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A New Catalogue of Orchidaceae for Saba, N.A.

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Abstract. The Orchidaceae on the island of Saba, Netherlands Antilles, have only briefly been studied and described. In January 2003, in cooperation with the Saba Conservation Foundation, a 3-year orchid population study of the island was established and is expected to continue as an on-going project. Unique in its geology, as well as its lack of serious tourism impact, the island of Saba provides a distinct research environment for Caribbean Island orchid habitation and ecology data. To date, the study has identified 13 species in eight genera of Caribbean orchids that may be considered naturalized. A unique copper form of *Epidendrum ciliare* has been located, which presents possible indications of variation from the usual *E. ciliare* Caribbean types. Orchid populations have been identified and GPS-located for use in future studies. Populations of significant size have been map-plotted for use by the Saba Conservation Foundation in its land-based environmental management programs. This paper addresses species recordings of the Saba Orchidaceae, with previous historical citations, to date of publication.

Key words: Saba, N.A., Orchidaceae species, microhabitat, naturalized, endemic

Introduction

Saba is located in the southeastern Caribbean (17°36′59″N, 63°15′09″W) and is part of the Windward Islands and the Netherlands Antilles. The island has an area of 13 km^2 with a maximum elevation of 866 m above sea level and is characterized by extremely mountainous topography. Saba has approximately 1400 residents, with primary population centers on the island lying at least 240 m above sea level. For the most part, access to the ocean from the population centers is limited because of the steep slopes of Mt. Scenery, the dominant geographical feature of the island.

Orchid species and other vegetation on the island of Saba have been discussed briefly in the Orchidaceae literature, including Internet documents (e.g., Rojer 1977). Contrary to what has occurred on larger Caribbean islands, no prior systematic, in-situ island-wide survey of Saba has been attempted or published. In December 2002, an on-going population survey was initiated with the additional purpose of establishing a more fully detailed study of Saban orchid population ecology.

Howard (1974) annotated ten Orchidaceae species for Saba. Of those, we have been able to confirm that four of these originally annotated species are populating the island. Additional and previously unrecorded species also have been located in the delimited study zones, areas below 500 m elevation. The ecological zone above 500 m is expected to reveal island cloud species previously unrecorded for Saba.

Previously unpublished observations and photographs taken above 500 m, primarily by Tom van't Hof and Jan Faber, are included in this report. At the time of publication, the additional six species annotated in-situ by Howard (1974) have yet to be verified.

Taxonomical verification of the species located and annotated in this study has been limited by the lack of a CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) authority on the island to provide export certification. This lack has precluded transportation of herbarium-quality material to taxonomic authorities for more detailed study. Thus, in lieu of taxonomical verification in the strict sense, we have relied on inspection of the inflorescences and images of the plants and their flowers.

Materials and Methods

Climatological Review

Saba is a single, composite, dormant volcano (Westermann & Kiel 1961) rising from sea depths of 600 m (Roos 1971). The island consists of a main peak surrounded by several individual peaks and domes. Numerous relatively straight V- and U-shaped valleys, locally known as "guts," characterize the slopes of the main mountain. The petrologic composition of the is-

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land has been described as mostly andesites (volcanic boulders) formed through processes such as fractionation and magmatic mixing from both mantle and crustal sources (Baker et al. 1977). The island has no permanent source of running water; but during heavy rains, the "guts" act as channels carrying water and sediments directly to the ocean (Buchan 2004).

