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Front cover: Sarracenia “Richard’s Red” by S. Morley
Back cover: Landscape at Jarain by Henry Noltie
Since the last issue in January 2020, most of us have spent more time at home with our plants than we were expecting. Thank you, covid-19! This number of Planta Carnivora leads with an article by Stephen Morley describing a remarkable cultivar of Sarracenia that he has selected, “Richard’s Red”. We have a short biography of Michal Golos, researching his PhD with Ulrike Bauer at the University of Bristol on the biomechanics of Nepenthes, and who has long been passionate about carnivorous plants especially Nepenthes and Heliamphora, cultivating a superb collection at his home. Recently he was lead author of a paper describing the new species Nepenthes fractiflexa from Borneo (Golos et al. 2020). In an earlier number we had a biography of Bruce Murphy, also researching Nepenthes for his PhD, but at the Royal Botanic Gardens, Kew and Imperial College, London. He has just published the first near-comprehensive species level phylogenomic study of Nepenthes treating 151 taxa of the 180 species currently accepted (Murphy et al. 2020). If you are interested in evolution of Nepenthes, this paper is for you!

Most of this volume is filled by three papers on Nepenthes. The first is led by Pak Mansur, from the Bogor Herbarium in Java, Indonesia’s main botanical research centre. He is supported by co-authors from Indonesia, and Francis Brearley of Manchester Metropolitan together with colleagues from Chester Zoo, famous for its superb live collection of Nepenthes species. This paper reports on the ecology, relative frequency, and ethnobotany of ten sorts of Nepenthes, including the threatened N. bicalcarata, in the Mandor Reserve of lowland Kalimantan (Borneo). Like so many protected areas, Mandor has seen massive destruction of its habitat, in this case due to gold mining. Henry Noltie of the Royal Botanic Garden, Edinburgh, noted scholar of Indian botanical history provides the final two papers, both on Nepenthes khasiana, the sole Indian species of the genus. His first paper explores the discovery by Europeans and first illustration of Nepenthes khasiana in the 1820s at the time of the British East India Company, at which point it was thought there was but a single species in the genus, N. distillatoria. It was to be about 50 years before Kew’s Joseph Hooker revealed that this Indian plant was a distinct species and gave it the name by which we know it today. From researching the deep history of our discovery of this species, Henry then takes us with him for a quick visit to the Jaintia Hills to see the plant in the wild in the final article of this issue.


Origins
This Sarracenia cultivar originated from seed from a cross made by fellow enthusiast Adrian Fawcett. Several years ago, Adrian did a cross between Sarracenia oreophila var ornata “Sand Mountain” and S. flava var atropurpurea “Blackwater”, and distributed the seed widely within the Carnivorous Plant community in the UK. I germinated some of the seed, and grew it on and eventually selected several good clones from the batch of seedlings, distilling this down to what I consider to be the best plant, which happened to be clone #3 in my naming system.

Characteristics
Sarracenia ‘Richard’s Red’ inherits the early season pitcher production characteristic from its S. oreophila parent, and is often the first plant to pitcher in my greenhouse. Pitcher shape is intermediate between the two parents (Fig. 1).

Pitchers are smooth, stocky and self supporting, with a very wide mouth and the pitcher tubes flare rapidly up to the mouth. The pitchers are suffused with red before they open, initially being light red with a golden-green lip and lid when they first open, with a pronounced network of veins in the lid and throat (Fig. 2). The pitchers then quickly colour up further in full sun, eventually becoming very dark, purply-red, with an iridescent sheen, especially towards the throat area (Fig. 3). Cameras do not seem to capture the colour well, and usually show it as a mid-red.

Pitchers grown up to 70 cm tall for me, with a mouth up to 9 cm diameter.

The hybrid thankfully does not inherit the early season dieback from the S. oreophila parent, and produces good growth throughout the season, and phyllodia in the autumn.
Cultivation
This hybrid is extremely vigorous, and quickly produces large rhizomes and multiple growth points, and propagates easily from division and cuttings.

To preserve the unique characteristics of the plant, *Sarracenia* ‘Richard’s Red’ should only be propagated vegetatively.

Etymology
The cultivar is proposed as *Sarracenia* ‘Richard’s Red’, named after my beloved brother who died in 2016 after a heroic battle against an aggressive cancer. Anyone who has received a plant from me labelled “*Sarracenia oreophila* Sand Mountain x *S. flava* var. *atropurpurea* Blackwater clone 3” can relabel it ‘Richard’s Red’.
Michal R. Golos is a biologist from London whose interests principally concern the functional morphology, evolution and animal–plant ecology (particularly carnivory and ecological facilitation) of Heliamphora and Nepenthes.

Fascinated by carnivorous plants from a young age, Michal has maintained a live collection of pitcher plants since the late 1990s. Having first observed Nepenthes in their natural habitat in Borneo in 2005, Michal has gained field experience with a number of carnivorous plant genera, including Nepenthes throughout Southeast Asia, particularly Borneo (Fig. 1) and Sumatra, Drosophyllum in Morocco and Spain, as well as Heliamphora, Brocchinia, Catopsis, Drosera, Genlisea and Utricularia in Venezuela, visiting nine tepuis (Fig. 2), and Brazil. In his spare time he contributes pages on Nepenthes to Wikipedia.

