

NEPENTHES ROBCANTLEYI: A NATURAL HYBRID

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Introduction

This paper is a follow-up to the protologue of the newly described *Nepenthes nebularum* Mansell & Suarez (2016), and presents details leading to the inevitable conclusion that *N. robcantleyi* (Cheek 2011) is not a species but a natural hybrid originating from a combination of *N. truncata* Macf (1911) and *N. nebularum*.

In April 2013, author Geoff Mansell, corresponded with the then Acting Keeper of the Kew Gardens Herbarium, Dr. David Simpson to obtain clarification of the description of *N. robcantleyi* and a copy of the photos kept at K and PNH, which represent the wild parent and a paratype, that were used for comparison in the paper. Dr. Martin Cheek, Senior Research Leader at Kew Gardens and the author of the *N. robcantleyi* description, responded in kind and also commented on the topic of *N. robcantleyi* being a natural hybrid. Basically he said that to qualify as the missing *N. robcantleyi* parent a new species should at least have fringed wings, a squatter pitcher than *truncata*, a well developed lid dome with nectar glands concentrated there, long widely spaced peristome ridges and teeth, and partial-peduncles with bracts on the inflorescence.

Since this communication, *N. nebularum* has been described and in the above correspondence the specific traits proposed are attributed solely to a new species. However most of these are *N. truncata* and/or *N. nebularum* characteristics. Also, from what the authors have established, the characteristics that Cheek assigned solely to *N. robcantleyi* are actually intermingled ones from the other two species mentioned, as discussed below, with the only conflicting factor being the partial peduncle bracts that, to the best of our knowledge, have only been displayed on the type specimen of *N. robcantleyi*.

Notes on the discovery and description of *N. robcantleyi*

Nepenthes robcantleyi was described from cultivated material and from photos of the putative female parent as detailed in the following excerpt from Cheek (2011) [A link to the photo can be found at <http://pitcherplants.proboards.com/thread/10684/black-truncata-new-species?page=12>]:

“In January 1997, Robert Cantley was in Mindanao, Philippines, seeking to collect seeds of *Nepenthes truncata* for his plant nursery ‘Borneo Exotics’. Having obtained permission to collect in a logging concession, and accompanied by the head of security for the logging corporation to whom the concession had been granted, he observed a large number of plants believed to be *N. truncata*. These plants had set seed but their fruit was as yet all quite immature and bore no viable seed. At the same location he also discovered two morphologically atypical plants, one of which was nearing the end of its fruiting phase, with one seed head from which nearly all seed had already dispersed. Robert collected the limited amount of seeds remaining and succeeded in raising nine individuals, which at maturity were found to match the photographs that he had taken of their wild parent. Since their pitchers were much

darker than typical *N. truncata*, some with a black peristome, they have been exhibited at flower shows worldwide as ‘The black *N. truncata*’. Whilst morphologically uniform, these seedlings show variation in peristome colour reflected in the cultivar names given to three of the individuals, respectively ‘King of Spades’, ‘King of Hearts’ and ‘Queen of Hearts’.

In reference to the above excerpt, Cantley said the putative female parent of *N. robcantleyi* was growing with a large number of plants that were believed to be *N. truncata*. Borneo Exotics later offered seedlings of these *N. truncata* plants for sale described as *N. truncata* “highland from Mt. Pasian, Mindanao”, in 2002. Another point stated (Cheek 2011) is that Cantley succeeded in raising nine individuals from the original wild-collected seed which at maturity were found to match the photographs of their wild parent. However, in fact, there were eleven individuals and Cantley raised only six of these (Paroubek, pers. comm.). Cantley explained on a public forum that the other seedlings (five) were accidentally sent to other nurseries through staff mistakes when sending out seedlings of the *N. truncata* - Mt. Pasian, where one ended up in the collection of Shinya Yamada of Japan, and four to Tony Paroubek of Par-O-Bek Orchids in the United States.

