shale) areas; nearly always on loam soil, with a litter (humus) layer from < 5 cm to 10 cm and sometimes near rivers.

All the trees recorded during the September fieldwork belong to the Long Si'ang community (but not to individuals in the community) and had been tapped but were in good condition. The trees had multiple cuts from the base upwards past the point reachable without climbing aids and are said to have strong poison. The management recorded was that people from elsewhere may use them as well as Long Si'ang people but there is an understanding that the sap must be harvested carefully and the bark left to recover before another harvest. If a tree appears recently harvested, then a collector will go to another tree.

## 10.0 Draft survey methodology including assessment protocol

In the office<sup>4</sup>:

- Identify steep terrain and potential logging areas in the survey area based on slope maps generated from topological maps. Exclude steep terrain from survey.
- Correlate known abandoned Penan wild sago processing camps (*la'a*) with known *birai* and exclude these from operable areas.
- Contact the village headman (Tuai Kampung; TK) responsible for the area to be surveyed, giving advance notice of the survey trip dates and objectives. Identify the best possible local informant(s) for the survey area (usually the TK).

In the field:

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<sup>4</sup>Decisions made during meeting of project staff and WWF staff on 25 September 2015

1. Explain the survey objectives to the TK and listen to what Penan feel is important.
2. Explain what the survey will involve (area to be covered, survey method, local assistance needed for setting up camps and guiding or evaluating).
3. Ask the TK to pick a team of local informants and porters.
4. Ask the local Penan community the locations of *birai* significant or important to their needs.
5. Decide on a threshold size (area or minimum no. of clusters, e.g. 30 clusters) which a *birai* must meet to be included in the survey.
6. Ask the TK to advise on camp location(s) so that team is as close as possible to areas to be surveyed (establishing a camp will probably take a full day).
7. Brief local and project team members on information to be recorded or use of GPS to track *birai* perimeter.
8. Do a trial survey run and get feedback (do all understand what is needed?).
9. Survey, with local help, the perimeter of each *birai* that meets the minimum size specifications.

After returning to office:

10. Map *birai* resource areas surveyed and exclude from operable area.
11. Make sure both the Penan and the logging companies know the areas identified.

Table 2: Equipment required by each survey sub-team

Topographical maps	Clinometer	Binoculars
Record sheets (hard copy) & clipboard	Tape measure (50 m)	Camera
GPS (Timbalai 1948 Datum) loaded with map data	Diameter tape	Ruler

#### 11.0 Survey sheets with rationale for survey methods / assessment protocol

The survey sheet to record *birai* survey data, with rationale, is attached as Appendix 3 and that to record *takjem* survey data is attached as Appendix 4.

Table 3: Palm species in addition to *Eugeissona utilis* recorded during survey

Penan (Long Si'ang) name	Scientific name	Remarks from Penan (Long Si'ang)
<i>jakah</i>	<i>Arenga undulatifolia</i>	<ul style="list-style-type: none"> <li>• No thorns so good</li> <li>• <i>Apo</i> can be extracted at fruiting stage; if</li> </ul>

		fruit has fallen then <i>apono</i> good
<i>anau</i>	<i>Pholidocarpus maiadum</i>	<ul style="list-style-type: none"> <li>• Jakah leaf for plug of blowpipe dart</li> <li>• With thorns</li> <li>• Used for <i>apo</i> but <i>apo</i> is coarse, not fine</li> <li>• Leaf for blowpipe dart</li> </ul>
<i>iman</i>	<i>Caryota no</i>	<ul style="list-style-type: none"> <li>• No thorns</li> <li>• Used for <i>apo</i> (good)</li> </ul>
<i>balau</i>	? <i>Orania sylvicola</i>	Planted / found in Kayan/Berawan area where locals use it for sago Leaves like coconut leaves
<i>nyivung</i>	<i>Oncosperma horridum</i>	a slender solitary palm with black thorns
<i>bohok</i>	<i>Arenga brevipes</i>	
<i>les'ei</i>	<i>Caryota mitis</i>	<i>Apo</i> is good
<i>segela</i>	<i>Plectocomiopsis geminiflora</i>	Mentioned this is <i>lalis</i> , shoot very bitter
<i>wai bukui</i>	<i>Calamus caesius</i>	Little finger size. Best rattan for handicraft. When bent, skin flies off.
<i>wai inang</i>	<i>Calamus optimus</i>	Thumb size. Good quality handicraft rattan
<i>wai janan</i>	* <i>Calamus ?scipionum or C. ornatus</i>	Rattan; fruits edible
<i>wai semui</i>	? <i>Calamus</i>	Thumb size. Good quality handicraft rattan
<i>udat</i>	<i>Daemonorops didymophylla</i>	Rattan fruits used to dye rattan red for handicrafts
<i>sum</i>	<i>Salacca ?affinis var. borneensis</i>	* no information noted (Penan Long Si'ang: the frond is short)
<i>lemujan</i>	<i>Salacca ?rupicola</i>	* no information noted (Penan Long Si'ang: the frond is long and the fruit red)