Michal has a BSc. in Biology and a MSc. in Taxonomy and Biodiversity, both from Imperial College London. Subsequently he was employed at University College London. In October 2018 he started a PhD on the biomechanics of Nepenthes and Heliamphora traps under the supervision of Dr. Ulrike Bauer at the University of Bristol. He hopes this will be a first step towards turning a lifelong passion into an academic career.
A detailed ecological and ethnobotanical survey of *Nepenthes* was undertaken in Mandor Nature Reserve, West Kalimantan, Indonesia in January 2018. Forty 100 m² quadrats were surveyed along eight transects. Three habitats supported *Nepenthes* populations: peat swamp forest (five transects), heath forest (*kerangas*) (two transects) and swamp forest (one transect). A total of ten *Nepenthes* taxa (six species and four natural hybrids) are reported from the reserve. In the plots, *Nepenthes ampullaria* was the most abundant species followed by *N. gracilis*, *N. rafflesiana*, *N. x mirabilis*, *N. bicalcarata*, *N. x hookeriana*, *N. rafflesiana x N. mirabilis*, *N. reinwardtiana* and *N. ampullaria x N. mirabilis*; *N. bicalcarata x N. gracilis* was also found outside the plots. Forty-nine tree species were recorded in the *Nepenthes* habitat of which *Cratoxylum glaucum* dominated; the trees were generally small and of low stature. Whilst most local people do not know the individual species by name, they are aware of *Nepenthes* plants and use them for a variety of household and medicinal purposes, and consider that the numbers of *Nepenthes* are declining in the area concurring with forest loss due to illegal gold mining in recent decades. We discuss our results in the light of forest conservation in Borneo.

**Key words:** Borneo, diversity, ethnobotany, Indonesia, *Nepenthes*, Mandor Nature Reserve, population

**Introduction**

The Palaeotropical pitcher plants belong to the genus *Nepenthes*. They are climbing, dioecious plants with a pitcher whose function is to trap insects or other small animals to digest their nutrients in order to meet their nutritional needs, especially for nitrogen (Brearley & Mansur, 2012). They generally grow in wet tropical forest environments in poor soils and are distributed from Madagascar and Sri Lanka to Indochina and South-east Asia through to northern Australia and to the Louisiade islands of Papua New Guinea.

In 1980, 80 species were recognized (Phillips & Lamb, 1996), by 2001 this number increased to 87 species (Clarke, 2001) and in 2012, to 139 species (Mansur, 2013). Now, there are over 180 species recognized (Murphy et al., 2020) and within the last ten years, ten new species have been found in Indonesia alone, namely: *N. epiphytica* from Kalimantan (Robinson et al., 2011a), *N. monticola* from Papua (Robinson et al., 2011b), *N. nigra* (Nerz et al., 2011), *N. undulatifolia* (Lee et al., 2011), *N. maryae* (Cheek & Jebb, 2016a) and *N. minima* (Cheek & Jebb, 2016b) from Sulawesi, *N. halmahera* and *N. weda* (Cheek, 2015) from Maluku, *N. biak* (Cheek et al., 2018) from Papua and *N. fractiflexa* (Golos et al., 2020) from Kalimantan, so that...
Indonesia now hosts about 45% of the world's total *Nepenthes* species. Kalimantan, in Indonesia, is one of the richest regions with a number of endemic species including *N. ciliate*, *N. veitchii*, *N. lowii*, *N. ephippiata*, *N. hemsleyana* and *N. bicalcarata* (Damayanti et al., 2011).

Ethnobotany is the study of the traditional knowledge and customs related to plants and their uses and it has a long history, particularly in tropical regions where usage of natural products from forests remains an important practice. Understanding the particular importance of forest products to local communities can play a role in conservation through developing sustainable forest management techniques and involving local people in conservation (Prance, 2000). Whilst there are a large number of studies on the use of various forest products from Indonesia, *Nepenthes* have been little studied in this regard despite their common occurrence (Sanusi et al., 2017).

Various threats to Indonesian forest habitats include annual forest fires during the dry season, conversion of forest areas into agricultural land and oil palm plantations, illegal gold mining, illegal logging and excessive direct exploitation (Gaveau et al., 2014), which leads to a reduction in population and diversity of *Nepenthes* in Kalimantan, especially the endemic species that require certain conditions for growth and survival; such prolonged stress on the habitats of *Nepenthes* may cause species extirpation or even extinction.

The purpose of this study is to record the diversity and population of *Nepenthes* species in Mandor Nature Reserve, to examine local uses of *Nepenthes* and to look at the condition of their habitat at the present time in the hope that the results can be used to lay the ground for in-situ and ex-situ conservation efforts and that the forest can be maintained and protected in the future.

