

Rediscovery of the Neotropical orchid *Porroglossum parsonsii* and recommendations for its conservation

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Abstract Understanding the distribution and habitat requirements of species is crucial for designing conservation actions, yet this information is not available for many plant species. We report the first confirmed wild populations of *Porroglossum parsonsii*, which, because of its horticultural value, is commercialized in national and international markets, from where it was first described to science. Our large-scale survey of 341 10 × 30 m plots spanning Andean forests, *paramo* habitats and pasturelands in Colombia suggests that *P. parsonsii* has a restricted geographical distribution in Andean forests with high forest cover (71.4–86.2%), where it occurs in low numbers (5–17 individuals per plot). Because of its market value (USD 18–20 per plant) there is a risk the species could be collected illegally, and therefore the habitat of the species in the Santuario de Fauna y Flora de Iguaque requires appropriate conservation.

Keywords Andean biodiversity, Colombia, endemism, habitat loss, horticultural value, Orchidaceae, *Porroglossum parsonsii*, threatened species

Orchidaceae is one of the most species-rich families (Plants of the World Online, 2023), yet an estimated 4,342 orchid species are threatened with extinction (Zizka et al., 2021). This estimate only includes species for which the taxonomy is clear and for which basic knowledge regarding geographical location, habitat requirements and/or population size exists (Luer, 1996; Kelloff & Kass, 2018; Parra et al., 2023). For many orchid species such knowledge is lacking, and therefore there is inadequate information for appropriate conservation actions.

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Porroglossum parsonsii Luer is one such species for which there is no geographical or ecological information. It is one of the 51 known species in the genus (Karremans et al., 2023), which has its greatest diversity in Ecuador (Baquero et al., 2020) and Colombia (Ortiz-Valdivieso & Uribe-Velez, 2007). Despite being traded on the global market, the only recognized collection of *P. parsonsii* is the holotype in herbarium MO, which was exported from Colombia without any traceable documentation, as suggested in the protologue ‘without collection data, obtained from a Colombian collector, in 2004, flowered in cultivation . . . in California’ (C. Luer 20985, MO).

During a large-scale orchid survey (January 2019–December 2021) we found natural populations of *P. parsonsii* for the first time (voucher E.Parra-Sanchez 1240, herbarium VALLE, Universidad Nacional de Colombia, Palmira; Plate 1). We surveyed 341 randomly located 10 × 30 m plots in Andean forests, *paramo* habitats and pasturelands in the Eastern Cordillera of the Colombian Andes. Our survey covered c. 270 km from north to south over 1,130–3,700 m elevation (Fig. 1; for additional details see Parra-Sanchez et al., 2023). In each plot we recorded adult orchid individuals in the understorey (up to 2 m aboveground). Surveys, by EP-S, required 2–5 h per plot. Around each plot we quantified forest cover in 12 buffer zones to estimate the potential available habitat for species (100, 200, 300, 500, 800, 1,000, 1,200, 1,500, 1,800, 2,000, 2,200 and 2,400 m; Fahrig, 2013; Hansen et al., 2013). We used *landscapemetrics* (Hesselbarth et al., 2019) in R 4.1.3 (R Core Team, 2022) to quantify the forest cover in each buffer based on the 30 m resolution global change forest map from 2018 (Hansen et al., 2013).

We found *P. parsonsii* in two of the 341 plots, separated by 17.6 km, with forest cover of 77.2–82.0% in the protected area Santuario de Fauna y Flora de Iguaque at 3,140 m, and 71.4–86.2% cover in Arcabuco at 2,580 m in a forest patch c. 30 m from a dirt road and near pasturelands (Fig. 1). The species grows as an epiphytic plant on mature trees (tree density 0.20–0.29 trees/m²), with low local population sizes (5–17 adult individuals per plot). We have not extrapolated this local density to a larger area as *P. parsonsii* probably grows in non-uniform, small and widely spaced clusters, as suggested by our surveys and by surveys elsewhere of other orchid species in related genera (Peláez et al., 2009; Baquero & Meyer, 2014; Kindlmann et al., 2014).