The climate of Saba is intimately related to the geologic conditions present on the island. The extreme vertical gradient of the island, combined with predominantly northeast trade winds, create broad variations in microclimate. Temperature and humidity measurements vary greatly as a result of altitude, topography, and compass orientation. The landmass, now know as Mt. Scenery, also plays a significant role in microhabitat creation by acting as a screen for light from the south and precipitation from the northeast. The orientation of many "guts" accounts for full shade on one side of the valley and full sun on the other, as well as great variations in microhabitat and microclimate conditions in locations separated by less than 100 m. The mean annual rainfall on Saba is ca. 1000 mm (Westermann & Kiel 1961). The island has a distinct wet and dry season, common to all of the Caribbean islands. The dry season is normally between December and July, and precipitation varies depending on altitude and exposure to the eastern trade winds. This seasonality does not preclude occasional tropical deluges of rain during the dry season. These are, however, limited in occurrence. Annual rainfall has been known to exceed 1920 mm on the higher windward slopes and the summit of the island.

Saba is located within the hurricane belt and has been exposed to numerous tropical storms and hurricanes, the most significant being Hugo in 1989, Luis in 1995, and Lenny in 1999. Heavy winds, often with substantial precipitation, of a squall nature occur on an unpredictable basis at any time of year, particularly from the northeast, which is the prevailing wind. Because of Saba's exposure, sea conditions in the north and east are usually rough. Air temperatures vary from monthly maximum temperatures exceeding 33°C (91.4°F) in June–August, to monthly minimum temperature of less than 25°C (77°F) in January–March (Buchan 2004).

An unusual occurrence on Saba is the uplift of rains caused by the predominance of Mt. Scenery itself. Frequently observed on Saba is the advent of an oncoming storm dividing and going around the island entirely. Storms that do impact the island result in heavy erosion of the slopes, often washing out many areas in the steeper locations. These geologic and climatologic factors contribute to a diversified microclimate system, producing a variety of niches for both annotated and previously unrecorded species.

Aerial Photography

Aerial photographs were obtained from the Saba Department of Tourism for review and evaluation of possible orchid population locations based on geologic and climate conditions prior to actual field studies on the island. Analysis of the images, combined with a review of topographic maps, climate data, and limited geological profiles of the island (Westermann & Kiel 1961), allowed identification of areas on the island and selection of sites for initial field investigation. The use of computer-enhanced aerial photographs, in conjunction with a topographic map overlay, became a significant tool in the initial stages of selecting project target areas for study and may serve as the basis for an environmental model of the island, a future goal of the project.

Geographic Zones

The geology of Saba may play a significant role in the habitat of orchid populations. The majority of orchids located below 500 m have been found growing as lithophytes with limited populations, primarily of epiphytic *Epidendrum ciliare* and *E. anceps.* Field observations suggest that a transition to terrestrial and epiphytic growth in the upper altitudes occurs as the high-altitude forest cover becomes predominate.

Many of the island's lower elevation areas have been largely denuded of orchid populations by fauna found grazing in them; a plausible explanation for the non-confirmed status of some of the remaining six species compiled by Howard. An additional factor may be the impact and habitat loss resulting from hurricanes Hugo and Luis, in 1989 and 1995 respectively.

Utilizing the data provided by the topographic maps and aerial photographs, the island was further divided into zones based on altitude and polar orientation. The primary directions of the cardinal points were first loosely established as the regional orientation of all mapping and GPS location coordinates. Climatic and primary geological features were utilized for final quadrant demarcation, as will be described below. These four quadrants were again divided into two altitude ranges: areas below 500 meters are designated as Lower Altitude Locations (LAL) in the grid system, with areas above 500 meters identified as Upper Altitude Locations (UAL). The lower altitude area has been sub-divided as the study progressed taking into consideration

the topography, natural wind patterns, rainfall, ambient humidity and sun exposure time frames that define the numerous microhabitats to be found on Saba.

Locations with rich individual species concentration of material were independently surveyed and grid-blocked for future studies. Currently, one large population of *Epidendrum ciliare* has been grid divided, and 200 plants have been tagged and are being monitored by Mary Roduner for pollination studies of *E. ciliare*. A preliminary identification has been made of two previously unrecorded pollinators for *E. ciliare*: *Protambulyx strigilis* and *Manduca sexta* (M. Roduner & S. Chipka unpubl. data). Ackerman and Montalvo (1990) report pollination of *E. ciliare* by the hawk moth *Pseudosphinx tetrio*. Ackerman (1995) reports different flowering seasons for the well-defined variant populations he has identified in Puerto Rico. Such variation may even reflect a group of related species.