\*according to Appendix 4 Glossary of Penan words

Rattan handicrafts made at Long Si'ang are sold at Long Latik where prices are fixed and there is a handicraft centre by the road, and at Long Bedian. Long Latik people sell the handicraft on to Miri etc. Rattan seeds are not easy to find<sup>5</sup>. Normally locals will take back a seedling and try planting it. It's not easy to grow.

## 12.0 Challenges

Moving around the forest was difficult and time-consuming especially for those not used to it or less physically fit. Reaching each *birai* took longer than recording the *birai* (which could be surveyed in about one hour by the method in use for the pilot survey).

It was difficult to take photos of the *birai* being surveyed.

<sup>5</sup>Datuk Ose Murang, Deputy State Secretary of Sarawak, told me his office will pay RM 30 per gantang of rattan fruit the Penan collect for planting.

### 13.0 Recommendations

1. Remote sensing might be an alternative option to identify *birai*. Hyperspectral analysis may be a useful technique (Affendi Suhaili, of the Forest Department Sarawak, is an expert in this technique). A paper on *Metroxylon sagu* (Santillana *et al.*, 2012) shows how the spectra from different palm species differ for some wavelengths, and that spectra for different development stages can also be used to differentiate between palms. The Project could ask Forest Department Sarawak to fly over the survey area – options can be explored in the upcoming WWF Malaysia workshop in November.
2. Places TK Asai recommends for *birai* evaluation on a future trip are: Ba Eh, Ba Jekau (kecil and besar), Ba Pahe, Ba Mutan as well as Lumut and Ulu Temaron. Make camp at Ba Eh and split into groups of four persons. From there go by logging road to the top of Pelemau (> 700 m) (recommended for conservation, not reached by logging but as such probably on terrain that is too steep) and Lumut (ulu Ba Temaron). *Pu'un uvut* at Pelemau are fat and soft and can be cut with parang rather than axe. Such a trip would need two to three weeks. Headwaters of Magoh, Puak etc.
3. For a trip to Ba Selulong contact En Selapan (expert in the local terrain). En Asai would also be willing to go. Fit people evaluating the Ba Selulong community's area could make a camp (*lamin*) in Ulu Puak and finish in one to two weeks. (Map 1).
4. TK Asai recommends groups of four (one person from the project, one experienced person and two others from local villages)<sup>6</sup>. If there are not enough Long Si'ang people, Ba Selulong people could be brought in.
5. Places with a lot of *birai* are: Ba Teping, Ba Kajau, Ba Rutanib at TRB of Tutoh river, Ba Pangi, Ba Beluan on its True Left Bank (TLB). There are also a lot of *birai* at Ba Keduan, Ba Rusun, Ba Pangeh and Ba Marong and also to West and South of Long Si'ang reserve (Map 1, area shaded dark green).
6. Earlier Migration Patterns are of interest in terms of *birai* locations  
TK Asai explained that before the logging company came, the Penan who now make up the Ba Si'ang, Ba Selulong, Long Kawa, Long Taha and Ba Selulong groups were all nomadic in the forest. They went looking for *birai* at Ba Magoh, Ba Barih, South of Ba Selulong, Ba Tutoh and to Ba Tabar (South of Ba Kuba'an) and to its South and as far as Ba Tik. They did

