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Threatened Species Series

Biology, Conservation Status and Management Priorities for the Critically Endangered, *Labeo boga* (Hamilton, 1822), in Bangladesh

Oyshi Islam[1], Shanto Banik[1], Fatema Jannat Raina[2], Shahariar Hasnat[2], Mohammad Shafi Ullah[2], and Md. Yeamin Hossain[2*]

[1]*Department of Fish Biology and Genetics, Faculty of Fisheries, Sylhet Agricultural University, Sylhet-3100, Bangladesh.*
[2]*Department of Fisheries, University of Rajshahi, Rajshahi-6205, Bangladesh.*

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ABSTRACT

Labeo boga (Hamilton, 1822) is a South Asian riverine cyprinid whose broad regional distribution contrasts with severe depletion in Bangladesh. This review synthesizes verified information on its taxonomy, distribution, habitat, feeding ecology, nutritional composition, population biology, reproduction, genetics, and conservation status. In the Padma River, 211 specimens (9.78–27.50 cm total length; 10.00–276.10 g body weight) showed statistically isometric length–weight relationships in males, females, and pooled samples, with the pooled equation yielding $a = 0.0074$, $b = 3.133$, and $r^2 = 0.967$. Mean relative weight was 101.37 ± 15.46, indicating satisfactory condition during 2011–2012, although this historical observation cannot confirm current stock security. A Rajshahi market study reported fecundity of 23,484–81,648 eggs and a female-biased sex ratio of 1:2.274, whereas the Padma River sample showed near parity (1:1.05), suggesting spatial and sampling-related variation. Muscle composition varied seasonally, with protein, lipid, moisture, and ash ranging from 16.46–17.54%, 1.95–3.26%, 77.22–83.11%, and 1.03–1.23%, respectively. Although globally Least Concern, the species is Critically Endangered in Bangladesh due to overfishing, habitat degradation, pollution, siltation, and altered hydrology. Conservation priorities include stock monitoring, habitat protection, seasonal and gear restrictions, community-managed sanctuaries, pollution control, and genetically responsible captive propagation.

Introduction

Freshwater fishes are declining faster than many terrestrial vertebrate groups because rivers and wetlands concentrate the effects of water abstraction, flow regulation, pollution, invasive species, overexploitation and climate change (Dudgeon et al. 2006; Reid et al. 2019). Inland fisheries nevertheless remain essential to food security and livelihoods, particularly in Asia, while their contribution is frequently undervalued in water and development policy (Cooke et al. 2016). Species-level syntheses that connect natural history, population evidence and implementable management are therefore necessary, especially where global and national risk assessments diverge, as shown by earlier threatened-fish accounts from Bangladesh (Hossain 2014; Hossen et al. 2015).

Labeo boga (Hamilton, 1822), commonly called boga maach or bhangan bata, is a medium-sized labeonine cyprinid native to Pakistan, India, Bangladesh, Nepal and Myanmar. Authoritative species information characterizes it as a freshwater, benthopelagic and potamodromous fish inhabiting large rivers and tributaries above tidal influence and spawning in flooded rivers (Talwar and Jhingran 1991; Froese and Pauly 2026). Its morphology - an elongate, moderately compressed body, inferior to subterminal mouth, thick lips and deeply forked caudal fin - is consistent with feeding and movement in riverine habitats (Rahman 2005). The species is globally assessed as Least Concern, yet the Bangladesh Red List categorizes it as Critically Endangered (IUCN Bangladesh 2015). This spatial mismatch is not contradictory: a taxon may retain

*Corresponding author
Email address: yeamin.fish@ru.ac.bd (Md. Yeamin Hossain)

a broad range while undergoing severe decline within a politically and ecologically important part of that range.

