A checklist of Rubiaceae species from Eastern Samar, Visayas, Philippines

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Abstract
Samar Island is a center of botanical wealth throughout the Philippine archipelago. However, floristic knowledge of the island is deficient and most of its forested areas remain largely unexplored. Thus, floristic surveys of Rubiaceae members were made on Eastern Samar, located in Visayas, Philippines. Collections were conducted from June 2013 to June 2017 within 5 municipalities: Borongan, Balangkayan, Taft, Guiuan, and Llorente. In total, 59 species belonging to 31 genera representing 21 tribes of the family were recorded. The most species-rich tribes belong to Naucleeae, Psychotrieae, and Spermacoceae, with 10, 8, and 6 species, respectively. Of the 59 species recorded, 37 are endemic to the Philippines. Twelve species are listed as threatened species based on its proposed IUCN category and DAO 2017-11. This study presents an enumeration of Rubiaceae found on selected forested areas of Eastern Samar, Philippines.

Key words
Endangered taxa, floristic survey, forested areas, Gentianales, inventory, Samar Island Natural Park.

Introduction
The Philippine archipelago has garnered the attention of numerous scientists due to its extremely diverse assemblage of flora and fauna. The Philippines, renowned as a center of biological evolution, was utilized as a model for studying the effects of geographic template on the divisions of biodiversity (Heaney 2007, Brown et al. 2013). The Philippines is also considered as a mega-diverse nation and a hot spot that greatly require global conservation (Brown et al. 2013). However, its regions comprising thousands of islands have not been explored, resulting in a great dearth of data regarding the distributions and identities of numerous organisms dwelling on the archipelago, especially true of the Philippine flora.

Since the end of the Philippine botanical era in the late 1920s, a significant proportion of the plant species have not been re-collected. With the only known collections made by E. Merrill and A. Elmer, many species have consequently been assumed to be extinct (Koopowitz et al. 1998) due to the rapid deforestation that transpired over the last 2 to 5 decades. Merrill made one of the greatest
contributions to Philippine botany with his renowned work “An Enumeration of Philippine Flowering Plants” (Merrill 1923–1926), but this is nearly a century old and now outdated. Thus, re-collections, updated floristic inventories, and surveys are imminent, especially for areas of priority that require proper conservation and management in the midst of human-driven habitat destruction and the detrimental effects of climate change.

Within the Philippines, Samar Island Natural Park (SINP), which is located in the province of Samar, hosts one of the most diverse floras on the Philippine archipelago. Samar sits on the edge of Eastern Visayas, facing the Pacific Ocean, and together with the neighboring island of Leyte to the west, comprises a unique phyto-geographic region in the Philippines. SINP comprises one of the largest areas of old-growth forests known in the country (Patindol 2016). Considered as a center of plant endemism, around 400 endemic species of flowering plants belonging to at least 200 genera are recorded in SINP (Madulid 2000). However, most of the forested areas on the island remain largely unexplored and require protection from abusive land use and alteration.

The coffee family Rubiaceae is regarded as the fourth largest family of angiosperms, and offers a wealthy contribution to the immense biodiversity of the Philippine archipelago. In the most recent global assessment of the family by Davis et al. (2009), the Philippines ranked third among the 20 areas which hold the most number of endemic species and also ranked tenth on the 20 most diverse regions for Rubiaceae (Alejandro and Arriola 2013). Approximately 550 species in about 80 genera are recognized in the Philippines, accounting for 12.1% of the global Rubiaceae. Among the ca 550 species found in the Philippines, 83% are endemic (Davis et al. 2009). With the recent recognition of a new endemic genus, 4 genera are endemic to the country: *Antherostele* Bremek., *Villaria* Rolfe., *Greeniopsis* Merr., and the recently discovered *Kanapia* Alejandro and Arriola (Arriola et al. 2016, Alejandro 2007).

Despite the emergence of studies contributing to the knowledge of the Philippine Rubiaceae, updated floristic inventories are unavailable and lacking. Renowned as a center of plant diversity on the Philippines and throughout Malesia, Samar Island remains considerably unexplored, and thus requires intensive floristic surveys that will contribute to the knowledge of the Philippine flora. Hence, we provide a checklist of Rubiaceae species of Eastern Samar, with notes on their ecology and conservation.

### Methods

#### Study site

With an area covering 466,047 ha, Eastern Samar occupies the eastern division of the Visayas region within the Visayas region (Fig. 1). To its northern borders lie Northern Samar, and to the west by Samar. Eastern Samar is faced to the east by the Philippine Sea whereas it is faced by the Leyte Gulf in the south (Lancion 1995). The study site is a thickly vegetative area comprising of mostly old-growth forests, and includes a diverse array of habitats ranging from mangrove forests, lowland evergreen rainforests, and limestone and ultramafic soil forests (Fig. 2). The soil in the forested areas of Eastern Samar is mostly clay loam or clay.

The northeastern region of Samar has the Type II climate, which is characterized by heavy amounts of rainfall with no dry season during December and January. Type IV climate is observed in the Southeastern region of the island, manifesting an even distribution of rainfall throughout the year (Madulid 2000, Patindol 2016). Across the entire Samar island, the climate is humid throughout the year (Kintanar 1984). Considering Samar’s geographical position, it suffers heavily from tropical cyclones. Table 1 provides a summary of the specific areas surveyed within the municipalities of Eastern Samar, including the coordinates of each area and the date of all the field activities conducted.

#### Data collection

The floristic study was done in 5 field expeditions from 2013 to 2017. Purposive sampling of Rubiaceae species were performed along and approximately 10 m adjacent to trails at the study sites. Specimens were collected during their reproductive stages to ensure precise identification of species, processed for herbarium preparation, and deposited vouchers in the University of Santo Tomas Herbarium (USTH). Because existing databases and updated information regarding the flora of Samar are lacking, specimens were identified utilizing original descriptions, taxonomic revisions, and determination keys. Our specimens were also compared to those in the collections of USTH and the Philippine National Herbarium (PNH), to digital type specimens in international herbaria, and from available online resources such as “Co’s Digital Flora of the Philippines” (Pelser et al. 2011). The IUCN conservation status of species were indicated in Table 2 and taken from “Co’s Digital Flora of the Philippines” (Pelser et al. 2011) and the Department of Environment and Natural Resources Administrative

### Table 1. Study sites in Eastern Samar, Philippines.

<table>
<thead>
<tr>
<th>Date of survey</th>
<th>Municipality</th>
<th>Location</th>
<th>Coordinates</th>
</tr>
</thead>
<tbody>
<tr>
<td>7–15 January 2013</td>
<td>Borongan</td>
<td>Barangay San Gabriel</td>
<td>11°36'26.08&quot;N, 125°16'50.74&quot;E</td>
</tr>
<tr>
<td>19–24 June 2015</td>
<td>Balangan</td>
<td>Minasangay Island Marine Eco-Park</td>
<td>11°28'24.67&quot;N, 125°31'13.80&quot;E</td>
</tr>
<tr>
<td>24–28 June 2016</td>
<td>Taft</td>
<td>Mount Abaca, Barangay Magsaysay</td>
<td>11°26'40.52&quot;N, 125°26'16.88&quot;E</td>
</tr>
<tr>
<td>16–24 November 2016</td>
<td>Guian</td>
<td>Maharikka Forest, Barangay San Rafael Villareal</td>
<td>11°51'49.85&quot;N, 125°22'51.36&quot;E</td>
</tr>
<tr>
<td>23–27 June 2017</td>
<td>Llorente</td>
<td>Barangay Candoros</td>
<td>10°47'06.56&quot;N, 125°41'38.04&quot;E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Barangay Magtinio</td>
<td>11°16'34.25&quot;N, 125°24'25.03&quot;E</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11°20'32.22&quot;N, 125°20'57.99&quot;E</td>
</tr>
</tbody>
</table>
Figure 1. Map of the study sites in Eastern Samar. Areas surveyed are marked in yellow circles.

