

Redescriptions of Five Species of Japanese *Dendronephthya* (Octocorallia: Alcyonacea) Based on Type Material Collected by Döderlein in 1879–81

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(Received 11 August 2012; Accepted 25 December 2012)

Five species of the soft-coral genus *Dendronephthya* from Japanese waters are redescribed based on the type specimens deposited in the Naturhistorisches Museum der Burgergemeinde Bern: *D. doederleini* Kükenthal, 1905, *D. punicea* (Studer, 1888), *D. flabellifera* (Studer, 1888), *D. pumilio* (Studer, 1888), and *D. rigida* (Studer, 1888). These specimens were collected by the German zoologist Ludwig Döderlein between 1879 and 1881 during his stay in Japan. Several other specimens ascribed to these species by later authors and deposited in natural history museums in Europe and the U.S.A. were also examined in the present study; some of those are considered to have been misidentified.

Key Words: *Dendronephthya*, Döderlein, type, polyp, sclerites, anthocodial formula, Japan.

Introduction

Dendronephthya, containing over 260 species, is the largest genus of the soft-coral family Nephtheidae. Several authors have tried to divide this genus into smaller genera, sections, or groups. Kükenthal (1905), for example, in his revision of the genus, arranged the species into three main divisions, viz., Glomeratae, Divaricatae, and Umbellatae, based on the growth form of the colony, and he also recognized 18 minor groups such as the *hemprichi*-group, *rigida*-group, etc. Tixier-Durivault and Prevorsek (1957) proposed to make these main divisions into genera, viz., *Spongodes*, *Roxasia*, and *Morchellana*, respectively, which Utinomi (1962) reduced to subgenera of *Dendronephthya*, viz., *Dendronephthya* (*Dendronephthya*), *D.* (*Roxasia*), and *D.* (*Morchellana*). Authors since Verseveldt (1966) have generally supported Utinomi (1962) and followed his classification, but recent molecular studies have shown that these three divisions do not reflect phylogenetic relationships (Lee and Song 2000; Song and Lee 2000).

Until the work of Sherriffs (1922), the architecture of the sclerites of the polyp armature had not been described objectively, although such information had long been considered very important in distinguishing species (Holm 1894; Kükenthal 1896; Wright and Studer 1889). Sherriffs (1922) presented a diagram of the arrangement of the sclerites and provided a unified terminology for each part of the polyp mentioned in earlier literature, as well as a new system of representing the architecture of the polyp sclerites. His system employed both an anthocodial grade (expressed as a Roman numeral) and a formula of counts and conditions, such as “II=8p+0Cr+very weak S.B.”, where “p” (or “P” for the most highly developed sclerites) are the point sclerites,

“Cr” are the crown sclerites, and “S.B.” is the supporting bundle. Sherriffs (1922) assigned an anthocodial grade to 49 previously described species and proposed a sclerite formula for 22 species, including three new species collected by the Siboga Expedition in 1899–1900. There is a certain degree of subjectivity in determining the anthocodial grade and formula for a species, because there may be much variation in the arrangement of sclerites of the anthocodial armature among the polyps of a colony. This method was, nonetheless, accepted by later authors (e.g., Thomson and Dean 1931; Roxas 1933) as being very useful for the identification of species. Utinomi (1952) added to this system the number of intermediate sclerites flanking the points (M). Tixier-Durivault and Prevorsek (1959) then added counts of the number of supplementary sclerites (SS and ss) situated above the supporting bundle (Fig. 1). Their system was accepted by later authors and is still utilized as one of the most important ways to express species-level characteristics of these soft corals.

Even so, because many species described before Sherriffs' (1922) paper have not been rechecked, the anthocodial grade and formula have until now been ascertained in a precise way for less than one-third of the species of *Dendronephthya*. Indeed, although Tixier-Durivault and Prevorsek (1959, 1960, 1962) assigned an anthocodial grade and formula to almost all of the previously described species by referring to old descriptions and often figures of those species, their works need to be confirmed by inspection of type specimens.

Studer (1888) described six species of *Dendronephthya* from Japan, all originally placed by him in the genus *Spongodes*: *Dendronephthya coccinea* (Studer, 1888), *D. flabellifera* (Studer, 1888), *D. glomerata* (Studer, 1888), *D. pumilio* (Studer, 1888), *D. punicea* (Studer, 1888), and *D. rigida*