Nepenthes robcantleyi’s similarities with *N. truncata*

In the introduction to the description of *N. robcantleyi*, it is mentioned that the original seedlings proved to be “morphologically uniform”, only showing “variation in peristome colour”. However, it is now known that the extant siblings from the original batch exhibit degrees of variations that do not fit the distinguishing characters stated for *N. robcantleyi*. Perhaps the most instantly notable here, concerns the lid dome which was stated to be a diagnostic character for his species. This feature is actually absent in the cultivated plants mentioned previously, Yamada’s plant and also in the cultivated plant unofficially named “Un-named 3” which was presented by Cantley on a forum as a diagnostic tool for *N. robcantleyi* and can be viewed at the following web site: <http://pitcherplants.proboards.com/thread/10684/black-truncata-new-species?page=14>. Moreover, the lid boss is also absent on the seed parent; although a domed lid is evident on the photo showing it being held by a



Figure 1: The plant grown by Shinya Yamada (left) and its male flower (right). Photos by Shinya Yamada.



Figure 2: Partial-peduncle bract remnants of female *N. truncata* flower. Photo by Exotica Plants.

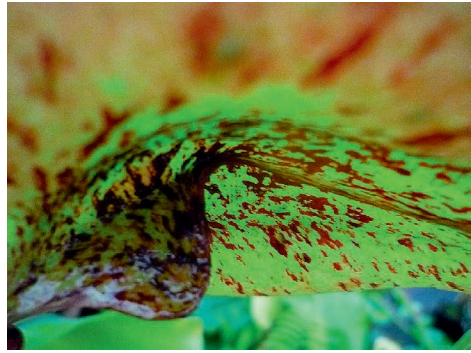


Figure 3: Lid dome and gland concentration of *N. truncata*. Photo by Exotica Plants.

Filipino, the other known photo in existence, perhaps taken at a later date, shows the lid base at a much straightened out configuration, but becoming decidedly convex towards the middle portion; a closer examination reveals that the median keel is broken, perhaps an artifact of human or animal induced damage. The flaring peristome said to also be a distinguishing feature of *N. robcantleyi*, is not observed on Yamada's specimen, and so we cannot use this as means to delimit *N. robcantleyi* from *N. truncata* (Fig. 1). The presence of partial peduncle bracts in female inflorescences is also mentioned in the protologue as a character that separates it from *N. truncata*. But further research and observation by the authors from plants in anthesis has also shown that some plants of *N. truncata* do display partial-peduncle bracts, albeit rudimentary (Fig. 2). In the description (Cheek 2011), it was also said that these same bracts are absent on male inflorescences, and yet these are clearly developed in Yamada's plant, which is male (Fig. 1). The characterization of the lid gland concentration on the lid dome and the basal appendage, is actually a characteristic observed in *N. truncata* (Fig. 3). Lastly, the dimensions achieved by both the seed parent and its cultivated progenies match those reached by *N. truncata*.

Shared traits of *N. robcantleyi* with *N. nebularium*

Nepenthes robcantleyi appears to have more in common with the recently described *N. nebularium* than it has with *N. truncata*. For one, the flaring of the peristomes seen in a number of *N. robcantleyi* plants is actually commonly observed in *N. nebularium*. The leaf tip acumen in *N. robcantleyi* is also present in *N. truncata* but much abbreviated, but this is also well-developed in *N. nebularium*. The development of peristome ribs in *N. robcantleyi* is also very similar to *N. nebularium*, as are the peristome teeth, although the degree of development is comparatively more pronounced in the latter taxon, which can have teeth extended for up to 5 mm in length. Additionally, pitcher wings are present in both *N. nebularium* and *N. robcantleyi* even up to maturity, and both share similar dendritic indumentum, however these are expressed to a more reduced degree in the latter. One feature that clearly sets *N. nebularium* apart from *N. robcantleyi* is seen in the plants' dimensions, with *N. robcantleyi* attaining greater sizes than *N. nebularium*.

The plant grown by Yamada shares some similarities to *N. robcantleyi* but does not match the original description. To be specific, it is visually distinguishable, by its smaller size, lack of lid dome, and bracts that are present on the partial-peduncles of the male flower.