Results

Within Eastern Samar, 59 species of Rubiaceae were recorded belonging to 31 genera and 21 tribes (Table 2). The most diverse tribe in terms of species number was Naucleeae (10 species), followed by Psychotrieae (8), Spermacoceae (6), Urophylleae (4), Aleisantheae (4), Ixoreae (4), Lasiantheae (3), Vanguerieae (3), Guettardeae (2), Mussaendeae (2), and Ophiorrhizeae (2). The tribes Agustaeae, Argostemmateae, Coffeae Condamineae, Gardenieae, Morindeae, Octotropideae, Pavetteae, Pris-
matorideae, and Schradereae were each represented by a single species. A total of 37 species (62.71%) are identified as endemic to the Philippines. Of the 59 Rubiaceae species inventoried, 28 (42.37%) are shrubs, 17 (28.81%) are trees, 6 (10.17%) are herbs, 6 (10.17%) are vines, and 2 (3.39%) are epiphytes. Twelve species were identified to be threatened based on their proposed IUCN status and the DENR-DAO 2017-11 (2017).

List of species with notes on Philippine endemics

Tribe Agustaeae

Wendlandia luzoniensis D.C., Prodr. 4 (1830) 412.

Materials examined. Table 2. Fig. 4G

Small to medium-sized tree about 4–6 m high. Leaves narrowly to widely elliptic, 14–18 × 5–7 cm with a few or scattered hairs on the blades, puberulent on the midrib. Inflorescence terminal, paniculiform, many flowered, puberulent. Calyx 1–1.5 mm, globose to subglobose, puberulent. Corolla tubular, white, lobes 1 mm, tube 3–4 mm. Fruits globose to subglobose, capsular, somehow woody, 1–2 mm, with calyx remnants.
# Table 2. List of species identified on the study sites. Vouchers, habit (T = tree, S = shrub, H = herb, V = vine, E = epiphyte), proposed status based IUCN Red List of Threatened Species or the *DENR Administrative Order 2017-11 (NE = Not Evaluated, DD = Data deficient, OT = Other Threatened Species, LC = Least Concern, V = Vulnerable, EN = Endangered, CR = Critically endangered), endemicity (E = Philippine endemic, N = non-endemic) and GPS coordinates are presented.

<table>
<thead>
<tr>
<th>Species Agastaceae</th>
<th>Voucher</th>
<th>Habit</th>
<th>Status</th>
<th>Endemicity</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wendlandia luzoniensis D.C. (Fig. 4G)</td>
<td>USTH-013345</td>
<td>T</td>
<td>NE</td>
<td>E</td>
<td>11°25′48.88″</td>
<td>125°25′46.85″</td>
</tr>
</tbody>
</table>

| Tribe Alesiastieae | Greeniopsis discolor Merr. (Fig. 4A) | USTH-013280 | T | CR | E | 11°26′37.50″ | 125°26′32.88″ |
|--------------------| Greeniopsis euphlebia Merr. | USTH-014329 | T | CR | E | 11°20′44.70″ | 125°27′38.80″ |
| Greeniopsis meganathia Merr. | USTH-014365 | T | CR | E | 11°21′11.80″ | 125°27′16.90″ |
| Greeniopsis multiflora (Elmer) Merr. (Fig. 4C) | USTH-014340 | T | EN | E | 11°20′43.80″ | 125°27′38.10″ |

| Tribe Argostemmateae | Agostemma maquilinense Elmer | USTH-013973 | H | NE | E | 11°49′19.02″ | 125°17′04.99″ |

| Tribe Coffeae | Diplopora tiganoiensis (Elmer) Ali & Robbrect | USTH-014457 | S | NE | N | 11°36′26.08″ | 125°16′50.74″ |

| Tribe Condaminaeae | Dolicholobium philippinense Trelease (Fig. 5F) | USTH-013960 | T | NE | E | 11°49′34.27″ | 125°16′53.19″ |

| Tribe Guettardaceae | Guettarda speciosa L. | USTH-014369 | T | NE | N | 11°25′53.40″ | 125°28′33.80″ |
| Timonius philippinensis Merr. (Fig. 6E) | USTH-013331 | T | NE | E | 11°25′53.99″ | 125°25′39.47″ |

| Tribe Gardenieae | Adia pulcherrima (Merr.) Ridsdale (Fig. 4F) | USTH-013268 | V | NE | E | 11°25′57.13″ | 125°25′28.81″ |

| Tribe Ixraceae | Ixora bartlingii Elmer (Fig. 3E) | USTH-013285 | S | NE | E | 11°26′10.98″ | 125°25′36.87″ |
| Ixora longifolia Sm. in A. Rees (Fig. 4E) | USTH-013296 | S | NE | N | 11°28′26.21″ | 125°31′10.94″ |
| Ixora salicifolia (Blume) D.C. | USTH-013954 | S | NE | N | 11°49′23.48″ | 125°17′00.38″ |
| Ixora silagoensis Banag, Manalastas & Alejandro | USTH-013965 | S | CR | E | 11°49′22.03″ | 125°17′00.87″ |

| Tribe Lasianthaceae | Lasianthus attenuatus Jack (Fig. 6F) | USTH-013967 | S | NE | N | 11°49′20.59″ | 125°17′00.90″ |
| Lasianthus hirsutus (Roxb.) Merr. (Fig. 7F) | USTH-013945 | S | NE | N | 11°49′19.14″ | 125°17′08.29″ |
| Lasianthus verticillatus (Lour.) Merr. | USTH-013956 | T | NE | N | 11°49′19.51″ | 125°17′07.78″ |

| Tribe Morinidaceae | Morinda citrifolia L. (Fig. 7A) | USTH-013330 | S | NE | N | 11°28′24.86″ | 125°31′15.47″ |

| Tribe Mussaeaeae | Mussaenda philippica var. philippica A. Rich (Fig. 6C) | USTH-013951 | S | NE | N | 11°49′43.43″ | 125°16′53.19″ |
| Mussaenda vidalii Elmer | USTH-014344 | T | *VU | E | 11°22′13.00″ | 125°26′07.40″ |