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<sup>6</sup>For the October fieldwork the teams comprised one member from the project and seven other members: one experienced guide each from Long Si'ang and Ba Selulong, two representatives from Long Si'ang and Ba Selulong and three porters to do the survey as well as two to guard the camp. After the fieldwork, it was found that groups of five are better (one member from the project, one cook who also looked after the camp, one experienced guide and two porters).

not go into West side of the High Conservation Value Forest (HCVF) in the Kubaan-Puak area because it is kerangas and not good for *birai*, or to North of Ba Tabar (where the soil is different and there were fewer *birai*). Before the *birai* in one area had finished they would already have found another source.

#### 14.0 References

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## 15.0 Appendices

## Appendix 1: Schedule of activities

Sept. 10	Met En Asai Berat, Tuai Kampung of Long Si'ang. Interviewed him about wild sago and <i>takjem</i> .
11	Continued to interview En Asai concerning stages of wild sago that produce starch, and concerning <i>takjem</i> .
12	Walked to Long Temaron and thence to Tokong Belah Ba Temaron (350 m). Observed how Penan name stages of wild sago, evaluate starch content etc. and visit <i>takjem</i> tree.
13	Continued to interview TK Asai at Long Si'ang about wild sago growth, habitat and planting; he mapped 12 <i>takjem</i> trees from memory.
14	By 4WD to Long Temaron, up Ba Temaron, 35 mins (Penan set up camp ( <i>lamin</i> )) and then up river to first <i>birai</i> and saw <i>besunga</i> (weevil that attacks <i>pu'un uvut</i> and makes grubs ( <i>su-ut</i> ) in cut stem.
15	Whole group up Ba Temaron and then up True Left Bank (TLB) to ridge (438 m) to look at first <i>birai</i> (Uvut Bawang Pegetah) and try out methodology to evaluate it. Peak of ridge is Berusuk Patah. Discussed parameters to measure with team, including Penan.
16	Split into 3 groups each to evaluate different <i>birai</i> . Tried out fine-tuned methodology.
17	In 3 groups to evaluate individual <i>birai</i> and our group evaluated a <i>takjem</i> tree. Heavy rain just after got back to <i>lamin</i> .
18	Struck camp and left belongings at Long Temaron for pick-up. Asked En Asai on (i) Penan group migration in the area prior to logging; (ii) diseases of <i>uvut</i> . Went up logging road past Kem Rawoot and split into 3 groups, each to evaluate another <i>birai</i> . Re-estimated height of Kem Rawoot <i>takjem</i> tree on way back.
19	Returned to Kuching via Long Seridan flight to Miri.

## Appendix 2: Survey team members

Project members	Guides from Long Si'ang	Porters from Long Si'ang
Katharine (Kit) Pearce (Consultant)	TK Asai Berat (Village Headman)	Elisa Asai
Emmy Goh Ling Ling (Project Manager)	Wong Berat	Masi Naun
Mohd. Khairulazree bin Sulaiman (GIS Officer)	BalungMalin	Thomas Sang
Alfred Keleman (WWF-DPA)		