Inconsistent morphological traits of *N. robcantleyi*

In light of morphological similarities of *N. robcantleyi* to both *N. truncata* and *N. nebularium*, the question that begs an answer is “what then are the distinguishing traits of *N. robcantleyi*?” The problem here is that the description was based heavily on the unofficial cultivar “Queen of Hearts”, which served as the holotype. An inspection of the protologue of this taxon tells us that the “Additional specimens examined (paratypes)”, are Cantley’s “photographic record” and Cheek 15877, which incidentally, also happens to be the holotype. Other variants of *N. robcantleyi* with the unofficial cultivar names, “King of Spades” and “King of Hearts” differ quite noticeably from the type, although in the description of *N. robcantleyi* (Cheek 2011), it was stated that they were morphologically uniform, including pitcher color. It should be noted that although pitcher color is not usually used as a strong distinguishing characteristic, it is quite relevant when compared to *N. nebularium*.



Figure 4: The two seedlings grown by Tony Paroubek that had deformed growth and subsequently died. F2, F3 hybrids? Photos by Tony Paroubek.

With regards to the floral bracts, it has never been detailed that the flower spike of the putative female parent of *N. robcantleyi* displayed these. However, we believe that its presence should have been examined as well as the nine *N. robcantleyi* plants themselves. To date, Yamada from Japan has a male plant of *N. robcantleyi* from the original nine which displays these floral bracts. At the time of writing this article, the only male plant of *N. robcantleyi*, that we are aware, Borneo Exotics has flowered, is the unofficial cultivar “King of Spades” which has no floral bracts. With the limited number of plants of *N. robcantleyi* that were produced and available for examination and the contrasting production of these bracts, we believe that this characteristic is atypical and is an exception most likely attributed to the hybrid origin of *N. robcantleyi* and not a distinguishing factor. Indeed, the supposed diagnostic traits of this taxon overlaps both those of *N. truncata* and *N. nebularium*. It should be noted that hybridization from several parents (complex) can produce surprising results, as will be discussed later in the paper.

Of the four seedlings that Paroubek raised, none are known to have survived. However, he explained (pers. comm.) that two died before maturity and never grew properly, always had deformed leaves and stunted growth, and the other two large plants were stolen before they reached maturity. The description that he gave of the deformed growth of two of the plants was likely an indication of F2 or more hybridization, as has been observed at Exotica Plants over many years of hybridizing *Nepenthes*. It can also be seen in the photographs supplied by Paroubek (Fig. 4) that the deformed growing plants were more like immature *N. truncata* than *N. robcantleyi* in their pitcher morphology. With the publishing of *N. nebularium* there are no doubts that *N. robcantleyi* characters are a mixture of both *N. truncata* and *N. nebularium*. It seems very likely that *N. robcantleyi* occurred from hybrid events between these two species and further introgression. This introgression is apparently still occurring as is suggested by photos (Fig. 5) from habitat on Mindanao, Philippines.



Figure 5: Introgression in *N. nebularium* in habitat. Photos by Mark Rouse.

A further comment (Cheek 2011) suggests possible hybrid origin of *N. robcantleyi* as follows in this excerpt: "... he (Cantley) observed a large number of plants believed to be *N. truncata*. These plants had set seed but their fruit was as yet all quite immature and bore no viable seed. At the same location he also discovered two morphologically atypical plants, one of which was nearing the end of its fruiting phase, with one seed head from which nearly all seed had already dispersed." Although this statement is alluding to the difference in flowering times of *N. truncata* and *N. robcantleyi*, it should be noted that Cantley observed only one fruiting plant which may or may not have flowered typically. In our observations, flowering male plants of *N. truncata* typically begin flowering at least one month before the female plants, may have multiple flower spikes, and continue to flower for several months after the female plants have been pollinated. Therefore in the scenario detailed in Cheek's paper, hybridization was very likely and probable due to the abundance of *N. truncata* plants and no observation of any atypical mature male plants.

