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Taxonomic consideration of eight Chinese bisexual *Artemia* populations, based on the morphology of frontal knob and gonopod and the result of cross-breeding tests

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Abstract

The taxonomic assignment of the *Artemia* from Qinghai-Xizang Plateau has been argued. In the present paper, the morphology of frontal knobs and gonopods of five *Artemia* populations from Qinghai-Xizang Plateau (Lagkor Co, Cam Co, Dagdong Co and Jibu Caka, Tibet; Jingyu Hu, Xinjiang) and three populations from North China (Badain Jaran and Yimeng, Inner Mongolia; Xiechi Lake, Shanxi) is described and compared with four non-Chinese species, the results of cross-breeding tests between the eight Chinese populations are documented and the taxonomic assignment of these *Artemia* populations is discussed. Morphological observations show that gonopods of the Chinese populations are significantly longer than those of the other species; distal gonopods of the Chinese populations possess spines that can be classified into three groups (posterior spines, exolateral spines and orthostichous spines). In the four non-Chinese species, however, orthostichous spines are absent (thus providing a morphological separation between *A. urmiana* and *A. tibetiana*) and the number of spines is much smaller than those of the Chinese populations. Discriminant analysis on numerical characters showed that three North China populations were divergent from four Tibetan populations, with Jingyu Hu population intermediate. Compared with the North China populations, the Tibetan populations possess a longer gonopod (longer gonopod, longer distal gonopod and longer finger-like tip), larger basal gonopod spine, larger percent of frontal knob spines that emerge by 2 spines from the same region and smaller percent of frontal knob spines that emerge by 4 and 5 spines from the same region. The *Artemia* from Jingyu Hu is morphometrically close to the Tibetan populations by possessing a larger basal gonopod spine, larger percent of frontal knob spines emerging by 2 spines from the same region and smaller percent of frontal knob spines emerging by 4 and 5 spines from the same region, but different from the latter by having a shorter gonopod (shorter gonopod, shorter distal gonopod and shorter finger-like tip), fewer frontal knob spines, more distal gonopod spines and more posterior spines. The results of cross-breeding tests showed that isolating barrier did not exist among the three North China populations or among the five Qinghai-Xizang Plateau populations, while they might exist between *A. urmiana* and the populations of Xiechi Lake (type locality of *A. sinica*) and Lagkor Co (type locality of *A. tibetiana*) and between the Qinghai-Xizang Plateau populations and *A. sinica.* The present results thus support the validity of *A. tibetiana*. Among the eight Chinese populations, the five populations from Qinghai-Tibet Plateau belong in *A. tibetiana*, whereas three populations from North China belong in *A. sinica.*

Key words: *Artemia*, frontal knob, gonopod, cross-breeding test, taxonomy, Chinese salt lakes

Introduction

Brine shrimp *Artemia* is a cosmopolitan anostracan crustacean including parthenogenetic and bisexual representatives (Browne & Bowen 1991). All the parthenogenetic *Artemia* have been assigned to the binomen *Artemia parthenogenetica* because of lacking taxonomic criteria, while in the bisexual *Artemia*, several species have been identified by the criterion of reproductive isolation (e.g. Clark & Bowen 1976; Baratelli *et al.* 1988; Cai 1989; Baratelli *et al.* 1990; Pilla & Beardmore 1994; Yang *et al.* 1995; Hou *et al.* 1997b; Abat-

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