The upper-altitude locations have not been surveyed, as of this publication. Upper altitude locations are currently being analyzed for future study, using maintained trails that traverse the areas as references, in conjunction with the local knowledge of Tom van't Hof. Species herein described for the upper altitude locations are listed based on verifiable references and sources.

GPS Systems and Primary Reference Stations

A transmission/receiver tower, located near the summit of the island, has been utilized as the base station location for all GPS coordinate references. Three of the existing 14 survey boundary markers, placed by the Dutch Government in the early 1970s, were utilized as reference points for GPS calibration purposes. In 2001, several Saba markers were added to the World Geodetic System (WGS) 1984.

The positions of all locations were recorded utilizing a *Garmin GPS 72 Personal Navigator* hand-held unit. This unit incorporates the WASS system to provide elevation data at recorded locations. For purposes of localized elevation determination, the GPS was placed 10 cm above grade line. On reference-station points incorporated within the WGS system, the marker top was utilized as the base elevation. In most cases, elevation data are accurate to within 30 m, while longitude and latitude are subject to a variance of 100 m. These reference locations have been established for research instrument calibration and coordination in the remaining stages of the project. Occasional and significant variances of GPS location readings (primarily longitude and latitude readings for some island locations) were recorded during the study period. Variations were attributed to the screening/blocking of satellite transmissions caused by localized terrain conditions.

Field Observations

The trail system developed and maintained by the Saba Conservation Foundation (SCF) was utilized primarily during the initial phase of the field study. A map of the trails is available at the SCF office in Windwardside for tourist hiking. The trails are extensive and provide an overview of the numerous microclimates to be found on Saba. Many of the initial species counts and identifications were made directly on these public trails.

As the study progressed, and the island population became aware of the project, additional opportunities arose for investigation of private property and locations were reported and offered as additional focus sites. Based on observations made in these supplemental locations, the number of recorded species was expanded.

Considering the geological history of Saba, it is very unlikely that any of the botanical material found on the island can be considered endemic. Thus the term *naturalized* is being used in this report and applies to Orchidaceae migrating from South America and other older islands of the Caribbean. Populations or individual orchids known to be of Asian origins have been removed from the lists of species naturalized in Saba. It can be assumed with a high degree of probability that these plants; *Dendrobium, Arachnis,* and *Phaleonopsis* species and hybrids, were introduced to the island by human factors and have escaped cultivation. Therefore they cannot be considered naturalized in the strictest sense of the word.

Oeceoclades maculata is accepted as a naturalized species. Its presence in the Caribbean Basin has been ascertained throughout the Caribbean area. The inclusion of *O. maculata* and other species of putative African origin, as naturalized species for Saba, conforms to the publication of previous Caribbean naturalized species lists (Stern 1988, Ackerman 1992).

Delimitation of the Quadrants

The Orchidaceae species found in Saba have been identified by genera, species, and quadrant location. Some species are found throughout the island in numerous microhabitats. Other species have been found in either single, or very restricted, habitat locations. It is expected that additional locations of currently recorded species will be identified, possibly providing ecological

transition zone data for recorded species and their pollinators during future stages of the project. All quadrant zones described were subdivided to include altitude area "belts". The "Below 60 Meters Belt" was not considered at this stage of the study. It continuously is subjected to battering seas, wind erosion, and ocean salt contamination of plant habitat. Large cliff faces have been limited to binocular review and will require rappelling activity for plant measurements and observations close at hand.

