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## The intertidal Fortuyniidae (Acari: Oribatida): new species, morphological diversity, ecology and biogeography

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### Abstract

Three new fortuyniid species, *Fortuynia longiseta* sp. nov., *F. maledivensis* sp. nov. and *Alismobates pseudoreticulatus* sp. nov., were found in littoral environments of the Maldives and Singapore and are described based on adult and juvenile morphology. A key is given to all *Alismobates* and *Fortuynia* species. The genus *Fortuynia* shows a homogeneous morphology and this is supposed to be a result of a limited habitat preference shown in this genus. Nearly all species only occur on rocky intertidal shores, except for *F. rotunda* dwelling in mangrove habitats and *F. smiti* found in riverine environments. *Fortuynia smiti* was now also found in a typical littoral habitat in Singapore and hence the remarkably broad ecological range of this species is discussed. The records of further fortuyniid species in the Indo-Pacific affirm that this taxon may be continuously distributed along shores of this geographic region.

**Key words:** thalassobiontic, juveniles, plastron, Maldives, Singapore

### Introduction

The family of Fortuyniidae represents a thalassobiontic taxon and consists at present of three genera, *Fortuynia* van der Hammen, 1960, *Alismobates* Luxton, 1992 and *Circellobates* Luxton, 1992. Members of this family are distributed transoceanically and dwell in intertidal habitats of subtropical and tropical coasts (Schuster 1989; Pfingstl & Schuster 2014). Hammen (1960) originally placed the genus *Fortuynia* within the Podacaridae but soon he revoked his decision based on juvenile morphology and erected the family of Fortuyniidae. Luxton (1967) confirmed the validity of this family and Grandjean (1966, 1968) assumed a close relationship with the Selenoribatidae. Schuster (1977) agreed with this statement and Behan-Pelletier (1997) also listed several important synapomorphies affirming the close relationship of these two intertidal mite families. Since then many new fortuyniid species were described (e.g. Marshall & Pugh 2002; Bayartogtokh *et al.* 2009) but systematics and the family status of Fortuyniidae remained unchanged for a long time. Only the large amount of new characters necessitated to adjust the definition of the family which was recently done by Pfingstl & Schuster (2012a). However, Iseki & Karasawa (2014) investigated several groups of oribatid mites by means of molecular genetics and their results confirmed a close relationship of Fortuyniidae and Selenoribatidae but at the same time rendered the Fortuyniidae paraphyletic. This clearly contradicts the formerly supposed distinctness of the family and raises new questions that need to be answered.

Concerning the ecology, all fortuyniid species were found exclusively in intertidal environments so far and recently Pfingstl (2013a) highlighted the stenotopic marine association of these animals. In the same year, Ermilov *et al.* (2013) described a new species, *Fortuynia smiti* Ermilov, Tolstikov, Mary & Schatz, 2013, from New Caledonia which was only found in a river far away from the open ocean. The exclusive occurrence in a typical freshwater habitat clearly deviates from the marine associated ecology of fortuyniid mites and raises questions about the true ecological range of Fortuyniidae.

This new and unexpected information on systematics and ecology shows that knowledge about this intertidal family is still incomplete and that further studies are necessary to resolve the recently emerged controversy.

The present investigation of specimens from the Maldives and Singapore revealed the existence of further new fortuyniid species and a new record of the supposed freshwater species *F. smiti*. Aim of the present paper is hence, first, to describe the new species based on adults and juveniles, second, to discuss the possible paraphyly of the family and third, to review the ecology of the whole taxon.