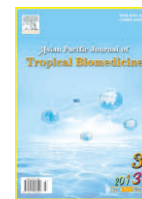




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Spinal deformities in a wild line of *Poecilia wingei* bred in captivity: report of cases and review of the literature

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PEER REVIEW

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Comments

It is a good study with interesting and novel information about skeletal deformities in a wild fish species kept in aquarium environment. The results will be helpful to evaluate the abnormalities occurring by toxic substances experimental studies made on this of other fish species.

(Details on Page 189)

ABSTRACT

Objective: To describe the occurrence of various spinal deformations in a captive-bred wild line of *Poecilia wingei* (*P. wingei*). **Methods:** Fish belonging to a wild line of *P. wingei* caught from Laguna de Los Patos, Venezuela, were bred in an aquarium home-breeding system during a period of three years (2006–2009). The spinal curvature was observed to study spinal deformities in *P. wingei*. **Results:** Out of a total of 600 fish, 22 showed different types of deformities (scoliosis, lordosis, kyphosis), with a higher incidence in females. Growth, swimming and breeding of deformed fish were generally normal. **Conclusions:** Possible causes for spinal curvature in fish are discussed on the basis of the current literature. While it is not possible to determine the exact cause(s) of spinal deformities observed in the present study, traumatic injuries, nutritional imbalances, genetic defects or a combination of these factors can be supposed to be involved in the pathogenesis of such lesions.

KEYWORDS

Poecilia wingei, Spinal deformities, Scoliosis, Lordosis, Kyphosis

1. Introduction

Skeletal deformities are commonly encountered in both cultured and wild fish[1–8], with a higher frequency in hatchery populations. Such anomalies can cause economic loss to fish farmers; in addition, when occurring in wild species, they are used as indicators of water pollution because of their high incidence in polluted areas[7, 9–11]. Evidence suggest that such abnormalities are induced during the embryonic and post-embryonic periods of life and it has been proposed that the condition has a multifactorial aetiology[12]. Spinal malformations are

the most frequent type of deformity seen in fish, mainly represented by dorso-ventral deviation (kyphosis and lordosis) or curvature in the coronal plane (scoliosis), which can be variably associated. Affected fish do not usually swim efficiently, are less capable of acquiring food, are at a greater risk of predation, as well as are more susceptible to physiological imbalances[2]. To the best of our knowledge, occurrence of spinal deformations in *Poecilia wingei* (*P. wingei*)[13], an endemic little livebearer from Laguna de Los Patos, Laguna La Malaguena, and Laguna Buena Vista in the North of Venezuela, has not yet been reported. In this survey, we report several cases of spinal deformities

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occurring in a wild line of *P. wingei* bred in a home fish farm during a period of three years. Discussion on the possible causes for spinal curvature in fish is also made on the basis of a literature review.

2. Materials and methods

Fish specimens, belonging to a wild line of *P. wingei* caught from Laguna de Los Patos near the city of Cumaná, Venezuela, by Dr. Roman Slaboch in 2001 and successively bred in Italy by one of the authors, were collected from an aquarium home-breeding system during a period of three years (2006–2009). Four different tanks were used: one was represented by a planted 200 L aquarium (pH 7.9; Gh 10; Kh 6; PO_4^{-3} 0.3 mg/L; O_2 7 mg/L; CO_2 10 mg/L; Fe 0.07 mg/L; NO_2^{-1} 0 mg/L; NO_3^{-1} 7.5 mg/L), whereas 3 tanks (50 L) were used for breeding, as well as fry growing (pH 7.4; Gh 8–8.5; Kh 5; PO_4^{-3} 0.5 mg/L; O_2 7–8 mg/L; NO_2^{-1} 0 mg/L; NO_3^{-1} 12.5 mg/L). Each aquarium was equipped with its own internal filtering, heating (26 °C) and water pump systems. A weekly 50% water change and 2 times a day feeding were also applied, using frozen *Artemia salina*, as well as a wide range of high quality dry foods, supplemented with vitamins A, C, D3, E, highly unsaturated fatty acids and beta glucan. Since the spine of *P. wingei* is visible without magnification, fish were evaluated for curvature from the side and above while in a glass tank and then photographed with a digital camera (Nikon Coolpix E5200).