Bangladesh-specific biological data are concentrated in a small number of studies. A Ganges/Padma River investigation described length-frequency distribution, sex ratio, length-weight relationships, four condition indices and form factor from 211 fish collected during April 2011-March 2012 (Hossain et al. 2015). Earlier work in Rajshahi reported length-weight relationships and condition (Pervin and Mortuza 2008), while a market-based reproductive study quantified fecundity and sex ratio (Parvin et al. 2011). More recently, morphometric work from Head Panjnad, Pakistan documented negative allometric growth, demonstrating geographic variation (Khalid et al. 2023). Seasonal muscle-composition studies from the River Tawi provide an additional food-quality perspective (Gandotra et al. 2017a, b). However, these data have often been repeated without distinguishing direct evidence from inference, or a historical condition snapshot from current stock status.

This review therefore aims to: (i) consolidate and critically appraise species-specific evidence on identity, ecology, nutrition, population biology and reproduction; (ii) reconcile global and Bangladesh conservation assessments; (iii) distinguish results supported by primary data from plausible but untested ecological interpretation; and (iv) propose a staged conservation and research agenda suitable for Bangladesh's river-floodplain systems.

Materials and methods

Review design and source selection

The manuscript was developed as a structured narrative evidence synthesis. The attached draft, including its nine tables, was used to define the scope and locate candidate sources. Species-specific studies were prioritized when they reported traceable sampling information or quantitative biological variables. The core evidence comprised Hossain et al. (2015) for Ganges/Padma River population biology, Pervin and Mortuza (2008) for an earlier Rajshahi length-weight record, Parvin et al. (2011) for fecundity and sex ratio, Khalid et al. (2023) for Pakistani morphometrics, and Gandotra et al. (2017a, b) for seasonal proximate composition. Taxonomy, distribution and conservation status were checked against FishBase, the global IUCN assessment and the Red List of Bangladesh. General freshwater-fisheries literature was used only to frame threats and management.

Searches combined the scientific name with terms including taxonomy, distribution, length-weight relationship, condition factor, fecundity, sex ratio, proximate composition, morphometrics, genetics, Bangladesh and conservation. Original articles and institutional assessments were preferred over secondary summaries. A formal meta-analysis was not attempted because the available studies differed in sampling design, units, season, sex composition and reported statistics, and several traits were represented by only one population.

Data extraction and evidence appraisal

For each quantitative study, locality, sampling frame, sample size, length and weight ranges, model coefficients, uncertainty measures and biological interpretation were extracted where available. Length-weight relationships were interpreted through $W = aL^b$, with b tested against 3 rather than classified from its point estimate alone (Le Cren 1951; Froese 2006; Hossain et al. 2012). This distinction is important because the pooled Ganges estimate (b = 3.133) is numerically above 3, but its reported test supported isometry. Relative weight near 100 was treated as evidence of balanced condition in the sampled period, not as proof of population stability or habitat integrity at present.

Evidence was classified as: (1) direct species-specific evidence; (2) contextual evidence from databases or broader freshwater literature; or (3) management inference. Unsupported numerical values, duplicated references and claims that could not be linked confidently to a source were removed or qualified. No new field data were generated, and no causal effect was inferred from cross-sectional biological indices.

Nomenclature and conservation-status verification



Fig. 1: External morphology of *Labeo boga* (Hamilton, 1822)

The accepted name *L. boga* (Hamilton, 1822) was retained because current FishBase nomenclature lists it as valid and the core literature uses that combination (Froese and Pauly 2026). Global status was reported separately from the Bangladesh assessment to avoid collapsing different geographic scales. The 2015 national assessment was used for current Bangladesh categorization; the 2000 Red Book was retained only as historical context.

Kingdom: Animalia
Phylum: Chordata
Class: Actinopterygii (Ray-finned fishes)
Order: Cypriniformes
Family: Cyprinidae (Minnows and carps)
Subfamily: Labeoninae
Genus: *Labeo*
Species: *L. boga*

Species account and evidence synthesis

Taxonomy, common names and identification

L. boga belongs to Animalia, Chordata, Actinopterygii, Cypriniformes, Cyprinidae and the subfamily Labeoninae. The original combination was *Cyprinus boga* Hamilton, 1822, with *Cirrhina boga* and *Gobio boga* among historical synonyms. Vernacular names include bhangan and bhangan bata in Bangladesh, boga labeo in English, and several regional variants across India and Nepal (Rahman 2005; Froese and Pauly 2026; Table 1). Because market names overlap among minor carps, vouchers should be confirmed with diagnostic morphology and, where conservation stocking is involved, molecular markers.