| Tribe Naucleaceae | Neonauclea bartlingii var. cumingiana (S.Vidal) Ridsdale | USTH-014368 | T | NE | E | 11°16′34.25″ | 125°24′25.03″ |
| Neonauclea jagarrii (Merr.) Merr. (Fig. 3F) | USTH-013961 | S | NE | N | 11°49′20.20″ | 125°17′03.17″ |
| Neonauclea lanceolata subsp. gracilis (S. Vidal) Ridsdale (Fig. 5A) | USTH-013292 | T | NE | N | 11°25′50.43″ | 125°25′40.13″ |
| Neonauclea viridiflora Ornds, Banag, Alejandro (Fig. 6A) | USTH-013060 | T | EN | E | 11°49′19.79″ | 125°17′01.63″ |
| Neonauclea wenzeliai (Merr.) Merr. | USTH-014461 | T | NE | E | 11°36′26.08″ | 125°16′50.74″ |
| Uncaria attenuata Korth. | USTH-014346 | V | NE | N | 11°22′11.60″ | 125°26′02.90″ |
| Uncaria cordata (Lour.) Merr. (Fig. 3A) | USTH-014362 | V | NE | N | 11°21′55.60″ | 125°25′57.60″ |
| Uncaria lanosa Wall. in Roxb. | USTH-013336 | V | NE | N | 11°26′42.04″ | 125°26′16.80″ |
| Uncaria longiflora (Poir.) Merr. | USTH-013941 | V | NE | N | 11°49′27.04″ | 125°17′59.81″ |
| Uncaria nervosa Elmer | USTH-014330 | V | NE | N | 11°20′44.30″ | 125°27′38.20″ |

| Tribe Octotropidaceae | Hypobathrum purpureum (Elmer) Merr. | USTH-014447 | S | NE | E | 11°36′26.08″ | 125°16′50.74″ |

| Tribe Ophiorrhizaceae | Ophiorhiza acuminata DC. (Fig. 3D) | USTH-013974 | H | NE | E | 11°49′33.51″ | 125°17′01.44″ |
| Ophiorhiza camiguinensis Elmer (Fig. 3C) | USTH-013974 | S | NE | E | 11°49′18.26″ | 125°17′07.46″ |

| Tribe Pavetteae | Tarenna luzoniensis (S. Vidal) Bremek.(Fig. 4B) | USTH-013959 | T | NE | E | 11°49′26.64″ | 125°17′00.34″ |

| Tribe Prismatinitaeae | Prisomatamnaris tetandra (Roxb.) K. Schum. | USTH-014334 | S | NE | N | 11°20′37.30″ | 125°27′36.70″ |

| Tribe Psychotriaceae | Hydrophytum leytense Merr. | USTH-014454 | E | OT | E | 11°36′26.08″ | 125°16′50.74″ |
| Myrmecodia tuberosa Jack. (Fig. 7C) | USTH-013962 | E | NE | N | 11°49′19.08″ | 125°17′06.78″ |
| Psychotria conglomerataphylla Sohmer & Davis | USTH-014446 | S | CR | E | 11°36′26.08″ | 125°16′50.74″ |
| Psychotria membranifolia Bartl. ex DC. (Fig. 6D) | USTH-014335 | S | NE | N | 11°20′44.70″ | 125°27′38.80″ |
| Psychotria paloensis var. subelliptifolia Sohmer & Davis (Fig. 7E) | USTH-013313 | S | CR | E | 11°28′25.99″ | 125°31′10.96″ |

Continued.
Table 2. Continued.

<table>
<thead>
<tr>
<th>Species</th>
<th>Voucher</th>
<th>Habit</th>
<th>Status</th>
<th>Endemcity</th>
<th>Latitude (N)</th>
<th>Longitude (E)</th>
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<td>Psychotria papillata (Merr.) Merr.</td>
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<td>S</td>
<td>VU</td>
<td>E</td>
<td>11°36'26.08&quot;</td>
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<td>Psychotria radicans (Merr.) Merr.</td>
<td>USTH-013964</td>
<td>S</td>
<td>VU</td>
<td>E</td>
<td>11°49'18.12&quot;</td>
<td>125°17'06.17&quot;</td>
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<tr>
<td>Psychotria venzeli (Merr.) Merr.</td>
<td>USTH-013312</td>
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<td>CR</td>
<td>E</td>
<td>11°25'50.41&quot;</td>
<td>125°25'47.43&quot;</td>
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<td>Tribe Schradereae</td>
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<td>Schradera monoccephala (Merr.) Puff, Buchner &amp; Greimler (Fig. 7D)</td>
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<td>NE</td>
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<td>11°22'03.10&quot;</td>
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<td>Tribe Spermacoceae</td>
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<td>Exallage auricularia (L.) Bremek.</td>
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<td>H</td>
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<td>N</td>
<td>11°49'19.94&quot;</td>
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<td>Exallage burensis (Miq.) Bremek.</td>
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<td>N</td>
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<td>Exallage costata (Roxb.) Bremek. (Fig. 5E)</td>
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<td>NE</td>
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<td>NE</td>
<td>E</td>
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<td>Hediosys phanerophlebia Merr. (Fig. 3D)</td>
<td>USTH-014345</td>
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<td>Spermacoce remota Lam. (Fig. 6B)</td>
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<td>NE</td>
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<td>Tribe Urophylleae</td>
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<tr>
<td>Prarvinia grandisepala (Merr.) Bremek. (Fig. 5B)</td>
<td>USTH-013271</td>
<td>S</td>
<td>&quot;EN&quot;</td>
<td>E</td>
<td>11°26'11.44&quot;</td>
<td>125°25'35.99&quot;</td>
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<tr>
<td>Prarinia stenophylla (Merr.) Bremek.</td>
<td>USTH-014331</td>
<td>T</td>
<td>NE</td>
<td>E</td>
<td>11°20'44.00&quot;</td>
<td>125°27'38.10&quot;</td>
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<tr>
<td>Prarinia triflora (Quisumb. &amp; Merr.) Bremek.</td>
<td>USTH-014449</td>
<td>T</td>
<td>NE</td>
<td>E</td>
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<td>125°16'50.74&quot;</td>
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<td>Urophyllum memereyoides (C. Presl) S. Vidal (Fig. 5C)</td>
<td>USTH-014331</td>
<td>S</td>
<td>NE</td>
<td>E</td>
<td>11°22'03.50&quot;</td>
<td>125°25'56.10&quot;</td>
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<td>NE</td>
<td>E</td>
<td>11°49'25.48&quot;</td>
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<td>Tribe Vanguerieae</td>
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<td>Canthium glandulosum (Blanco) Merr.</td>
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<td>NE</td>
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<tr>
<td>Psydrax amplifolia (Elmer) Davis</td>
<td>USTH-014443</td>
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<td>125°16'50.74&quot;</td>
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<td>Pyrostria elmeri (Merr.) Ariola, Meve, Alejandro (Fig. 4D)</td>
<td>USTH-014323</td>
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<td>NE</td>
<td>E</td>
<td>11°20'44.70&quot;</td>
<td>125°27'38.80&quot;</td>
</tr>
</tbody>
</table>

Greeniopsis megalantha Merr., PJS 12 c (1917) Bot. 164.

