

## New and Interesting Plants From Ha Long Bay, Vietnam

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### Abstract

Six new species are described from Ha Long Bay, Vietnam: *Chirita halongensis* Kiew & T.H. Nguyen, *C. hiepii* Kiew, *C. modesta* Kiew & T.H. Nguyen (Gesneriaceae), *Impatiens halongensis* Kiew & T.H. Nguyen (Balsaminaceae), *Livistona halongensis* T.H. Nguyen & Kiew (Palmae) and *Paraboea halongensis* Kiew & T.H. Nguyen (Gesneriaceae). In addition, notes on habit and habitat for *Chirita drakei* B.L. Burt, *C. gemella* D. Wood and *C. hamosa* R. Br. are provided.

### Introduction

Ha Long Bay, a World Heritage Site, 165 km northeast of Hanoi, is renowned for its spectacular seascape with tower karst limestone islands dotting the wide bay. Of the nearly 2000 islands, 788 are included within the 434 square kilometer World Heritage Site.

While there are some early collections from the area, there has not been a focus on investigating its flora until the impetus to select 30 characteristic plant species for Wendy Gibbs to paint for a forthcoming tourist guide of the wild plants of Ha Long Bay (T.H. Nguyen & Kiew, 2000). During the course of exploration, which covered many islands, several new species were encountered, which are here named and described. A new ginger, *Alpinia calcicola*, is described separately by Q.B. Nguyen *et al.* (2000). In addition, some species previously poorly known are here provided with a more detailed description, particularly for their habit, based on living plants.

Flowering at Ha Long Bay is for most species seasonal with the majority flowering in the hot, wet summer (May to October) when temperatures average between 27° and 29°C and the rainfall in June, July and August exceeds 300 mm a month. Rather few flower in the cool, dry winter when temperatures drop to between 16° and 18°C and there is less

than 30 mm rainfall in each of December, January and February.

Early collectors named several species for Ha Long Bay, viz. *Ficus alongensis* Gagnep., *Jasminum alongense* Gagnep. and *Schefflera alongensis* R. Viguier. Of these only the jasmine appears to be endemic to Ha Long Bay. Other endemics include *Chirita drakei* B.L. Burtt and *C. gemella* D. Wood, as well as *Alpinia calcicola* Q.B. Nguyen & M. Newman, *Chirita halongensis* Kiew & T.H. Nguyen, *C. hiepii* Kiew, *C. modesta* Kiew & T.H. Nguyen, *Impatiens halongensis* Kiew & T.H. Nguyen, *Livistona halongensis* T.H. Nguyen & Kiew, and *Paraboea halongensis* Kiew & T.H. Nguyen from our study. This high level of endemism illustrates the conservation importance of Ha Long Bay.

### ***Chirita* (Gesneriaceae)**

Seven species of *Chirita* Benth. are now known from Ha Long Bay, of which three are new species described below. Apart from *C. hamosa* R. Br. in Sect. *Microchirita* C.B. Clarke, which has a wide geographic range in SE Asia, the rest belong to Sect. *Gibbosaccus* C.B. Clarke and are endemic to Ha Long Bay.

Of these six, *C. modesta* is extremely rare and only one small population was found growing around the mouth of one cave. It most closely resembles to *C. speluncae* (Hand.-Mazz.) D.Wood, a Chinese species known from a single cave in NE Yunnan. *C. gemella* is also extremely local. We found it on a single island where it was abundant on one slope. Previously it was known from a single collection without precise locality being recorded as from 'Tonkin'. *C. hiepii* is not as common as *C. halongensis*, which at sea level grows in the same habitat, i.e. in crevices in the limestone rocks in light shade. The distribution of *C. halongensis* extends higher up slopes, where conditions are exposed. *C. drakei*, the most common chirita at Ha Long Bay, is a remarkably beautiful shrubby plant with silver-grey leaves and large, white tubular flowers with violet lobes. It is certainly a handsome plant and is found everywhere growing on exposed limestone rocks from sea level up exposed, rocky slopes. This species and *C. gemella*, *C. halongensis* and *C. hiepii*, that all have attractive purple lobed flowers, are potential ornamental plants. The seventh species, *C. semicontorta* Pellegrin, was not refound during our survey.

### **Key to *Chirita* Species of Ha Long Bay**

1a. Plants large and bushy or with an erect stem and a single leaf or

- leaves in pairs ..... 2
- 1b. Plants with a short subterranean rhizome and a tuft of leaves at the top ..... 3
- 2a. Low bush with woody stem and terminalia branching with tufts of silky silver-grey leaves at tip, flowers from leaf axils, c. 5 cm long, white with violet lobes ..... 1. *C. drakei*
- 2b. Erect, fleshy plant, at first with one leaf, then producing pairs of leaves, flowers epiphyllous, c. 1 cm long, flowers dull white ..... 4. *C. hamosa*
- 3a. Leaves with petiole longer than lamina ..... 4
- 3b. Leaves with petiole shorter than lamina ..... 5
- 4a. Petioles 4—8.5 cm long, lamina 3—5.5 x 1.8—4.5 cm, fruits 14—22 mm long ..... 7. *C. semicontorta*
- 4b. Petioles 3.5—4.5 cm long, lamina 2.5—3.8 x 1.4—2.1 cm, fruit 7—12 mm long ..... 6. *C. modesta*
- 5a. Leaves horizontal in a tight rosette, flowers 1(—4) flowers per stalk ..... 2. *C. gemella*
- 5b. Leaves upstanding in a lax tuft, inflorescence paniculate with 6—30 flowers ..... 6
- 6a. Upper surface of lamina glossy and glabrous, lateral veins on lower surface plane and obscure ..... 3. *C. halongensis*
- 6b. Upper surface of lamina densely hirsute, lateral veins on lower surface very prominent ..... 5. *C. hiepii*