3. Results

Out of a total of 600 fish, 22 (3.6%) showing spinal deformations were detected: 2 fry, 2 adult males, and 18 adult females. The predominant type of spinal abnormalities was scoliosis, which was observed in 20 fish (2 fry, 2 males, 16 females) with variable degree of curvature (Figure 1 and 2). Of 18 adult fish with scoliosis, 1 female also had secondary kyphosis (Figure 3a), 2 females also had secondary lordosis (Figure 3b), whereas 2 females also showed both kyphosis and lordosis. Two females only exhibited primary lordosis. All but 1 fish were born with apparently normal spines and developed scoliosis within the 2–3 weeks past birth, whereas lordosis and kyphosis only became macroscopically evident after sexual maturity. Curvatures were generally observed in the posterior half of the spinal column. All but 1 fish showed normal growth, swimming and breeding behaviour. A unique female fish born with scoliosis and lordosis displayed abnormal swimming, characterized by a vertical position, which did not prevent it from acquiring food. However, it did not appear to be able to reproduce.

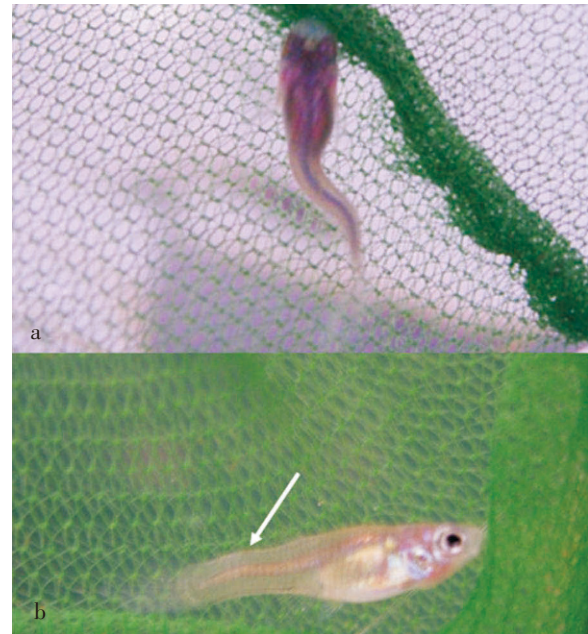


Figure 1. *P. wingei*.

a: Dorsal; b: lateral (arrow) view of a fish fry showing severe scoliosis.

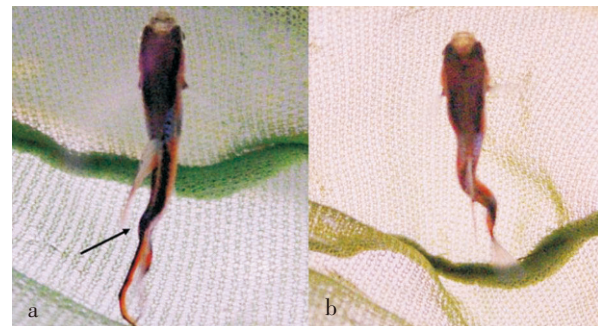


Figure 2. *P. wingei*.

Two adult males showing a: mild (arrow) b: severe scoliosis.

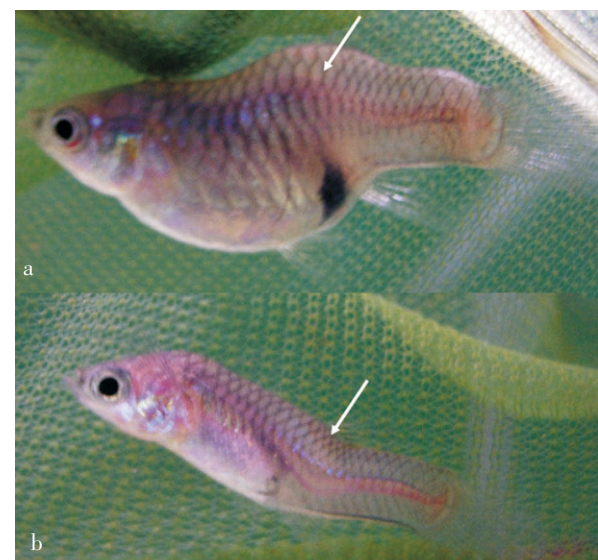


Figure 3. *P. wingei*.

a: Adult pregnant female showing kyphosis (arrow); b: Adult female showing lordosis (arrow); this fish displayed abnormal swimming.

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