Materials examined. Table 2.

Medium-sized tree about 9 m high. Leaves elliptic to lanceolate, 15–20 × 5–6 cm, coriaceous, glabrous but with sparse hairs on the midrib. Inflorescences terminal, pubescent, many-flowered. Calyx 6 mm, rhomboid, pubescent. Corolla white, urceolate, pubescent outside, lobes 3 mm, tube 4 mm. Fruits ellipsoid, 7–10 mm, brown, pubescent.

This species has the largest flowers compared to all Greeniopsis species and is easily recognized by its somewhat glabrous leaves and stipules (Alejandro et al. 2010).

Greeniopsis multiflora (Elmer) Merr., PJS 4 c (1909) Bot. 325.

Materials examined. Table 2. Fig. 4C

Shrub about 2 m high, pubescent. Leaves elliptic to obovate, 20–25 × 10–15 cm, glabrous with scattered hairs on midrib. Inflorescences terminal, sparsely pubescent, many-flowered. Calyx 2 mm, rhomboid, pubescent. Corolla white, urceolate, pubescent outside, lobes 1 mm, tube 1–2 mm. Fruits subglobose, 4–5 mm, brown, pubescent, with calyx remnants.

In contrast to the other Greeniopsis species found in Eastern Samar and assessed as Critically Endangered, *G. multiflora* is very widespread across the Philippines.

Tribe Argostemmateae

Argostemma maquilense Elmer, LPB 9 (1934) 3242.

Materials examined. Table 2.

Small herb about 5–7 cm high. Leaves oblong to

*Wendlandia luzoniensis* is widely distributed in the Philippines, inhabiting low to medium elevation, primary and secondary forests. However, this is the first report of this species occurring in the Visayas.

Tribe Aleisanthieae

*Greeniopsis discolor* Merr., PJS 12 c (1917) Bot. 163.

Materials examined. Table 2. Fig. 4A

Small tree about 5 m high. Leaves elliptic, 15–26 × 5–10 cm, subcoriaceous, with densely hairy abaxially. Inflorescences terminal, pubescent, many-flowered. Calyx 2 mm, obtuse, puberulous. Corolla white, rarely yellow, campanulate, densely pubescent, lobes 1 mm, tube 3–4 mm. Fruits ellipsoid, 4 mm, brown, pubescent, with calyx remnants.

This species is highly similar to *G. multiflora* and *G. pubescens* in terms of reproductive structures, but is easily distinguished by its white, woolly hairs on the abaxial surface of the leaf (Alejandro et al. 2010).

*Greeniopsis euphlebia* Merr., PJS 17 (1921) 319.

Materials examined. Table 2.

Shrub about 3 m high, pubescent. Leaves broadly elliptic, 20–22 × 6–10 cm, subcoriaceous, densely hairy abaxially. Inflorescences terminal, pubescent, many-flowered. Calyx 5 mm, obtuse, pubescent. Corolla white, rarely yellow, campanulate, pubescent outside, lobes 2 mm, tube 4–5 mm. Fruits ellipsoid, 8 mm, brown, pubescent, with calyx remnants.

This species is distinguished from other *Greeniopsis* by its sunken secondary veins adaxially on its leaves and its leaf indumentums (Alejandro et al. 2010).


Materials examined. Table 2.

Medium-sized tree about 9 m high. Leaves elliptic to lanceolate, 15–20 × 5–6 cm, coriaceous, glabrous but with sparse hairs on the midrib. Inflorescences terminal, pubescent, many-flowered. Calyx 6 mm, rhomboid, pubescent. Corolla white, urceolate, pubescent outside, lobes 3 mm, tube 4 mm. Fruits ellipsoid, 7–10 mm, brown, pubescent.

This species has the largest flowers compared to all *Greeniopsis* species and is easily recognized by its somewhat glabrous leaves and stipules (Alejandro et al. 2010).

*Greeniopsis multiflora* (Elmer) Merr., PJS 4 c (1909) Bot. 325.

Materials examined. Table 2. Fig. 4C

Shrub about 2 m high, pubescent. Leaves elliptic to obovate, 20–25 × 10–15 cm, glabrous with scattered hairs on midrib. Inflorescences terminal, sparsely pubescent, many-flowered. Calyx 2 mm, rhomboid, pubescent. Corolla white, urceolate, pubescent outside, lobes 1 mm, tube 1–2 mm. Fruits subglobose, 4–5 mm, brown, pubescent, with calyx remnants.

In contrast to the other *Greeniopsis* species found in Eastern Samar and assessed as Critically Endangered, *G. multiflora* is very widespread across the Philippines.

Tribe Argostemmateae

*Argostemma maquilense* Elmer, LPB 9 (1934) 3242.

Materials examined. Table 2.

Small herb about 5–7 cm high. Leaves oblong to
Obovate, 3 × 1–2 cm, very membranous, glabrous on both sides, except for midrib that is somewhat puberulent. Infructescences solitary or in 2 to 3 fruits, terminal. Flowers not seen. Fruits globose to subglobose, 4 mm in diameter, crowned with calyx remnants, green.

Named after its type locality on Mount Makiling, Laguna, this species is also reported on Mount Bulusan, Sorsogon, on the island of Luzon north of Samar. The species is known to be ecologically restricted to wet, mossy forest summits. Hence, our new observation represents a new occurrence of this species, inhabiting moist, lowland rainforests.

Tribe Coffeae


**Materials examined.** Table 2.

Tribe Condamineeae

*Dolicholobium philippinense* Trelease, LPB 3 (1911) 984.

**Materials examined.** Table 2. Fig. 5F

Small tree about 5 m high, stems somewhat villous. Leaves elliptical, 12 × 5–6 cm, with conspicuous hairs.

along the midrib. Inflorescences lateral on ultimate branches, 2–3 flowered. Calyx shortly lobed about 2 mm. Corolla yellowish-white to white, lobes 9–10 × 6 mm, tube 4–5 mm. Fruits not seen.

Of the 28 known species of this genus, Dolicholo-bium philippinense is the only species recorded on the Philippines. This species thrives in forests along river banks. Variability on the indumentums on the vegetative structure differ among individuals, as stated by Jansen and Ridsdale (1983).

Tribe Guettardeae

Materials examined. Table 2.

Materials examined. Table 2. Fig. 6E
Small tree about 3 m high. Leaves ovate-lanceolate, 9–11 × 2.8–5.5 cm, glabrous. Inflorescence axillary, with
5–6 flowers. Calyx globose, 7 mm in diameter. Corolla salver-form, white, lobes 3 mm, tube 7 mm. Fruits not seen.

This endemic species is widely distributed on the Philippines, thriving in lowland and beach forests.

Tribe Gardenieae


**Materials examined.** Table 2. Fig. 4F

Vine or scandent shrub, about 5 m high. Leaves elliptic to oblong, 16–20 × 5–8 cm, coriaceous, glabrous. Inflorescences in axillary cymes, with 5–8 flowers. Calyx funnel-shaped, 15 mm long. Corolla white to pink, lobes 8–10 mm, tube 10 mm. Fruits ellipsoid, 12–15 mm, yellowish, glabrous.

