

© RUT Printer and Publisher

Print & Online, Open Access, Research Journal Available on <http://jbsd.in>

ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)

**Research Article**



## Zingiberaceae of Kalatungan Mountain Range, Bukidnon, Philippines

Mark Arcebal K. Naïve

Department of Biology, Central Mindanao University, University Town, Musuan, Maramag, Bukidnon 8714, Philippines  
arciinaive19@gmail.com

### Article Info

Received: 16-05-2017,

Revised: 19-06-2017,

Accepted: 22-06-2017

### Keywords:

*Alpinia apoensis*, Bukidnon, *Etilingera pandanicarpa*, Kalatungan Mountain Range, Zingiberaceae

### Abstract

A floristic study of the family Zingiberaceae in the Kalatungan Mountain Range, Bukidnon, Philippines has been carried out from April 2015 to March 2016. Samples of Zingiberaceae were directly collected during trekking and searching along the trail. The samples were processed to herbarium specimens and, where possible, identified. Based on the analysis of morphological characters, twelve species of Zingiberaceae were identified; *Alpinia alpina*, *Alpinia apoensis*, *Alpinia haenkei*, *Etilingera* cf. *alba*, *Etilingera pandanicarpa*, *Etilingera philippinensis*, *Etilingera* sp. 1, *Etilingera* sp. 2, *Globba campsophylla*, *Hornstedtia lophophora*, *Zingiber banahaoense*, *Zingiber* sp. 1. I have suggested further research for *Etilingera* sp. 1, *Etilingera* sp. 2 and *Zingiber* sp. 1 on its possibility as species new to science.

### INTRODUCTION

The ginger family, Zingiberaceae, is a monocot family and is the largest of 8 families in order Zingiberales. According to Lamb et al. (2013), the family consists of more than 1500 species in 53 genera, which can be mostly found in tropical forests. Southeast Asia is especially rich, with about 80% of all the known species. In the Philippines, there are 14 genera, and over 107 species, however, those are only the named species (Pelser *et al.*, 201). The family serves as an important natural resource that provides useful products for food, spices and condiments, medicines, dyes, perfumes and aesthetics to man (Bhunja & Mondal, 2012). The most recent classification recognizes 4 subfamilies and 6 tribes: Siphonochiloideae (Siphonochileae), Tamijioideae (Tamijieae), Alpinioideae (Riedelieae, Alpinieae) and Zingiberoideae (Zingibereae, Globbeae) (Kress *et al.*, 2004).

At present, there has been little taxonomic

work on Philippine Zingiberaceae since Merrill's *magnum opus* in 1925, and studies on the ecology, distribution, and ethnobotany of the family are few and outdated. Further, many existing taxonomic treatments don't have keys, illustrations, or complete descriptions of species, making wild specimens in this taxon difficult to identify. Given the increasing pace of forest destruction and loss of traditional knowledge, it is likely that some unknown or poorly known gingers face extinction before their medicinal or other uses can be fully explored.

The Kalatungan Mountain Range is considered to be one of the highest mountain ranges in the Philippines. It was declared as a Natural Park on the 5<sup>th</sup> day of May 2000, under proclamation 305. It has an area of 37,550.27 hectares with a maximum elevation of 2,824 m above sea level. It lies between the coordinates 8°00' and 8°60' latitude and between 124°35' and 124°60' longitude. The mountain harbors a diverse flora and

fauna amongst its numerous rivers and waterfalls, a lake and small wetland area, cliffs, caves and rock formations that provide habitats for wildlife (Naive *et al.*, 2017). The said mountain range supports diverse vegetation types and is rich in plant genetic resources including gingers.

To date, taxonomic studies of Zingiberaceae in Kalatungan Mountain Range have not yet been conducted. Thus, this study was done to gather benchmark information on the Zingiberaceae species present in the area, which are thought to be undocumented and to a larger extent, undescribed. The aim of this study is to enumerate the Zingiberaceae species present in the area. Taxonomic and ecological data of the plants are important information for efficient biological resource management for the natural park.

## MATERIALS AND METHODS

The survey was conducted in Kalatungan Mountain Range focusing on the trail of Mount Nabukalan, Kalatungan Mountain Range, Bukidnon. Gingers were collected along the trail between the camps. Plant collection and observation was done from April 2015 to March 2016. Collected plants were pressed for herbarium specimens and parts of flowers and fruits (if available) were preserved in 70% ethanol for spirit collection. Specimens were deposited in Central Mindanao University Herbarium (CMUH). Identification was mainly based on the prologues of

the *Leaflets of Philippine Botany* Volume VII and VIII of A.D.E. Elmer (1908-1910, 1915-1919). In addition, type specimens of the family in JSTOR were also used for the identification of the Zingiberaceae species. Collection numbers of the recent collections, were given the initials MAKN, which stands for Mark Arcebal Kling Naive.