NE Quadrant

Within this quadrant are the villages of Upper Hells Gate, Lower Hells Gate, an abandoned sulfur mine, an iron-rich geologic deposit of recent volcanic origin (Westermann & Kiel 1961), and the island airport. This area of the island receives the greatest amount of moisture from trade winds and regular precipitation. The geological feature known as "Old Booby Hill" is designated as the border between the northeast and southeast quadrants on the south side. The maintained hiking trail, known as All Too Far Trail, is the border between the northeast and northwest quadrants.

The All Too Far Trail is an important vertical trail for observing Saban ecology transitions. Descending from the Sandy Cruz Trail to the North Coast Trail is a transition of a few hundred m. The microhabitats observed during this transition, as the lower elevations become more shaded and steep in terrain, are very diverse. This area deserves more intense, localized study as part of the continuing project.

This quadrant has the most densely concentrated populations of Orchidaceae at lower island elevations. Orchids in this quadrant are found growing almost exclusively as lithophytes, with limited epiphyte and terrestrial occurrences.

NW Quadrant

This area of the island is uninhabited as the result of climate and terrain considerations. The North Coast Trail, which traverses this area at 200–350 m elevation, is the only available area safe enough for study at this altitude, as work off the trail is not recommended, and a local guide is recommended. The Sandy Cruz Trail, located at a higher elevation of 400–500 m, is navigable without a guide's help at these altitudes. The All Too Far Trail connects the Sandy Cruz and North Coast trails vertically on the east side of the quadrant.

The northwest quadrant receives significant precipitation on its eastern half, as well as buffered trade wind influences. The illumination intensity levels in this quadrant are relatively low, as it is blocked significantly by the summit of the island volcano, resulting in a shaded region of high humidity and extensive vegetative undergrowth. Topography is extremely steep, resulting in numerous mudslides and tree and boulder falls during heavy rain events. The trail microhabitats are primarily within low altitude, shaded, rain forest habitat.

A transition area occurs between the northeast and northwest quadrants from lithophytic to epiphytic growth. Low light-requiring terrestrials reportedly are located within this area, but discovery of them is hampered by the dense, low vegetative growth that characterizes the area. The number of orchid populations located to date in this quadrant is limited. Stated simply, it is an extremely difficult area in which to work. Fieldwork is limited to the dry season when trail areas are stable.

SW Quadrant

At the far west side of the NW quadrant, the island terrain begins to turn radically to the southwest at an abandoned village area know as Mary's Point; this can be considered the northern boundary of the SW quadrant. The Mary's Point ruins are incorrectly located on the trail maps, being at the far west side of the NW quadrant, rather then centrally, as is shown on the map. Several abandoned fruit orchards and building remains provide locations of both epiphytic and lithophytic orchid populations at Mary's Point ruins. Care must be taken working in this area, as the cliff face has collapsed in some areas, in one case, dropping a cistern several hundred meters into the sea. Located within this quadrant are the island capital of The Bottom, the ferry and barge landing dock from St. Maarten, the Saba Medical School, the island gas station, and the island quarry operation. This is the most densely populated part of the island.

For purposes of the study, this is the largest quadrant in land area, returning almost fully east along the south coast. The quadrant extends to the eastern side of the present quarry on the island's south shore, to a point identified as "Wash Gut."

The area's climate can be characterized as dry, with trade winds and moisture blocked by Mt. Scenery. It contains many volcanic sinks, resulting in shaded bowls of vegetation bordered by steep cliff faces. These bowls are considerably drier in climate than similar bowls on the northern side of the mountain. Orchids in these areas are primarily found on the high cliff faces where the sun and uplifted moisture provide favorable habitat. Climatologic variations, within a few dozen meters, from humid shade to dry and sunny exposure, particularly after the mid-

day transit of the sun, are characteristic of this part of the island. Temperature changes along the vertical faces of the steep cliffs caused by long periods of sun exposure also have been recorded. This area of the island has been studied on a very limited basis, as rappelling gear is required to access most of the orchid populations.