**Material and Methods**

The study was conducted between 15 and 20 January 2018 in Mandor Nature Reserve, Mandor district, Landak regency in West Kalimantan, Indonesian Borneo (Figure 1a). We conducted an inventory of *Nepenthes* and associated tree species in their habitats at Mandor by surveying the areas of peat swamp forest, heath forest (*kerangas*) and in an open area formerly damaged by illegal gold mining. In each habitat, transects were made consisting of five quadrats of 10 x 10 m spaced 20 m apart, with a total of 40 plots (25 in peat swamp forest, 10 in heath forest and 5 in the open area) covering a total area of 4000 m² (0.4 ha). In each plot, we recorded the species name, stem diameter and height for both *Nepenthes* and associated tree species, for analysis of composition, population and structure. We collected herbarium specimens from each species within the plots and identified them at Herbarium Bogoriense. The identity and nomenclature of each tree species follows *Flora Malesiana* (van Steenis et al., 1948-2013).

We calculated the relative density (RD) as the percentage of individuals in each species against the total number of individuals, the relative frequency (RF) as the percentage of the number of quadrats a species was found in against the total frequency of all species and the relative dominance (RDo) as the percentage basal area (BA) occupied by each species where BA = (½D)²π and D = stem diameter. The sum of RD, RF and RDo denotes the importance of a species in the plot and is designated as the Importance Value (IV) (Cox, 1967; Mueller-Dombois & Ellenberg, 1974). We calculated the tree biomass as = aDᵇ, where D was stem diameter and a and b were constants of 0.19 and 2.37, respectively (Brown, 1997; Sutaryo, 2009).

To obtain ethnobotanical data on *Nepenthes*, ten respondents from Mandor Village from various professions (e.g. village head, traditional leaders, employees, traders, farmers and students) were interviewed by means of questionnaires.
Results and Discussion

Habitat Condition

Based on 2006 and 2017 Landsat image maps, damage to the Mandor Nature Reserve is estimated at 57.7% of the total area of 3080 hectares (Figure 1b), which has increased from 48.2% in 2006, much of this is due to illegal gold mining by the local community within the last two decades. In 2015, gold mining was banned by the local government and, currently, in some locations, pioneer plant species have grown indicating the process of succession is beginning (Figure 2). *Nepenthes* were found within three habitats in the study site, namely peat swamp forest, heath forest (*kerangas*) and swamp forest (Figure 3).

![Fig 1b. Map of Mandor Nature Reserve (West Kalimantan, Indonesian Borneo) forest in 2017.](image)

![Fig 2. Present regenerating condition of Mandor Nature Reserve in West Kalimantan, Indonesian Borneo a and b](image)
Nepenthes species and population

We recorded a total of ten *Nepenthes* taxa comprising six species and four natural hybrids (Figure 4a-j). Nine taxa were recorded in the quadrats (Table 1) with one additional taxon recorded outside them, i.e. *N. bicalcarata x N. gracilis*. This was fewer species than reported by Mansur & Brearley (2008) in heath forests of Barito Ulu in Central Kalimantan (eight) but more than the peat swamp forest of Sebangau, also in Central Kalimantan (three; Mansur, 2008). *Nepenthes ampullaria* was the most abundant species with an Importance Value (IV) of 103.3, followed by *N. gracilis* (IV = 59.8) and *N. rafflesiana* (IV = 49.1). All of these three species were widespread in the study site, whilst *N. bicalcarata* and *N. reinwardtiana* grew clustered in the peat swamp forest habitat. The largest population was recorded for *N. ampullaria* with 386 individuals in the total sampled area of 0.4 hectare, followed by *N. gracilis* (313) and *N. mirabilis* (153), while *N. bicalcarata* and *N. reinwardtiana* were recorded with only small populations, i.e. 31 and 8 individuals, respectively. Natural hybrids such as *N. ampullaria x N. mirabilis*, *N. rafflesiana x N. mirabilis* and *N. x hookeriana* (ampullaria x rafflesiana) generally had small numbers of individuals (Table 1). Whilst five of the species we found are broadly distributed within lowland habitats of Kalimantan, *N. bicalcarata* is limited to peat swamps of northern Borneo where it has a fascinating symbiotic association with ants (Bazile et al., 2012). It was reported that there was previously a large population of *N. bicalcarata* at Mandor (Damayanti et al., 2011) but this now appears to be declining. In terms of their conservation status, the five broadly-distributed species are considered as Least Concern by the IUCN whereas *N. bicalcarata* is classified as Vulnerable and is protected under Indonesian law. Nevertheless, it is still promising that most of these species may recover following severe disturbance after gold mining as found by Setiawan et al. (2018); whilst they did not record *N. reinwardtiana* they did find *N. bicalcarata*, which is of greater conservation concern, to recover.

### Table 1. Density (D), Frequency (F), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Dominance (RDo) and Importance Value (IV) of nine *Nepenthes* taxa within 0.4 ha sampling area at Mandor Nature Reserve, West Kalimantan, Indonesian Borneo.