## RESULTS AND DISCUSSION

There was a total of 12 species belonging to Family Zingiberaceae recorded from Kalatungan Mountain Range, Bukidnon, Philippines namely: *Alpinia alpina* (Elmer) R.M. Sm. ex M.F. Newman, Lhuillier & A.D. Poulsen, *Alpinia apoensis* Ridl., *Alpinia haenkei* C. Presl, *Etilingera cf. alba* (Blume) A.D. Poulsen, *Etilingera pandanicarpa* (Elmer) A.D. Poulsen, *Etilingera philippinensis* (Ridl.) R.M. Sm., *Etilingera* sp. 1, *Etilingera* sp. 2, *Globba campsophylla* K. Schum., *Hornstedtia lophophora*, *Zingiber banahaoense* Mood and Theilade, and *Zingiber* sp. 1. These species belong to 5 genera, 2 subfamilies (Alpinioideae and Zingiberoideae) and three tribes (Alpinieae, Globbeae and Zingibereae) (Table 1). The genus *Etilingera* has the highest number with 5 species, followed by *Alpinia* with 3 species. Based on the checklist of Pelsner *et al.* (2011 onwards), this study has found 36% of the total 14 genera and 11.21% of the 107-species found in the Philippines. Brief descriptions or short notes, where appropriate, are provided below.

**Table 1. List of gingers species found in Kalatungan Mountain Range.**

No.	Tribe	Genus	No. of species
1	Alpinieae	<i>Alpinia</i>	3
2		<i>Etilingera</i>	5
3		<i>Hornstedtia</i>	1
4	Globbeae	<i>Globba</i>	1
5	Zingibereae	<i>Zingiber</i>	2
TOTAL			12

### Alpinieae A. Rich

*Alpinieae* is an evergreen herb. This tribe is characterized by the plane of distichy of leaves is transverse to direction of rhizome, having fibrous rhizome rather than fleshy, lack of extract oral nectaries, lateral staminodes are much more reduced

or absent and never petaloid, labellum never connate to filament, having a medium length of filament that is sometimes arching, anther crest petaloid or absent, ovary trilocular, placentation is axial or free central and capsule is indehiscent or fleshy.

## 1. *Alpinia* Roxb.

The genus is easily distinguished by its terminal inflorescence on leafy shoot, which is emerging above its uppermost leaf sheath, rarely appearing lateral and if so then not densely congested and labellum large and showy.

### 1.1 *Alpinia alpina* (Elmer) R.M.Sm. ex M.F.Newman, Lhuillier & A.D.Poulsen Checklist of the Zingiberaceae of Malesia, Blumea Suppl.: 16:7. (2004)

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1773 m, 31<sup>st</sup> October 2015, MAKN 01/2015 (CMUH).

Terrestrial herb that grows up to 2 m tall. Rhizome creeping, reddish when young, greenish when mature, measures 6 to 11 cm in diameter. Leaves sessile, lanceolate, 30 to 33 cm long by 10 to 13 cm wide. Young leaves purplish beneath. Base rounded, apex acuminate, margins entire to sinuate, and glabrous. Leaf sheaths have purple streaks when young, ligule bifid, membranous, greenish margins. Inflorescence terminal and cone-shape. Infructescence terminal. Fruit hard and shiny dark green, glabrous, 0.7 to 1 cm long and elongated. Bracts greenish red, glabrous margins. No inflorescence was observed, only infructescence.

Distribution: Kalatungan Mountain Range.

Ecology: It grows mostly at high elevations of between 1700 to 2100 m in deeply shaded localities on upper montane to mossy forests with humid environment.

Vernacular name: Not recorded.

Uses: Not recorded.

### 1.2 *Alpinia apoensis* Ridl. Philipp. J. Sci., C 4(2): 188. (1909)

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, , elev.1537 m, 31<sup>st</sup> October 2015, MAKN 02/2015 (CMUH).