1. **Chirita drakei** **B. L. Burtt**. Notes R.B.G. Edinb. 23 (1960) 98.  
 Nguyen & Kiew, Wild Plants of Ha Long Bay (2000) Plate 22.

### Plate 1c

This beautiful species was previously known from three specimens, all collected from Ha Long Bay. In fact, it is one of the most common and striking plants there with its long, white tubular, violet-lobed flowers and silky, silver-grey leaves. It grows in exposed conditions on limestone cliffs, rocks and screes from sea level to about 100 m altitude.

The early herbarium specimens are misleading as they represent snippets of shoot tips of this most robust species. It is in fact a low, much branched shrub rooted deeply in crevices with a gnarled and woody trunk

3.5—4 cm thick, frequently subterranean, producing thick, horizontal branches spreading over the rock surface and forming a hemispherical bush up to 1 m across and 60 cm tall. These branches can grow up to 45 cm long and exhibit terminalia branching where a series of tufts of leaves are produced at the tips. The ultimate twigs are c. 1 cm thick. The internodes are very short, often with the nodes touching. Presuming only a few tufts of leaves are produced each year, these plants must be very ancient.

It can be found in flower throughout the year and is very floriferous in the summer months (July to November) compared with sparse flowering in winter and early spring. Usually its inflorescences are two-flowered but occasional three-flowered inflorescences can be found.

The wife of a fisherman told us that all parts of the plants are boiled and the decoction is drunk after childbirth.

*Specimens: Nguyen Tien Hiep & L. Averyanov NTH 2599 12 May 1999 (HN, LE, MO, SING), Nguyen Tien Hiep & Ruth Kiew NTH 2599 15 July 1999 (HN, SING), Nguyen Tien Hiep & Ruth Kiew NTH 4059 11 Nov 1999 (HN, K, LE, MO, SING).*

2. **Chirita gemella D. Wood.** Notes R.B.G. Edinb. 33 (1974) 141.

### Plate 1d

Previous to our study, *C. gemella* was known only from the unicate type specimen of four plants on a single sheet, (*Lemarie 123* - holo P, photo E). The locality was recorded just as 'Tonkin'. It is in fact a very rare species and we found it on a single unnamed island in Ha Long Bay. As we were able to observe it in both the flowering and fruiting seasons, Wood's description is here supplemented by our observations of living plants.

Perennial, rosette herb, *rhizome* subterranean, c. 6—7 cm long x 1.5—1.8 mm wide, sometimes spreading by stolons up to 5 mm thick. *Leaves* in the centre of the rosette almost sessile, but the *petioles* elongate and in the outer, lower leaves the petioles reach 4.5 cm, *lamina* stiff and fleshy, dark green above, whitish green beneath, indumentum of white hairs dense on both surfaces, especially dense on margin and under surface of veins, 3.5—5(—9) x 2.2—3.0 cm, lateral veins (2—)3(—4) pairs, in life impressed above, prominent beneath. *Flower* solitary, from the axils of the outer, older leaves, with up to 5 flowers open simultaneously on a single plant, pedicel pale purple (4.5—)7.5—13.5 cm long, *corolla* 19—20 x 15—18 mm, white outside, lobes mauve, inside tube white with bright yellow bilobed patch on upper surface of the throat, *stamens* with pale green filaments with tuft of long

white hairs at top, anthers pale purple. *Capsule* with persistent calyx, narrowly cylindrical, 31 x 1.5 mm, pale brown, splitting on upper surface, style persistent.

*Distribution:* Vietnam, Quang Ninh Province. Ha Long Bay, only found on one island.

*Habitat:* In rock crevices or on thin soil among grass tussocks on a steep slope above sea level.

*Specimens:* *Nguyen Tien Hiep & L. Averyanov NTH 2597* 12 May 1999 (HN - flowers); *Nguyen Tien Hiep & Ruth Kiew RK 4745* 16 July 1999 (SING - fruits), *NTH 4205* 11 April 2000 (HN, BM, E, K, LE, MO, SING - flowers).

*Notes:* Flowering freely in early spring (April and May), by July it is in fruit. It differs from the other *Chirita* species in Ha Long Bay in its very small, woolly leaves arranged in a tight rosette. All the plants in the population we found had solitary flowers, as compared with the type specimen that had up to four flowers on a pedunculate inflorescence, but apart from this single character our specimens matched the type.