Table 1. Common names of *Labeo boga* reported in selected regions.

Region/country	Common name	Source
Bangladesh	Bhangan; Bhangan bata	Rahman (2005); FishBase (2026)
India	Boga; Bogabata; Bangum batta	FishBase (2026)
India/Nepal (English)	Boga labeo	FishBase (2026)
Nepal	Boga tikauli	FishBase (2026)

The species has an elongate, moderately compressed body, a gently convex dorsal profile, a short blunt snout, inferior or subterminal mouth with thick lips, silvery flanks, a darker dorsum and a deeply forked caudal fin (Talwar and Jhingran 1991; Rahman 2005; Fig. 1). FishBase reports a maximum total length of 30 cm. The Ganges/Padma sample reached 27.50 cm, whereas the Head Panjnad specimens ranged from 21.40 to 27.30 cm. Geographic differences in proportional measurements may reflect environment, size structure or stock variation, but they do not by themselves demonstrate genetic differentiation.

Labeo boga can be distinguished from other sympatric labeonine carps by the following combination of characters: Body elongate and laterally compressed. Dorsal profile more convex than ventral profile. Snout projecting beyond the mouth and devoid of lateral lobes. Mouth narrow, inferior to subterminal. Lips thick and fleshy; lower lip connected to the isthmus by a fleshy bridge. One minute pair of maxillary barbels only. Eyes relatively large. Lateral line complete with 37-39 scales. A distinct dark blotch is frequently present above the base of the pectoral fin. Fins often exhibit a reddish tinge. Adapted for benthopelagic feeding in riverine habitats through its thick lips and inferior mouth. Fin formula: D. III, 9-10; P_1. I, 15-17; P_2. I, 8; A. III, 5-6; C. 19.

Distribution, habitat and feeding ecology

The documented native range encompasses Pakistan, India, Bangladesh, Nepal and Myanmar. The species occurs primarily in large rivers and tributaries above tidal influence and uses seasonally flooded habitats for reproduction (Talwar and Jhingran 1991; Froese and Pauly 2026). Within Bangladesh, records include the Ganges/Padma system and other connected rivers and floodplains (Rahman 2005; Hossain et al. 2015). Broad occurrence records should not be equated with contemporary abundance: repeatable basin-wide surveys are lacking, and local disappearance may be masked by persistence elsewhere.

The attached species account describes *L. boga* as benthopelagic and associated with sandy or muddy substrates, consuming detritus, algae, decaying plant matter and plankton. The inferior mouth and thick lips are consistent with bottom-oriented grazing. Nevertheless, a quantitative diet study for Bangladeshi populations was not located, so precise trophic proportions, ontogenetic dietary shifts and seasonal feeding intensity remain evidence gaps. Conservation planning should focus on maintaining the connected mosaic of channel, floodplain, nursery and feeding habitats rather than a single habitat type.

Nutritional composition

River Tawi muscle analyses demonstrate that the food value of *L. boga* varies seasonally. Gandotra et al. (2017a) reported protein of 16.46-17.54%, lipid of 1.95-3.26%, moisture of 77.22-83.11% and ash of 1.03-1.23% across seasons (Table 2). A related pre-monsoon versus monsoon study reported maximum May protein and lipid of 17.84% and 3.70%, respectively, and lower values during the spawning-season monsoon (Gandotra et al. 2017b). These results support its nutritional value but should not be generalized uncritically to Bangladesh because composition responds to location, season, body size, diet and reproductive state.

Table 2. Seasonal ranges in the muscle proximate composition of *Labeo boga* from the River Tawi, India.

