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Case Report

SURGERY MANAGEMENT OF RECURRENT BILATERAL DROP EYE SYNDROME IN A CAPTIVE SILVER AROWANA (*Osteoglossum bicirrhosum*) (Cuvier, 1829)

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SUMMARY

A silver arowana (*Osteoglossum bicirrhosum* Cuvier, 1829) with an estimated age of over 10 years old and measuring 81 cm total length was presented with bilateral drop eye syndrome while housed in a recirculating aquaculture system (RAS) at Aquaria KLCC. The condition was suspected to be associated with overfeeding and a high protein diet leading to excessive fat deposition around the eyes. The condition had been previously observed, and surgical correction was done in February 2025 through removal of dorsal orbital fat. The condition recurred after a month with prominence on the right side; thus, a second surgery was done on the 26th March 2025 which involved removing of the dorsal orbital fat and severing the ventral orbital tissue. The fish was anesthetized using isoeugenol via immersion and direct gill irrigation delivery method. Postoperatively, the fish was treated with dexamethasone as anti-inflammatory and vitamin C and B-complex to supplement the healing. The prognosis is considered good to fair following recovery.

Keywords: cosmetic surgery, dorsal orbital fat, drop eye syndrome, fish anesthesia, silver arowana

INTRODUCTION

The silver arowana (*Osteoglossum bicirrhosum*) (Cuvier, 1829) is a native freshwater fish from the Amazon River basin in South America and highly valued in the ornamental fish trade for its striking appearance and predatory behavior. These species are known for their surface-feeding habits (Medipally et al., 2016) and ability to leap out of water to capture its prey (Verba, et al., 2018). In captivity, the silver arowana are prone to drop eye syndrome (Loh et al., 2016). This syndrome is characterized by the downward displacement of one or both eyes and can be of multifactorial origin, with contributing factors including overfeeding, high-protein diets, sinking foods and environmental stimuli, bright light and reflection at the bottom of the tank. While mild cases or early course syndrome can be treated conservatively through diet and enclosure modification, in severe, recurrent or chronic cases it often requires surgical intervention. This report describes a clinical case of bilateral drop eye syndrome in captive silver arowana, focusing on suspected etiology, surgical management and corrective and preventive intervention. In addition, bilateral recurrence in an older captive arowana is rare and the limited documentation regarding surgical correction and relapse management, thereby providing valuable clinical insights into this condition.

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CASE REPORT

Patient Signalments and History

A male silver arowana, estimated to be 10 years old and measuring 81 cm in total length weighing at 5.2kg, was originally housed in Deep Forest exhibit Aquaria with a total of 100 000 liters of water volume. The fish was fed with tilapia fillet and crickets to satiety, around 5-10 crickets and 40-80g of tilapia fillet daily. The fish had a history of bilateral drop eye syndrome, a condition first observed by the staff along with similar presentations on two other arowanas in the same exhibit. Previously, this silver arowana has undergone surgery to correct the drop eye bilaterally by removal of dorsal orbital fat. However, recurrence of the condition was noted in March 2025, being more prominent in the right eye, while the left one improved. Thus, the second surgery was scheduled on 26 March 2025 with a similar procedure of removal of dorsal orbital fat and severing the ventral tissue to relieve the tension and pressure of the deviated eye. The silver arowana was then isolated prior to the surgery with a recirculating aquaculture system. The water quality parameter readings were weekly prior to case presentation (Table 1).

Table 1: The water quality parameter readings recorded weekly prior to case presentation were within normal limits.

Parameter	4/3/25	11/3/25	18/3/25	25/3/25
Salinity (S.G)	1.001	1.001	1.001	1.000
pH	7.07	7.06	6.66	7.64
Temp (°C)	25.60	25.70	27.90	26.00
DO (mg/L)	8.01	8.15	7.62	7.86
Ammonia (mg/L)	0.01	0.06	0.05	0.06
Nitrite (mg/L)	0.013	0.009	0.02	0.007
Nitrate (mg/L)	3.0	4.1	5.4	7.2
Copper (mg/L)	0.01	0.00	0.00	0.00
Chlorine (mg/L)	0.01	0.00	0.00	0.00

Physical Examination and Diagnostic Approaches

Upon examination, the silver arowana was presented with bilateral bulging of the eyes with the abnormal ventral deviation of both eyes (Figure 1), with no other abnormal clinical sign. The differential diagnosis considered includes obesity-related fat accumulation, ocular inflammatory reactions, trauma and ocular neoplasia.

