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Local Distribution of Three Threatened *Ballota* Species in St. Catherine Protectorate, Southern Sinai, Egypt

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BALLOTA species growing in Sinai, Egypt, are subjected to a number of threats, which caused an abrupt decline both in number and size of their populations. Phytosociological data were collected to study *Ballota* species distribution. By using multivariate analyses (TWINSPAN and CCA), *Ballota kaiseri* and *B. saxatilis* were represented as associating species in *Galium sinaicum* vegetation group while *B. undulata* was recorded as associating species in *Teucrium polium–Phlomis aurea*, *Nepeta septemcrenata–Origanum syriacum*, and *Galium sinaicum* vegetation groups beside its own vegetation group. Results revealed that *Ballota* species are significantly and positively affected by elevation. While *B. undulata* prefers low pH values, *B. kaiseri* and *B. saxatilis* share the same microhabitats favoring high soil clay and silt percent, organic matter content, and consequently low sand percent which mean low pH also and high soil moisture content.

Keywords: *Ballota*, Sinai, Threatened species, Multivariate analysis, Classification, Ordination.

Labiatae is one of the most represented plant families in St. Catherine Protectorate. Of which, high percent are endemic, medicinal, and/or threatened (Moustafa, 1990; Moustafa *et al.*, 1999; Zaghloul, 1997 and Zaghloul, 2003). *Ballota* species belong to Labiatae and are subjected to a number of threats, which cause their populations to decline in both number and size. Some of these threats are specific to *Ballota* populations, but the majority affects the functional communities and ecosystems in which *Ballota* populations ultimately exist. These threats are either natural or human-induced.

The natural threats include drought, floods, and natural enemies (mice and pests). Drought and flood years' cycle has been observed in the area (Abd El-Wahab, 2003). While drought and low precipitation (< 20 mm year^{-1}) may be the prevailing weather pattern for 7-10 cosecutive years, it may be followed by rainy year/years in which torrential rainfall sometimes exceed 120 mm in few days that

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