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THE PHOLCID SPIDERS OF AFRICA (ARANEAE: PHOLCIDAE): STATE OF KNOWLEDGE AND DIRECTIONS FOR FUTURE RESEARCH

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Abstract: Pholcids are among the dominant web-building spiders in many tropical and subtropical areas of the World. They occupy a wide variety of habitats ranging from leaf-litter to tree canopies, and several species occur in caves and in close proximity to humans. This chapter summarizes the present state of knowledge about pholcids in Africa. A total of 17 genera and 162 nominal species are currently described from Africa. High levels of diversity and endemism are recorded for Madagascar, Eastern Africa, and Southern Africa. A brief overview is given on those genera that have not been worked on for several decades and that are most in need of revision.

Key words: Pholcidae; Araneae; Africa; biogeography; diversity; *Smeringopus*; *Pholcus*; *Smeringopina*; *Crossopriza*; *Leptopholcus*

1. INTRODUCTION

1.1 Abundance and diversity of African pholcids

A recent inventory of spiders in the East African Uzungwa Mountain forests (Sørensen, 2003; Sørensen et al., 2002) found pholcids to be the most abundant spider family. In a sample of 14,329 adult specimens, there were 4,319 pholcids, followed by linyphiids (2,025) and theridiids (1,338) (L. Sørensen, Copenhagen, pers. commun.), and pholcids included the first and second most abundant species in the area sampled. At the same time,

pholcids are one of the most diverse spider families. The fact that most of this diversity is concentrated in tropical and subtropical regions has historically biased species numbers (Huber, 2003b), but recent revisions have dramatically changed our view. For example, revisions of African taxa previously assigned to *Spermophora* Hentz have increased species numbers more than 5-fold (Huber, 2003a, b, c). At the same time, circumstantial evidence (patchiness of collection sites, low numbers of shared species among sites) suggests that only a small percentage of species actually occurring has been collected. It has been estimated that the present number of about 800 species worldwide may represent no more than maybe 10% of the actual diversity (Huber, 2003b).

1.2 Natural history of pholcid spiders

Several species of pholcids are ubiquitous in human buildings around the world, ranging from regional anthropophilics to cosmopolitans like *Pholcus phalangioides* Fuesslin. Most of these species have characteristically long legs, they spend most of the time in their webs in corners and on the ceiling, and vibrate when disturbed. Several synanthropics are widespread in Africa, namely *Artema atlanta* Walckenaer, *Crossopriza lyoni* (Blackwall), *Smeringopus pallidus* (Blackwall), *Pholcus phalangioides*, *Physocyclus globosus* (Taczanowski), and the smaller *Modisimus culicinus* (Simon) and *Micropholcus fauroti* (Simon). Their impact on disease transmitting insects may be substantial, but this has been studied in only one case (Strickman et al., 1997).

Other species occupy a wide range of habitats in a variety of ecosystems. In arid regions, pholcids occur under rocks, in cavities and crevices, and in caves. In forests, they are found in the leaf litter, in webs between buttresses and twigs of trees reaching up to the canopy, and on the underside of preferably large leaves. Many species are cryptic. For example, those occurring between buttresses are typically dark, those on the underside of leaves tend to be light greenish.

Substantial research has been done on a few species occurring in temperate regions as well as on some Neotropical species, but the biology of African pholcids remains largely unknown.

2. RECENT PROGRESS

Recent revisions of the small, six-eyed pholcids previously assigned to *Spermophora* have resulted in some progress regarding the taxonomy, distribution patterns, and phylogenetic relationships of these taxa in Africa (Huber 2003a, b, c). Most African species are not congeneric with the type

species of *Spermophora* (which is Asian). Moreover, there are several regions that combine high species diversity with high levels of endemism, notably Madagascar, Eastern Africa and Southern Africa. In Madagascar, two genera occur (*Zatavua* Huber, *Paramicromerys* Simon), both of them endemic to the island and widely distributed on it, but apparently restricted to largely undisturbed forests (Huber, 2003a). In Eastern Africa, the species-rich genus *Buitinga* Huber is restricted to the humid area delimited by the Somali and Sudanese deserts to the north, the Malagasy rain shadow to the south, and the central African plateau to the west. All known species have limited distributions, most being known from the type locality only (Huber, 2003b). At the same time, some of these species are among the dominant web-building spiders in the Eastern Arc montane rainforests (Sørensen, 2003; Sørensen et al., 2002). In Southern Africa, another species-rich genus (*Quamtana* Huber) is most diverse in eastern South Africa, with a distribution that follows quite exactly the area with more than 600 mm mean annual precipitation. The genus has a wide distribution, with some representatives occurring as far north as Cameroon (Huber, 2003c). However, Western African pholcid diversity remains largely unknown, mainly due to inadequate collecting. The same is true for the Ethiopian mountains and the Congo basin.