### Appendix 3: Survey sheet to record *birai* survey data with rationale

<b>Tarikh:</b>	<b>Jam keluar kem:</b>	<b>Jam balik kem:</b>	<b>Jumlah masa</b>	<b>Rational for inclusion</b> For planning future surveys	
<b>Borang penilaian birai</b>				<b>Nota:</b>	
Nama ahli rombongan:				Any additional notes	
Ahli Project:					
Ahli tempatan (berpengalaman):					
Ahli tempatan (porters):					
<b>Masa untuk direkod:</b>	<b>Mula:</b>	<b>Habis:</b>	<b>Jumlah masa</b>	For planning future surveys	
Birai No.:				For birai identification together with date	
Nama tempatan birai:					
Ketinggian (m):				Habitat data	
Aspek (bulatkan): U UT T ST S SB B UB				"	
Cerun dari atas:				"	
Habitat:					
Batu: ada /tidak (bulatkan)				"	
Jenis batu: shale, batu pasir, lain-lain (nyatakan)				"	
Jenis tanah: lom, pasir, tanah liat (bulatkan)				"	
Ketebalan lapisan humus: < 5 cm; 5-10 cm; > 10 cm (bulatkan)				"	
Drainage: well-drained / poorly drained (bulatkan)				"	
<b>Tempat ambil bacaan koordinat</b>	<b>Bacaan koordinat (GPS Timbalai 46):</b>		<b>Waypoint (darjah, perpuluhan minit)</b> (x_y_z di mana x = No. birai; y = no. bacaan; z = huruf 'recorder')		
pu'un uvud pertama	N	°	E	°	..... Mula jejakkan
pohon yang terakhir sebelah kanan	N	°	E	°	.....
pohon yang terakhir sebelah kiri	N	°	E	°	.....
akhir (di simpang / hujung birai)	N	°	E	°	.....
Sungai yang terdekat	N	°	E	°	..... get from map
Kira peringkat setiap kelompok /batang mengikut senarai dibawah:				Stop & save jejak GPS ..... FAILGPS X_ddmmyy (X = Birai No.)	
<b>Peringkat batang</b>	<b>Sebelah kiri bukit</b>	<b>Sebelah kanan bukit</b>	<b>Jumlah</b>		
Sinuvud (belum mula berbunga; sesuai untuk ambil umbut)					
Sipak (tiada apo)					
S'belit pa'ong (buah belum dilihat)					
Ngibesor					
Buan dalam (pucuk dalam tukar jadi buah)					
Ngeletang (bunga belum dilihat)					
Uvud ekor buaya					
Buah bala (buah merah, saiz hujung jari kelengkeng)					
Buah ngemurah (buah merah, saiz jari kelengkeng atau cili)					
Buah pegak (buah saiz ibu jari kaki; terbuka, apo (pollen) dalam buah hilang)					
Ulun piked (tidak sesuai untuk ambil apo)					
Buah nevangah (kelopak dahan sudah gugur, parut (berbukun) jarak jauh, batang mati)					
Ngugau (buah besar, gugur, siap untuk cambah)					
<b>Peringkat kelompok (pu'un uvud)</b>					
Sahin uvud (semua batang besar tebang habis)					
Ngengor (potong habis)					
Tanya orang tempatan yang berpengalaman: Pada pendapat anda:					
1. Bagaimana keadaan birai ini (bulatkan): subur / tidak subur ada / tidak ada seranggan perosak					
2. Bagaimana kemampunan (tahan untuk masa depan) birai ini (bulatkan): mampan / tidak mampan					
3. Bagaimana kekerapan ambil uvud dari birai ini (bulatkan): kerap / jarang					
4. Siapa ada hak ambil uvud daripada birai ini (asal ada kebenaran)?					
Imej birai:					
Peta (sketch map) birai					

## Appendix 4: Survey sheet to record *takjem* survey data

Tarikh:	Jam keluar kem:	Jam balik kem:	Jumlah jam:
<b>Borang penilaian tajem</b>		<b>Nota:</b>	
Nama ahli rombongan:			
Project:			
Tempatan (berpengalaman):			
Tempatan:			
Tajem No.:			
Nama tempatan lokasi:			
Ketinggian (m):			
Aspek (bulatkan): U UT T ST S SB B UB			
Cerun dari atas:		0	
<b>Habitat:</b>			
Batu: ada /tidak (bulatkan)			
Jenis batu: shale, batu pasir, lain-lain (nyatakan)			
Jenis tanah: lom, pasir, tanah liat (bulatkan)			
Ketebalan lapisan humus: < 5 cm; 5-10 cm; > 10 cm (bulatkan)			
Lain-lain butir:			
<b>Tempat ambil bacaan koordinat</b>	<b>Bacaan koordinat (GPS Timbalai 46):</b>		<b>Waypoint (darjah, perpuhan minit)</b>
Lokasi tajem	N	E	(x_y_z di mana x = No. tajem; y = no. bacaan; z = huruf 'recorder')
Garis pusat paras dadah (dbh) (1.3 m)		cm	....._....._..... Mula jejakkan
Anggaran ketinggian pokok sampai atas		m	Stop & save jejak GPS
			...._.....
			FAILGPS_X_ddmmyy (X = Birai No.)
Tanya orang tempatan yang berpengalaman: Pada pendapat anda:			
1. Bagaimana keadaan tajem ini (bulatkan): subur / tidak subur			
ada / tidak ada seranggan perosak			
2. Bagaimana kemampuan (tahan untuk masa depan) tajem ini (bulatkan): mampan / tidak mampan			
3. Bagaimana kekerapan ambil getah dari tajem ini (bulatkan): kerap / jarang			
4. Siapa ada hak ambil getah daripada tajem ini (asal ada kebenaran)?			
5. Bagaimana keadaan tajem (dart poison) (bulatkan) sangat bagus / bagus / sederhana			
Imej tajem:			
Peta (sketch map) tajem			