This endemic species recorded only in certain areas of Southern Luzon, Negros and in Mindanao. This is a first report of this species occurring on Eastern Samar.

Tribe Ixoreae

**Ixora bartlingii** Elmer, LPB 3 (1911) 1020.

**Materials examined.** Table 2. Fig. 3E

Small tree about 4 m high. Leaves elliptic to oblong, 20–25 × 7–10 cm, membranous. Inflorescences terminal, pendulous, trichotomously branched. Calyx shortly triangular. Corolla white, lobes 4–6 mm, tube 10–15 mm. Fruits globose, 5–7 mm in diameter, red to pink.

This endemic species is widely distributed across the archipelago. It is easily distinguished from other *Ixora* species in the study area by its terminal, pendulous, red inflorescences.

**Ixora longifolia** Sm. in A. Rees, Cycl. 19 (1811) no. 3.

**Materials examined.** Table 2. Fig. 4E

**Ixora salicifolia** (Blume) D.C., Prodr. 4 (1830) 487.

**Materials examined.** Table 2.


**Materials examined.** Table 2.

Shrub about 1 m high. Leaves, sessile, erect, linear, 27–30 × 1–3 cm, coriaceous. Inflorescences shortly peduncled, red. Calyces narrowly triangular, 2–3 m, red. Corolla white, tinged with pink on lobes, lobes 10 mm, tube 40–45 mm. Fruits subglobose, 0.5–1 cm in diameter, red.

**Ixora silagoensis** was discovered in the municipality of Silago on southern Leyte in 2012 and was reported as a Critically Endangered species (Banag et al. 2014). Numerous populations of this species occur on Eastern Samar, particularly in lowland primary forests. It resembles *I. auriculata* but is distinguished by its fruits and flowers. The geographic distributions of these species also differ; *I. auriculata* occurs on Luzon whereas *I. silagoensis* occurs on Samar and Leyte (Banag et al. 2014).

Tribe Lasiantheae


**Materials examined.** Table 2. Fig. 6F

**Lasianthus hirsutus** (Roxb.) Merr., J. Arnold Arb. 33 (1952) 229.

**Materials examined.** Table 2. Fig. 7F


**Materials examined.** Table 2.

Tribe Morindeae


**Materials examined.** Table 2. Fig. 7A

Tribe Mussaendeae

**Mussaenda philippica var. philippica** A. Rich., Mém. Rubiac. (1830) 165.

**Materials examined.** Table 2.

**Mussaenda vidalii** Elmer, LPB 3 (1911) 993.

**Materials examined.** Table 2.

Small shrub about 1 m high. Leaves ovate, 2–2.5 × 1.2–1.5 cm, membranous, densely hirsute on both sides especially on the venations. Inflorescences terminal, spreading corymb. Calyx with a single swollen lobe (calycophyll), white, broadly ovate, 6–8 × 3–8 cm, sparsely pubescent. Corolla infundibular, lobes 4–6 mm, tube 2–3 cm, orange to yellow. Fruits ellipsoid, 1–2 cm, with dense warts. This species is often observed on secondary forests or in open-regrowth forests of Eastern Samar. While the type specimen of *M. vidalii* is described as a scandent shrub, most collections of this species are represented by erect shrubs or small trees. In their revision, Alejandro et al. (2015), they noted phenotypic variability of the habit of this species, which ranges from scandent shrubs to small, erect shrubs or trees.

Tribe Naucleaeae


**Materials examined.** Table 2.

Small tree about 4 m high, without myrmedomes on ultimate branches. Leaves ovate-elliptic, 12–21 × 3–6 cm, coriaceous. Diameter of mature flowering heads across corollas 30–40 mm. Calyx with well-developed appendages, 3–4 mm deciduous. Corolla infundibular, yellow, lobes 1–1.3 mm, tube 6–11 mm. Fruiting head woody, 20–23 mm in diameter.

This endemic species is distributed throughout the Philippines. The color of the flowers, however, vary,
ranging from white, light-purple, and pink. Most *Neonauclea* species in Eastern Samar (except *N. wenzellii*) have yellow flowers.


**Materials examined.** Table 2. Fig. 3F

Small rheophytic shrub less than 1 m high. Leaves linear-lanceolate, 14–20 × 1–2.5 cm, coriaceous. Diameter of mature flowering heads across corollas 35–38 mm. Calyx with well-developed appendages, 3–4 mm deciduous. Corolla infundibular, yellow, lobes 1 mm, tube 8–10 mm. Fruiting head woody, 20–23 mm in diameter.

This species is a Philippine endemic which is reported only from Samar and Camarines Sur. It is one of the few species of *Neonauclea* that exhibit rheophytism and is quite abundant on rivers and on streams of Eastern Samar. It is easily recognizable by other *Neonauclea* species in having its linear-lanceolate leaves and a rheophytic habit.


**Materials examined.** Table 2. Fig. 5A


**Materials examined.** Table 2. Fig. 6A

Small to medium-sized trees about 6–8 m high, with myrmecomes on ultimate branches. Leaves broadly elliptic, 19–20.2 × 9.5–14.5 cm, coriaceous. Diameter of mature flowering heads across corollas 35–37 mm. Calyx with well-developed appendages, about 7–8 mm, deciduous. Corolla infundibular, yellow, tube 2.5 mm, lobes 1 mm. Fruiting head woody, 23–30 mm in diameter.

Eastern Samar is the type locality for this species, which is abundant there. It is easily mistaken as *N. fornicaria* or *N. conniculicyna* based on its habit, vegetative parts, and the presence of myrmecomes, but *N. viridiflora* greatly differs in its reproductive morphology. The species tends to display minor differences in its leaf morphology, and individuals found near rivers have much smaller and narrower leaves compared to those found in dry areas.

*Neonauclea wenzelii* (Merr.) Merr., J. Wash. Acad. Sci. 5 (1915) 542.

**Materials examined.** Table 2.

Medium-sized tree about 6–8 m high, with myrmecomes on ultimate branches. Leaves broadly elliptic, 13–20 × 8–16 cm, prominently veined with conspicuous hairs, deep brown to red. Diameter of mature flowering heads across corollas 35 mm. Calyces with well-developed appendages, about 6 mm, deciduous. Corolla densely hairy, purple, tube 8 mm, lobes 2–3 mm. Fruiting head woody, 30 mm in diameter, prominently crowned with calyx remnants.

This species is a narrow endemic of the Samar and Leyte islands. According to Merrill (1914) and Ridsdale (1989), this is the sole species of *Neonauclea* having six-serous flowers. Our specimen had only 5 lobes, and it is likely that *N. wenzelii* tends to exhibit five- to six-serous flowers on different individuals.


**Materials examined.** Table 2.

*Uncaria cordata* (Lour.) Merr., Interp. Herb. Amb. (1917) 479.