Terrestrial herb, grows up to 0.8 m long. Rhizome creeping, brownish-yellowish and 1 to 1.5 cm in diameter. Leaves ovate-lanceolate, 17 to 19 cm long by 1 to 3 cm wide, and arranged distichously. Margin entire to wavy, base rounded, apex acuminate and glabrous. Ligule reddish, entire, oblong, 0.1-0.5 cm long, petiolate, 0.8-1.2 cm long. Inflorescence panicle, terminal, up to 30 cm long, bearing many flowers, floral bracts white with oblong tips. Fruits green when immature, yellow to red when ripe, globose elongate, glabrous.

Distribution: Kalatungan Mountain Range.

Ecology: It grows in shaded localities with humid environment in montane forest at elevations of between 1500 to 1900 m asl.

Vernacular name: Not recorded.

Uses: Not recorded.

### 1.3 *Alpinia haenkei* C. Presl. Symb. Bot.: 66, pl., t.43. (1832)

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1352 m, 31<sup>st</sup> October 2015, MAKN 03/2015 (CMUH).

Terrestrial herbaceous plant that grows up to 2 m tall. Rhizome reddish, creeping, 5 to 10 cm in diameter. Leaf distichous, broadly lanceolate, 65 to 67 cm long by 10-11 cm wide. Margin entire to wavy with fine hairs. Leaves adaxially and abaxially pubescent, base oblique, apex broadly acuminate, petiole 4 to 6 cm long, ligule bifid, oblong shaped per lobed, reddish, 2.2 cm long. Inflorescence terminal, racemose, 20-35 cm long, racemous. Fruit round to oblong, 2 to 3 cm long by 0.5 to 1 cm in diameter, pubescent all throughout. Green when immature and red when ripe.

Distribution: Kalatungan Mountain Range.

Ecology: It grows in shaded to open canopy localities at elevations of between 1300 to 1900 m asl.

Vernacular: Not recorded.

Uses: Not recorded.

### *Etilingera* Giseke

Characterized by having an inflorescence separate from the 1-8 m tall leafy shoot, involucre of tightly overlapping bracts sterile bracts, presence of filaments and a more pronounced staminal tube.

#### 2.1 *Etilingera* cf. *alba* (Blume) Poulsen. *Etilingera* of Sulawesi: 58. (2012).

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1359, 30<sup>th</sup> April 2015, MAKN 04/2015 (CMUH).

Terrestrial herb, grows up to 4 m long. Rhizome creeping, densely orange-brown-pubescent, pubescent at base stilt roots absent. Leaves lanceolate, 31 to 34 cm long by 8 to 11 cm wide. Lamina lanceolate, not plicate, mid-green and glabrous. Base truncate, rounded or slightly cordate. Apex acute to acuminate. Margin ciliate, sometimes only near apex. Inflorescence 12 to 23 cm long, arising from rhizome, receptacle extending to with flowers well-spaced exposing the pubescent receptacle axis, with 23 to 52 flowers. Peduncle 3 to 18 cm long ascending to erect. Calyx is cream ± tinged green with slight red tinge at apex, apex 3-toothed.

Labellum panduriform, cream, slightly pink at margin. Bracts white and broadly ovate with acute apex and 3.2 long by 0.9 cm wide. Inflorescence arises from the rhizome and 9 cm long. Head 6 to 8 by 5 to 10 cm long, ovoid or ellipsoid, bracts bracteoles (sometimes split in two) and calyces persistent, with 21 to 36 fruits per head. Fruit 1 to 2 by 1.2 to 2 cm, rounded, spiny throughout, curved, sometimes in semi-rows, yellowish green, orange-brown or reddish, sericeous; seeds flattened.

Distribution: Kalatungan Mountain Range.

Ecology: It grows in shaded localities with humid environment mostly near the river at elevations of between 1300 to 1500 m asl.

Vernacular name: Katugis (Talaandig tribe)

Uses: Fruit is edible.

**2.2. *Etilingera pandanicarpa* (Elmer) A.D.Poulsen. Blumea 48(3): 525. (2003)**

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1360 m, 28<sup>th</sup> January 2016, MAKN 05/2015 (CMUH).