Figure 1: Drop eye syndrome observed in the silver arowana with prominent dorsal orbital fat of the left eye observed here.

In this case, diagnosis was made by visual assessment of the eye position, which showed a bulging eye with ventral deviation, indicating drop eye. Surgical correction was performed as both a cosmetic treatment and a diagnostic procedure. From the surgery, we can confirm the presence of fat on the bilateral dorsal orbital, and the excised tissue was sent for histological examination.

Anesthetic Protocol

A week prior to the surgery, the silver arowana was transferred to an isolation tank to allow acclimatization, reduce handling stress, and facilitate close monitoring. On the day of surgery, the fish was transported from the isolation tank using a sturdy, water-filled transfer bag to ensure safe and stress-minimized handling (Figure 2).

Figure 2: Fish is transported to the induction tank for anesthesia.

Anesthesia was induced using isoeugenol (Aqui-S, Syndel, USA) at an initial dose of 10 mg/L, corresponding to 1.2 mL for a 67-liter induction tank. The anesthetic was administered via immersion, where the anesthetic agent is diluted in water in the induction tank with dosing performed via a titration technique to achieve a surgical plane of anesthesia. Monitoring the fish's response to anaesthetic drug was done by noting its loss of equilibrium, response to stimuli and opercular movement. Although loss of equilibrium was noted, the fish remained responsive to tactile stimuli. To achieve a surgical plane of anesthesia, two incremental doses were administered into the induction tank at three-minute intervals, each increasing the anesthetic concentration by approximately 10 mg/L. As the desired depth of anesthesia was not achieved after the third dose, a final 10 mg/L equivalent was administered directly through gill irrigation, resulting in a cumulative anesthetic concentration of approximately 40 mg/L. This protocol successfully induced a stage III plane of anesthesia (surgical plane) defined by total loss of equilibrium and absence of response to stimuli. Anesthesia was maintained throughout the procedure using continuous gill irrigation with anesthetic-laden water powered by a pump.

Surgical Protocol

The fish was placed in the right lateral recumbency on the surgical platform that was covered with a wet towel (Figure 3), to maintain moisture on the fish's skin. Occasionally, the exposed lateral skin is moistened with water. The surgical area was thoroughly cleansed and disinfected using a povidone-iodine swab, following standard preoperative antiseptic procedures, to reduce microbial contamination and minimize the potential for infection.

Figure 3: The silver arowana are placed on the platform after reaching surgical anesthesia stage III.

The procedure was initiated on the left eye. Gentle depression of the globe was performed to expose the dorsal bulging area using fine forceps (No. 7) (Figure 4). A 2 cm curved incision was made on the dorsal orbital skin using a No. 20 surgical blade, and the excess orbital fat was carefully excised with the same blade and removed using iris scissors. The ventral portion of the eye was then accessed by gently elevating the globe outward and dorsally, followed by careful severing of the connective tissue to relieve the downward traction using the No. 20 blade and iris scissors for deeper access. The same procedure was subsequently performed on the right eye. Povidone-iodine solution was applied and covered with hydrocolloid powder dressing to both surgical sites for antisepsis. No sutures were applied