### 3. *Chirita halongensis* Kiew & T.H. Nguyen, *sp. nov.*

(Sect. *Gibbosaccus* C.B. Clarke)

Nguyen & Kiew, Wild Plants of Ha Long Bay (2000) Plate 25.

*Chiritae semicontortae* Pellegrin similis, sed foliis majoribus, petiolis quam laminis brevioribus et floribus majoribus differt.

*Typus:* Ha Long Bay, *Nguyen Tien Hiep & Ruth Kiew 4219* 12 April 2000 - flowers (HN holo; E, LE, MO, SING iso).

#### Plate 1e

Perennial herb, *rhizome* large, subterranean, ± woody, to c. 11 x 2—2.5 cm with a corky layer formed by leaf cushions, often branched, internodes congested. *Leaves* subopposite, crowded at apex, upstanding and brittle (snapping easily), glabrous (except for margin), *petiole* winged, (1—)2.5—6 cm long, fleshy, flat and slightly grooved above, *lamina* narrowly elliptic to slightly obovate, (3—)11—14 x (0.75—)2.5—3 cm, either plain dark green above and whitish green and suffused deep rosy purple in lower two thirds beneath or dark green above with midrib and lateral veins white and completely whitish green beneath or, in totally exposed conditions, purple

green above and rosy purple beneath; succulent, slightly glossy, apparently glabrous above but with microscopic, unicellular, eglandular trichomes, base decurrent into winged petiole, margin finely ciliate with long uniseriate trichomes, appearing recurved in dried state, entire or subcrenate, apex acute, lateral veins 3—4 pairs, ascending, slightly raised above, plane beneath. *Inflorescences* up to 3 per axil from older leaves, erect, 24—36 cm, paniculate with second or third order branching and between 8 to 30 flowers, peduncle rosy purple or reddish brown, to 30 cm long; bracts 2, foliaceous, 6—10 x 1.5—3 mm, green or purplish green, bracteoles similar but 3—4 x 1—1.5 mm. Peduncle, pedicels, calyx and ovary densely pilose with minute, glandular hairs, calyx with some short non-glandular trichomes as well. *Pedicels* 9—20 mm long, *calyx* green, divided to base, lobes 1.5—2.5 x 0.75 mm at base, tapering to acute apex, *corolla* campanulate, slightly saccate at base, minutely hispid outside with short glandular trichomes, completely glabrous inside, tube 7—10 x 6.5—13 mm, white inside and out or with 2 golden brown nectar guides inside and faintly yellowish outside, lobes deep purple on inner surface, white tinged purple outside, upper 2 lobes recurved, lower 3 spreading, c. 5 x 6—7 mm, *stamens* and staminodes attached c. 3—4 mm above base of corolla, staminodes c. 1 mm long, filaments geniculate, white, 2—5 mm long, completely glabrous, anthers brown, c. 3 x 1 mm, fused face to face, *disc* annular, c. 0.3 mm deep, *ovary* pale green, c. 7—8 x 1 mm, style white c. 2 mm long, stigma spatulate and slightly bifid at apex, exerted just beyond corolla mouth. *Fruit* with pedicel 13—30 mm long, calyx persistent, capsule narrowly cylindrical, reddish brown, (16—)32—37 x 1 mm, style persistent.

*Distribution:* Vietnam, Quang Ninh Province, Ha Long Bay, on several islands.

*Habitat:* It grows in cracks or among rocks from sea level in semi-shade to exposed screes near summit of limestone islands.

*Notes:* Another species, *C. semicontorta* Pellegrin, was early described from Ha Long Bay and *C. halongensis* is similar to it in habit (thick rhizome with conspicuous leaf scars), in the leaves being more or less glabrous, and the inflorescences, which have long peduncles and relatively short branches. *C. halongensis* is clearly different from this species in a number of characters. The leaves of *C. semicontorta* are smaller and relatively broader (3—5.5 x 1.8—4.5 cm), the petioles are longer than the lamina, the inflorescence is much shorter (to 9 cm long) with fewer flowers (3—9 flowers), and the flowers are very much smaller (10 x 2.5 mm).

*Chirita halongensis* is a very attractive plant with variegated leaves

and many-flowered inflorescences with dangling, purple-lobed flowers. It flowers in spring. It grows in rock crevices or on rock screes. In exposed conditions, its leaves are much smaller (c. 4 x 0.75 cm) and are distinctly purplish on both surfaces, compared with larger plants that grow in light shade. Populations on different islands exhibit differences in flower colour. Most have flowers with a completely white corolla tube, but in some populations the corolla tube is yellowish with two golden brown nectar guides in the throat.

*Specimens:* type and *Nguyen Tien Hiep & L. Averyanov NTII 2617* 11 May 1999 (HN), *Nguyen Tien Hiep & Ruth Kiew NTII 4069* 10 November 1999 (fruits (HN, SING)).

4. ***Chirita hamosa* R. Br.**, *Cyrtandreae* 117 (xii 1839).

*Nguyen & Kiew, Wild Plants of Ha Long Bay* (2000) Plate 27.