<table>
<thead>
<tr>
<th>Nepenthes taxa</th>
<th>D</th>
<th>F</th>
<th>BA (cm²)</th>
<th>RD (%)</th>
<th>RF (%)</th>
<th>RDo (%)</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>ampullaria</em></td>
<td>386</td>
<td>7</td>
<td>164.21</td>
<td>37.26</td>
<td>17.95</td>
<td>48.10</td>
<td>103.30</td>
</tr>
<tr>
<td><em>gracilis</em></td>
<td>313</td>
<td>8</td>
<td>30.83</td>
<td>30.21</td>
<td>20.51</td>
<td>9.03</td>
<td>59.76</td>
</tr>
<tr>
<td><em>rafflesianna</em></td>
<td>133</td>
<td>7</td>
<td>62.65</td>
<td>12.84</td>
<td>17.95</td>
<td>18.35</td>
<td>49.14</td>
</tr>
<tr>
<td><em>mirabilis</em></td>
<td>153</td>
<td>5</td>
<td>25.39</td>
<td>14.77</td>
<td>12.82</td>
<td>7.44</td>
<td>35.02</td>
</tr>
<tr>
<td><em>bicalcarata</em></td>
<td>31</td>
<td>3</td>
<td>45.51</td>
<td>2.99</td>
<td>7.69</td>
<td>13.33</td>
<td>24.01</td>
</tr>
<tr>
<td><em>x hookeriana</em></td>
<td>8</td>
<td>5</td>
<td>7.34</td>
<td>0.77</td>
<td>12.82</td>
<td>2.15</td>
<td>15.74</td>
</tr>
<tr>
<td><em>reinwardtiana</em></td>
<td>8</td>
<td>1</td>
<td>4.08</td>
<td>0.77</td>
<td>2.56</td>
<td>1.20</td>
<td>4.53</td>
</tr>
<tr>
<td><em>rafflesianna x mirabilis</em></td>
<td>3</td>
<td>2</td>
<td>1.20</td>
<td>0.29</td>
<td>5.13</td>
<td>0.35</td>
<td>5.77</td>
</tr>
<tr>
<td><em>ampullaria x mirabilis</em></td>
<td>1</td>
<td>1</td>
<td>0.20</td>
<td>0.10</td>
<td>2.56</td>
<td>0.06</td>
<td>2.72</td>
</tr>
<tr>
<td>Total</td>
<td>1036</td>
<td>39</td>
<td>341.41</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Forest Habitat**

The habitat type at the study site is secondary forest with generally flat topography with either alluvial or podzolic soils. In the 0.4 ha area there were 455 trees (diameter > 5 cm) divided into 49 species, 35 genera and 21 families with a total basal area of 8.3 m² and a biomass of 21.2 tonnes. The diversity of tree species was categorized into a medium level by the Shannon ($H'$) diversity index of 1.3. Based on the Importance Value (IV), there were five dominant tree species in the *Nepenthes* habitat: *Cratoxylum glaucum* (IV = 87.2), *Gymnostoma nobile* (IV = 26.7), *Lithocarpus elegans* (IV = 18.6), *Cryptocarya ferrea* (IV = 12.8) and *Ploiarium alternifolium* (IV = 12.3) (Table 2). The distribution of the tree trunk diameter classes indicated that the habitats are dominated by thin-trunked individuals (77 %) which are less than 10 cm in diameter and then the number decreases with increasing diameter class (Figure 5a); this is typical for nutrient-stressed environments such as the peat swamp and heath forest habitats found here (Miyamoto et al. 2007; Mirmanto 2010). The smaller trees (< 10 cm dbh) are dominated by *Cratoxylum glaucum* and *Ploiarium alternifolium*, while larger trees (>10 cm dbh) are dominated by *Cratoxylum glaucum* and *Gymnostoma nobile*.
Fig 4. Nepenthes species and their natural hybrids in Mandor Nature Reserve, West Kalimantan, Indonesian Borneo:

a: N. rafflesiana (lower pitcher);
b: N. mirabilis (upper pitcher);
c: N. bicalcarata (lower pitcher);
d: N. reinwardtiana (upper pitcher);
e: N. ampullaria;
f: N. gracilis (upper pitcher);
g: N. x hookeriana (lower pitcher);
h: N. rafflesiana x N. mirabilis (upper pitcher);
i: N. x hookeriana (upper pitcher);
j: N. ampullaria x N. mirabilis (lower pitcher).

Photos by M. Mansur.
The two species with the greatest trunk diameter were *Gymnostoma nobile* (38.8 cm) and *Shorea pinanga* (30.6 cm). The height distribution of trees recorded 79% of the trees with a height of less than 10 m, 20% with height between 10 to 20 m and only 1% greater than 20 m in height (Figure 5b); *Gymnostoma nobile* was the tallest tree at 27 m.

**Table 2.** List of ten dominant tree species (diameter > 5 cm), Basal Area (BA), Relative Density (RD), Relative Frequency (RF), Relative Dominance (RDo), and Importance Value (IV) in habitat of *Nepenthes* species in Mandor Nature Reserve, West Kalimantan, Indonesian Borneo.