Terrestrial herbaceous plant, grows up to 5 m tall. Rhizome creeping, 8 to 13 cm in diameter. Leaves broadly lanceolate, ascending from the base, 57 to 65 long by 13 to 15 cm wide, adaxially glabrous, abaxially pubescent. Petiole short with fine hairs. Margin entire to wavy, reddish. Ligule oblong and obtusely round in the apex with white fine hairs, 0.5-1.5 cm long. Leaf base broadly cuneate, apex acuminate. Inflorescence arises from the rhizome. Easily recognized by its numerous yellow flower, short labellum, orange anther crest and bright red stigma. Peduncle short, 2 cm length and fleshy. Bract is tubular, 3 to 3.5 cm long by 0.3 to 0.6 cm wide, reddish apex and whitish base. Bracteole tubular, 2.5 to 3 long by 0.2 to 0.4 cm wide, reddish apex and whitish base. Inflorescence arises from the rhizome, barely above the ground, 10 to 15 cm long. Peduncle short, 2-3 cm long, covered with persistent sheaths. Provided with imbricating bracts, pubescent when young, lanceolate to oblong. Head subglobose, hard, 7-10 cm long. Fruit angularly ovoid, 2 to 4 cm long. Pericarps tough and deep purple on the inside. Seeds numerous, blackish brown and conglomerated.

Distribution: Kalatungan Mountain Range,

Ecology: It grows in shaded to slightly lit localities with humid environment near the river at elevations of between 1300 to 1400 m asl.

**2.5 *Etilingera* sp. 2**

Vernacular name: Not recorded.

Uses: Fruits edible.

**2.3. *Etilingera philippinensis* Ridl. R.M.Sm. Notes Roy. Bot. Gard. Edinburgh 43(2): 248. (1986)**

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1495 m, 30<sup>th</sup> April 2015, MAKN 06/2015 (CMUH).

Terrestrial herbaceous plant, grows up to 5 m tall. Rhizome brown to reddish, 10 to 15 cm in diameter, creeping. Leaves distichous, broadly lanceolate, margin entire to wavy, with fine hairs abaxially. Base oblique, apex acuminate to cuspidate. Petiole 2 to 4 cm long by 0.5 to 0.8 cm in diameter. Ligule entire, oblong, reddish, 1 to 3 cm long. Inflorescence arises from the rhizome and emerged from the leaf litter and the long lips of their flower appears brilliantly red on the forest floor. Ribbon like inflorescence, up to 10 cm long. Bracts reddish with white base, 6 to 7 cm long by 0.7 to 1 cm wide. Lips entirely red, corolla also red with white base and oblong shape. Calyx elongated and tubular same color with the corolla and 2 to 3 cm long by 1 to 1.5 cm wide. Fruits not observed.

Distribution: Kalatungan Mountain Range.

Ecology: It grows in deeply shaded localities with humid environment at elevations of between 1300 to 1500 m asl.

Vernacular name: Not recorded.

Uses: Not recorded.

**2.4 *Etilingera* sp. 1**

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1346 m, 28<sup>th</sup> January 2016, MAKN 07/2015 (CMUH).

Terrestrial herb, grows up to 3 m tall. Rhizome creeping and reddish-brownish. Leaves broadly lanceolate, 30 to 35 long by 8 to 12 cm wide. Petiole 0.5 to 1 cm long. Ligule, oblong, reddish at the apex. Margin entire to wavy. Apex acute to acuminate, base broadly cuneate. Inflorescence and infructescence spike, arises from the rhizome. Peduncle 3 to 6 cm long. Bracts pointed, ovate, coriaceous, red at tip and yellowish to greenish at base. Flowers yellow. Fruit orbicular and 1 to 1.5 cm long, red-orange, pubescent.

Distribution: Kalatungan Mountain Range.

Ecology: It grows in slightly lit to shaded localities with humid environment at elevations of between 1300 to 1500 m asl.

Vernacular name: Not recorded.

Uses: Not recorded.

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1359 m, 30<sup>th</sup> April 2015, MAKN 08/2015 (CMUH).

Terrestrial herb, up to 3 m tall. Rhizomes creeping, branched hard, raised on stilts. Leaves broadly lanceolate, 48 to 74 cm long by 9 to 16 cm wide, glabrous, base cuneate, apex acuminate. Dorsal part of the leaf purple, the ventral green. Margin entire to wavy, glabrous. Petiole 0.2 to 0.4 cm long. Ligule 0.7 cm long, entire, apex truncate. Inflorescence and infructescence arises from the rhizome, 5.5 to 7 cm long, spindle-like shape. Bracts reddish, broadly ovate, and 1 to 2.5 cm long by 0.5 to 1 cm wide. Bracteoles ovate, membranous, pale brown and measures 0.8 cm long by 0.3 cm wide. Fruit pale brown-tinge green and measuring about 1 cm long.

Distribution: Kalatungan Mountain Range.