This species is remarkable for its annual habit and rapid growth. At Ha Long Bay, we found it growing in soil in the shaded mouth of one cave. In July, it formed drifts of hundreds of seedlings, ranging in size from plants c. 4 cm tall with a single leaf c. 2.7 x 1.9 cm with 7–9 pairs of veins to plants up to 25 cm tall with the single lower leaf c. 21 x 13.5 cm with c. 12 pairs of veins and with an additional pair of small, expanding leaves above. Even one-leaf plants with a leaf c. 8 x 7 cm were in flower and fruit. By November, they had grown to robust plants c. 25 cm tall, but on returning to the cave in April, they had completely died down and not a trace of them was to be found!

*Chirita hamosa* is a widespread and variable species (Wood, 1974). However, there appear to be regional differences in fruit size as plants from Ha Long Bay have much longer fruits (5–7.75 cm long) than the many specimens from Thailand, which have fruits c. 2 cm long. One specimen from Laos, *Poillane 15951* (K), has fruits 3–4 cm long and the type specimen from Martaban, Myanmar, has fruits 6 cm long (B.L. Burtt, *pers. comm.*).

The Ha Long population is also different in flower size and colour. It has flowers 15–25 mm long and 7–9 mm wide (compared with 7–11 mm long and 4 mm wide in *C. hamosa* s.s.) and, while some plants have white flowers with a lemon yellow patch in the throat, others have very pale mauve ones. There appear to be seasonal differences in flower colour as in July all the plants had white flowers, while in November some had mauve flowers.

Long fruits (7 cm long) and lilac blue flowers are characteristic of *C.*

*aratriformis* D. Wood from Khaumoi, Langson Province, Tongkin, but the Ha Long plants would not be confused with this species, which has axillary (not epiphyllous) flowers that are larger (28 by 12 mm) and besides it is a large plant to 60 cm tall with proportionately smaller leaves up to 11 by 9 cm.

*Specimens:* 16 July 1999 Nguyen Tien Hiep & Ruth Kiew NTH 3906 (HN), NTH 3927 (HN), NTH 3937 (HN), RK 4744 (SING); 9 Nov 1999 NTH 4051 (E, HN, LE, MO, SING).

**5. *Chirita hiepii* Kiew, *sp. nov.***

(Sect. *Gibbosaccus*) C.B. Clarke

Nguyen & Kiew, Wild Plants of Ha Long Bay (2000) Plate 25.

*Chiritae halongensi* Kiew & T.H. Nguyen similis, sed foliorum pilis densis et albis, nervis prominentibus et fructibus brevioribus differt.

**Typus:** Ha Long Bay, Nguyen Tien Hiep & Ruth Kiew NTH 4208 11 April 2000 (HN holo; BM, E, K, LE, MO, SING iso)

**Plate 1f**

Perennial herb, softly hairy with straight white, uniseriate, eglandular trichomes, c. 4–6 mm long, particularly dense on petiole, leaf margin, undersurface of lamina, and sparse and 1 mm long on upper surface of lamina, peduncle and calyx; peduncle and calyx with dense layer of short, glandular hairs; *rhizome* subterranean, ± woody, c. 3–5 cm long and 2–2.5 cm thick, internodes congested and the leaves forming a compact tuft at the apex. *Leaves* subopposite, at first sessile, *petiole* elongating to 3–5.5 cm in the outer leaves, fleshy, flat or grooved above, *lamina* lanceolate, 7.5–9 x 3.5–4.2 cm, mid-green above, whitish green beneath, succulent, base narrowing or decurrent, margin subcrenate to entire, apex acute or blunt, lateral veins 3–4 pairs, plane or slightly impressed above, midrib and veins very prominent beneath. *Inflorescence* one per older leaf, erect, 13–25.5 cm long, paniculate with second or third order branching and up to c. 6 or 14 flowers respectively, peduncle 2–5.5 cm long, pale brownish-green; bracts in whorl of 3 at top of the peduncle, mid-green or pale brownish-green, linear, c. 9 x 1.5 mm, apex rounded, trichomes short glandular, bracteoles similar but c. 3 x 0.75 mm. *Pedicels* of lower flowers 15–30 mm long, of upper 7–16 mm long, *calyx* densely hairy, mid or pale green, divided to base, lobes c. 2–3 mm long, tapering to an acute apex, *corolla* straight, slightly pouched, outer surface with sparse layer of short glandular trichomes, tube white, 5–9 x 5–7 mm, inner lower surface of



throat with two bands of glandular hairs, lobes purple, spreading, rounded, isomorphic, 4—6 x 3—6 mm, *stamens* and staminodes attached c. 1 mm above base of corolla tube, staminodes c. 2—3 mm long, filaments geniculate, c. 6 mm long, sparsely hairy below anther, anthers brown, c. 2.5 x 1 mm, fused face to face, *disc* annular, c. 0.5 mm deep, *ovary* reddish brown, pilose with dense layer of short glandular trichomes, c. 6—10 mm long with slender style c. 4 mm long, stigma spatulate, shallowly bifid at apex, white or pale green. *Fruit* with pedicel 1.1—4.5 cm long, calyx persistent, capsule narrowly cylindric, 13—15 x c. 1.5 mm, stigma and style persistent.