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Family</th>
<th>BA (m²)</th>
<th>RD (%)</th>
<th>RF (%)</th>
<th>RDo (%)</th>
<th>IV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Cratoxylum glaucum</em></td>
<td>Hypericaceae</td>
<td>1.272</td>
<td>41.978</td>
<td>6.931</td>
<td>38.268</td>
<td>87.177</td>
</tr>
<tr>
<td><em>Gymnostoma nobile</em></td>
<td>Casuarinaceae</td>
<td>0.562</td>
<td>4.835</td>
<td>4.950</td>
<td>16.910</td>
<td>26.696</td>
</tr>
<tr>
<td><em>Lithocarpus elegans</em></td>
<td>Fagaceae</td>
<td>0.198</td>
<td>7.692</td>
<td>4.950</td>
<td>5.941</td>
<td>18.584</td>
</tr>
<tr>
<td><em>Cryptocarya farrea</em></td>
<td>Lauraceae</td>
<td>0.167</td>
<td>4.835</td>
<td>2.970</td>
<td>5.023</td>
<td>12.829</td>
</tr>
<tr>
<td><em>Ploiarium alternifolium</em></td>
<td>Bonnetiaceae</td>
<td>0.069</td>
<td>5.275</td>
<td>4.950</td>
<td>2.060</td>
<td>12.285</td>
</tr>
<tr>
<td><em>Elaeocarpus griffithii</em></td>
<td>Elaeocarpaceae</td>
<td>0.069</td>
<td>4.176</td>
<td>4.950</td>
<td>2.088</td>
<td>11.214</td>
</tr>
<tr>
<td><em>Castanopsis javanica</em></td>
<td>Fagaceae</td>
<td>0.120</td>
<td>2.418</td>
<td>2.970</td>
<td>3.606</td>
<td>8.994</td>
</tr>
<tr>
<td><em>Syzygium clavatum</em></td>
<td>Myrtaceae</td>
<td>0.056</td>
<td>1.319</td>
<td>4.950</td>
<td>1.682</td>
<td>7.951</td>
</tr>
<tr>
<td><em>Vatica rassak</em></td>
<td>Dipterocarpaceae</td>
<td>0.049</td>
<td>3.516</td>
<td>2.970</td>
<td>1.463</td>
<td>7.950</td>
</tr>
<tr>
<td><em>Rapanea hasseltii</em></td>
<td>Primulaceae</td>
<td>0.054</td>
<td>1.758</td>
<td>3.960</td>
<td>1.623</td>
<td>7.342</td>
</tr>
</tbody>
</table>

**Ethnobotany**

The results of the ethnobotanical interviews found that all of the Mandor villagers interviewed generally know what a pitcher plant is with local names of *entuyut* (50%) and *kerukun* (20%). In terms of identifying individual species, however, only 10% of people know the majority of species and 10% know some species of pitcher plants, whilst the remainder do not know the individual species. Ninety percent of the Mandor villagers stated that the *Nepenthes* population around their village have been reduced in number compared to 10 years ago and they attributed this to changes in forest area (50%), illegal logging (20%), illegal mining (20%) and forest fires (10%). Local people commonly use *Nepenthes* pitchers to cook rice (70%), the roots and pitcher liquid as medicines (20%) and the stems as straps or binding (10%). Schwallier *et al.* (2015) describe the cooking of rice snacks using *Nepenthes* in more detail. The roots of the plant are used for skin conditions such as scabies or ringworm (20%), while the liquid from the enclosed pitcher is used as cough medicine (10%) and eye drops.
(10%). Only 10% of local people know that the pitcher plant can be sold as ornamental plants. There were no cultural stories or rituals reported to use *Nepenthes*. Our results concur with a similar set of reported uses from Sintang Regency in Kalimantan where local people also used *Nepenthes* stems for dyes and hang pitcher plants by their longhouse doors for good luck/protection (Setiawan et al. 2015).

**Conclusion**

The destruction of *Nepenthes* habitat in the Mandor Nature Reserve is still present. We found six species (and four hybrids) at the study location and the population of *Nepenthes bicalcarata* is of particular concern as it a species endemic to Borneo and its population appears to be declining. Therefore, we propose ex-situ conservation efforts by generative or vegetative cultivation and in-situ conservation through habitat protection to avoid the loss of this species from Kalimantan.

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**References**


In the library of the Royal Botanic Gardens, Kew I have recently been cataloguing the collection of drawings commissioned by Nathaniel Wallich between 1817 and 1828, the first period during which he permanently held the post of Superintendent of the Calcutta Botanic Garden. The collection was previously dispersed among the worldwide taxonomic sequence of drawings, divided into two parts: the smaller sheets kept in the herbarium, the larger ones in the library. Until reassembled the scale and importance of the Wallich collection was barely suspected, but it can now be said to number about 1020 drawings, though a few more probably still await discovery. In terms of Indian botanical history and taxonomic significance the collection is second in importance only to the Roxburgh Icones, and in terms of artistic merit the work of Wallich’s artists far surpasses that of Roxburgh’s. The drawings have now been restored to their two original series – Wallich’s ‘working set’ of about 820, which bear the misleading annotation ‘Royle, Carey & Others’ (‘RCO’, a designation added after they arrived at Kew, on the dispersal of the India Museum and Library, in 1879), and 200 annotated ‘Wallich 1828 East India Co.’. Within each series the drawings have been placed in their Angiosperm Phylogeny Group (APG) families and the families arranged alphabetically; each drawing has been given a unique reference number so that for the first time they can be cited in an unambiguous manner.