Magnified evidence of *N. nebularum* in *N. robcantleyi* second generation progeny

Further evidence that *N. nebularum* was one of the parents of *N. robcantleyi* can be seen in the seedlings that were produced by Borneo Exotics nursery (Cheek 2011), by crossing two differing variants of *N. robcantleyi*. The diluted characteristics of *N. nebularum* seen in *N. robcantleyi* have now been amplified in the crossing, which we believe is a further hybridizing of *N. robcantleyi*. It has been observed that this progeny vary a great deal and interestingly, there have been noted deformities in leaves, pitchers, pitcher shape, and pitcher production, as seen often in F2 or more complex hybrids and also in the original Paroubek plants. It can also be observed that plants of this seed batch flower at a very small size, compared to their parents, and around the usual time for *Nepenthes* spp. to flower from seedlings, which is around 3 years. The type specimen of *N. robcantleyi* took approximately 10 years to flower and produced, as described, a flower spike said to rival *N. truncata* in dimensions at 1.4 meters in length (Cheek 2011).

There are many other characteristics that show that these *N. robcantleyi* F2 seedlings are actually a complex combination of *N. truncata* and *N. nebularum*. This being the case, the majority of seedlings that the authors have seen seem to be displaying more characteristics of the proposed parent *N. nebularum*, as would be expected, as *N. robcantleyi* and its putative parent also display some of these.

The most conspicuous differences are listed below:

1. Male and female inflorescences of the described *N. robcantleyi* are 2.13 m and 1.4 m respectively (Cheek 2011). The inflorescences on this progeny vary greatly with the largest we have observed between 0.8 m and 1.2 m. Most notably, the bracts on the partial peduncles are very unstable with both male and female flowers observed on this progeny with and without them.
2. The seedlings exhibit variability in pitcher color, from green to dark brownish to purple/black (Fig. 6). From what we have observed in many years of breeding *Nepenthes* spp., is if this color was stable, as in a similar dark colored species such as *N. izumiae*, there would be little, if any, variance, especially not the drastic variation seen in this progeny. Where we have produced primary hybrids using a pure species with dark red to black colored pitchers (as per the description of *N. robcantleyi*) such as *N. truncata* "green" × *ovata* and *N. izumiae* × *truncata* "green", all the progeny display this dark color. It seems to be a very dominant character when used in hybridization with a lighter colored species. However, we have seen many times, when we have bred with *Nepenthes* hybrids (both primary and complex) displaying black pitchers, the progeny produces pitchers that vary from green through to black. This



Figure 6: The above photo shows lids from different plants as detailed. It can be quite easily seen that the lids on the plants of *N. x robcantleyi* F2 show characteristics of both *N. truncata* and *N. nebularum* which is more evidence of the hybrid nature of *N. x robcantleyi*. Photos by Exotica Plants.

lack of dark pigment is also very much evident in the numerous hybrids that Borneo Exotics have produced with the typical *N. robcantleyi*.

3. The lid boss, which was used as a specific diagnostic character in the original description of *N. robcantleyi*, is not evident or diminished greatly in all the seedlings we have seen, which again aligns them more to the characteristics of *N. nebularum*.
4. The spur on the pitcher of the seedlings is another interesting feature that varies greatly. On two mature plants observed at Exotica Plants, the spur of one is 1.2 cm and the other is 4.5 cm (Fig. 7).
5. The leaf shape on many plants from this crossing have reverted somewhat to the truncated appearance of *N. truncata* and *N. nebularum*. The front of the leaf is more square rather than oblong-elliptic as described and seen in the line drawing in the description of *N. robcantleyi* and wider at the front as in *N. nebularum*.
6. The pitcher shape is another major difference in this progeny. The pitchers range from the squat (similar to those of the type specimen) to narrow green pitchers similar to those of *N. truncata* (Fig. 8).



Figure 7: The dramatic difference in spur length in just two of the progeny *N. x robcantleyi* of the crossing. Photos by Exotica Plants.