Component	Reported range (%)	Interpretation	Source
Protein	16.46-17.54	Major edible-muscle macronutrient	Gandotra et al. (2017a)
Lipid	1.95-3.26	Seasonally variable energy reserve	Gandotra et al. (2017a)
Moisture	77.22-83.11	Dominant component of fresh muscle	Gandotra et al. (2017a)
Ash	1.03-1.23	Proxy for total mineral residue	Gandotra et al. (2017a)

Values are from an Indian river population and should not be assumed to represent all Bangladesh populations.

Length-weight relationships, form factor and condition

Hossain et al. (2015) sampled 103 males and 108 females from the Ganges/Padma River. Total length ranged from 9.78 to 27.50 cm and body weight from 10.00 to 276.10 g. The pooled relationship was $W = 0.0074L^{3.133}$ (r^2 = 0.967); male and female *b* estimates were 3.008 and 3.114, respectively. Their 95% confidence intervals included or closely bracketed 3, and the reported t-tests classified all groups as isometric. Intercepts differed between sexes, but slopes did not. These details are retained in Table 3 because labels such as positive allometry should be based on inference, not merely $b > 3$.

Table 3. Comparative length-weight relationships reported for *Labeo boga*.

Locality and sample	Length range	*a*	*b*	Inference	Source
Ganges/Padma River, Bangladesh; pooled n=211	9.78-27.50 cm TL	0.0074	3.133	Isometric by reported t-test	Hossain et al. (2015)
Rajshahi, Bangladesh; pooled sexes	91-290 mm TL	Not reported here	3.108	Near-isometric point estimate	Pervin and Mortuza (2008)
Head Panjnad, Pakistan; n=48	21.40-27.30 cm TL	Not reported here	2.710	Negative allometry	Khalid et al. (2023)

$W = aL^b$. *Growth classification should be based on a statistical test of b against 3 when uncertainty is available.*

The earlier Rajshahi study reported $b = 3.108$ for pooled fish, whereas Head Panjnad fish exhibited negative allometry ($b = 2.710$) with strong length-weight correlation (Pervin and Mortuza 2008; Khalid et al. 2023). Such differences can arise from length range, sampling season, sex and maturity composition, gear selectivity and habitat productivity. They should prompt standardized comparative monitoring, not a conclusion that one population is intrinsically superior.

The form factor standardized to $b = 3$, a body-shape index widely applied to threatened fishes in Bangladesh (Hossain et al. 2014), was 0.0102 in males, 0.0113 in females and 0.0111 in pooled fish (Table 4). Mean Fulton's condition factor was 1.02 ± 0.14 for males, 1.11 ± 0.17 for females and 1.06 ± 0.16 overall. Relative weight averaged 99.98 ± 13.69 in males, 101.95 ± 16.07 in females and 101.37 ± 15.46 for all fish. Because W_r did not differ from 100, the 2011-2012 sample was interpreted as having balanced prey-predator availability and condition (Hossain et al. 2015). A condition index is an individual-level diagnostic, however; it cannot substitute for abundance trends, recruitment or fishing mortality.

Table 4. Length-weight and form-factor parameters of *Labeo boga* from the Ganges/Padma River, Bangladesh.

Sex (n)	*a*	*b* (95% CI)	r^2	Growth type	Form factor ($a_{3.0}$)
Male (103)	0.0099	3.008 (2.878-3.139)	0.954	Isometric	0.0102
Female (108)	0.0080	3.114 (2.994-3.234)	0.962	Isometric	0.0113
Pooled (211)	0.0074	3.133 (3.055-3.211)	0.967	Isometric	0.0111

Source: Hossain et al. (2015). Reported t-test values were 0.05, 0.67 and 1.23 for males, females and pooled fish, respectively.

Reproductive biology

Parvin et al. (2011) examined 550 market specimens collected during June 2006-April 2007, including 120 gravid females used for fecundity estimation. Fecundity ranged from 23,484 ± 226 eggs in a 227-mm, 101.42-g female to 81,648 ± 721 eggs in a 290-mm, 450-g female. Fecundity increased with body length, body weight, ovary length and ovary weight, reinforcing the disproportionate reproductive value of large females (Table 5). The market sample contained 168 males and 382 females, a male:female ratio of 1:2.274.