Our extensive survey suggests *P. parsonsii* has a limited geographical range, a non-uniform occurrence within the

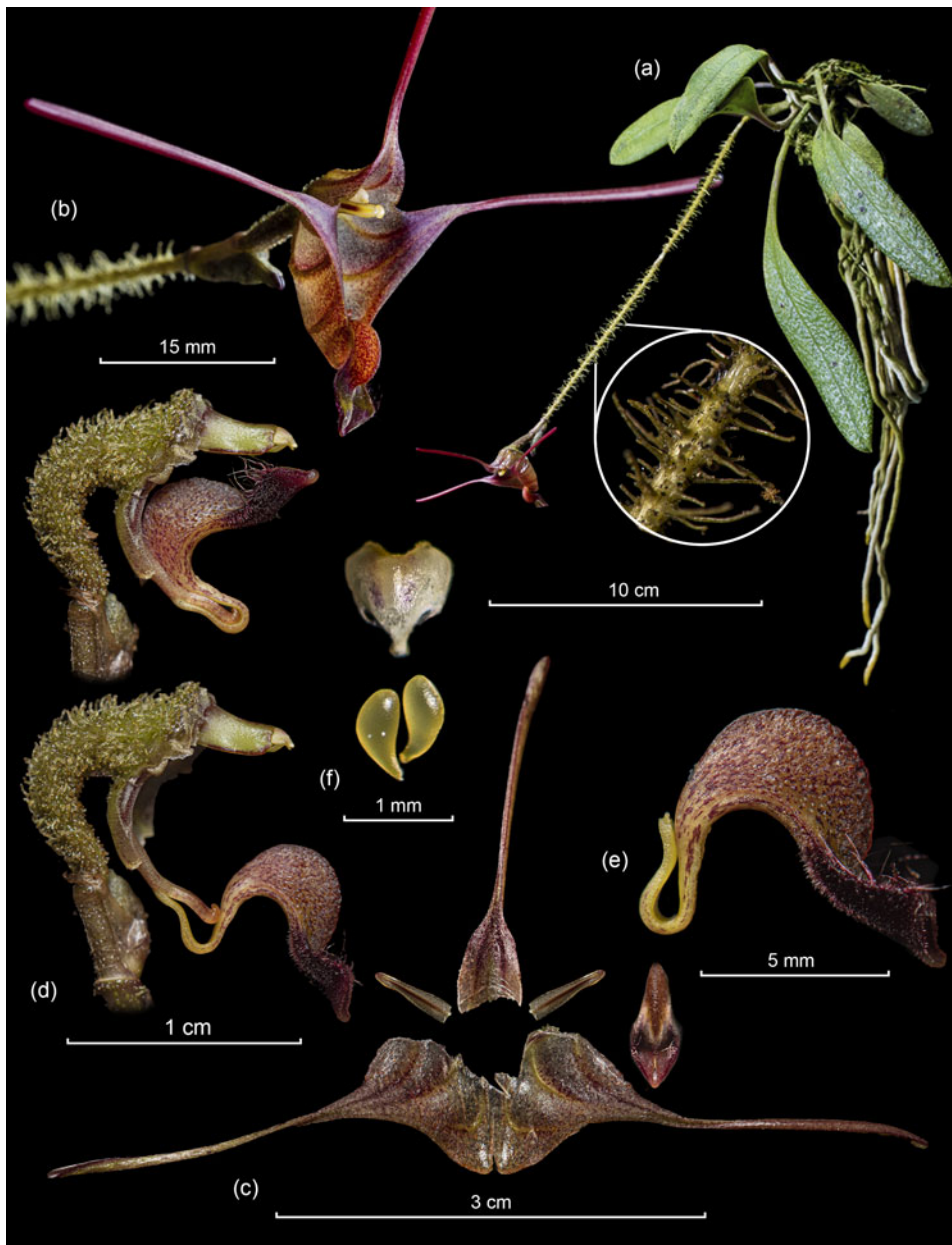


PLATE 1 *Porroglossum parsonsii* Luer showing (a) habit, (b) peduncle and flower, (c) dissected sepals, petals and lip, spread, (d) ovary, column and lip, lateral view, (e) detail of the lip, lateral view, and (f) detailed pollinia and anther cap. Photographs: JSM and SV-U from in situ plants. Voucher preserved as E.Parra-Sanchez 1240 at herbarium VALLE.

same habitat or across habitats in the region and a small population size. *Porroglossum parsonsii* should probably be categorized as Critically Endangered on the IUCN Red List as it has a restricted distribution (area of occurrence $< 500 \text{ km}^2$, criterion B; IUCN, 2012), with a small number of individuals (< 50 , criterion D), and there is an inferred past population reduction based on the reduction of habitat in the landscape, although the landscape still has high structural connectivity and habitat availability. A full Red List assessment will require additional information on population dynamics, and further surveys in the surrounding areas are required to identify whether there are any additional populations.