## Appendix 5: Instructions for taking GPS readings

1. Switch on GPS Garmin (on RHS)
2. Press Quit or Page button to navigate to the satellite page. Make sure the GPS is fully initialised (check accuracy – below – GPS + Glonass < 10 m)
3. Navigate to Main Menu page. Go to Track Manager and press Enter on the Current Track. Select Clear Current Track
4. Navigate to Map and the GPS will automatically start tracking
5. Press Mark button to mark point
6. To save, navigate to Main Menu, select Track Manager > Current Track then select Save Track

## Appendix 6: Images



Image 1: A birai of 17 *pu'un uvut* seen from logging road after Ba Ranga  
© WWF-Malaysia / Alfred Keleman 18 Sept.2015



Sepelit Pa'ong



Ngeletang



Buah bala



Iko baya



Iko baya



Nevangah 1/ Ulun piket



Buah ngemurah



Nevangah 2/ Ulun daran



Nevangah 3

Image 2: A composite showing uvut at various stages of development  
© WWF-Malaysia / Alfred Keleman



Image 3: A *birai* of c.10 *pu'un uvut* on hillside seen from logging road with Ba Eh on Right  
© WWF-Malaysia / Alfred Keleman



Image 4: *Besunga* – the weevil that attacks immature uvut inflorescences  
© WWF-Malaysia / Alfred Keleman



Image 5: *Takjem* (*Antiaris toxicaria*) tree beyond Kem Rawoot  
© WWF-Malaysia / Alfred Keleman