3. DIRECTIONS FOR FUTURE RESEARCH

This section will concentrate on the most apparent gaps in our knowledge about the taxonomy, distribution, and relationships of African pholcids. Included are Madagascar and the Comoro Islands, excluded are the Canary and Cabo Verde Islands, Socotra, and the Seychelles. Apart from taxonomic, phylogenetic and biogeographic studies, pholcids offer excellent opportunities for research on adaptation due to their diverse habitats, on their significance for the control of disease transmitting insects, and on a variety of ecological topics. Most pholcids are easily maintained in the laboratory, making them ideal spider objects for in-depth single-species studies.

Figure 1A shows the known African genera with current species numbers. Marked in grey are those genera that have not been revised recently, and these shall be the focus of this section. Figure 1B gives a historical perspective, showing all records of these five genera in Africa. With 95% of all records having been published before 1960, it becomes evident that our knowledge about these genera is quite outdated. The scarcity of records underlines our ignorance about species distributions and levels of

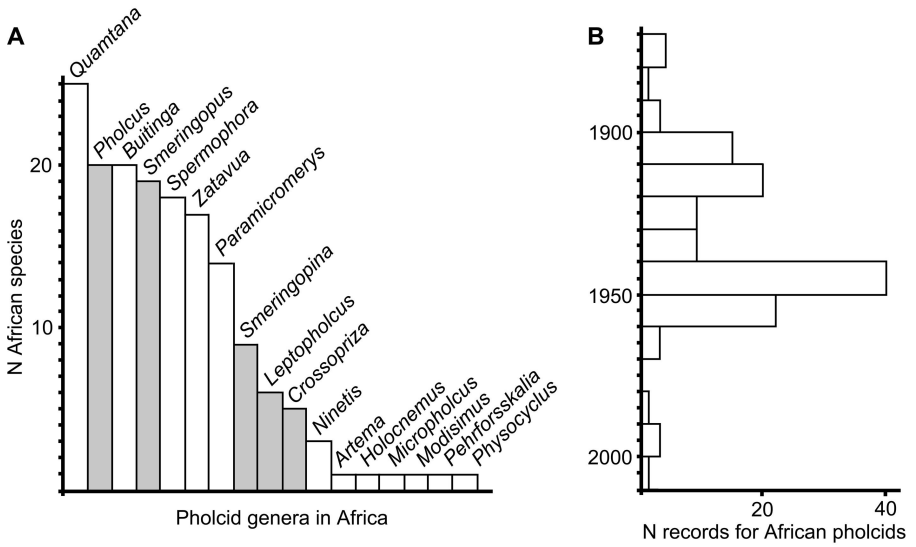

Figure 1. A. Pholcid genera in Africa, with current species numbers. Marked in grey are those genera that are most in need of revision. B. Publication dates of all records published for the five genera marked in grey in Fig. 1A.

endemism: 46% of the species included in these five genera are known from the type locality only. Several species are known from females only, but males are often necessary for species determination in pholcids. With this level of knowledge, interpretation of distribution maps of genera is difficult, but rough estimates can be provided (Fig. 2) and reveal interesting patterns.

At an alpha-taxonomic level, much remains to be discovered. Recent revisions of African *Spermophora* and related taxa has multiplied the number of known species by a factor of 5.2. If a similar increase occurs in the five genera under consideration, this would amount to over 200 new species.