*Distribution*: Vietnam, Quang Ninh Province, Ha Long Bay, rare, found on only one island.

*Habitat*: Its rhizome roots into cracks in limestone rocks above the high tide mark in semi-shade.

*Notes*: This species is not as common or as widespread as *C. halongensis*, which it most closely resembles in habit (thick rhizomes that penetrate rock crevices), crowded, narrowly lanceolate, fleshy leaves and panicles of pretty purple-lobed flowers held above the leaves. It is distinct from *C. halongensis* in several characters, the most striking of which is the dense, soft, white indumentum on both leaf surfaces and the very prominent veins on the lower surface. (The leaves of *C. halongensis*, in contrast, are on the upper surface glabrous to the naked eye and the veins are plane on the lower surface). In addition, the flowers of *C. hiepui* do not have reflexed upper corolla lobes, there are two bands of short glandular hairs in the throat of the corolla tube, the stamens are long and attached near the base of the corolla, the filaments are hairy at the top, and the capsule is short. In contrast, *C. halongensis* has reflexed upper corolla lobes, a glabrous inner surface of the corolla, short stamens (2—5 mm long), which are attached c. 3—4 mm above the base of the corolla, the filaments are glabrous, and the fruits are 16—37 mm long. In life, these two species are distinct in the colour of their leaves: mid-green and concolourous above and whitish green beneath in *C. hiepui*, while in *C. halongensis* the leaves are dark green above, frequently the midrib and veins are white on the upper surface, and the lamina is frequently rosy purple beneath.

This species is named for Dr Nguyen Tien Hiep, senior botanist and veteran plant collector of The Herbarium, Institute of Biology and Biological Resources, Hanoi.

*Specimens*: Ha Long Bay - type and Nguyen Tien Hiep & Ruth Kiew NTH 4205 (HN).

6. **C. modesta Kiew & T.H. Nguyen, sp. nov.**

(Sect. *Gibbosaccus* C.B. Clarke)

*Chiritae speluncae* (Hand.-Mazz.) D. Wood similis, sed foliis majoribus, inflorescentiis paniculatis et floribus albis differt.

**Typus:** Ha Long Bay, *Nguyen Tien Hiep & Ruth Kiew NTH 4078* 10 Nov 1999 (HN, holo, SING, iso).

Perennial herb, *rhizome* slender c. 5 mm thick embedded in rock fissures, internodes congested. *Indumentum* of short, uniseriate, glandular and eglandular trichomes, c. 0.2 mm long, dense on lower surface of lamina and petiole, sparse on upper leaf surface with many unicellular trichomes with a raised base. *Leaves* tufted, spirally arranged, *petiole* brownish, at first short, elongating to (28—)35—45(—55) x 2—3 mm in the outer leaves, terete, *lamina* oval, (16—)25—30(—38) x (7—)14—17(—21) mm, dark green above, pale beneath, thick and fleshy, base decurrent, margin entire, slightly recurved, apex slightly acute, midrib slightly impressed above, lateral veins (1—)2(—3) pairs, in life completely plane above and beneath, in dried state midrib and lateral veins slightly prominent beneath. *Inflorescence* erect, 4—11 cm long, paniculate with third order branching and up to c. 16 flowers, indumentum of peduncle, bract, pedicel and calyx of dense, glandular trichomes, c. 0.75 mm long, peduncle (3.5—)5.5(—10.5) cm long, purplish brown, bracts linear, c. 1—1.5 mm long, *Pedicel* 9—15 mm long, *calyx* divided to base, lobes narrowly linear, c. 1.5 mm long, *corolla* campanulate, minutely pilose outside, glabrous inside, white, outside tube slightly greenish at base with 3 faint purple lines behind the upper lobes, c. 6—10 x 4—6 mm long, lobes rounded, upper lobes recurved, 1.5 x 2 mm long, lateral lobes 2.5 x 2 mm, and lower lobe 3 x 3 mm, spreading, *stamens* and staminodes attached c. 2 mm from base of corolla, staminodes c. 1 mm long, filaments geniculate, strongly curved in upper half, c. 2.5 mm long, green, glabrous, anthers white, c. 2.5 x 0.5 mm, fused face to face, *disc* annular, c. 0.3 mm deep, *ovary* green, densely pilose with short glandular trichomes, c. 3—4 mm long, style 3.5 mm long, stigma spatulate, exerted just beyond upper corolla lobes. *Infructescence* curling backwards on itself. *Fruit* with persistent calyx, capsule narrowly cylindric, initially splitting along upper side, subsequently splitting into 4 longitudinal parts, (5—)7—12 x c. 1.5 mm, style sometimes persistent c. 1—4 mm long.

*Distribution:* Vietnam, Quang Ninh Province, Ha Long Bay, narrow endemic found only at Tam Cung Cave.

*Habitat*: It grows in small crevices with the rhizome deeply embedded and with only the small tuft of leaves above the rock surface. It appears to grow only on the vertical cliff faces close to the cave mouth in light shade.