SE Quadrant

The SE quadrant extends from Old Booby Hill on the East, returning to Wash Gut on the West. The island village of Windwardside is the primary population center of this quadrant. Humidity in the quadrant is reasonably constant year round with almost full sun exposure over the course of a day. Many areas within this quadrant are completely void of brush vegetation, and local orchid populations are found on cliff faces or 2 m above the ground level growing in the trees. Terrain in this area is extremely steep. No terrestrial orchids have been located in this quadrant.

Taxonomic Treatment

Catalogue of Recorded Naturalized Species

Island-Wide Population (60–500 m)

Epidendrum ciliare L. This is easily the most predominate orchid genus found on Saba. Its presence has been documented throughout the island in a variety of floral forms and growth habits. The predominate growth habit (estimated as 85% of the located island population) is lithophytic, with limited occurrences of epiphytic growth. Numerous color forms, ranging from white to medium green, with flowers ranging 3–5 cm in size and 5–7 blooms per inflorescence, may be found blooming at any time of the year. Predominate blooming season is November–May for the majority of the populations located. This variation of flowering times conforms to what was observed by Ackerman (1995) in the populations of the species he has observed in Puerto Rico.

A unique color form with copper petals and sepals has been located in the NE quadrant in very large populations. These populations range through an altitude of 300–500 m, exhibiting a florescence of 9–12 blooms, rather than the 5–7 of the more common *Epidendrum ciliare* forms. Studies, being continued with the assistance of Mary Roduner, preliminarily have identified the moths *Protambulyx strigilis* and *Manduca sexta* as pollinators of *E. ciliare* on Saba. The microhabitat of this form seems to be limited to a location in conjunction with the most recent lava flow from the island volcano. Further research on this color form has been initiated for possible biochemical iron response to the lithophytic substrate. Results of this analysis are pending.

Epidendrum anceps Jacq. Spread throughout the island as a lithophyte and in limited locations as an epiphyte, *E. anceps* is found growing primarily in areas of dappled shade, in association with an unidentified moss population. This species often has been confused with *E. secundum.* This confusion, which arose from the misapplication of the type by several authors (Garay & Sweet 1974, Liogier & Martorell 1982) was resolved when the Committee for Spermatophyta of the International Association for Plant Taxonomy (IAPT) resolved that only Jacquin names could be used to typify Jacquin specimens (Ackerman 1995, Howard 1974). Current pollination studies of this species, supervised by Mary Roduner, attempt to verify pollination by the Ctenuchid moth, *Lymire edwardsii* (Adams & Goss 1976).

NE Quadrant (60–500 m)

Epidendrum nocturnum Jacq. Limited populations of *Epidendrum nocturnum* have been located in altitudes of 150–300 m elevation as lithophytes with southwest orientation. A very dense population has been identified growing on a south-oriented wall, shaded in the morning by an adjacent residence, in Windwardside (SE quadrant). This concentration, reportedly a relocated population from unidentified elevations, is not considered a naturalized population for purposes of the study. Rather it is considered as collected and established naturalized material from unidentified locations on the island. Based on material located to date, it appears much of the entire island population of *E. nocturnum* has been relocated to this wall. Limited locations of epiphyte growth habit occur on the Spring Bay Trail at 170 m elevation. These may be found on lower tree limbs 2–4 m up in the trees along the trail.

Polystachya foliosa (Hook.) Rchb.f. in W.G.Walpers. Ann. Bot. Syst. 6: 640. 1863 [Jan-Mar 1863]. Limited populations have been located in the Sandy Cruz trailhead area growing as lithophytes. As the study has progressed, the population appears to be expanding in both number and range. We attribute this to the cleistogamic character of *Polystachia foliosa.* The very similar

species, *P. concreta,* has not been located on the island.