Though uncatalogued, the latter series was known and had been studied taxonomically in 2010/11 as part of the project ‘Wallich and Indian Natural History’, a collaboration between Kew, the Natural History Museum and British Library as part of the ‘World Collections Programme’. The ‘1828’ series turns out to represent a set of fine drawings presented to the British East India Company (EIC) library when Wallich travelled to London in July 1828. In the ensuing four-year leave Wallich would curate the vast herbarium he had assembled in Calcutta; prepare the first five parts of a lithographed catalogue of the collection (the ‘Numerical List’ or ‘Wallich Catalogue’), and select 296 of the working drawings for lithography by Maxim Gauci. These were published, hand-coloured, with text by himself and other leading botanists (notably C.G.D. Nees von Esenbeck and George Bentham), as the three volume, glorious, large-folio work Plantae Asiaticae Rariores.

The names of the artists are not given on the drawings, but Wallich recorded the names of two of them, his head painters, Vishnuprasad (also spelt Vishnupersaud) and Gorachand, on the plates of Plantae Asiaticae Rariores. It is known, however, that by 1827 there were about 20 artists in the Botanic Garden team, of whom seven (including Vishnuprasad – Gorachand had died in Burma in 1826) were lent to J.F. Royle to work at Saharanpur while Wallich was in Britain. The fine set is doubtless the work of the same artists as the ‘working set’ and are among the greatest glories of Indian botanical art.

Among the drawings recently catalogued two depict a Nepenthes (accession numbers WRCO.475 [Fig. 1] and W1828.83 [Fig. 2] respectively), one of many examples where a plant is represented by a version in both ‘RCO’ and

![Fig 1. The probable earliest drawing of Nepenthes khasiana (Acc. No. WRCO 475, with dissections and many annotations). Photo by Henry Noltie](image-url)
‘1828’ series. Not only is the plant one of the more interesting depicted, but the drawings also demonstrate the possibility of restoring ‘missing data’ by re-establishing the link with material in the ‘Wallich Herbarium’, a process started by Tim Utteridge and Clare Drinkell of RBG, Kew, at least for the ‘1828’ drawings, as part of the Wallich Project.

The original drawing is undoubtedly the ‘RCO’ one and is unfinished (Fig. 1). Many of the leaves have only washes of ‘under-painting’, but enough is completed, both of the leaves and the flowers in the lower part of the inflorescence, which would have allowed for its completion at some later date. The sheet of English made paper is annotated on the verso, in Wallich’s hand, with the name ‘Nepenthes distillatoria Linn.’ – the name then generally applied to Indian and SE Asian pitcher plants. In the late 19th century, however, the Kew botanist W. Botting Hemsley ("W.B.H.") added the annotation ‘cfr. Khasyana H.f.’ (Fig. 3), by which he meant N. khasiana, the endemic NE Indian member of the genus, described by Joseph Hooker in 1873 almost half a century after the drawing was made. Martin Cheek has confirmed that this is indeed the identity of the plant shown in the drawings. The ‘1828’ version is on a grander scale but, unlike most of this collection, is also unfinished (Fig. 2). More of the leaves have been fully coloured than in the ‘original’, but the inflorescence is entirely in ‘undercoat’.

As is the case with the vast majority of the collection, the Nepenthes drawings bear no locality information, but further information can be gained by consulting the ‘Wallich Catalogue’ (via the excellent online version made by Mark Watson at the Royal Botanic Garden Edinburgh. http://wallich.rbge.info/) and specimens in the ‘Wallich Herbarium’. Although Wallich’s name is not unreasonably associated with both Herbarium and Catalogue, it is worth pointing out that the name of the collection is actually the ‘Herbarium of the Honorable East India Company’ and the title of the catalogue ‘A Numerical List of Dried Plants in the East India Company’s Museum’. The Herbarium was assembled in the Calcutta Botanic Garden by Wallich in the 1820s mainly by himself and his collectors, but included some earlier collections including ones from the Tranquebar Missionaries, William Roxburgh and Francis Buchanan. His own collections were made in the Garden itself (designated HBC, for Hortus Botanicus Calcuttensis).
and on his trips to Nepal (1820/1), Singapore (1822), Upper India (1825) and Burma (1826/7). Wallich's most productive professional collectors were Francis de Silva (working in Sillet and the Khasia Hills), William Gomez (Sillet/Khasia and Tavoy in Burma), Kamroop (in the NW Himalaya) and Robert Blinkworth (in Kumaon). His major ‘amateur’ collectors/correspondents were Matthew Richard Smith (Sillet/Khasia) and Captain Patrick Gerard (NW Himalaya), and the professional botanists John Forbes Royle and Dr George Govan (both active in the NW Himalaya from a base at Saharanpur). The specimens come from an enormous geographical range, from the NW Himalaya to the islands of Indonesia.