*Notes*: This is an atypical species of *Chirita* in its spatulate stigma and its fruits that eventually split into four longitudinal parts. However, Wood (1974) has already drawn attention to a few other *Chirita* species (e.g. *C. integra* Barnett and *C. lacei* (W.W. Sm.) B.L. Burtt) that have a spatulate stigma. Of all the *Chirita* species, this new species shares a remarkable resemblance with *C. speluncae* (Hand.-Mazz.) D. Wood from north-east Yunnan in its small size, rather few, small hairy petiolate leaves in a lax tuft, small flowers and short fruits. *C. modesta* differs from *C. speluncae* in its larger leaves, paniculate inflorescences, white flowers and spatulate stigma. (*C. speluncae* has petioles 2—10 mm long, laminas 9—22 x 5—9 mm, and solitary flowers with violet-blue lobes and a shallowly two-lobed stigma).

*Chirita modesta* occupies a very narrow niche (see *Habitat* above) and this may explain why it is so rare as very few caves meet its exacting requirements. The single locality of *C. speluncae*, as its name suggests, is recorded as a cave, but details of its habitat are lacking.

*Specimens*: Ha Long Bay – type and Nguyen Tien Hiep & Ruth Kiew NTH 3905 11 July 1999 (HN, SING).

***Paraboea halongensis* Kiew & T.H. Nguyen, sp. nov.**

(Gesneriaceae)

*Paraboea rabillii* Xu & B.L. Burtt similis, sed foliis oppositis et inflorescentiis terminalibus differt.

**Typus**: Ha Long Bay, Nguyen Tien Hiep & Ruth Kiew NTH 4055 9 Nov 1999 (HN holo; BM, E, K, LE, MO, SING iso).

Thin, wiry, perennial shrublet, branching close to base, *stems* at first felty becoming glabrous and pale grey with age, 13—18 cm x c. 2 mm, stems weak becoming decumbent and rooting, nodes annular, lower internodes 1—1.5 cm long, upper congested. *Indumentum* on upper surface of lamina of glistening, translucent, long, uniseriate, glandular trichomes with dense layer of short unicellular hairs; young stem, lower leaf surface, bracts, rachis of inflorescence with a tangled felt of long, unicellular, eglandular trichomes, ferruginous at first becoming white with age, on lower surface of veins with sparse long, dark brown, uniseriate trichomes that wear off

with age. *Leaves* opposite, lower pairs distant, upper clustered at top of stem, *petiole* (6—)12—17 mm, *lamina* lanceolate to slightly ovate, 26—43 x 15—25 mm, in life deep green above, dark fawn or grey-fawn beneath, base rounded to slightly cordate, sometimes slightly unequal, margin serrate, outlined in white (ciliate), apex acute, lateral veins ascending 4—5 pairs, impressed above, prominent beneath. *Inflorescence* terminal, paniculate with fourth order branching, peduncle c. 0.5 cm long, branches 6.5—10 cm long, 2—5 spreading, rachis white, extremely fine, rachis to second order branching c. 4 cm long; bracts foliaceous, 12 x 6 mm with stalk 4 mm long, *Pedice*l c. 9 mm long, green, *calyx* divided to base, lobes narrowly linear, c. 2 x 1 mm, light green, *corolla* campanulate, 8 x 7—8 mm, completely white inside and out, tube slightly saccate at base, mouth oblique, lobes  $\pm$  isomorphic, broadly rounded, c. 2 x 4—5 mm, recurved, *stamens* strongly curved to position anthers c. halfway along corolla tube, filaments pale rosy purple, c. 3—4 mm long, anthers connivent, white, c. 1.5 mm long, *ovary* white, c. 5 mm long, style straight c. 3 mm long, stigma positioned at the corolla mouth, minute, globose and glistening, *Capsule* narrowly cylindrical, 12—20 x 1—1.5 mm, twisted when mature and splitting on both upper and lower sides.

*Distribution*: Vietnam, Quang Ninh Province, Ha Long Bay, at Me Cung Cave and one other island.

*Habitat*: It grows in soil-filled cracks in bare, exposed rocks near the summit of limestone islands.

*Notes*: The habit - a thin, wiry plant with weak stems, branching near the base - is rather unusual in *Paraboea* and resembles that of *P. rabillii* Xu & B.L. Burt from Thailand. In addition *P. rabilli* has similar small, lanceolate leaves, slender inflorescence branches, and short, white flowers and short fruits. However, it would not be mistaken for *P. halongensis* as *P. rabillii* has alternate leaves with 8—10 pairs of veins, and axillary inflorescences.

The individual branches of *P. halongensis* are monocarpic. The leaves and shoot die after fruiting and are replaced by a new shoot, which contributes to the bushiness of the shrublet.

### ***Impatiens halongensis* Kiew & T.H. Nguyen, sp. nov.**

(Balsaminaceae)

Nguyen & Kiew, Wild Plants of Ha Long Bay (2000) Plate 28.

*Impatiens bonii* Hook. f. maxime similis, sed foliorum nervis lateralibus magis numerosis, floribus albis apice luteis et alis recurvis differt.