Ecology: It grows in slightly lit localities with humid environment at elevations of between 1300 to 1500 m asl.

### 3. *Hornstedtia Retz.*

The inflorescences are always born radically, have an involucre of tightly overlapping sterile bracts and a rachis which is condensed into flat receptacle. Filament is lacking and staminal tube inconspicuous.

3.1 *Hornstedtia lophophora* Ridl., LPB 2:607 (1909)

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1351, 31<sup>st</sup> October 2015, MAKN 09/2015 (CMUH).

Terrestrial herbaceous plant that grows up to 7 m tall. Rhizome branch woody, reddish, creeping. Leaves broadly lanceolate, base rounded, apex acuminate, margins entire to sinuate with reddish purple color along the edge and glabrous. Midrib pinkish purple. Petiole pubescent, 0.3 to 0.4 cm long. Ligule oblong, pubescent, entire. Inflorescence and infructescence arises from the rhizome, spindle-shape. Bracts reddish with white base, leathery, broadly ovate with sharp apex. Labellum longer than corolla lobes, .7 to 2 cm long by 0.5 to 0.8 cm wide. Peduncle short, 1-2 cm long. 5.

Distribution: Kalatungan Mountain Range.

Ecology: It grows as terrestrial in deeply shaded to slightly lit localities mostly near the river with humid environment at elevations of between 1300 to 1700 m asl.

Vernacular name: Tagbak (Talaandig tribe)

Uses: Fruit edible.

### Globbeae Meisn.

The tribe *Globbeae* is characterised by unilocular ovary with parietal placentation, and labellum is often connate to filament in a slender tube.

### 4. *Globba* L.

The inflorescence is borne at the top of the leafy shoot. The flowers are unmistakable with a long-exserted filament, which is curved and ends in an anther with two or four appendages. The style is often stretched across the filament like the string of a bow.

#### 4.1 *Globba campsophylla* K. Schum, in Engl., Pflanzenreich 20:145 (1904)

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1352 m, 30<sup>th</sup> April 2015, MAKN 10/2015 (CMUH)

Terrestrial herb that grows up to 1 m tall. Rhizome creeping, short, fleshy and tufted with fleshy roots measuring up to 2 cm in diameter. Leaves distichous, lanceolate, pubescent, sessile, 23 to 30 by 5 to 7 cm wide. Leaf apex acuminate to cuspidate, leaf base rounded. Ligule entire, 0.6 cm long. Inflorescence arises terminally from the leafy shoot, lax, and principally white in color. Long curved filament present and the reflexed, yellow streaked white labellum partially fused to floral tube and the lateral staminodes attached below of it. Anther appendages present. Fruit globose to oblong, grooved, 1 to 1.5 cm long by 0.3 to 0.5 cm in diameter, glabrous.

Distribution: Kalatungan Mountain Range.

Ecology: Terrestrial in shaded localities with humid environment, and grows mostly near the river at elevations of between 1300 to 1400 m asl.

Vernacular name: Not recorded.

Uses: Ornamental.

### Zingibereae Meisn.

The genera embedded within the tribe Zingibereae have plane distichy leaves that are parallel to rhizome. It is distinguished from *Globbeae* in having trilocular ovary with axial, basal or free columnar placentation, and labellum are usually not connate to filament.

### *Zingiber* Mill.

The inflorescence is composed of spirally arranged bracts can be borne from the rhizome, at the top of the leafy stems, or break through the leaf sheaths from the pseudostem above the ground. The species are easily distinguished by having a beak-shaped anther crest wrapped around the style and stigma.

#### 5.1 *Zingiber banahaense* Mood & Theilade Nordic J. Bot. 21: 129. (2001)

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1362 m, 31<sup>st</sup> October 2015, MAKN 11/2015 (CMUH).

Terrestrial herb, up to 2 m tall. Rhizome creeping and 12 to 14 cm in diameter. Leaves elliptic, distichous, 28 to 34 long x 6 to 7 cm wide, adaxially dark green, abaxially silver green. Petiole absent or sessile. Ligule papery, bifid, glabrous. Leaf base rounded, apex acuminate. Inflorescence arises from the rhizome, cone shape and apex rounded or flat, up to 25 cm long. Peduncle erect, greenish, up to 15 cm long. Bracts obovate, 3 to 4 long by 2.8 to 3.4 cm wide, incurved forming open pouches, glabrous, outside dark red, inside white with prominent veins.

Distribution: Kalatungan Mountain Range.