Wallich brought the entire collection to London in 1828 in 30 barrels weighing 20 tons and, from a house in Frith Street Soho, spent four years curating it with the help of specialists (including Robert Brown, John Lindley, George Bentham and Robert Graham). The species were identified and numbered, with supplementary letters or numbers for different collections of what were taken to belong to the same species. The ‘Numerical List’ was produced

Fig 4. Part of the “Wallich Catalogue” (The Numerical List) referring to species 2244 “Nepenthes distillatoria” comprising several different elements, labelled a, b, c, each with one or more specimens, most but not all of which ("b" & "c", but not "a") are what 50 years later, would be described as N. khasiana Hook. f. Photo by Henry Noltie

Fig 5. One of the multiple specimens of “Nepenthes distillatoria” species 2244 in the Wallich collection. This one, labelled as from the Jaintia Mts, was selected as Lectotype of Nepenthes khasiana Hook.f. in 1996 by Jebb & Cheek. Photo by Henry Noltie
by lithography and sent with the numerous duplicate sets that were made up and distributed widely. When Wallich returned to Calcutta in 1832 the Company presented the top set to the Linnean Society, which in 1913, in its magnificent mahogany cabinets, was presented to Kew where it remains at the northern end of Wing B.

No 2244 of the ‘Wallich Catalogue’ is *Nepenthes distillatoria*, for which there are four collections (the D element is an addendum, on p 159):

A. Singapore, 1822 [One of Wallich’s own collections, now identified as *N. gracilis* with elements of *N. albomarginata*: see Jebb & Cheek 1997: 53].

B. Sillet, M.R. Smith.

C. HB Calc e Sillet.

D. Hb. Madras, Courtaulm [A Tranquebar collection, probably of Benjamin Heyne or Johann Gottfried Klein, which has not been satisfactorily identified. As no *Nepenthes* is known from Courtaulm, there is the possibility of a label-switch, and the specimen is perhaps from Sri Lanka].

The sheets in the Herbarium corresponding with these numbers (e.g. Fig. 5) are numerous, but in a state of unresolvable confusion. When the collection was microfiched in 1971 at least six had the number ‘2244?’ attached, which probably all belong either to the B or the C element; however, the original field tickets are no longer certainly attached to the correct sheets. None bears Smith’s name, though the small one reading ‘Nepenthes distillatoria Sillet’ could conceivably be his (Fig.6 topmost of the three tickets). The labels and their data are informative nonetheless and strongly suggest that the plant was first discovered by Matthew Richard Smith, or more likely one of his collectors. Smith was a magistrate at Pundua at the foot of what were then known as the ‘Sillet Mountains’, the place now probably called Companiganj and in Bangladesh. The hills that rise above this to the north are now the Khasi and Jaintia Hills in the Indian State of Meghalaya. Smith was a prolific correspondent of Roxburgh, H.T. Colebrooke and Wallich and a major donor to the Calcutta Garden. He had died in 1819 but it was doubtless his collections that were propagated and grown in the Garden under the name of *N. distillatoria*.

Some of the loose labels date from late 1828 and 1829 after the drawings were made (by these dates they were in London). Assuming the original drawing to have been made from a cultivated specimen in the Garden (rather than from Smith’s original collection), two of the labels are relevant
and suggest that the original drawing could have been made in 1827 or early 1828. Of these one field ticket (written on paper made of Daphne bark, see Fig. 6 - middle) reads ‘Nepenthes distillatoria. HBC Aug 1827. Intrd. fr. Sylhet’, the other ‘No 101. Teelunkoor – from Jantipore hill. Nepenthes distillatoria. – flowd. in January 1828’. (Fig. 6 - bottom). The local name (spelled ‘telenkoo’ on one of the later labels), is of interest as is the locality, which is given as ‘Jentya Mountns.’ on the other label. These refer to the Jaintia Hills (to the east of Shillong), which is almost certainly where Smith’s collectors first found the plant, and where it still occurs if in a highly endangered state (see the following article).

Further reading:
Almost 20 years before finding the early drawings of *Nepenthes khasiana* Hook. f. at Kew (see previous article) I had been fascinated by the only indigenous member of the genus in India, and had taken the opportunity to see it for myself in the wild. Here is the account of that excursion from my diary.

Shillong, 15 November 2000

I seem to have become a botanical twitcher and achieved one of my ambitions in coming here – to see *Nepenthes khasiana* in the wild.