**Typus:** Ha Long Bay, *Nguyen Tien Hiep and Ruth Kiew NTH 4056* 11 Nov 1999 (holo HN, iso SING)

**Plate 1b**

Glabrous, perennial balsam. *Stem* succulent, erect, unbranched (sometimes bifurcating), smooth and glossy, reddish-brown, to c. 40 cm tall, in life c. 12.5 mm thick at base, tapering to 5 mm at stem apex, leaf scars conspicuous. *Leaves* spirally arranged, clustered at stem apex, *petiole* reddish brown, (1.7—)3.5—4.5 cm long, grooved above, *lamina* broadly lanceolate, thin, glossy, dark green above, pale green beneath with dark green veins, (3.2—)7—10.5 x (1.9—)4.5—6.7 cm, base rounded slightly unequal with pair of small, pale green glands at base of midrib, margin crenate, apex acuminate, lateral veins 5—7 pairs, slightly impressed or plane above, slightly prominent beneath. *Flowers* solitary, 2 per axil, flowering asynchronously, basically white with edges of petal lobes yellow or greenish yellow, the lower centre of throat with a bright yellow patch, inside the throat pale green with lines of minute red spots sometimes coalescent, c. 14 x 12 mm; *pedicel* slender, shorter than petiole, 2—2.5 cm long, pale brownish green; ebracteate; *sepals* 4, outer lateral sepals broadly ovate, c. 6 x 5 mm, united into an acuminate tip, upper lateral sepals fleshy, acinaciform, c. 4 x 1 mm, lip naviculate, c. 21 mm long of which c. 7 mm is the spur, c. 8 mm across mouth and c. 7 mm deep, spur simple, recurved, inflated, c. 6 x 2.5 mm; *standard* obovate with a keel-like pouch, c. 9 x 6 mm with 2 rounded lobes c. 3 mm across, pouch c. 3 mm wide, *lateral petals* connate, c. 8 x 13 mm; distal lobes c. 4 x 13 mm, strongly recurved, basal lobes rounded c. 7 x 6.5 mm, shallowly notched, notch c. 2.5 mm deep, inner margin with raised bright yellow central ridge; *ovary* c. 3 mm long, *stigma* sessile, globose, c. 2 mm across. *Capsules* obovate, c. 12 x 4 mm, narrowing abruptly to an apicula c. 3 mm long, glabrous, strongly ribbed, dark green, almost white between ribs. *Seeds* discoid, flat, slightly obovoid, c. 2 x 1 mm, minutely rugose.

*Distribution:* Vietnam, Quang Ninh Province, endemic to Ha Long Bay.

*Habitat:* In light shade, on ground in soil derived from limestone rocks.

*Notes:* The common balsam at Ha Long Bay is *Impatiens verrucifer* Hook. f., which is conspicuous as it grows on vertical limestone cliffs and rocks close to sea level. It is a massive balsam growing to 1 m in height with tough succulent stems about 3 cm thick. It produces large, deep pink flowers, though some populations have paler flowers. In contrast, the new species is not as common and has only been found on a few islands where it grows

in light shade under the tree canopy.

*Impatiens halongensis* belongs to a group of Vietnamese balsams, which includes *I. boni* Hook. f. and *I. verrucifer* Hook. f., that are glabrous, have axillary flowers, four lateral sepals of which the outer ones are free, a short spur and connate lateral petals. It would not be mistaken for *I. boni* and *I. verrucifer*, which have large 3-cm wide, pink flowers with a deeply divided lip and a pedicel that is longer than the petiole.

Some plants of *I. boni* (formerly described as distinct and called *I. pygmaea* Hook. f.) have basically white flowers and pedicels shorter than the petioles, but *I. halongensis* is clearly distinct from them in the number of lateral veins (3—5 pairs in *I. boni*), in flower shape (the distal lobes of the lateral petals are not recurved in *I. boni*), and colour (the white flowers of *I. boni* have violet apices).

***Livistona halongensis* T.H. Nguyen & Kiew, sp. nov.**

(Palmae)

Nguyen & Kiew, Wild Plants of Ha Long Bay (2000) Plate 24.

Forma foliorum et magnitudine fructuum *Livistonae endauensi* J. Dransf. & K.M. Wong similis, sed inflorescentiis erectis et multo longioribus praecipue differt.

**Typus:** Ha Long Bay, *Nguyen Tien Hiep, L. Averyanov & Nguyen Van Can NTII 2630* 12 May 1999 flowers (holo HN, iso SING)

**Plate 1a**

Solitary palm. *Stem* to c. 10 m tall and c. 20 cm diam., flowering at c. 5 m tall, leaf scars conspicuous and close. *Leaf* with petiole longer than lamina. Leaf base and leaf sheath clasping the stem, c. 15 cm wide at base, thickly woody; ligule rich brown, triangular and fibrous, the proximal 35—38 cm stretched to form a fibrous network, the distal c. 70 cm tattered into ribbons. *Petiole* glabrous, 1.25—1.30 m long, c. 2 cm wide at base, c. 1.5 cm wide distally, adaxially flat and green with light yellow band along the margin, abaxially green and rounded, proximal 15 cm without spines, distally with 77—86 irregularly spaced spines per side: spines dull orange, paler green towards centre, 10—12 mm long, woody, hooked, underside strongly keeled. Adaxial hastula persistent, papery, broadly ovate, c. 3 x 2.5 cm (hastula absent on the abaxial surface). *Lamina* unsplit at base, then splitting into one-veined segments which ultimately split along the single vein to become bifid, segments slightly pendant; near the margin, lamina c. 47 cm long and splitting c. 6 cm from base, in the centre c. 77 cm long and splitting c. 23—25 cm from base, veins c. 64; lower surface at base with pale fawn scurfy