SE Quadrant (60–500 m)

Epidendrum difforme Jacq. *Epidendrum difforme* populations have been located at 250–500 m elevations in limited areas of the SE quadrant. Growing as lithophytes, on south- and southeast-facing cliffs, numerous plants found in pod await pollination studies to identify the island pollinator(s).

Epidendrum paniculatum Ruiz & Pav. *Epidendrum paniculatum* has been located growing as a lithophyte and epiphyte in the SE quadrant at 300–400 m elevations. Populations are found primarily in shaded locations on the northern side of rock outfalls and on exposed, but shaded, tree limbs. Evidence of pod set is present from past dispersals. Further pollination studies for this species are currently being evaluated.

Octomeria graminifolia (L.) R.Br. in W.T. Aiton. A single population of *Octomeria graminifolia* has been located on the southwest side of Booby Hill at 475 m elevation. Currently nine plants are recorded and located in an area of ca. 500 m^2. Previous evidence of pod set and seed dispersion is present. Further studies, to identify pollinators of this species, are currently being evaluated.

Jacquiniella globosa (Jacq.) Schltr. This species has been found in several locations growing in cliff pockets at 200–500 m elevation as lithophytes with south or southwest orientation. The usual locations are pockets of the cliffs that are 3 m or more above the adjacent ground line.

Tolumnia prionochilia (Kraenzel.) Braem. A very limited population of six plants was found growing as lithophytes (at a single private property location on the windward side. The population, growing on a south-facing wall in full sun exposure on private lands, was not established by the property owner. In May 2003, the plants were preliminarily identified as *T. calochila*. On further review, we concluded that the population in question was one of *T. prionochila* instead. First, the distribution range of *T. calochila* has been documented for Hispaniola with some annotations for Cuba and the Cayman Islands (Royal Botanic Gardens, Kew 2003). Second, the distance of the Eastern limit of the distribution zone to Saba and the lack of reports in the islands in between, tend to rule out natural distribution to Saba of *T. calochila.* Third, plants show the growing habit of *T. prionochila* with plantlets, in stolonic fashion, growing from the nodes of the long inflorescences. The form of the observed flowers conforms and compares to the illustrations and description of *T. prionochila* by Ackerman (1995). Fourth, the natural distribution range of *T. prionochila* (Puerto Rico to the Leeward Islands; see Ackerman 1995, Royal Botanic Gardens, Kew 2003), and its pollination strategies, which are heavily dependent on seed dispersal (Ackerman 1995), make the naturalization of *T. prionochila* in Saba (as a result of seed dispersal from the Leeward Islands) an event more plausible than a transition from Hispaniola to Saba. The lack of records of the species in the intermediary land masses, which must occur in the case of *T. calochila,* supports this conclusion.

P. Feldman (pers. comm.) postulates that the species in question is *Tolumnia urophylla*; a species he and Barré (1993, 2001) have indicated as observed on Saba. The plants and flowers studied in-situ do not conform to those of *T. urophylla,* nor has that species been located during the course of the study on Saba to date.

Communication with Bill Bergstrom of Bergstrom Orchids, well respected in the propagation of *Oncidium* and *Tolumnia* species, reviewed photographs of the in-situ colony and has reinforced our preliminary identification of this species as *T. prionochila*..

A more formal taxonomic verification based on a collected sample of the population will require the appointment of a CITES authority on Saba to permit specimen collecting and removal. It also will require permission from the property owner for collection, once a CITES authority has been designated.

NW Quadrant (60–500 m)

Oeceoclades maculata Lindl. Only two specimens of *Oeceoclades maculata* have been located on Saba. A single plant was found on the Sandy Cruz Trail at 400 m elevation in dense shade. An additional specimen was located on the North Coast Trail, again in dense shade, at 350 m elevation. Both specimens are growing on north-facing slopes, densely shaded, in pockets of leaf detritus. Neither plant showed evidence of previous flowering, and both are being monitored as possible invasive plant population study candidates.