I got to the bus station by 7.30 and found a bus to Jowai about to leave. The journey of 64 km took two hours and I managed to get a front seat, though even this was a frightful squash. It seems that all roads out of Shillong are guarded by sand-bagged sentry posts with protruding machine guns. We passed through lovely scenery but the light was hazy all day. I’m sure that on a clear day one should have been able to see the mountains of eastern Bhutan when looking north. The plateau in this direction (east) is as deeply dissected as on my previous journey southwards, the higher parts are covered in pine (presumably planted, but possibly the native *Pinus kesiya*), the lower slopes beautifully patterned with parallel rows of lazy beds. It seems odd in a wet climate like this that these go perpendicular to the contours rather than following them. The rice fields are terraced but are only in the valley bottoms. A lovely sight these are at the moment having just been harvested, the stubble and straw golden against the dark green, pine-clad slopes. The same crops as yesterday with the addition of peas and no different wild plants except for shoots of what I took to be a *Curcuma* in the pine woods. Another conifer, but an exotic one, is common here – *Cryptomeria japonica*. Its side branches are always lopped so that they form lollipops with rather pyramidal heads.
In Jowai, an unpicturesque, bustling little town, I made straight for the market. Disappointing on the ethnobotanical front, but with a colourful variety of vegetables and, rather surprisingly, an enormous meat section. The people here are mainly Christian and therefore carnivorous, eating beef, pork and goat. Some more curious creatures are also consumed reminding me that we are close to China, or perhaps simply a relic of the original forest home of a tribal people. Two invertebrates were on offer – bowls of fat, wriggling silkworms, yellow with a row of black spiracles – *Philosemia ricini*, which feeds on the castor oil plant. These are apparently boiled and eaten, rather than being sold for spinning silk. The other invertebrates for the pot were bee grubs, which a girl was removing from small sections of honey-comb. Other wild-collected items included some small toadstools with cream stipes and gills with a flat, greyish-brown cap; small bundles of a species of *Potentilla* with a brown tap root and silver undersides to the leaves, reminding me that the roots of silverweed were once eaten in Scotland. Vast quantities of intact, orange-coloured, betel fruit were for sale, accompanied by piles of bundles of betel-pepper leaves wrapped (as was the meat) in the leaf blades of a *Phrynium*. Everyone chews betel here with the horrid result of stained mouths and disintegrating teeth. Other market produce was similar to that in Shillong, but there were several things that I couldn’t identify – some small, white, peeled tubers, like tiny potatoes, perhaps a *Cyperus* and small clusters of green berries. Handsome, flattened, purple legumes, rather like elephant ears, were probably *Lablab purpureus* and other fruit included pomelo, star-fruit, delicious, small, green-skinned oranges, *Phyllanthus emblica* and guava; there were also dusky-purplish-brown banana flower buds.

After an hour I realised that there wasn’t really anything else to see in Jowai, which is the capital of the Jaintia Hills, and was starting to think that I would just have to come back to Shillong. I suddenly thought ‘stop being so wet’, pulled myself together, got into a taxi and asked to be taken to the local Forest Office. The District Forest Office (DFO) and Conservator were ‘on tour’ but the pleasant man who had been left in charge was playing ludo with a secretary and spoke excellent English. Having been told by the
Botanical Survey in Shillong that they were not allowed to tell foreigners where to find *Nepenthes* I was pleasantly surprised that, on stating my quest, a charming Field Officer called Salan Swer was summoned to help me to see India’s only species of pitcher plant. In next to no time we were off in a Tata Sumo taxi. Without Salan’s help I could never possibly have got there, which turned out to be a place called Jarain, 25 km south of Jowai on the NH 40 road that leads to Bangladesh. The scenery was similar to that around Cherrapunji, of largely denuded, grass-covered, low hills (Fig. 1). There were also plenty of megaliths here, and at one point the remains of a beautiful clapper bridge, with four piers and three (of five) remaining slabs. Some link with ancient Cornwall no doubt!

Soon after the village, and from the road, we started to see the *Nepenthes* growing as low, free-standing, clumps in marshy spots in the grassland (Fig. 2), but at a small patch of woodland (more accurately, large scrub) we leapt out of the taxi. The trees were literally draped with the handsome plants, some up to 20 feet tall. The sight of the golden light streaming through the pitchers, whose lids had not yet opened, was truly magical (Fig. 3). The mature pitchers have attractive markings – the underside of the lid and inside of the upper part of the tube are flushed with dull red, the rim sculpted with fine ribs; the outside of the pitcher is pale yellowish-green marked with red – flecks at the top, lines lower down (Fig. 4). Two ribs run down the length of the front of the pitcher and slightly below halfway an oblique line marks the extent of the glandular tissue on the inside. We upended several and found them well stocked with insects – including a sizeable grasshopper – testifying to their efficiency as traps. I hadn’t realised that the plant was dioecious, but the first, dried-up, inflorescence we saw was male, with groups of tiny anthers borne on a column. There were also plenty of fruiting spikes, looking rather like a *Hedychium*, but these were unripe and the scobiform seeds still green. The ability of the plant to persist after the forest has gone is remarkable, but the deforestation is appalling and one longed to erect fences to keep people and livestock out to allow some regeneration of the forest fragments that do survive. I was told that being a forester here is a dangerous job as the locals are armed and see the Forest Department’s activities as against their interests. All rather depressing.

We were back in Jowai in just over two hours – a real whistle-stop twitch, where Salan put me into a jeep to come back to Shillong, and absolutely refused to take a tip for his kindness.
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