indumentum wearing off distally; intercostal veins fine and slightly darker green, just visible to the naked eye; margin at base with a c. 2 cm-long row of very fine teeth. Old leaves forming a conspicuous skirt beneath the crown, ultimately marcescent. *Inflorescence* solitary, interfoliar, green, glabrous, c. 3.4 m long, more or less erect and projecting above crown; prophyll and 10 upper bracts tubular and thick leathery-fibrous, prophyll 2-keeled, c. 33 x 5 cm at base tapering to 3 cm wide; bracts each c. 50 cm long and terete, the upper 7 with partial inflorescences; peduncle c. 1.6 m x 2 cm with 5 bracts; partial inflorescences divaricate, softly pale fawn velvety, with one bracteole c. 27 cm long, proximally stalk flat, terete distally, c. 95 cm long of which stalk is 60 cm long, arching outwards and downwards with c. 10 second order rachillae, lower with third order rachillae, ultimate rachillae c. 1—1.5 mm thick. *Flowers* minute in distant pairs on common stalk c. 0.3 mm long, bud obovoid, flowers pale creamy yellow, c. 2 mm long; *calyx* c. 1 mm long, glabrous, tubular dividing c. halfway, lobes 3 acute; *corolla* c. 2 mm long, divided c. halfway, lobes 3, cucullate; *stamens* 6, c. 1 mm long, staminal tube rich brown, narrowing abruptly into short filament, anthers subglobose, glistening white, c. 0.3 mm long; *ovary* obovoid, deeply ridged, dark reddish brown, c. 1 mm long; single united style, pale brown, c. 0.3 mm long; stigma minute. *Fruit* stalk to (2—)3—5 mm long, fruit globose 10—12 mm across, smooth, glossy bright dark green, epicarp and mesocarp leathery, endocarp crustaceous and brittle, c. 0.75 mm thick, single-seeded, endosperm homogeneous with an intrusion of testa in the centre.

*Distribution*: Vietnam: Quang Ninh Province, endemic to Ha Long Bay.

*Habitat*: Limestone islands, in soil-filled crevices on rocky limestone substrate, sometimes gregarious but it is not present on all islands.

*Specimens*: collections from same plant, all numbered *NTH 2630* (12 May 1999 – type); *Nguyen Tien Hiep & Ruth Kiew* 15 July 1999 (fruits); 11 April 2000 (immature inflorescences).

*Notes*: This is the first *Livistona* species to be described from limestone. It flowers in May, when it produces spectacular large, cream inflorescences above the green leaf canopy. It fruits in July.

It is clearly different from the other Vietnamese species of *Livistona* as indicated in the key.

### Key to the Vietnamese Species of *Livistona*

- 1a. Lamina irregularly divided into broad segments that almost reach the hastula ..... *L. saribus* Merrill ex A. Cheval.
- 1b. Lamina unsplit at base, segments regularly divided ..... **2**
- 2a. Tips of leaf segments conspicuously pendulous ..... *L. chinensis* R.Br.
- 2b. Tips of leaf segments not or only slightly pendulous ..... **3**
- 3a. Inflorescences as long as leaves, fruits ellipsoid, 25—35 x 20—25 mm ..... *L. speciosa* Kurz
- 3b. Inflorescences longer than the leaves, erect and held above the crown, fruits globose, 10—12 mm wide ..... *L. halongensis*

*Livistona fengkaiensis* X.W. Wei & M.Y. Xiao from southern China has a short, pendulous inflorescence and larger, ellipsoid fruits and so would not be mistaken for *L. halongensis*. John Dransfield (*pers. comm.*) suggests that this Chinese species is in fact conspecific with *L. speciosa*.

*Livistona halongensis*, in its relatively small fruits and its leaves, which do not split to the base and which have single-veined segments that bifurcate near the margin, most resembles *Livistona endauensis* J. Dransf. & K.M. Wong, which grows on sandstone ridges in southeast Peninsular Malaysia. However, apart from the large erect inflorescences (which are more than twice the size of those of *L. endauensis*, which has inflorescences to c. 1.5 m long), it differs in several other characters: the leaves have a shorter petiole (they are c. 1.75 m long in *L. endauensis*), a conspicuous hastula (it is only 1 cm long in *L. endauensis*) and the leaf is more deeply split (more than a third of the way down, compared with only halfway in *L. endauensis*). In addition, its fruit is globose and slightly smaller than that of *L. endauensis*, which is pyriform and 16 by 14 mm in size.

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**Plate 1.** Endemic plants of Ha Long Bay.

a. *Livistona halongensis*, b. *Impatiens halongensis*, c. *Chirita drakei*, d. *Chirita gemella*, e. *Chirita halongensis*, f. *Chirita hiepii*.