Ecology: It grows as terrestrial in slightly lit localities with humid environment in montane forest at elevations of between 1300 to 1600 m asl.

Vernacular name: Not recorded.

Uses: Not recorded.

#### 5.2 *Zingiber* sp. 1

Specimen examined: Philippines, Mindanao, Bukidnon, Kalatungan Mountain Range, elev. 1362, 30<sup>th</sup> April 2015, MAKN 012/2015 (CMUH)

Terrestrial herb, up to 1 m tall, arching. Rhizome creeping, whitish, 1 to 1.5 cm in diameter. Leaves lanceolate, glabrous, dark green, 18 to 33 long by 4 to 7 cm wide, sessile. Base rounded, apex acuminate, margin entire to wavy. Ligule notched 0.3 cm long with reddish tip. Inflorescence and infructescence cone-shape, arises from the rhizome, up to 12 cm long. Peduncle 7 to 8 cm, scaly, reddish in color. Bracts fleshy, pale red with red oblong tips. Bracteoles pale white in color.

Distribution: Kalatungan Mountain Range.

Ecology: It grows as terrestrial at deeply shaded localities with humid environment near the river at elevations of between 1300 to 1700 m asl.

Vernacular name: Not recorded.

Uses: Not recorded.

#### Key to genera

- 1a. Inflorescence arising from the leafy shoot-----2
- 1b. Inflorescence arising from the ground separate from the leafy shoot-----3
- 2a. Inflorescence surrounded by an involucre of sterile bracts at base and rachis strongly condensed into a domed receptacle-----4
- 2b. Inflorescence not surrounded by involucre of sterile bracts, rachis more or less elongate----*Amomum*
- 3a. Stamen not exerted-----*Alpinia*
- 3b. Stamen exerted-----*Globba*
- 4a. Filament lacking, staminal tube inconspicuous-----*Hornstedtia*
- 4b. Filaments present, staminal tube conspicuous-----*Etingera*

#### Key to the different Zingiberaceae species

- 1a Inflorescence and/or infructescence terminal-----2
- 1b Inflorescence and/or infructescence emerges from the rhizome-----5
- 2a Stamens long, curved and exerted-----*Globba campsophylla*
- 2b Stamens not curved and not exerted-----3
- 3a Inflorescence lax, fruits globose to oblong-----4
- 3b Inflorescence clusted, fruits ovoid-----*Alpinia alpina*
- 4a Inflorescence panicle; leaf base rounded; leaf glabrous both sides; fruit glabrous-----*Alpinia apoensis*
- 4b Inflorescence raceme; leaf base oblique; leaf pubescent both sides; fruit pubescent-----*Alpinia haenkei*
- 5a Leaves sessile-----6
- 5b Leaves petiolate-----7
- 6a Leaves lanceolate, glabrous both sides, peduncle reddish; bracts pinkish-----*Zingiber* sp.1
- 6b Leaves elliptic, abaxially pubescent, peduncle greenish; bracts reddish to maroon--*Zingiber banahaoense*
- 7a Inflorescence spindle-shape; ligule entire, oblong, pubescent; lip longer than corolla lobes, pinkish-----*Hornstedtia lophophora*
- 7b Inflorescence not spindle-shape-----8
- 8a Labellum long, central lobe expanded; ligule entire, hyaline, reddish, leaf base oblique, leaf margin entire to wavy-----*Etingera philippinensis*
- 8b Labellum short, central lobe not expanded-----9
- 9a Ligule entire-----10

- 9b Ligule oblong-----11  
 10a Leaf base oblique, leaf apex acuminate to cuspidate, fruit spiny, reddish-----*Etlingera alba*  
 10b Leaf base cuneate, leaf apex acuminate, fruit glabrous, greenish-----*Etlingera* sp. 2  
 11a Leaf glabrous, abaxially pubescent, fruit clustered, glabrous-----*Etlingera pandanicarpa*  
 11b Leaf glabrous, fruit racemous, pubescent-----*Etlingera* sp. 1

## DISCUSSION

In this survey, the tribe Alpinieae is well represented, with 9 species, including one new record for the Philippines, namely *Etlingera* cf. *alba*, and three possibly undescribed species. This is followed by the tribe Zingibereae, with 2 species from one genus. Tribe Globbeae is represented by only one species, respectively. About 75% of the collected taxa have so far been identified to species level, and about 25% or 3 species are only up to generic level.