**Materials examined.** Table 2. Fig. 3A

*Uncaria lanosa* Wall. in Roxb., Fl. Ind. 2 (1824) 131.

**Materials examined.** Table 2.


**Materials examined.** Table 2.

Tree about 10 m high high. Leaves elliptic, 12–15 × 4.5–6 cm, glabrous, coriaceous. Inflorescences terminal.

*Hypobathrum purpureum* (Elmer) Merr., EPFP 3 (1923) 534.

**Materials examined.** Table 2.

Medium-sized shrub about 3 m high. Leaves lanceolate, 10–12 × 4 cm subcoriaceous, and glabrous. Inflorescences axillary, solitary or in few-flowered glabrous cymes. Calyx turbinate, 2.5 mm. Corolla white, 2–3 mm. Fruits not seen.

Based on its original description, *H. purpureum* is characterized by having inflorescences with few- to many-flowered cymes. Our collection of this species in Eastern Samar has solitary or few-flowered axillary cymes. The morphology of this specimen, however, is highly similar overall. Similar individuals having solitary and few-flowered inflorescences were observed from the Province of Cagayan, Luzon (Pelser et al. 2011).

Tribe Ophiorhizeae

*Ophiorrhiza acuminata* DC., Prodr. 4 (1830) 416.

**Materials examined.** Table 2. Fig. 3D

Small to medium-sized herb less than 1 m high, branching starts at upper portion of stem, forming dense cluster of leaves. Leaves elliptic, glabrous, membranous, apex strongly acuminate, base attenuate, somewhat decurrent. Inflorescence terminal cymes. Flowers white. Fruits loculicidally dehiscent.

The species was only known from its type locality at Sorsogon, Luzon. This species however, is regarded as a “dubious taxon” by Pelser et al. (2011) based on the accounts of Merrill (1923) wherein he indicated “the type is a specimen collected at Sorsogon, Luzon, by Haenke. I know the species only by description”. Nevertheless this species is accepted, and we were able to re-collect it outside its type locality.

*Ophiorrhiza camiguinensis* Elmer, LPB 5 (1913) 1881.

**Materials examined.** Table 2. Fig. 3C

Shrubs of about 60–80 cm high, very loose branching and leaves usually found at terminal ends. Leaves narrowly elliptic, 12–16 × 2–4.6 cm, glabrous but with sparse trichomes, distinctly red when dry. Inflorescences terminal, branching from a main axis, numerous flowers. Corolla white, red when dry. Fruits capsular, 1.5–2 mm wide, green, red when dry.

This Philippine endemic occurs on lowland primary forests in moist areas or along streams. It was previously observed only on Mindanao.

Tribe Pavetteae


**Materials examined.** Table 2. Fig. 4B

Medium-sized shrub about 3 m high. Leaves lanceolate, 10–12 × 4 cm subcoriaceous, and glabrous. Inflorescences axillary, solitary or in few-flowered glabrous cymes. Calyx turbinate, 2.5 mm. Corolla white, 2–3 mm. Fruits not seen.

Based on its original description, *T. luzoniensis* is very similar to *T. fornicaria*, but in its reproductive morphology, and individuals found near rivers have much smaller and narrower leaves compared to those found in dry areas.

*Hypobathrum purpureum* (Elmer) Merr., EPFP 3 (1923) 534.

**Materials examined.** Table 2.

Medium-sized shrub about 3 m high. Leaves lanceolate, 10–12 × 4 cm subcoriaceous, and glabrous. Inflorescences axillary, solitary or in few-flowered glabrous cymes. Calyx turbinate, 2.5 mm. Corolla white, 2–3 mm. Fruits not seen.

Based on its original description, *H. purpureum* is characterized by having inflorescences with few- to many-flowered cymes. Our collection of this species in Eastern Samar has solitary or few-flowered axillary cymes. The morphology of this specimen, however, is highly similar overall. Similar individuals having solitary and few-flowered inflorescences were observed from the Province of Cagayan, Luzon (Pelser et al. 2011).
Flowers numerous in umbel clusters, white to dirty-white. Fruits not seen.

This endemic species is widespread across the Philippines, thriving in lowland primary forests.

Tribe Prismatorideae


**Materials examined.** Table 2.

Tribe Psychotrieae


**Materials examined.** Table 2.

Epiphytic, myrmecophytic shrub about 60 cm high. Leaves oblong, 5–8 × 1–3 cm, coriaceous, glabrous. Inflorescences axillary. Flowers not seen. Fruits ovoid, 5 mm long, fleshy, red. This species occurs on Laguna, Sorsogon, and Leyte on lowland undisturbed forests. DENR-DAO (2017) classified this species under “Other
threatened species”, but its numbers may decline with the loss of its hosts due to deforestation.


**Materials examined.** Table 2. Fig. 7C


**Materials examined.** Table 2.

Medium-sized shrub about 2–3 m high. Leaves oblanceolate-oblong, 30–34 × 10–12 cm, coriaceous, glabrous. Inflorescences trichotomous, but appearing monochotomous, with many fruits. Flowers not seen. Fruits obovoid, dark purple, glabrous, 8 mm, with prominent longitudinal ridges. This species is very distinct from other species of Philippine *Psychotria* by its prominently large leaves and unique inflorescences.

This species was originally described from Samar. It was initially classified as a Critically Endangered or a possibly Extinct species (Sohmer and Davis 2007), so our rediscovery of this remarkable species is important.
Psychotria membranifolia Bartl. ex DC., Prodr. 4 (1830) 522.

Materials examined. Table 2. Fig. 6D


Materials examined. Table 2. Fig. 7E

Medium-sized shrub about 3 m high. Leaves oblanceolate, with hairs along the midrib below. Inflorescences monochotomously branching, puberulent. Flowers not seen. Fruits globose, 5–6 mm, glabrous, red or black. This species is endemic to both Samar and Leyte and had not been re-collected since its discovery. It is easily recognizable from other Psychotria species by its sessile inflorescence and its densely pubescent leaves.

Psychotria papillata (Merr.) Merr.

Materials examined. Table 2.

Shrub about 1–2 m high, very pubescent all throughout. Leaves elliptic, 8–10 × 2–4 cm, chartaceous, pubescent. Inflorescences terminal, sessile, pubescent. Flowers not seen. Fruits black, obovoid, 7–8 mm, pubescent. Psychotria papillata is one of the few species in the Philippines easily recognized by its sessile inflorescence and its densely pubescent leaves.

Psychotria radicans (Merr.) Merr., EPFP 3 (1923) 560.

Materials examined. Table 2.

Scandent shrub about 2 m high. Leaves oblong-lanceolate, 8–10 × 3–4 cm, subcoriaceous, glabrous. Flowers not seen. Fruits globose, 5–6 mm, glabrous, red or orange.

This species is endemic to both Samar and Leyte and had not been re-collected since its discovery. It is easily recognized from other Psychotria species by its climbing habit. The flower morphology remains unknown.

Psychotria wenzelii (Merr.) Merr. EPFP 3 (1923) 564.

Materials examined. Table 2.

