# Chromosomal divergence and heterogameity in two annual killifishes of the genus *Pterolebias*

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The annual killifish (Cyprinodontidae) species *Pterolebias hoignei* and *Pterolebias zonatus* from the Orinoco basin, Venezuela, have been regarded as conspecific ecomorphs, but *P. hoignei* has a diploid number of 46, whereas *P. zonatus* has a diploid number of 42. Metacentric chromosome counts also differ between these two species. *Pterolebias hoignei* has a sexually dimorphic karyotype, while *P. zonatus* does not. Although the diploid number is the same for both sexes, male *P. hoignei* possess a single large Y chromosome not present in the female karyotype. The hypothesis of conspecificity is rejected on the basis of karyotypic divergence found between the species.

*Key words*: Cyprinodontidae, karyotype divergence, sexual dimorphism.

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Les espèces annuelles de cyprins («killifish») de la famille des Cyprinodontidés, le *Pterolebias hoignei* et le *Pterolebias zonatus* du bassin Orinoco, Vénézuela, ont été considérées comme des écomorphes conspécifiques. Toutefois, le *P. hoignei* possède un nombre diploïde de 46 chromosomes, tandis que celui de *P. zonatus* est de 42. De plus, les numérations des chromosomes métacentriques diffèrent chez ces deux espèces. Seul le *P. hoignei* possède un caryotype sexuellement dimorphe. D'autre part, si le nombre diploïde est le même pour les deux sexes, le *P. hoignei* mâle possède un seul gros chromosome Y, lequel est absent dans le caryotype femelle. Conséquemment, sur la base des divergences caryotypiques trouvées entre ces deux espèces, l'hypothèse de la conspécificité est rejetée.

*Mots clés* : Cyprinodontidés, caryotypes divergents, dimorphisme sexuel.

[Traduit par la rédaction]

## Introduction

Two very similar species of annual killifishes, *Pterolebias zonatus* Myers and *Pterolebias hoignei* Thomerson, have been described from the llanos of the Orinoco basin (Thomerson 1974). Although they have recently been collected syntopically (Thomerson and Taphorn 1987), *Pterolebias hoignei* tends to live in shaded pools and *P. zonatus* is usually found in open sunlit waters. Therefore, it might be argued that they are ecophenotypes of a single biological species. This article reports karyotype differences that substantiate their status as separate biological species.

## Materials and methods

Study specimens were collected by J.E. Thomerson and D.C. Taphorn as follows: *P. zonatus* (six males, seven females) and *P. hoignei* (five males, five females) from a borrow pit at Prestamo (kilometre marker 74) and *P. hoignei* (one male, five females) from a pasture pool at kilometre marker 60 on the Guanare to Guanarito road, Portugesa State, Venezuela, 17 July 1986. Mitotic karyotypes were prepared from gill epithelium, using the technique of Kligerman and Bloom (1977) as modified by Turner et al. (1985). Two chromosome spreads per specimen were photographed.

Chromosomes were classed according to their arm-length ratios: 1.70 or less, metacentric; 1.71–2.99, submetacentric; 3.00 or more, acrocentric (Levan et al. 1964).

## Results

Male and female karyotypes of *P. hoignei* were sexually dimorphic. Male *P. hoignei* (Figs. 1*a* and 1*b*) had a single, atypically large Y chromosome not seen in the female karyotype (Fig. 1*c*). This distinctive chromosome, or any sexual dimorphism, was not seen in the karyotype of *P. zonatus* (Fig. 1*d*). The two species also differed in diploid number: 46 (0 to 4 submetacentric chromosome visible) for *P. hoignei* (Figs. 1*b* and 1*c*) vs. 42 (2 to 6 submetacentrics visible) for *P. zonatus* (Fig. 1*d*). Their metacentric chromosome numbers also differ: 6 for *P. hoignei* vs. 12 for *P. zonatus*. Karyotypes from the two populations of *P. hoignei* were similar, even though the two collecting localities are separated by 300 km.

## Discussion

Thomerson (1974) recognized *P. hoignei* as a species distinct from *P. zonatus* primarily on differences in coloration, fin development, and meristic values. Until recently the two forms had not been found in syntopy (Thomerson and Taphorn 1987), and a reasonable argument could have been made that they were ecophenotypes of a single biological species. Because of striking differences in their karyotypes, it is unlikely that the two species could successfully hybridize.