SW Quadrant (60–500 m)

Epidendrum secundum Jacq. Limited populations of this species are located on the cliffs near Fort Bay growing at 100–200 m ele-

vation. Exposure is to the southwest, and *E. secundum* occur in conjunction with populations of *E. ciliare.* Location of this population is credited to Edward and Patricia Hassell of Windwardside, Saba, with verification by the study authors.

Psychilis correllii Sauleda. A limited population, growing on the cliffs just to the north of Fort Bay, is located at ca. 150 m elevation with southwest exposure. The population, growing in conjunction with *Epidendrum ciliare,* contains 26 plant groupings. Because of the location, pod set was unable to be determined. Rappelling work will be required for further investigation of this population. The plants were located by Edward and Patricia Hassell, and extreme long lens photography used to identify this plant was provided by Dos Winkel of Belgium. Ruben P. Sauleda has confirmed photographs of the flowers as *Psychilis correllii.*

Status Report: Additional Species Reported on Saba

The following material consists of previously unpublished observations by Tom van't Hof and Jan Faber with comments by the authors.

Habenaria sp. An unidentified species was reported growing at the base of the communications tower on the southeast side of Mt. Scenery. Since the bush is regularly trimmed, confirmation of the species location by the authors has not been accomplished.

Erythrodes hirtella (Sw.) Fawc. & Rendle. *Erythrodes hirtella* was reported by Howard (1974) from examined material for St. Eustatius. The species may have been located on Saba at the same time. Locations of the species may be confirmed during the Upper Altitude surveys.

Ponthieva racemosa (Walter) C.Mohr. *Ponthieva racemosa* was reported by Howard (1974) as present on St. Kitts without exam material for study. Localization of the species in Saba has not been confirmed.

Ponthieva petiolata Lindl. Howard reported Ponthieva petiolata from examined material from St. Kitts and St. Vincent. Confirmation and annotation of species for Saba may be confirmed during the Upper Altitude surveys.

Malaxis sp. Howard reports *Malaxis massonii* and *Malaxis umbelliflora* as extant on St. Kitts. Confirmation of status and species on Saba is pending.

Status Report on Species Described by Howard

Epidendrum ciliare L. *Epidendrum ciliare* has been verified throughout the island as the most common species in-situ below 500 m elevation. Flower form and color variations, noted in the description by Howard, do not include the copper form located in the NE quadrant. We attribute this to the currently limited locations of the copper form and a possible lack of this form in herbarium samples examined by Howard.

Epidendrum secundum Jacq. The confusion about the identification and possible synonymy of both *Epidendrum secundum* and *E. anceps,* based on the misapplications of drawings by Plumier, was resolved by the action of the IAPT decision that only Jacquin types were to be used to typify Jacquin described species. As a result, both species, *E. anceps* and *E. secundum,* are accepted as distinct species. Populations of both *E. secundum* (limited locations) and *E. anceps* (island-wide) have been identified and mapped for Saba.

Epidendrum pseudoramosum Schltr. Howard (1974) stated that the examined specimen was located in the Rendezvous area (our SE quadrant, at 200–400 m elevation). Royal Botanic Gardens, Kew (2003) reports a distribution pattern of the species from Mexico to Venezuela that tends to preclude the possibility of natural distribution on Saba; it flows from Mexico down Central America to Venezuela in the northern coast of South America.

To date, we have not confirmed the status of *Epidendrum pseudoramosum* as a species located in Saba. Tom van't Hof, a resident of the area, has not been able to locate it (pers. comm.). This is one of the species that we have doubts of confirming on Saba as a naturalized species.

Psychilis kraenzlinii (Bello) Sauleda as **Epidendrum Kraenzlinii** Bello. *Psychilis kraenzlinii* is endemic to Puerto Rico; it has only been reported for Puerto Rico (Ackerman 1995, Royal Botanical Gardens, Kew 2003). It is possible that Howard misidentified the plant. The location of *P. correllii* is reported for Saba based on a tentative photographic identification by R. Sauleda (pers. comm.). This raises the possibility that it was this species, not *P. kraenzlinii,* which Howard observed.