Porroglossum parsonsii is traded at a price of USD 18–20 per plant (based on the websites Equaflor-A, 2019, and

Ecuagenera, 2023), with the origins of these traded plants being unknown. We speculate that individuals were taken from the wild (either from the localities we report here or from others nearby) and grown in nurseries, as mentioned in the holotype. Illegal collection of native species is one of the greatest threats to orchid diversity (Wraith & Pickering, 2018), although the full impact of this on abundance in the wild is unknown (Hinsley et al., 2018; Morton et al., 2021). However, frequent illegal collections from orchid populations have led to local reductions in the number of adult individuals and could affect phenological cycles (Emeterio-Lara et al., 2021).

We recommend that Santuario de Fauna y Flora de Iguaque integrates *P. parsonsii* into its strategic plan for the conservation of threatened species (Díaz, 2020). This

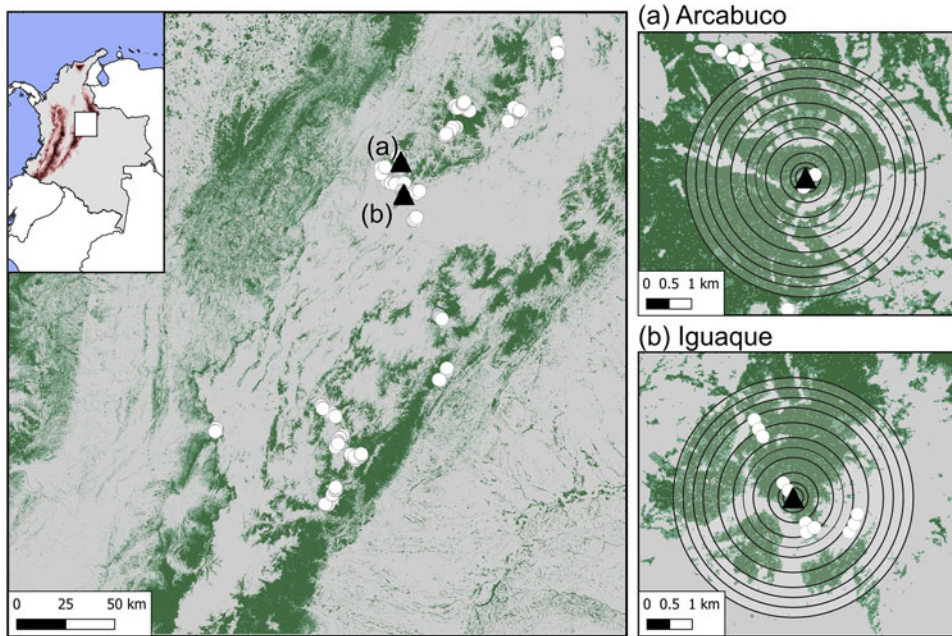


FIG. 1 Locations of the 341 survey sites along the Eastern Cordillera in the Colombian Andes (white circles) and the two locations where we found *Porroglossum parsonsii* (black triangles): (a) Santuario de Fauna y Flora de Iguaque, and (b) Arcabuco. The radii in (a) and (b) indicate the buffers used to calculate per cent forest cover around the survey plot (100, 200, 300, 500, 800, 1,000, 1,200, 1,500, 1,800, 2,000, 2,200 and 2,400 m).

would promote monitoring and conservation of the wild population. In addition, we recommend protection of the trail where the population is located, minimization of the effects of tourism and mechanical damage, further surveys across Santuario de Fauna y Flora de Iguaque to detect any other occurrences of the species, and inclusion of adult plants in the protected area's nursery.

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Author contributions Study design: EP-S, DPE; data collection and analysis: EP-S; species identification: LB; plate design: JSM; writing: all authors.

Conflicts of interest None.

Ethical standards Plants were collected under the joint permit between Instituto Alexander von Humboldt and PARAMO project number 20192300064121. This research abided by the *Oryx* guidelines on ethical standards.

Data availability Landscape metrics are available at doi.org/10.6084/m9.figshare.22818224.v1. Exsiccata is at herbarium VALLE.

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