BRIEFING NOTE

Conservation of the Orange Fringed River Bream in South Africa and Eswatini and broader implications for freshwater fish conservation

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Objective – A briefing note aims to provide a concise outcome based synopsis of recent research or expert opinion that may inform decision making and activities by Authorities, Industry, NGO's and NPO's. The briefing note series complements the academic peer reviewed literature or reports published by NRF-SAIAB. SAIAB is a Research Institution and not a management agency and as such the views presented are for consideration by all stakeholders and are non-binding.

Purpose – This brief aims to highlight the status, threats and conservation options for the Orange Fringed River Bream (*Chetia brevis*).

BACKGROUND

The Orange Fringed River Bream (*Chetia brevis*) is a predatory riverine cichlid fish endemic to the Lomati River in Hhohho Province, Eswatini and Mpumalanga Province, South Africa (Bills et al. 2004, Skelton 2024). It is the southern-most representative of the tropical genus *Chetia* which is distributed sporadically in Southern Africa and none of the species are particularly widespread or common. No dedicated scientific studies have focused on *C. brevis* and relatively little is known about its biology. We do know it is a small species with large males attaining 150mm total length, females breed in summer and mouth-brood eggs and fry producing around 50-80 eggs per spawning and they feed upon aquatic invertebrates and small fishes (Kleynhans 1974, Skelton 2024).

The distribution of this species is unusual as it is found in a single tributary of the Komati River system, the Lomati River, which arises in the Barberton region of Mpumalanga Province, flows into Hhohho Province in Eswatini and then back into Mpumalanga, South Africa. Historical records indicate *C. brevis*' upper distribution to be a little upstream from Ngonini, Eswatini (25°50'0.18"S, 31°22'48.74"E, 428m above sea level) and its lower distribution to be the Lomati-Komati confluence near the town of Phiva, Mpumalanga (25°38'12.57"S, 31°47'18.61"E, 192m above sea level).

The Komati river catchment is in the southern portion of the Zambezian lowveld ecoregion and is a biodiverse area important for a range plant and animal groups (Dallas 2005). There are just over 50 species of freshwater fishes in the wider Komati system (https://scientific-collections.gbif.org/institution/a90ba963-9569-4b96-8d56-452aa7b83f75, Skelton 2024). Several of these fish are considered as threatened within the IUCN Red Data list and *C. brevis* is amongst those (https://www.iucnredlist.org/). The Orange-fringed river bream was listed as Endangered following the latest IUCN Red List assessment (Roux & Hoffman, 2016). The threats were diverse, including agricultural and forestry impacts linked to excessive water abstraction, sedimentation and chemical pollution, damming of the river and alien fish introductions, all of which are on the rise. Since 1988, successive assessments reveal a concerning trajectory of shrinking geographical ranges, declining abundance and escalating threats (Skelton 1987, Engelbrecht & Bills 2007, Roux & Hoffman 2017).

Apart from *ad hoc* surveys and the decadal assessments of its conservation status through the IUCN criteria, the only notable conservation intervention was done in 1975, which was before the species was even considered threatened. Owing to its restricted distribution, absence from formally protected areas and exposure to multiple potential threats, it was translocated into three impoundments in Kruger National Park (KNP), Stolznek, Mpondo and Newu dams (Pienaar 1975). This was outside of *C. brevis*' natural range, but still within the larger Komati system. The justification for this move was that KNP would provide the species with long-term protection from the growing threats. Initial reports were that the translocation was a success but since then two of the dams have dried, while reports from rangers indicate they remain in Stolznek Dam (Petersen, pers.comm.).

In 2021, a collaborative research initiative was launched between the NRF-South African Institute for Aquatic Biodiversity (NRF-SAIAB), the Mpumalanga Tourism and Parks Agency (MTPA), and the University of Mpumalanga (UMP). The project set out to update knowledge on the distribution of *C. brevis* and to reassess its conservation status. What began as a straightforward survey quickly revealed alarming results. Fieldwork conducted on the Lomati River and in Driekoppies Dam uncovered no evidence of *C. brevis* in the river and recorded only a few large males in the dam. Critically, there were no signs of breeding or recruitment. These findings suggested that the species may potentially be functionally extinct in South Africa. These preliminary findings highlighted the need for urgency in coming up with strategies to prevent the complete disappearance of this species from the region.