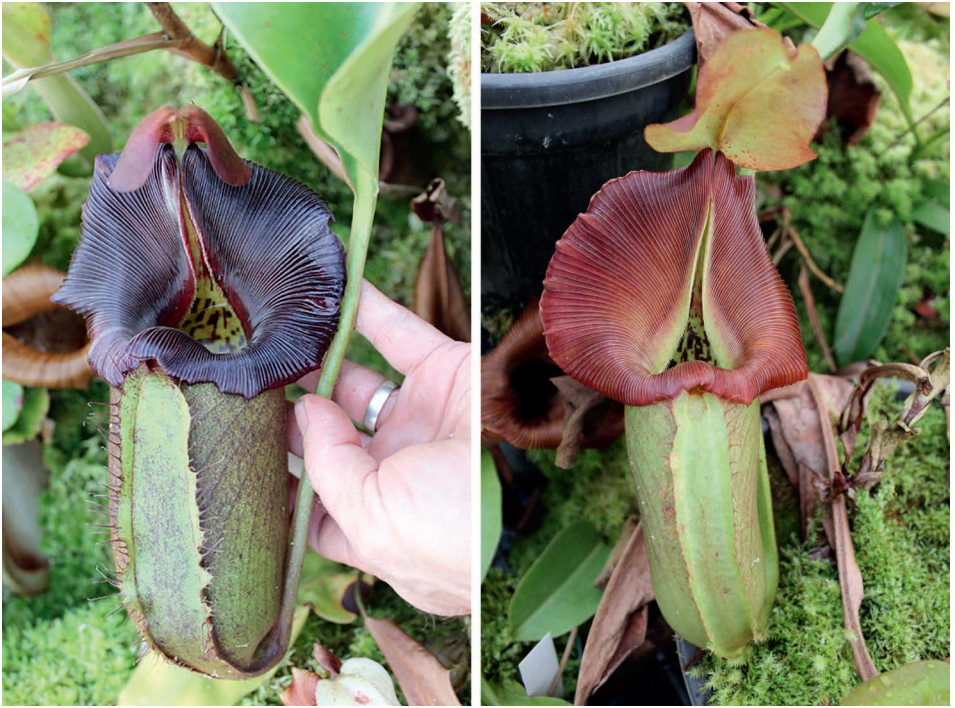


Figure 8: Two plants of *N. robcantleyi* progeny owned by Exotica Plants showing the notable differences in the pitchers and the lid deformation in the photo on the left. Photos by Exotica Plants.

7. The petioles of *N. nebularium* are velvety and the petiole wings are ferruginous villous where *N. robcantleyi* is described as glabrous to puberulent; *N. truncata* has very short hairs and the *N. robcantleyi* progeny is somewhere in between.
8. By comparing the pitcher lids of even a few plants, a combination of characteristics of both *N. nebularium* and *N. truncata* can easily be distinguished in the *N. robcantleyi* F2 plants (Fig. 6).

Referring back to the original question of stability of morphological characters of *N. robcantleyi*, we suggest that the answer is none. The peristome of *N. robcantleyi* varies from being flared to rolled back; the lid is seldom domed; the lid nectar gland distribution and stature is akin to that of *N. truncata*; the supposed presence of a lid boss is a reduced but still noted trait in both *N. nebularium* and *N. truncata*, and the presence vs. absence of partial peduncle bracts are both unstable; and its leaf acumen, coloration (albeit verging on the greens of *N. truncata* on F2 plants), persistent wings, peristome ribs and teeth development as well indumentum evokes those of *N. nebularium*. The difficulty in this situation is that the natural hybrid was described before one of its parents, and hence many people will have an understandable inclination to resist acceptance of *N. robcantleyi* to be a natural hybrid. If *N. nebularium* was described prior to *N. robcantleyi*, people would have had no difficulty interpreting *N. robcantleyi* as either a natural hybrid involving *N. nebularium*, or a variant of it.

Can it be seen as intermediate between *N. truncata* and *N. nebularium*? Yes, but interpreting *N. truncata* as a very variable species with *N. nebularium* as an extreme form of it would be going

too far, given the stable morphological traits and more or less stable ecological preferences of *N. nebularium* (see also Clarke & Moran 2011). To emphasize, it is our view that the seed parent is not the same entity as the “Royals” as they have unofficially been called in cultivation, and it may have been itself a product of natural hybridization. However, not knowing its history compels us to resort to Occam’s razor and just refer to it as *N. truncata*.