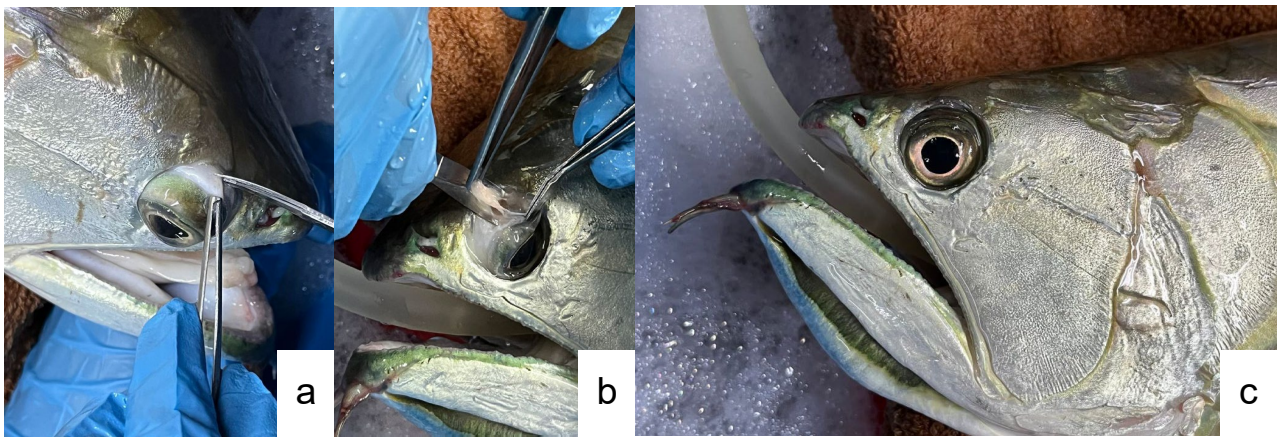

Figure 4. (a) Gentle depression of the globe was performed to expose the dorsal bulging area; (b) An 2cm curved incision was made on the dorsal orbital skin using a No. 20 surgical blade, and the excess orbital fat was carefully excised and removed using iris scissors; (c) Appearance of the left eye after removal of the fat around the dorsal orbital skin.

Postoperatively, intramuscular injections of dexamethasone (1 mg/kg; 5 mg/mL) were administered as an anti-inflammatory and analgesic, together with vitamin B-complex plus vitamin C (1 mL/10 kg) to support tissue healing. The fish was immediately transferred to an isolation tank for recovery. The excised dorsal orbital fat tissues were fixed in formalin for histological processing.

In the isolation tank, the fish was placed close to the aeration for oxygen supply. Occasionally, handlers will move the fish forward gently in the water while holding them to stimulate recovery. After 20 minutes, the fish righting reflex starts to recover and swim. Prognosis was assessed as good to fair, with recommendation to adjust the feeding regime and tank environment as needed to prevent recurrence. Following 14 days of observation and recovery, the fish showed no ocular abnormalities and complete lesion healing, after which it was returned to the exhibit (Figure 5)

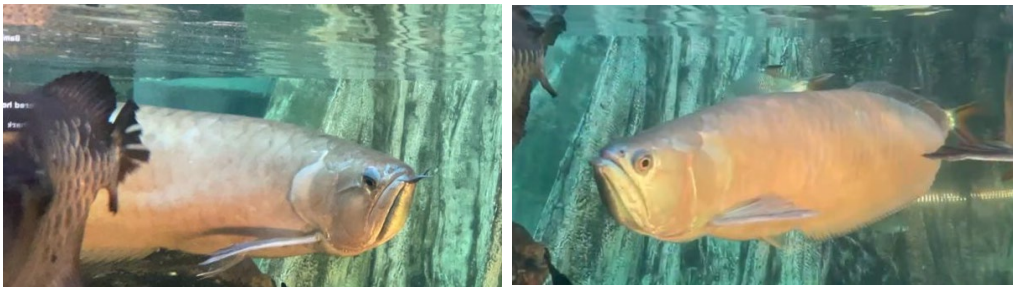

Figure 5: The Silver arowana returned to exhibit showed no ocular abnormalities and complete lesion healing post 14 days surgical correction.

Histological Assessment

Histology revealed that the fat sample consisted of large round to polygonal shape with clear cytoplasm adipocytes, supporting fat accumulation as underlying cause. Absence of neoplastic tissue, inflammatory cells and fibrous tissue rule out the other differential (Figure 6).

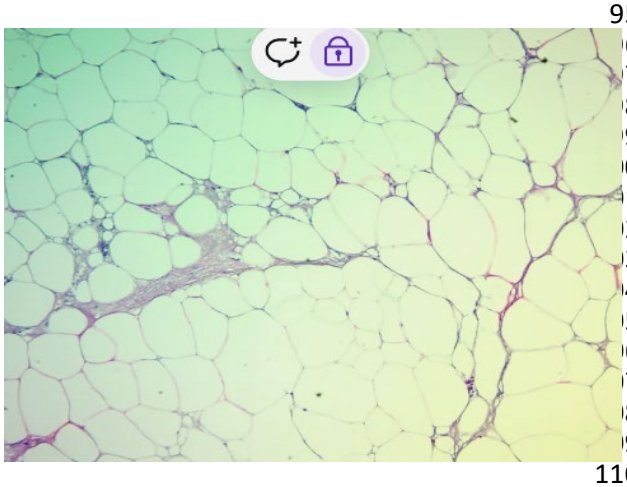

Figure 6: Dorsal orbital fat histology under 40x magnification shows adipocytes consists of large round to polygonal shape with clear cytoplasm.