BOLD STEPS TO SAVE A SPECIES IN FREE FALL

Following the recognition of the urgent need to halt the decline of *C. brevis*, a dedicated conservation program was initiated to secure remaining populations and promote the species' recovery. This was through assisted captive breeding and reintroduction into safe habitats free from largemouth bass (*Micropterus nigricans*) which were identified as the leading threat to this species. The program also aimed to survey the species' entire geographical range, including Mozambique and Eswatini, and to investigate key aspects of its biology, particularly age, growth, and fecundity, that are vital for informing effective conservation strategies. In parallel, efforts were designed to establish conservation populations in alien-free dams, drawing on both wild-caught and captive-bred individuals.

In 2024, the research team received a research grant from the Mohamed bin Zayed Conservation Fund (United Arab Emirates) to launch the program (https://www.speciesconservation.org), with the necessary permits secured from the Mpumalanga Tourism and Parks Agency (MTPA) and Eswatini Fisheries. This initiative marks a critical step toward preventing the species' extinction and restoring viable populations within its native range.

Figure 1. A male *Chetia brevis* showing breeding colouration of a yellow head, dark pelvic fins, orange lappets (upper edge) on the dorsal fin and egg spots on the anal fin.

CURRENT STATUS AND EARLY INSIGHTS

- Survey work has now been completed in all historical sites in Mozambique, Eswatini and South Africa. Specimens of *Chetia* were collected in coastal lakes in Mozambique around the region of Bilene and genetics have shown these to be potentially a different species. Within South Africa the only locality where *C. brevis* was found was Driekoppies Dam. Individuals were all very large males and were extremely rare, raising the possibility that these could be individuals that had washed down from the upper river as there are no indications of breeding or recruiting in the dam. The dam is the original site where large-mouth bass was introduced to the system and they appear to have significantly altered the species composition of the fish fauna with the loss of *C.*

brevis and most of the cyprinids. In Eswatini *C. brevis* was found in only 2.5km of river starting just above the Matsamo gauging weir which is an obvious up-stream barrier to bass movement. Old records indicate that it was distributed for some 15-20km further upstream, but these recent surveys did not record presence of this species in the upper sections of the river. Evidence suggests that populations in the upper river have been lost, likely due to a combination of pollution, reduced water flows, and sedimentation associated with intensive farming and gold mining in the catchment.

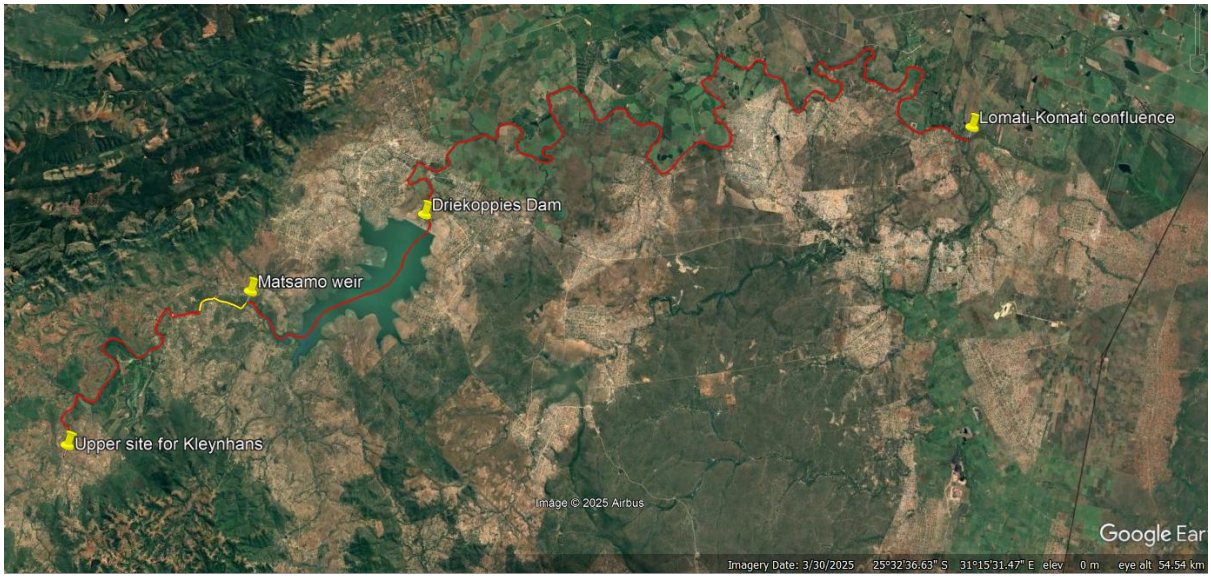

Figure 2. A map showing the current (yellow line) and historical (red line) range of *Chetia brevis* in South Africa and Eswatini, originally about 97km it is now only found in a 2.5km section of the Lomati River.