Medium-sized shrub about 3 m high, glabrous throughout. Leaves elliptic to obovate, chartaceous. Inflorescence trichotomously-branching. Flowers white, 4 to 5-merous, glabrous outside, villlose within corolla tube. Fruits globose, smooth, orange to dark red or black.

According to Sohmer and Davis (2007), this species was collected only once in 1914 on Jaro, Leyte, which led to its status as a Critically Endangered or possibly Extinct. However, its presence on Samar is proof of an extended geographic distribution beyond its type locality. This species closely resembles P. pauciflora Bartl. ex DC but is distinguished by having sessile or subsessile flowers and fruits.

Tribe Schraderae


Materials examined. Table 2. Fig. 7D

Tall shrub about 5 m high. Leaves oblong-elliptic to lanceolate, thick and subcoriaceous, nerves not prominent on both sides. Inflorescence axillary, globose heads. Calyx truncate. Flower white, valvate. Fruits brownish, with calyx remnant.

This species is widespread on the Philippines, but this is the first report of its occurrence on Samar. It is commonly mistaken as a species of Morinda due to similar inflorescences. Only 2 Schradera species, both endemics, are currently recognized in the Philippines; S. elmeri Puff, Buchner & Greimler is restricted to the province of Davao in Mindanao. Schradera monophylla is easily recognizable from S. elmeri by its leaves that have inconspicuous nerves and fruitlets that appear to be completely free from each other.

Tribe Spermacoceae


Materials examined. Table 2.


Materials examined. Table 2.


Materials examined. Table 2. Fig. 5E

Hedyotis longipedunculata Merr., PJS 17 (1921) 430.

Materials examined. Table 2. Fig. 7B

Erect shrub about 1 m high. Leaves oblong-ovate, 6–10 × 2.5–5.5 cm, chartaceous, glabrous. Inflorescences axillary, in clusters of 3–7 flowers attached in of 7–8 cm long peduncles. Calyces tinged purple, corolla white. Fruits as globose to oval capsules crowned with calyx, 2.5–3 mm, purple.

This species occurs along streams or very moist, low elevation areas in primary forests. It was previously only recorded at its type locality on Catanduanes Island.

Hedyotis phanerophlebia Merr., PJS 8 (1913) Bot. 34.

Materials examined. Table 2. Fig. 5D

Small, erect shrub about 2 m high. Leaves oblong-ovate, 6–7 × 2–3 cm, somewhat chartaceous, nerves very prominent. Inflorescences terminal, paniculate. Corolla
white, 3–4 mm including lobes and tube. Capsules ovoid, 7 mm in diameter, with calyx remains present.

This species was previously only recorded on the province of Misamis Occidental, Mindanao, which is far south of Samar. This species thrives on Mount Malindang where it lives in mossy forests above 1700 m in elevation. The flowers of Samar plants are much smaller than those of the type specimen (6 mm).

*Spermacoce remotae* Lam., Tabl. Encycl. 1 (1792) 273.

**Materials examined.** Table 2. Fig. 6B

Tribe Urophyllae

*Antherostele grandistipula* (Merr.) Bremek., J. Arnold Arb. 21 (1940) 30.

**Materials examined.** Table 2. Fig. 5B

Tall shrub about 7–8 m high. Leaves oblong, 12–15 × 3–4 cm, coriaceous, base decurrent. Inflorescences axillary, in umbels of 2 to 4 flowers. Corolla light-green to white. Fruits globose to ovoid, 2 cm in diameter, green.

All members of the genus *Antherostele* are endemic to the Philippines. This species is occurs on Camarines Sur, Catanduanes, Samar, and Leyte, thriving in riverine habitats and along creek banks in forests. With a narrow geographic distribution which is restricted on the eastern side of the Philippine archipelago, it is thought to be Endangered (Obico and Alejandro 2012). It can be recognized from other *Antherostele* species by its very large subsistent stipules and very large fruits.

*Praravinia stenophylla* (Merr.) Bremek., J. Arnold Arb. 21 (1940) 44.

**Materials examined.** Table 2.

Tree about 2 to 3 m high. Leaves narrowly elliptic to linear-lanceolate, 12–13 × 1.2–1.5 cm, glabrous but with scattered trichomes. Inflorescences solitary, axillary. Calyx somewhat globose, 3 mm in diameter. Corolla valvate, white, lobes 3–5 mm, tube 1 mm. Fruits not seen. This species closely resembles *P. glabra* (Merr.) Bremek, another endemic species, but is easily distinguished by its very narrow leaves.

This species was previously recorded only on Luzon at the type locality, but our observation extends its geographic distribution to Samar.

*Praravinia triflora* (Quisumb. & Merr.) Bremek., J. Arnold Arb. 21 (1940) 47.

**Materials examined.** Table 2.

Tree about 3 m high, branches densely pubescent. Leaves elliptic, 14–15 × 3.5–5 cm, pubescent, especially on the nerves. Flowers not seen. Infructescences in clusters of 3 fruits, globose, 3–4 mm, puberulous.

This species was only known from its type locality in Cagaiturang, Aurora, eastern Luzon. Our new record from Eastern Samar might indicate an expanisive geographic distribution across the eastern portion of the Philippines. This species thrives along streams on low elevation primary or secondary forests.


**Materials examined.** Table 2. Fig. 5C

Small to medium-sized shrub about 2–4 m high. Leaves lanceolate to oblong-ovate, coriaceous. Flowers not seen. Infructescences axillary, solitary, fruits globose, red-orange, with calyx remnants.

This species was only known from its type locality on Mount Urdaneta on the province of Agusan del Norte, Mindanao, where it occurs in high elevation mossy forests. However, our record of this species in medium-elevation, primary rainforests of Eastern Samar might indicate a wider ecological preference. This species closely resembles *Urophyllum memecyloides*, another species also found in Eastern Samar, but differs in its much smaller leaves.

Tribe Vanguerieae

*Canthium glandulosum* (Blanco) Merr., PJS 35 (1928) 8.

**Materials examined.** Table 2.

Shrub about 1 m high. Leaves lanceolate to obovate, 5–6 × 2 cm, glabrous. Flowers not seen. Infructescences axillary, in clusters of 2 to 3 fruits, globose, 2 mm, glabrous.

This Philippine endemic is recorded throughout the country, occurring in low- or medium-elevation, primary or secondary forests.


**Materials examined.** Table 2.

Shrub about 1 m high. Leaves elliptic to obovate, 12 × 6 cm, glabrous, bases decurrent. Flowers not seen. Infructescences axillary, in clusters of 3–5 fruits, 6–8 mm wide, globose, single or didymous, orange, glabrous.

This species is only known from its type locality on Mount Bulusan in Sorsogon Province. Our observation represents a new record for this species beyond its type locality.


**Materials examined.** Table 2. Fig. 4D

Shrub about 2 m high, branches droop down. Leaves oblanceolate, 10 × 3 cm, glabrous, coriaceous. Flowers not seen. Infructescence axillary, solitary, attached to 1 cm long peduncle, obovate, 10 mm in diameter, orange, glabrous.
This species was only known from its type locality on Mount Guiting-guiting on Sibuyan Island, Romblon, occurring in forests along streams. Its presence on Eastern Samar suggests an extended distribution across the Visayas Islands.

