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Fifty-three taxa of unionicolid water-mites were found in a survey of approximately 15,000 unionoid fresh-water mussels (comprising 51 genera with 173 species), viviparid snails, and spongillid sponges from North America, mainly the eastern United States. Twenty-three mite taxa had been known, and thirty more were recognized during this study; no names for the latter are introduced in this dissertation.

The mites included the genera Najadicola (Najadicolinae) and Atacella and Unionicola (Unionicolinae). Unionicola was represented by six subgenera in the study area: Unionicola, Pentatax, Parasitatax, Polyatax, Neoatax, and Unionicolella. A systematic study of these mites suggests that a revision of the subfamilies, genera, and subgenera is necessary. Suggestions for this revision are presented, but not implemented.

Population biologies, reproduction strategies, host

exploitation strategies, distributions, and host preferences are discussed for most species of these mites. Old host records and old distribution records are evaluated.

The major twentieth-century, higher systematic schemes for North American unionid mussel hosts are evaluated in terms of correlation with mite host preference data. This evaluation shows that the Davis and Fuller scheme is the best approximation of the natural classification of the mussels. Comments based on mite host preference data are provided in regard to the relationships of genera and species of certain mussels.

Zoogeographic studies showed that the more host specific mites have ranges that correspond with the ranges of their hosts, whereas the less host specific mites are the more widely distributed.

Population biology, host exploitation, and reproductive strategy studies permit the preliminary assignment of most mite species to either of Mitchell's models. The l model, where mite population size is determined by the size of the host, fits most species in the subgenera Parasitatax, Unionicola, Pentatax, and Neoatax. The m model, where mites usually restrict their populations to a single male and one or two females per host, fits most species in the Unionicolella, one species in the Parasitatax, one species in the Polyatax, and the genus Najadicola.

Such studies show host resource partitioning, also, because many mussels are parasitized simultaneously by different species of mites, which exploit distinctly different sites of oviposition, sites of encystment, and territories of females.

Adaptations of water-mites to parasitism include morphological specialization and the development of a range of host specificities. These adaptations and the zoogeography of the mussel-mite associations imply that the origin of these symbioses is ancient.

These organisms (plus their chironomid symbionts) are excellent subjects for the experimental study of coevolution because the taxonomy of each group is rather well developed, the symbiotic relationships are varied, and the animals are readily available and easily maintained under laboratory conditions.