N. truncata – highland?

While researching *N. truncata*, *N. nebularium*, and *N. × robcantleyi* for this article and as a slight aside from the main work, it was evident that the habitats of *N. nebularium*, the alleged *N. × robcantleyi* parent, and the *N. truncata* seen growing with it, were highland. They grew at an elevation of 1800 m asl. The interesting fact about this is that the *N. truncata* that Cantley saw growing with the *N. × robcantleyi* parent was very typical of this species that is usually known from lowland altitudes. In cultivation it has been our experience that this species from both elevations grows best in what would be classed as intermediate conditions. There has been unproven discussions about a morphologically distinct form of *N. truncata* from highland elevations over the years and, as also mentioned previously in this article, it was reported and posted on the Borneo Exotics website in 2004 as such. However, the plant displayed on Borneo Exotic’s website was later described as the female parent of *N. × robcantleyi* and formally described as distinct from *N. truncata*.

Another plant claimed to also be a highland form of *N. truncata* is propagated and sold by a nursery in Germany. We believe that there is only one variant of this plant which has been in propagation for over 20 years and is described as *N. truncata* – “highland, reddish leaves”. On seeing photos of mature plants and noting many similarities to *N. nebularium*, author, Geoff Mansell, contacted the nursery owner to establish the plant’s origin, but was informed that the information had been lost. However further research was conducted. This was done by asking growers of this plant to send us close-up photos to study the plant’s morphology, as well as the purchase of two plants, to establish if in fact it is a morphologically distinct form of the species or a distinct taxon. It is quite evident from the results and from our many years of experience hybridizing *Nepenthes* spp. that this plant from Germany falls into the parameters of a primary hybrid between *N. truncata* and *N. nebularium* (Fig. 9). The conspicuous characters demonstrated by this plant are part way between the two parents (Figs. 10 & 11). These are, the inner peristome pointed teeth-like projections, the lid keel and the front lid fold, pitcher wings, and the hirsuteness of the petiole, tendril, new leaf, and pitcher, with the pitcher also displaying the two distinct indumentum types. So to date, it seems that there has not been a highland form of *N. truncata* described or seen that has proven to be any different in its morphology than its lowland counterpart. Therefore in this respect, hobbyists cultivating this plant should be aware of this new information and if they agree with it and like to take it on its merit, this desirable plant should be renamed *N. truncata* × *nebularium*.

Therefore it seems that the alleged female parent of *N. robcantleyi* is a complex hybrid, showing stronger conspicuous characteristics of *N. nebularium* in its indumentum and lid appendages, yet it fails to show the strong inside teeth-like projections. The indumentum and lid appendages are clearly evident on the photo held at Kew Gardens (photo K) as part of the description, and which is also available at the following forum link at the time of writing; <http://pitcherplants.proboards.com/thread/10684/black-truncata-new-species?page=12> . However it is more like *N. truncata* in its characteristics, as seen in its greater dimensions, smaller inside peristome teeth, terrestrial growth preference, as shown in the comparative photo held at Kew which was included in the *N. robcantleyi* protologue and, from what can be observed from the Kew photo, leaf structure.



Figure 9: We believe the above photos give credence to our suspicion that *N. truncata* - red leaf (right) is a natural hybrid between *N. truncata* (left) and *N. nebularium* (center). Photos by Exotica Plants and S. Gladisch.