Discussion

The geological history of Samar-Leyte landmass gave rise to its highly unique and endemic flora. Its connection with Sorsogon on the north, Surigao del Norte through Dinagat island on the south, and Bohol during the Miocene Period resulted in the distribution of similar species. Only during the Post-Pleistocene period were the land connections were broken and, consequently dividing them into individual islands harboring a gradient of unique habitats and environments (Samson 1979). This drove the evolution of a rich diversity of Rubiaceae species which today occur on Eastern Samar.

We found several species that were previously documented only at their type localities outside of Eastern Samar. Thus, these records represent important new data for both Eastern Samar and for understanding the geographic distributions of these endemic species in the Philippines. Although only a single voucher for each species was taken, this does not imply that only a single individual of that particular species was observed by us. Some rare species were only encountered once or a few times during the survey.

The tribe Naucleeae had the most species found in our survey. These are easily distinguished from other Rubiaceae genera by having spherical inflorescences (Ridsdale 1979, Löfstrand et al. 2014). Members of the genus Uncaria Schreb. are tropical woody lianas, easily recognized by its hooks formed from reduced, modified branches (Ridsdale 1978). The Uncaria species observed contribute in part of the forest canopies, and of the 5 species recorded, none are endemic to the Philippines. The tribe’s largest genus, Neonauclea Merr., contains 16 species in the country and 10 of those are endemic. They occur as trees and shrubs with deciduous and highly ornate calyx lobes borne on well-developed appendages (Ridsdale 1989). Neonauclea tends to thrive along forest and river edges and in ravines and clearings at our surveyed sites. Four Neonauclea species were identified, with 3 of them endemic to the Philippines.

The genera Exallage Bremek., Hedyotis L., and Spermacoce L. belong to the complex tribe Spermococceae. This comprises an herbaceous lineage characterized by fimbriate stipules and four-merous flowers (Bremer and Manen 2000, Robbrecht and Manen 2006, Groeninckx et al. 2009). Presently, some generic delimitations within the tribe remain problematic and require taxonomic revision (Neupane et al. 2015). In the present survey, 6 species recorded belong to the tribe Spermococceae, with 2 that are Philippine endemics. These species occur on humus-rich soil, ultramafic soil, and moist areas within the densely forested areas of our study sites. They are at abundant on the forest floor but are threatened, especially the locally-adapted species such as Hedyotis longipedunculata Merr. and H. phanerophlebia Merr., which are known to be recorded previously only on Catanduanes and Misamis Occidental, respectively.

Psychotria L. is perhaps the world’s largest predominantly woody genus (Davis et al. 2001) comprised of approximately 2000 species (Sohmer 1998), which are chiefly distributed in the Paleotropics. In the Philippines, 112 species are currently recognized by Sohmer and Davis (2007) in their revision of the genus within the archipelago. However, more than half are assumed extinct in the wild due to rapid habitat losses (Koopowitz et al. 1998, Sohmer 2001). In our study, we found Psychotria as woody shrubs to small trees in primary or secondary vegetation. Five endemic species, P. conglomeratifolia, P. papillata, P. paloensis, P. radicans, and P. wenzeli are threatened (Sohmer and Davis 2007), with the P. conglomeratifolia and P. wenzeli considered possibly extinct. We have now re-collected this species and can confirm that it is not extinct.

The genus Greeniopsis Merr. is one of the few Philippine-endemic Rubiaceae genera, along with Antherostele Bremek. and Villaria Rolfe, recorded on Samar Island, and their presence on the island is associated to the geological history of the Samar-Leyte landmass (Madulid 2000). The genus Villaria unfortunately, was not encountered at our study sites. Greeniopsis is comprised of 6 species (Alejandro et al. 2010, Uy and Alejandro 2012), whereas the genus Antherostele is comprised of 5 species (Obico and Alejandro 2012, 2013). The species of Greeniopsis and the sole Antherostele representative, A. grandistipula, were observed within densely forested areas especially on humus-rich and ultramafic soils. Both genera are highly threatened due human-mediated pressures through land alterations and deforestation and thus warrant immediate protection from local extinction.

The pantropical Ixora L. constitutes one of the largest Rubiaceae genus in the Philippines comprising of 34 species of woody shrubs and trees, with 25 endemic species (Banag et al. 2015, 2017). Almost all Ixora have narrow ecological tolerances and are restricted to rainforest habitats (De Block 1998), as we observed. A recent study by Banag et al. (2015) revealed that Philippine endemic Ixora prefer narrow temperature and wider precipitation niches. The endemic I. bartlingii Elmer will have an expected range shift in their distribution southwards under predicted future climate scenarios.

Species such as Wendlandia luzoniensis D.C., Dolicholobium philippinense Trelease, Aidia pulcherima (Merr.) Ridsdale, Schradera monocophala Puff, Buchner & Greimler, Ophiorrhiza acuminata DC., Tarenna luzoniensis (S. Vidal) Bremek., Praravinia stenophylla (Merr.) Bremek., Urophyllum memecyloides (C. Presl) S. Vidal, U. urdanetense Elmer, and Pyrostria elmeri (Merr.) Arriola, Meve, Alejandro were collected mainly within forested areas generally unscathed by human
disturbances. However, continuous decrease in the sizes of these endemic species’ natural populations in their native vegetation is expected to proceed as land is developed by local people. Nevertheless, some endemic species, such as *Timonius philippinensis* Merr., *Ophiorhiza camiguinensis* Elmer, and *Mussaenda vidalii*, were observed in areas where human influence is extreme, such as the beach forests of the Minasangay Eco-park, a well-known tourist attraction and forest edges and field borders.

Occurrence reports of rare species, especially for narrow endemic taxa, are almost a century old. Thus, our rediscovery of these species extend their geographic distributions beyond their type localities and confirms that they are not yet extinct. Our new data on these endemic taxa are particularly important for evidence-based conservation management of the Eastern Samar flora.

Samar Island experienced one of the greatest forest loss within terrestrial protected areas in the country next to Palawan, experiencing a cumulative total of forest loss of 2.79% of its 442,095 ha forest area between 2000 to 2012 (Apan et al. 2017). In this context, losses in biodiversity will continue to rise as deforestation continues on Samar Island. It is crucial that more studies are made that can provide baseline information on the distribution, ecology, and biology of Rubiaceae, as well as other plant families. Updated floristic inventories and vegetation diversity analyses over time will aid in the identification of specific areas that will become priorities for conservation and protection. Optimistically, this will translate into valuable information for policy formulation and management in the conservation of the remaining biodiversity of Samar Island, and ultimately, the entire Philippine archipelago.

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Authors’ Contributions

All authors contributed to the research activities accomplished in the project, including the fieldwork and manuscript preparation. Specifically, JAO, NAP, RR, and CB-M conducted the field collections, species identifications, data analysis, and writing. GA and CB-M supervised the work.

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