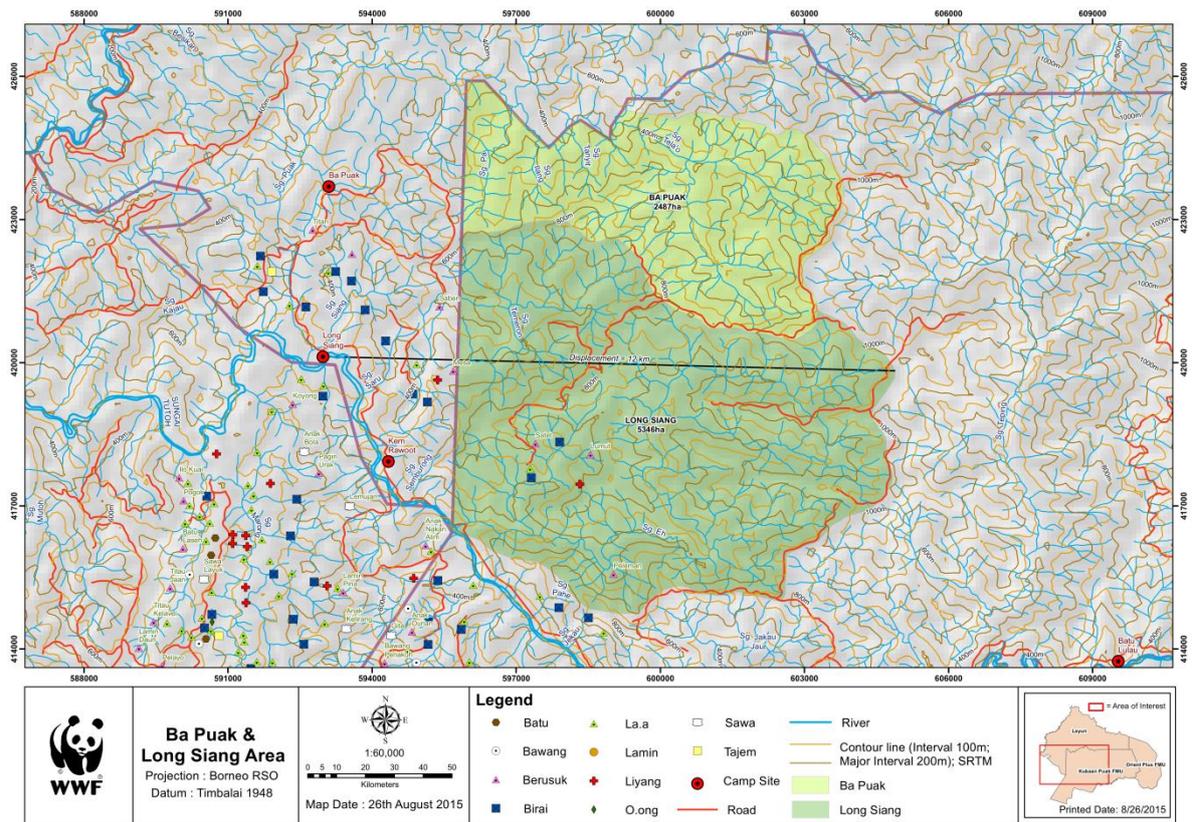


Image 6: *Takjem* tree being cut to extract poisonous latex  
© WWF-Malaysia / Alfred Keleman