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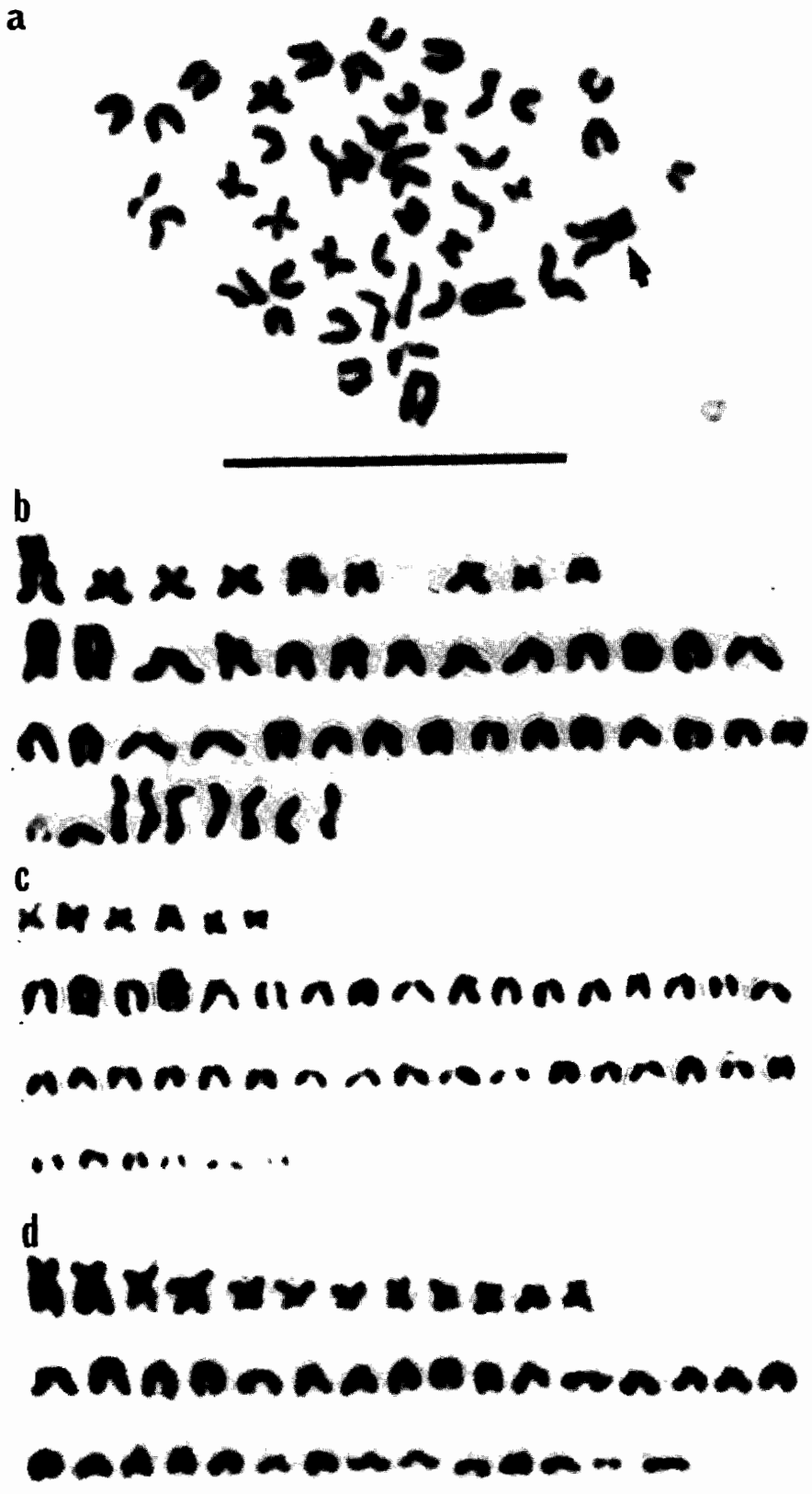
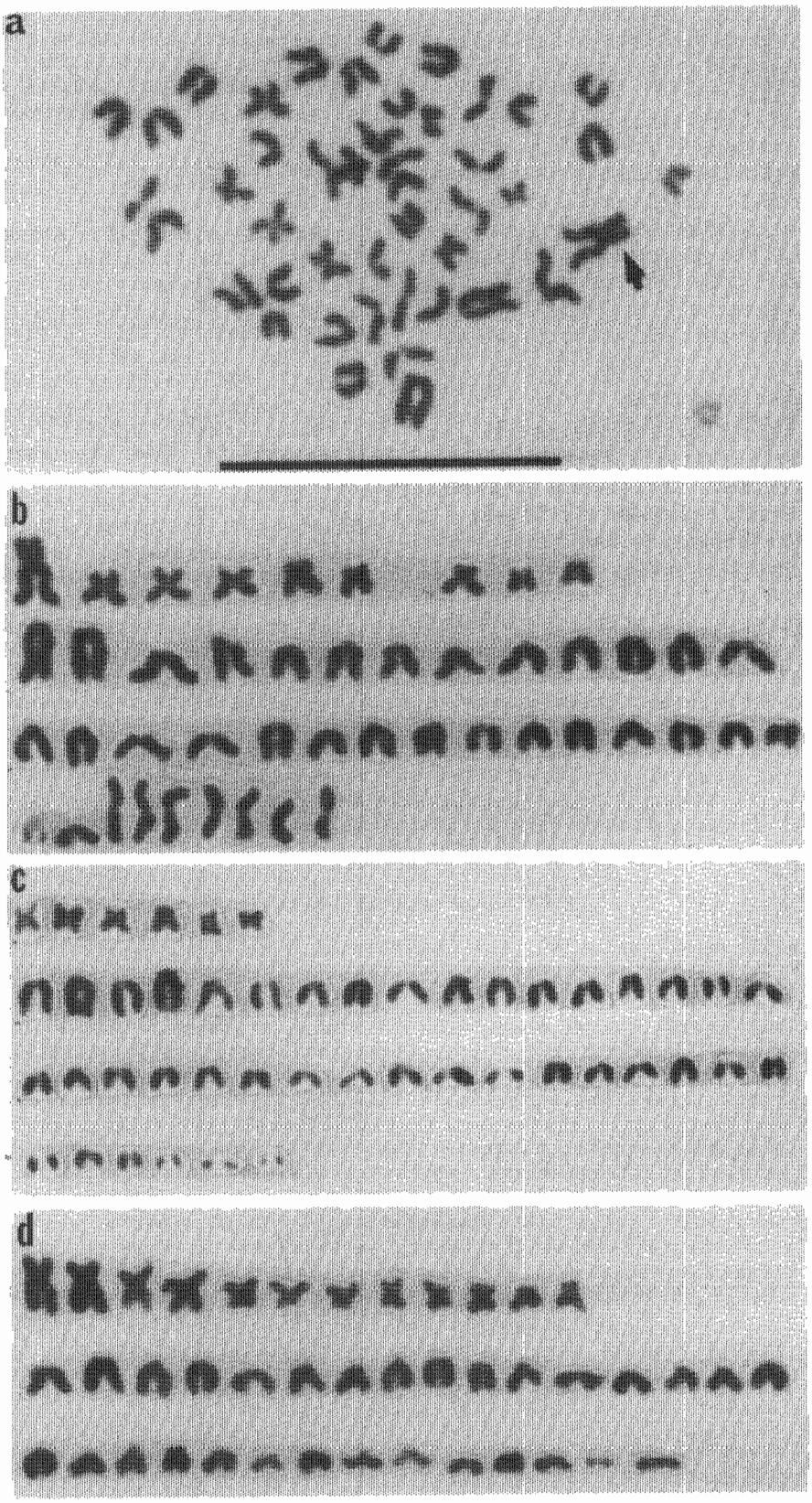