There are 3 unidentified species in my list, either due to insufficient materials for identification such as flowers or some of their characteristics did not fit to any of the described species. These specimens are believed to be new to science, since there have been few systematic studies conducted for gingers in the Philippines (Ridley, 1909; Elmer, 1915; Merrill, 1925; Mood & Theilade, 2001), there are still many species that remain undescribed, and yet to be documented particularly in Mindanao.

Compared to other areas in the Philippines, e.g., Cuernos Mountains (ca. 5 genera and ca. 14 spp., Ridley, 1909), Mt. Bulusan (ca. 10 genera and ca. 36 spp., Elmer, 1915), and Mt. Apo (6 genera and ca. 10 spp., Coquilla, 2012), with 12 species, Kalatungan Mountain Range yields 11.21% of the Zingiberaceae in the Philippines.

*Etlingera* cf. *alba* Baker is the first record of this species in the Philippines. *E.* cf. *alba*, which was originally described from Indonesia, was also found during the present study.

## CONCLUSION

The study concluded that there are 12 Zingiberaceae species present in Kalatungan Mountain Range, Bukidnon, Philippines, eight of which are endemic and are newly recorded species for the province namely; *Etlingera philippinensis*, *Etlingera pandanicarpa*, *Alpinia apoensis*, *Alpinia haenkei*, *Alpinia alpina*, *Globba campsophylla* K.Schum., *Hornstedtia lophophora* Ridl. and *Zingiber banahaense*. *Etlingera* cf. *alba* (Blume) A.D. Poulsen is probably a new record for the Philippines. Also, *Etlingera* sp. 1, 2 and *Zingiber* sp. 1 could be a new species waiting to be described. Further studies are needed in order to understand clearly the diversity of gingers in this

area. It is highly recommended to do propagation activities for future studies related to pharmaceutical, biodiversity conservation, socio economic and phylogenetic Zingiberaceae studies. On site investigation of existence of the doubtful, imperfectly known, and undescribed Zingiberaceae species is also recommended.

## ACKNOWLEDGMENT

The author is grateful to the following people for their valuable help during the conduct of this study: Dr. Axel Dalberg Poulsen, Ida Theilade, Dr. Mark Flemming Newman, Dr. Pieter Pelser, Jim Cootes, Dr. Miguel David De Leon, Yolanda Naive, Ronald Naive, Jessa Marie Betanio, Dave Buenavista, Dr. Florfe M. Acma, Dr. Victor Amoroso, John Vincent Anino, Charissa Joy Gumban, Cherry Waminal, Aljem Bonghanoy, Datu Johnny Guina, Datu Bobby, Lemlem, Kuya Jerry, Kuya Junior and Sir Roel Dahonog.

## REFERENCES

- Abhijeet Kasarkar, Dilipkumar Kulkarni, Prashant Dhudade and M. Sabu, 2017.** New Report on *Zingiber montanum* (K.D. Koenig) Link. From Kudal, Dist. Sindhudurg, (MS) India. *Bioscience Discovery*, 8(2): 270-273.
- Acma, FM, 2014.** *Amomum dealbatum* Roxb. (Alpinioideae, Zingiberaceae), a new record for the Philippine flora. *Asia Life Sciences*, 23: 527-535.
- BHUNIA D and Mhondal AK, 2012.** Antibacterial activity of *Alpinia* L. (Zingiberaceae) from Santal and Lodha Tribal areas of Paschim Medinipur Districts in Eastern India. *Advances in Bioresearch* 3(1): 54-63.
- Coquilla KL, 2012.** *Taxonomic study on Zingiberaceae in Mt. Apo, Mindanao, Philippines*. Central Mindanao University, Musuan, Maramag, Bukidnon, Philippines (B.Sc.). Pp. 105.
- Docot RV, Gomez MG, Aquino RB, Baretto AB, Orihara S, Mintu C, 2016.** Morphoanatomy and vegetative propagation of the Philippines endemic *Leptosolenia haenkei* C. Presl and *Vanoverberghi a sepulchrei* Merr. (Zingiberaceae) by rhizome cutting using NAA and Kinetin. *Thai Journal of Botany* 8(1): 111-126.



**Figure 1.** Inflorescence/infructescence of the twelve Zingiberaceae species present in Kalatungan Mountain Range, Bukidnon, Philippines A. *A. alpina* B. *A. haenkei* C. *A. apoensis* D. *E. cf. alba* E. *E. pandanicarpa* F. *E. philippinensis* G. *Etlingera* sp. 1 H. *Etlingera* sp. 2 I. *Globba campsophylla* J. *H. lophophora* K. *Z. banahaense* L. *Zingiber* sp.