Table 5. Reproductive characteristics of *Labeo boga* reported from Rajshahi, Bangladesh.

Parameter	Reported value	Conservation interpretation	References
Sampling frame	550 market specimens; 120 gravid females for fecundity	Potential market and gear selectivity must be considered	Parvin et al. (2011)
Fecundity range	23,484 ± 226 to 81,648 ± 721 eggs	Indicates substantial reproductive potential	Parvin et al. (2011)
Female total length	227-290 mm	Larger females produced more eggs	Parvin et al. (2011)

Parameter	Reported value	Conservation interpretation	References
Female body weight	101.42-450 g	Fecundity increased with body weight	Parvin et al. (2011)
Male:female ratio	1:2.274 (168:382)	Female bias in this market sample; not universal	Parvin et al. (2011)
Fecundity correlates	TL, SL, TW, OL and OW	Supports protection of large mature females	Parvin et al. (2011)

Source: Parvin et al. (2011). TL, total length; SL, standard length; TW, total weight; OL, ovary length; OW, ovary weight.

In contrast, the river sample contained 103 males and 108 females, an overall ratio of 1:1.05 that did not differ from parity (Hossain et al. 2015). The discrepancy may reflect gear selectivity, market sorting, season, spatial segregation or genuine demographic variation. It cautions against treating a single sex-ratio estimate as a basin-wide property. Moreover, published species-specific estimates of length at first maturity, spawning periodicity, egg quality, larval ecology and recruitment strength remain inadequate. Multi-model approaches applied to other Bangladeshi freshwater fishes offer a practical template for estimating length at first maturity (Hasan et al. 2021). Seasonal closures should therefore be locally validated through gonadosomatic index, maturity staging and larval surveys before regulations are fixed.

Genetic evidence and research needs

DNA barcoding is valuable for confirming cyprinid identifications and detecting market substitutions (Ward et al. 2005; Barman et al. 2018), but a barcode sequence is not a population-genetic assessment. The available evidence does not yet resolve connectivity among Ganges/Padma, Brahmaputra-Jamuna, Meghna and Indus populations, effective population size, inbreeding or adaptive differentiation. These gaps are particularly important if captive propagation or stock enhancement is pursued. Broodstock should be traceable to appropriate river basins, effective numbers of parents should be maximized, and hatchery releases should be preceded by genetic-risk assessment and post-release monitoring.

Conservation status, threats and management

Reconciling global and national status

The global IUCN assessment categorized *L. boga* as Least Concern in 2010 because of its broad South Asian distribution (Dahanukar 2010), whereas the Red List of Bangladesh categorizes the species as Critically Endangered (IUCN Bangladesh 2015; Table 6). These assessments address different spatial questions. The global category indicates that extinction risk across the entire range did not meet a threatened threshold at assessment, while the national category signals severe depletion and risk within Bangladesh. Management decisions in Bangladesh should consequently be driven by national status and contemporary local evidence, not by the global label alone.

Table 6. Conservation-status contrast for *Labeo boga*.

Assessment scale	Category	Assessment context	Source
Global	Least Concern	Broad South Asian distribution; assessed 20 March 2010	Dahanukar (2010)
Bangladesh	Critically Endangered	Severe national decline and high risk within Bangladesh	IUCN Bangladesh (2015)
Management implication	High national priority	National action should follow national status and current local data	This synthesis

Threat pathways

Threats identified in the national literature include overharvest, capture of brood fish, siltation, pollution, wetland conversion and alteration of river-floodplain connectivity (IUCN Bangladesh 2015; Hossain et al. 2015). These pressures interact. Flow regulation and embankment can restrict access to floodplain spawning and nursery areas; siltation can simplify channel habitat; agrochemical and domestic effluents can impair water quality and benthic food resources; and fishing can remove mature fish before reproduction. Climate change can amplify these mechanisms by altering flood timing, temperature, drought severity and connectivity (Reid et al. 2019; Mawa et al. 2022). Table 7 presents these pathways as hypotheses for monitoring rather than quantified species-specific effect sizes.