FIG 1. (*a* and *b*) Chromosome complement and karyotype of *P. hoignei* male. The Y chromosome is indicated with an arrow in Fig. 1 *i*. Bar represents 10 μm. (*c*) Karyotype of *P. hoignei* female. Note absence of large Y chromosome. (*d*) Karyotype of *P. zonatus* male. Note absence of large Y chromosome.

Karyotypic sexual dimorphism, involving a multiple sex chromosome fusion system, has been reported in the Old World aplocheiloid *Nothobranchius guentheri* (Ewulonu et al. 1985). Our observation of the unique large Y chromosome in male *P. hoignei* (Figs. 1*a* and 1*b*) is the second discovery of karyotypic sexual dimorphism in a New World

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aplocheiloid, the first being *Cynolebias cheradophilus* (Oliveira et al. 1988). It seems reasonable to regard lack of karyotypic sexual dimorphism as plesiomorphous for the aplocheiloids.

Parenti (1981) examined specimens of four species of *Pterolebias*, *P. peruensis* Myers, *P. zonatus*, *P. hoignei*, and the type species, *P. longipinnis* Garman, and concluded that the genus was monophyletic. Seegers (1987) reviewed the genus and recognized seven species but did not attempt a phylogenetic analysis. The morphological similarities between *P. zonatus* and *P. hoignei* are impressive, but their divergent karyotypes suggest that future phylogenetic analyses of the genus will show that these species are not sister groups.

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