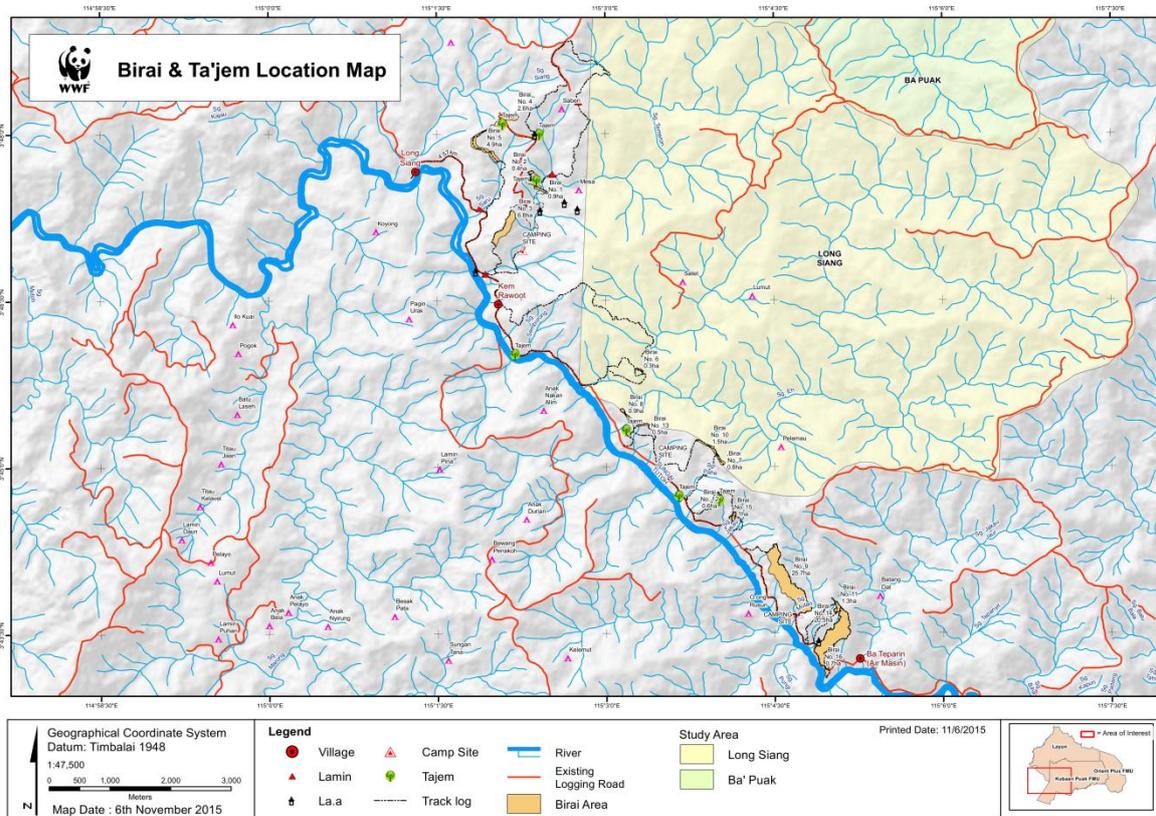


Image 7: The team on the way to set up camp at Ba Temaron  
© WWF-Malaysia / Alfred Keleman

Appendix 7: Maps



Map 1: Ba Puak and Long Si'ang area



Map 2: Birai and takjem location map

## Appendix 8: Terms of Reference for Consultancy

### Objectives

- 1) To develop a methodology that is suitable for studying hunting-gathering communities who are spread out over a large area, with focus on the resources of sago (*Eugeissona utilis*) and *takjem* (*Antiaris toxicaria*)
- 2) To develop an assessment protocol for quantifying resources of sago and *takjem*, leading towards supporting community development and conservation plans that are appropriate to their needs and include sustainable use of forests.

### Methodology

The following are the tasks that have been identified in order to undertake the project:

1. Interview local informants about sago and *takjem* use, and to map out location, identify habitat factors, past management practices, etc.
2. Locate and quantify sago clusters frequented by Long Siang community and considered to be the best, in terms of number of palms / cluster, extent, conditions, and to note signs of lack of sustainability.

WWF-Malaysia's collection of technical reports will be made available to the Contractee. Where available, digital copies will be provided to the Contractee and in cases where they are not available, the Contractee should consult the printed copies of the documents within the confines of the WWF-Malaysia office. In some cases, photocopies of the relevant documents will be made available for the Contractee. The Contractee is also expected to consult relevant literature from sources beyond WWF-Malaysia's publication collections and use his own equipment and resources in preparing the proposals and reports. Procurement of additional materials from external sources incurring additional costs must first be discussed with and approved by WWF-Malaysia.

### Output

The outputs of the consultancy are as follows:

Technical Report containing details of the Objectives and based on the methodologies above.

### Timeline

This assignment should commence on 10<sup>th</sup> September 2015 and be completed by 15<sup>th</sup> October 2015.

Due to the requirements of the project, all deadlines (see below) must be strictly adhered to facilitate complementary activities.

1. Submission of work plan

**10<sup>th</sup> September 2015**

- |   |                                     |
|---|-------------------------------------|
| 2. Submission of outline report         | <b>5<sup>th</sup> October 2015</b>  |
| 3. Submission of final technical report | <b>15<sup>th</sup> October 2015</b> |

### **Reporting**

The Contractee will report to Ms Emmy Goh, WWF-Malaysia with respect to all tasks and assignments, or in her absence Dr Samantha Liew, WWF-Malaysia

### **Copyrights And Other Intellectual Property Rights**

The Contractee agrees that all intellectual property rights including the copyrights throughout the world in all outputs developed and created by the Contractee shall vest in and be wholly and exclusively owned by WWF-Malaysia. The Contractee hereby irrevocably and unconditionally waives and consents any so-called “moral rights” as author to all outputs to the fullest extent permitted by law (either present or future), to WWF-Malaysia.

### **Report Format**

All reports should be written in English. The report should be supported by helpful diagrams, charts, maps and plates as necessary to support the discussions or conclusions presented. Please refer to the Standard Conditions of Contract (Annex C) for additional information on the format of the report.

The contract should commence from 10<sup>th</sup> September 2015 and be completed (with the submission of a fully-edited version of required reporting meeting WWF-Malaysia’s requirements) by 15<sup>th</sup> October 2015. Any diagrams for inclusion in the report should be on either **A4** or **A3**-sized paper. The reports should be saved in a format compatible with Microsoft Office XP.

The Contractee should adhere to the detailed regulations contained within the WWF-Malaysia Standard Conditions of Contract.