Table 7. Principal threat pathways relevant to *Labeo boga* in Bangladesh.

Pressure	Mechanism affecting the species	Priority indicator	References
Overharvest and brood-fish capture	Removal of mature fish before spawning; truncated size structure	Catch per unit effort; proportion mature; length structure	IUCN Bangladesh (2015)
Fine-mesh/destructive gears	Disproportionate juvenile mortality and recruitment loss	Gear-specific size composition	IUCN Bangladesh (2015)
Siltation and habitat simplification	Loss of channel refugia, benthic habitat and spawning substrate	Depth profile; substrate; refuge area	Dudgeon et al. (2006)

Pressure	Mechanism affecting the species	Priority indicator	References
Wetland conversion and disconnection	Reduced access to floodplain spawning and nursery habitats	Days connected; barrier inventory	Tickner et al. (2020)
Domestic, industrial and agricultural pollution	Physiological stress and disruption of benthic and planktonic food resources	Dissolved oxygen; nutrients; toxicants	Reid et al. (2019)
Flow modification and climate change	Shifted flood timing, temperature and habitat availability	Hydrograph, temperature and recruitment timing	Reid et al. (2019); Tickner et al. (2020)

Species-specific effect sizes remain poorly quantified; indicators are proposed for testing these pathways.

A staged management strategy

Immediate actions should follow a precautionary, place-based approach. First, remaining occurrence hotspots, spawning reaches, floodplain nurseries and dry-season refugia should be mapped with standardized catch-per-unit-effort and environmental DNA surveys. Second, large mature fish and breeding aggregations should be protected through locally validated seasonal closures, minimum retention sizes and restrictions on gears that capture juveniles or brood fish. Third, community-managed sanctuaries should be located where habitat remains connected and enforcement is feasible, with transparent benefit-sharing and compliance monitoring.

Habitat measures should maintain environmental flows and lateral connectivity, reduce direct pollutant inputs, restore degraded floodplain channels and prevent destructive extraction or conversion in priority areas. These actions benefit multiple freshwater taxa and align with global recommendations to bend the freshwater biodiversity curve through protection, restoration, pollution control, sustainable exploitation and improved connectivity (Tickner et al. 2020). Hatchery production may reduce harvest pressure and support recovery only if husbandry is biologically feasible and genetic safeguards are enforced. Stocking without habitat recovery, broodstock management or evaluation can waste resources and erode genetic integrity.

A minimum monitoring dashboard should include occupancy, standardized abundance, length-frequency structure, proportion mature, sex ratio, condition indices, evidence of recruitment, harvest and gear composition, water quality and connectivity. Quantitative harvest targets such as fishing mortality, spawning-potential ratio or maximum sustainable yield should not be estimated from the current evidence base because age/growth, selectivity, maturity and abundance time series are insufficient. Table 8 therefore distinguishes immediate conservation actions from research-dependent actions.

Table 8. Staged conservation and research actions for *Labeo boga*.

Action	Time frame	Expected output or outcome	Verification metric	References
Map current populations and critical habitats	Immediate (1-2 years)	Basin-wide occupancy and hotspot atlas	Standardized CPUE/eDNA occupancy	Tickner et al. (2020)
Protect spawning, nursery and refuge habitats	Immediate and continuous	Improved adult survival and recruitment	Juvenile occurrence; mature-fish abundance	IUCN Bangladesh (2015)
Apply locally validated seasonal and gear controls	Immediate after reproductive validation	Lower mortality of brood fish and juveniles	Compliance; size and maturity in catch	Hossain et al. (2015)
Establish community-managed sanctuaries	1-3 years	Protected source populations and local stewardship	Inside-outside abundance trend	Cooke et al. (2016)
Restore connectivity and reduce pollution	1-5 years	Improved habitat access and water quality	Connection days; dissolved oxygen; toxicants	Reid et al. (2019); Tickner et al. (2020)
Develop genetically responsible captive propagation	Research-dependent	Conservation assurance or carefully evaluated supplementation	Broodstock Ne; parentage; post-release survival	Barman et al. (2018)
Estimate maturity, selectivity, mortality and biomass	2-5 years	Basis for quantitative harvest reference points	Validated stock-assessment inputs	Froese (2006)
Resolve population structure with genomic markers	2-5 years	Management units and broodstock guidance	Genetic differentiation and diversity	Ward et al. (2005); Barman et al. (2018)