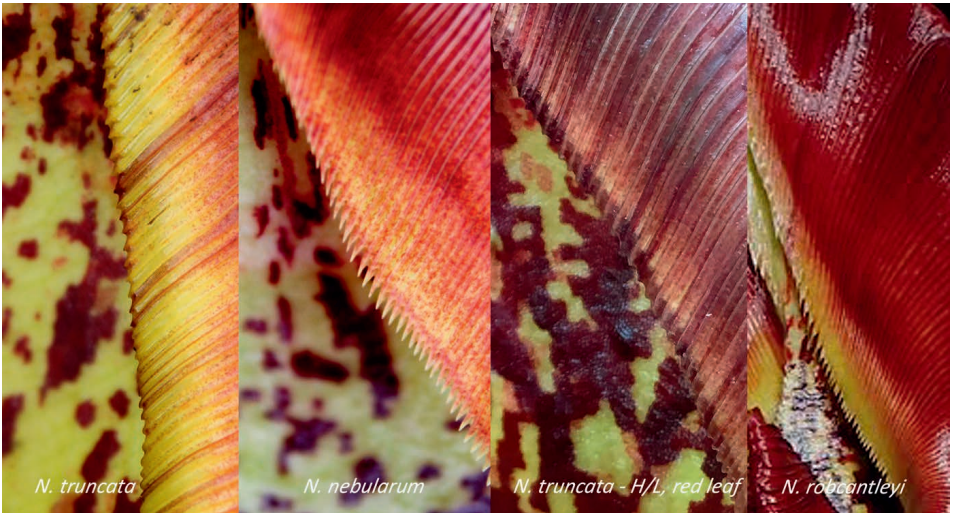


Figure 10: Comparison of the inner teeth-like projections on the peristomes of *N. truncata*, *N. nebularium*, *N. truncata* – highland, reddish leaves, and *N. robcantleyi*. Photos by Exotica Plants and A. Bianchi.



Figure 11: Comparison of the pitcher indumentum of *N. truncata*, *N. nebularum*, and *N. truncata* – highland, reddish leaves. Photos by Exotica Plants, A. Bianchi, and W. Suarez.

Conclusion

The images of the seed parent of *N. robcantleyi*, posted on the Borneo Exotics website, spurred the authors' suspicion that this taxon is a product of natural hybridization. But even without its existence, the hybrid nature of *N. robcantleyi* will eventually come into realization as more observations from the wild are being undertaken. Thomas Gronemeyer, who was in the first party that discovered the population of *N. nebularum* later visited by author Wally Suarez, also once remarked on a public forum, that “they were significantly smaller than the cultivated specimen”, referring to the type of *N. robcantleyi*. As we have mentioned in the *N. nebularum* protologue, none of these wild plants (*N. nebularum*) ever exhibited the size and pitcher coloration of the *N. robcantleyi* seed parent.

The same seed parent, from the photo held at Kew, which is part of the basis for the *N. robcantleyi* description (Cheek 2011), grows as a terrestrial. Taking into account the importance of ecology in delimiting species (Clarke & Moran 2011), we would like to point out that *N. nebularum* is primarily epiphytic, but has been observed as a lithophyte too. This preference for growing above ground probably explains the compact aspects of *N. nebularum* plants. *Nepenthes truncata* may facultatively also grow as an epiphyte. However, Alastair Robinson postulated that environmental factors such as elevation and hydrology may compel these plants to also grow as terrestrials.

The circumstances that led to the description of *N. nebularum* involved the *in situ* observations from several field trips, of many individual plants, from multiple localities. In the same vein, inferences were augmented with study of cultivated plants of both *N. truncata* and *N. robcantleyi* from multiple sources from different countries, and author Geoff Mansell's extensive experiences in the

hybridization of various *Nepenthes* plants. All of these observations spanned years. Admittedly, the authors only had at their disposal two extant photographs of the *N. robcantleyi* seed parent, for obvious reasons. But even so, educated insights can already be assembled, especially when these same photos are viewed in a larger context involving the observations made on wild and cultivated plants involving the relevant taxa.

At the time of its description, *N. robcantleyi* was regarded as a true species by the vast majority in the *Nepenthes* community, and the possibility of it being of hybrid origin was expressed by a very limited few. The authors tested this hypothesis by patiently exploring all possible avenues and areas of contention for more than four years, and unequivocally arrived at the conclusion that there is, indeed, a previously unknown parent species to *N. robcantleyi*. We leave it to the reader to decide if what we have undertaken has been a worthy enterprise. If so, then the name *N. nebularium* is available, and *N. robcantleyi* can now be referred to as *Nepenthes* × *robcantleyi*.

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