**Elmer ADE, 1915.** Notes and descriptions of Zingiberaceae. *Leaflets of Philippine Botany*, **8**(116): 2885-2919.

**Elmer ADE, 1915.** Zingiberaceae of the Sorsogon Peninsula. **8**(119): 2962-2995

**Funakoshi H, Kress WJ, Škorničková J, Liu AZ and Inoue K, 2005.** Return from the lost: rediscovery of the presumed extinct *Leptosolena* (Zingiberaceae) in the Philippines and its phylogenetic placement in gingers. *Acta Phytotaxonomica et Geobotanica* **56**: 41-53.

**Kasarkar AR and Kulkarni DK, 2011.** Phenological studies of Family Zingiberaceae with

special reference *Alpinia* and *Zingiber* from Kolhapur region, *Bioscience Discovery*, **2**(3): 322-327.

**Kress WJ, Prince LM and Williams KJ, 2002.** The phylogeny and a classification of the gingers (Zingiberaceae): evidence from molecular data. *American Journal of Botany*. **89**: 1682-1696.

**Kress WJ, Manos PS and Williams KJ, 2004.** The phylogeny, evolution and classification of the Genus *Globba* and the tribe Globbeae (Zingiberaceae): Appendages do matter. *American Journal of Botany*, **92**(1): 168-178.

- Kress WJ, Liu AZ, Newman M and Li QJ, 2005.** The molecular phylogeny of *Alpinia* (Zingiberaceae): A complex and polyphyletic genus of gingers. *American Journal of Botany*, **92**(1): 167-178.
- Lamb A, Gobilik J, Ardiyani M and Poulsen AD, 2013.** *A Guide to Gingers of Borneo*. Natural History Publications (Borneo), Kota, Kinabalu.
- Larsen K, 1980.** Annotated key to the genera of Zingiberaceae of Thailand. *Nat. Hist. Bull. Siam Soc.*, **28**:151-169.
- Larsen K, Ibrahim H, Khaw SH and Saw LG (KW WONG-Ed), 1999.** *Gingers of Peninsular, Malaysia and Singapore* Natural History Publications (Borneo) Kota Kinabalu, Malaysia.
- Ly Ngoc-Sam, Truong Ba-Vuong, Le Thi Huong, 2016.** *Zingiber ottensii* Valetton (Zingiberaceae) — a newly recorded species for Vietnam. *Bioscience Discovery*, **7**(2): 93-96.
- Merill E, 1925.** An enumeration of Philippine flowering plants. Vol. 1 fascicle 3. Bureau of Printing, Manila. Pp.228-247.
- Mood J, and Theilade I, 2001.** Two new species of Zingiber (Zingiberaceae) from the Philippines. *Nordic Journal of Botany* **21**: 129-133.
- Naive MA, De Leon MD & Cootes J, 2017.** *Bulbophyllum rubusoides* Naive, M.D. D Leon & Cootes and *Bulbophyllum tsekourioides* M.D. De Leon, Naive & Cootes, two new species of *Bulbophyllum* Thouars (Orchidaceae) from Bukidnon, Philippines. *Die Orchidee*, **3**(2): 9-13.
- Pelser PB, Barcelona JF & Nickrent DL (eds.), 2011 onwards.** Co's Digital Flora of the Philippines www.philippineplants.org.
- Poulsen AD, 2003.** One new name and new combinations of Malesian Zingiberaceae. *Blumea* **48**: 523-527.
- Poulsen AD, 2006.** *A Pocket Guide: Gingers of Sarawak*. Natural History Publications (Borneo), Kota Kinabalu. Pp 1-263.
- Ridley HN, 1909.** New Philippine Zingiberaceae. Leaflets of Philippine Botany. Manila Philippine Island. **7**(28): 569-572.
- Ridley HN, 1909.** Zingiberaceae from south Negros. Leaflets of Philippine Botany. Manila Philippine Island. **7**(31): 603-607.
- Škorničková JL & MF Newman, 2015.** *Gingers of Cambodia, Laos & Vietnam*. Singapore Botanic Gardens, National Parks Board, 1 Cluny Road Singapore 259569. Pp 141-147.

---

How to Cite this Article:

**Mark Arcebal K. Naïve, 2017.** Zingiberaceae of Kalatungan Mountain Range, Bukidnon, Philippines. *Bioscience Discovery*, **8**(3):311-319.