Epidendrum strobiliferum Rchb.f. Howard reported the species for Saba from examined material. As of this report, we have not been

able to confirm his report as remaining in-situ on Saba.

Erythrodes plantaginea (L.) Fawc. & Rendle. Howard reported having examined specimens of this species from Saba. Boldingh has been credited with observations of the orchid for Florida, St. Eustatius, Saba, and St. Martin as far back as 1909 (Howard 1974). We have been unable to confirm the presence of the species on Saba at the time of this report.

Jacquiniella globosa (Jacq.) Schltr. *Jacquiniella globosa* has been verified as remaining in-situ on Saba in the SE quadrant at 200–500 m elevation as a lithophyte on limited south- and southwest-facing cliff faces.

Brassavola cucullata (L.) R.Br. in W.T.Aiton. As of this report, we have not been able to confirm Howard's report.

Maxillaria coccinea (Jacq.) L.O.Williams ex Hodge. Verified by Tom van't Hof in upper altitudes not yet surveyed, the species was located growing primarily on the south sides of Mt. Scenery at 600–800 m elevation. Further verification of photographs has been provided by the Orchid Identification Center, Marie Selby Botanical Gardens.

Oncidium variegatum subsp. **leiboldii** (Rchb.f.) Withner as *Oncidium leiboldii* Rchb.f. Although use of the generic name *Tolumnia* Raf. is accepted and used by many botanists, Royal Botanic Gardens, Kew (2003) doesn't include it in their database, maintaining the use of *Oncidium* Sw.; thus *Tolumnia variegata* (Sw.) Braem is treated as *Oncidium variegatum* Sw.

Howard observed that specimens referable to this species also have been listed under *Oncidium velutinum* Lindl. (Kew records this species as *O. variegatum* subsp. *velutinum* (Lindl. & Paxton). Withner and other taxonomists treat it as *Tolumnia velutina* (Lindl. ex Paxton) Braem. A review of the literature reflects that *O. velutinum* is considered endemic to Cuba, reducing the possibility of natural distribution from Cuba to Saba. The published eastern range boundary of *Oncidium leiboldii* is also Cuba, again reducing the possibility of natural distribution from Cuba to Saba. Thus the probability is that Howard studied a variant of *Oncidium variegatum,* which is a highly variable species (Ackerman 1995, Sauleda & Ragan 1996) or a possible natural hybrid, which do occur in the Caribbean Basin. As of this report, we have not been able to confirm Howard's report, nor have we located any of the other possible candidates for consideration.

Conclusion

The authors acknowledge that at the time of this report, the level of progress reported can be considered modest. By preliminary identification, additional Orchidaceae genera and species have been annotated for Saba; the validity of some currently listed species has been confirmed and, in other cases, rejected; a new form of a species was discovered, and a population of this species is being observed to identify its pollinator(s). In addition the lower altitude of the island has been plotted in preparation for further visits to locate additional orchid species; and contact with local residents who share an interest in preservation of Saba's orchid populations has been developing.

Orchid conservation requires knowledge of what is being conserved and the relationship of ecological factors that influence the survival of the species under consideration. At this time, the cataloging project is but a modest step in the understanding of the Orchidaceae of Saba; yet it is a first step in understanding an island habitat and its orchid population. Continued project efforts will help provide that knowledge and understanding.

The authors would be interested in collaboration on this study with students who desire field study research and other professionals who are interested in the Caribbean Basin Orchidaceae. The research opportunities on Saba are unique, and we look forward to future collaborative work in both the field and in the lab to expand opportunities in this project. Of special interest are *Pleurothallis* and *Maxillaria* identification in-situ, population dynamics analysis, pollination studies, mycorrhizal association studies, and genetic analysis of located species.

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