DISCUSSION

Arowana maintained in captivity frequently develop drop-eye syndrome, a condition in which one or both eyes deviate ventrally. Despite being commonly recognized among hobbyists and aquarists, scientific literature on the condition remains limited. Arowana exhibiting drop-eye are often considered suboptimal for exhibition, resulting in substantial financial loss to keepers and breeders (Chow et al., 2024). Nutritional imbalance, particularly excessive feeding or diets high in protein and fat has been proposed as a major contributing factor, as it may promote deposition of adipose tissue within the orbit (Hemdal, 2009). The recommended diet for silver arowana emphasizes high-quality protein with strict portion control (Banna, 2025). Juvenile arowana require higher levels of protein and lipid (40% and 8%, respectively) with increased feeding frequency at least three times daily to support growth and maturation, after which feeding rates should gradually decrease (Fernández-Mendez et al., 2024). Tilapia fillets, containing approximately 38% protein and 1% fat, are therefore more appropriate for juvenile or growing fish, and over conditioning may contribute substantially to the syndrome's development.

Beyond nutrition, husbandry practices and environmental factors may also influence the condition. Provision of sinking food encourages the fish to orient downward, contradicting their natural surface-feeding behavior (Rose, 2024). In addition, tank designs with bottom-dwelling stimuli or reflective surfaces may predispose fish to consistently downward gaze. Silver arowana benefit from rotational diets incorporating live and frozen fish as well as insects to simulate natural foraging behavior (Fernández-Mendez et al., 2024). While the exact pathophysiology remains unclear, hypotheses include orbital fat hypertrophy, redistribution of connective tissues, weakened extraocular muscle tone, and behavioral conditioning over time.

Management depends on the severity of the condition. Mild or early cases may respond to conservative approaches such as dietary regulation and improved tank design. However, in advanced cases, surgical intervention remains the most effective option for cosmetic correction and restoration of visual orientation. The standard surgical approach involves excising excess dorsal orbital tissue and, in some reports, temporarily suturing the globe to maintain position during healing (Loh et al., 2016).

Anesthetic management is critical given the highly reactive and strong jumping behavior of arowana, which increases the risk of self-injury during induction. The induction tank must be securely covered, and external stimuli such as bright light or sudden noise should be minimized (Loh et al., 2016).

Teleost fish possess rapid epithelial regenerative capacity, allowing effective re-epithelialization and closure of superficial surgical wounds without the need for suturing (Parker-Graham et al., 2022). In this case, the surgical incision was intentionally left unsutured due to the high tension and constant movement at the ventral orbital region in arowana, combined with limited surrounding soft tissue available to anchor sutures securely. Primary closure under these conditions increases the risk of suture dehiscence, tissue tearing, and additional trauma. Instead, a hydrocolloid powder dressing was applied to promote hemostasis, protect the wound surface, and support secondary intention healing (Abramo et al., 2008). Post-operatively, monitoring for corneal irritation, feeding behavior, and buoyancy is important, although recurrence of drop-eye is generally low if husbandry improvements are maintained.

CONCLUSION

This report demonstrates the efficacy of a combined surgical approach comprising dorsal orbital fat excision and the severing of ventral connective tissues in the management of recurrent bilateral drop eye syndrome in a Silver Arowana (*Osteoglossum bicirrhosum*). This case highlights that while surgical correction provides immediate relief for advanced cases, and long-term resolution requires a holistic strategy addressing underlying husbandry factors, specifically dietary protein management and tank environment modification. These findings provide a valuable reference for veterinarians and aquarists managing high-value ornamental species with chronic ocular deviations.

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CONFLICT OF INTEREST

The authors have no conflict of interests to declare.

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