- Preliminary investigations into the biology of this species suggest a repetitive spawning strategy during the warm summer months, with individuals beginning to breed in their first year of life. Maximum observed ages are 4–5 years, with fecundity ranging from approximately 20 eggs in first-time spawners to over 60 in older females. This life-history strategy of early maturation combined with multiple spawning events may offer resilience in variable environments. Understanding these dynamics is critical for modelling extinction risk and designing effective conservation interventions. A new size record was recorded with one male of 220mm total length.

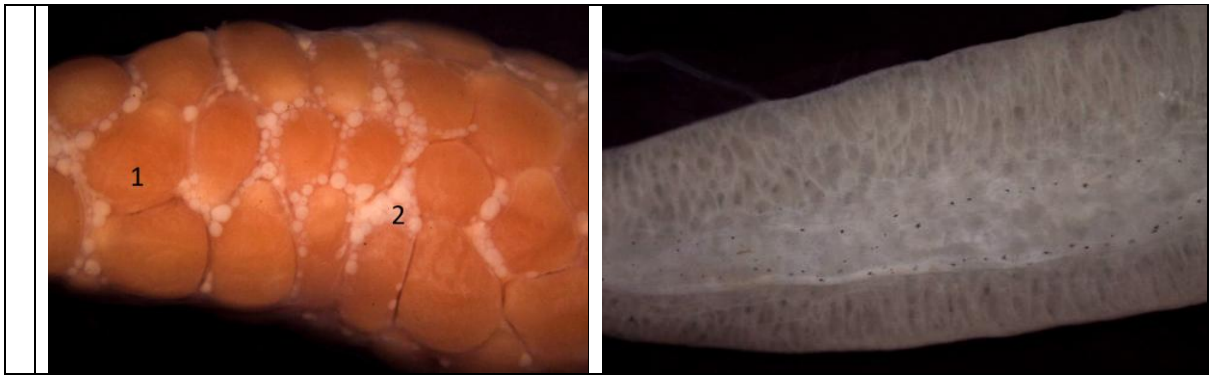

Figure 3. *Chetia brevis* – left ovary (showing two sizes of eggs: 1 ripe, 2 developing) and right testis.

Figure 4. A sectioned otolith (ear bone) from an estimated three-plus-year-old *Chetia brevis* showing growth rings used to estimate age.

- The captive breeding programme has been very successful, marking the first reproduction of *C. brevis* in captivity. This highlights that this species has the capability to breed readily and successfully recruit when provided with suitable conditions, specifically when protected from invasive predators. Between 2024 and 2025, over 1,000 offspring were produced, offering critical insights into the species' reproductive biology. Males are highly aggressive and territorial, defending breeding arenas which are 20–30 cm depressions excavated in the substrate. Females mouth-brood eggs and juveniles for approximately two weeks before releasing them, continuing parental care for an additional week, during which fry are guided into vegetated refuge areas. Key factors contributing to success included starting with small juveniles and allowing them to mature in large, dedicated breeding aquaria (2 m / 800 L), which provided sufficient space to allow expression of natural behaviours. The great success from the breeding program demonstrates that, with careful management, captive breeding can play a central role in conservation and population recovery efforts for this species.

Figure 5. A captive female *Chetia brevis* mouth-brooding young.

LOCAL STEWARDSHIP FOR LASTING IMPACT

- Restocking *Chetia brevis* has required close collaboration with private landowners in the Lomati Valley, where dams play a critical role in fruit and sugarcane farming. Many dams in the area are already impacted by invasive largemouth bass or subject to intensive use, making them unsuitable for reintroduction. However, through the cooperation of landowners who granted access to survey and assess their dams, new opportunities for conservation have been created.
- A key outcome of this collaboration has been the raised awareness among landowners of the plight of *C. brevis*. By agreeing to act as stewards for the species, they are ensuring ongoing protection and monitoring within their systems. This stewardship model represents the most effective pathway to securing the species' long-term sustainability and persistence into the future.
- To date, 22 dams have been stocked in 30 separate events, involving 2,744 fish (911 captive-bred and 1,833 wild-caught individuals). In addition, the upper Lomati River in Eswatini, within the species' historical range, has also been restocked.
- Formal assessments of stockings will begin in October 2025, but preliminary observations suggest that more than half of these have been successful. Preliminary insights suggest that larger, more natural dams provide the best conditions for survival, whereas irrigation dams with high drawdown and fluctuating flows are less suitable.