Pholcus Walckenaer is a cosmopolitan (largely Old World) genus, with highest diversity on the Canary Islands and in Asia. In Africa, a single Mediterranean species faces 17 sub-Saharan nominal species. The single record from Madagascar is dubious (one female specimen in a house), and the genus is apparently also absent from southern Africa (Huber, 2003c). The cosmopolitan *P. phalangioides* has probably not originated from Africa but from the Palaearctic. Whether sub-Saharan *Pholcus* represent a monophyletic clade is unknown.

Smeringopus Simon has a quite different distribution. It is largely

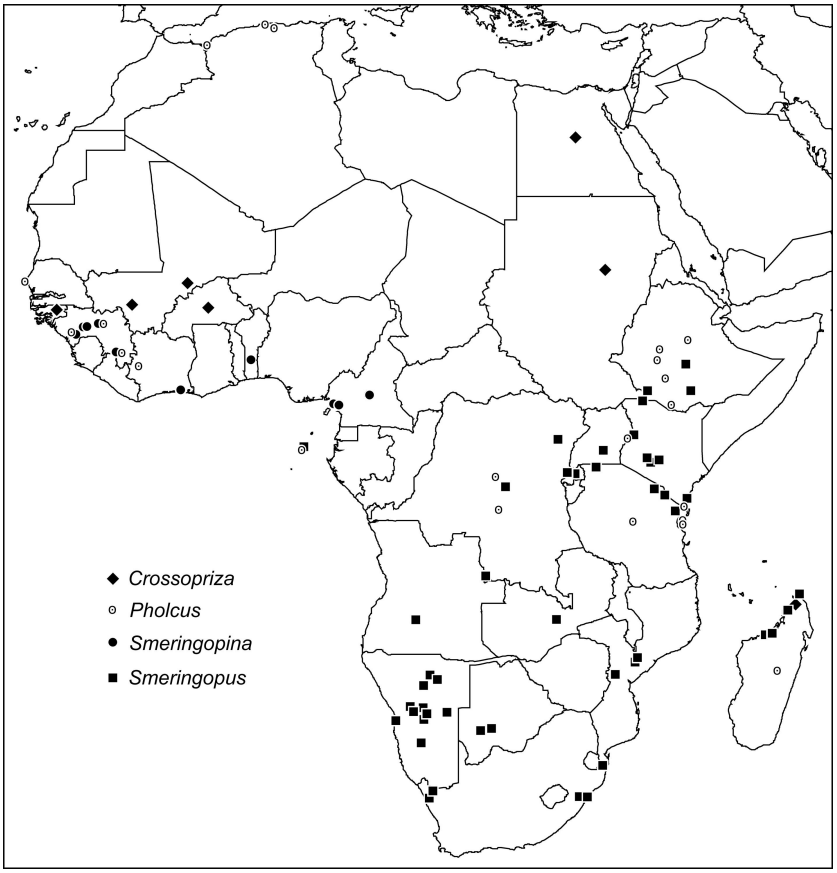

Figure 2. Known distributions of pholcid genera in Africa that are most in need of revision. For *Leptopholcus* see Huber et al. in press.

endemic to Africa, with 18 nominal species restricted to Southern and Eastern Africa (Kraus, 1957), and one species in Yemen (a single East Asian species is either misplaced or a synonym). *Smeringopus natalensis* is anthropophilous (Lawrence, 1947, 1967; Huber, 2001), and *S. pallidus* has followed humans around the world (Kraus, 1957).

Smeringopina Kraus was established for some species originally placed in *Smeringopus* as well as some new species (Kraus, 1957). The nine known species are restricted to Western Africa, and here the genus seems to occur in forests only. Thus, despite the similar names, *Smeringopus* and *Smeringopina* have disjunct distributions, very different ecologies, and are probably not even closely related (Huber, 1995). However, no representative of *Smeringopina* has ever been included in a phylogenetic analysis.

Crossopriza Simon may have similar ecological requirements as *Smeringopus*, but while the latter occurs in Southern and Eastern Africa,

Crossopriza (5 species in Africa) is restricted to the north, with further species on the Arabian Peninsula. The single species from Madagascar is known from one juvenile specimen collected in a house, and is thus probably a synonym of the synanthropic *C. lyoni*.

Leptopholcus Simon has a worldwide distribution, and the six African species occur widely in sub-Saharan Africa (Huber et al. in press). Most or all species appear restricted to relatively humid areas where they live cryptically on the underside of large leaves.

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