Sustainable Development Goal linkages

Conservation of *L. boga* contributes directly to SDG 2 through local food and nutritional security, SDG 6 through freshwater quality and environmental flows, and SDG 15 through restoration of inland waters and wetlands. SDG 14 is primarily framed around oceans, seas and marine resources; its sustainable-fisheries principles are relevant by analogy but should not replace the explicit inland-water mandate under SDG 6.6 and SDG 15.1. Community stewardship and coordination among fisheries, water, agriculture and local-government institutions support SDG 17 (United Nations 2015; Table 9). Framing the species within these connected goals makes clear that recovery is not only a fisheries problem but also a water-governance and rural-development objective.

Table 9. Linkages between *Labeo boga* conservation and the Sustainable Development Goals.

SDG	Relevant target or principle	Species-management linkage
SDG 2: Zero Hunger	Nutrition and resilient food production	Sustains access to indigenous fish and dietary protein
SDG 6: Clean Water and Sanitation	Target 6.6: protect and restore water-related ecosystems	Requires pollution control, environmental flows and wetland protection
SDG 14: Life Below Water	Sustainable-fisheries principles	Provides transferable harvest-governance principles; formally ocean-focused
SDG 15: Life on Land	Target 15.1: freshwater ecosystem conservation	Directly supports rivers, wetlands and floodplains
SDG 17: Partnerships	Multi-actor implementation	Connects fishers, communities, researchers and agencies

Source: United Nations (2015), interpreted for inland fisheries.

Knowledge gaps and research priorities

Five evidence deficits constrain management. First, current distribution and abundance are unknown across major Bangladeshi basins. Second, maturity ogives, spawning phenology, larval habitats and recruitment dynamics have not been resolved. Third, no robust estimates of growth rate, mortality, selectivity, exploitation or biomass are available for stock assessment. Fourth, diet, movement and habitat-use studies are needed to identify functional habitat and environmental-flow requirements. Fifth, population-genomic work is needed to define management units and guide broodstock sourcing. A coordinated multi-basin programme using harmonized sampling, open data and repeat surveys would provide substantially greater value than isolated descriptive studies.

Interpretive caution: the condition and length-weight results describe particular samples collected more than a decade ago. They should be used as historical baselines, not evidence that present populations are secure.

Conclusions

L. boga illustrates why global range-wide status can obscure urgent national conservation needs. Verified evidence shows that the species remains nutritionally valuable and possessed balanced condition and isometric growth in a historical Ganges/Padma sample, while reproductive studies demonstrate high fecundity and the importance of large females. These attributes indicate recovery potential, not resilience to unlimited harvest. Bangladesh's Critically Endangered assessment, combined with continuing pressure on river-floodplain habitats, justifies immediate precautionary management. The most defensible strategy integrates protection of breeding and nursery habitats, locally validated seasonal and gear controls, community-managed refuges, pollution reduction and genetic safeguards for any captive programme. Success should be judged through repeated measures of distribution, abundance, recruitment and size structure. Until those data exist, claims about sustainable yield or stock recovery would be premature.

Declarations

Conflict of interest

The authors declare no competing financial or personal interests.

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Data availability

No new dataset was generated for this review. All quantitative information is derived from the cited publications and the supplied source manuscript.

Ethics statement

Ethical approval was not required because this review did not involve new sampling or experimentation with animals or humans.

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