Figure 6. The Laughing Waters farm dam, the first stocking site which has been successful.

Figure 7. A historic moment as Andre Hoffman (former MTPA) releases the first *Chetia brevis* into the Laughing Waters dam.

FUTURE WORK

- Looking ahead, monitoring of stocked dams will begin in October 2025 and continue through to 2027, providing crucial insights into the establishment and survival of populations.
- Over the next six months, an additional 10 dams are expected to be stocked, further strengthening the species' chances of recovery.
- Parallel to these efforts, the biological study of *C. brevis* will expand into a Master's project (2026–27), generating the foundational knowledge needed to guide long-term conservation planning.

- Most importantly, a population genetics study is being initiated to compare the genetic diversity of stocked and wild populations. The results will inform a management strategy aimed at safeguarding genetic diversity and maintaining the species' evolutionary potential and adaptability well into the future.

RECCOMMENDATIONS

The freshwater fishes are the most highly threatened vertebrate group in South Africa and freshwater habitats in general are under significant stress (Skowno et al. 2019, Chakona et al. 2022). Threats are numerous and include alien invasive species (mainly predatory fishes), agricultural, industrial and mining impacts from physical degradation, sedimentation to chemical pollution, water abstraction and damming and finally varied municipal impacts but probably most notably the inputs of sewage into many rivers. Most of these threats are long-term and often work in synergy compounding their effects (Shumway 1999). Reviewing the IUCN red data lists shows a trend of increasing numbers of species listed as threatened and those on the lists becoming more threatened. There are few mitigations, few plans and even fewer conservation staff likely capable of implementing effective species recovery programmes. Although the current program is expected to secure the survival of *Chetia brevis*, several other South African species face equally severe threats. The following broad recommendations are therefore intended not only for *C. brevis* but also for these other imperilled species.

- The trend of diminishing scientific staff with training in aquatic sciences from provincial conservation organisations is a major concern. These are the people who should be monitoring the conservation status of freshwater fishes, other aquatic species, more generally the status of aquatic environments and implementing recovery programmes. They themselves are going extinct and this should be rectified.
- Striking a balance between recreational angling and conservation is a complex challenge. However, meaningful collaboration between conservation authorities and the angling community offers a pathway to reconcile the protection of South Africa's freshwater biodiversity heritage with sustainable economic development through better management of conflict species. For many of South Africa's endangered freshwater fishes alien fishes are the single greatest threat to their survival.
- Municipal services in many areas do not work. Sewage treatment works are often dysfunctional and refuse removal either doesn't happen or it only serves portions of communities. The result is that waste ends up in rivers which is both a threat to biodiversity and also human health. This is a nationwide problem and it needs to be solved.
- Expanding the network of protected areas may offer refuge for certain species. This could be achieved through partnering with landowners to establish conservancies or reclaimed degraded landscapes and riverscapes. However, effective protection must go beyond boundaries of protected areas, because aquatic ecosystems face unique threats such as upstream impoundments that disrupt natural flow regimes, and rivers also act as conduits for pollutants and invasive species. Conservation strategies must therefore be tailored to address these dynamic, inter-connected challenges.
- The biology, ecology, and life history strategies of many threatened freshwater fish species in South Africa remain poorly understood, creating a critical gap that undermines the effectiveness of conservation interventions. More biological studies are therefore required to better understand species to guide development and implementation of effective conservation and management plans. Without this foundational species-specific knowledge, efforts to protect and restore populations risk being misdirected or ineffective.

- Aquatic biologists in the country have been documenting the increasing environmental threats and gradual declines of many freshwater fishes for the past 50 years. To halt these declines, targeted conservation actions, such as this current project, are now urgently required. These are generally expensive, require significant funding and increased capacity for field ecologists.

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AGENCIES THAT SHOULD BE CONTACTED

Mpumalanga Tourism and Parks Agency (MTPA)
Fisheries Department, Ministry of Agriculture, Eswatini
Komati Basin Water Authority (KOBWA)
Water Research Commission (WRC)
Endangered Wildlife Trust (EWT)
South African National Biodiversity Institute (SANBI)
Lowvelder News agency
Farming organisations in the region
Department of Forestry, Fisheries and Environment (DFFE)
Nelson Mandela University
University of Mpumalanga
Rhodes University
North West University
Cape Nature
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