

Descriptors of Sun Catfish, *Horabagrus brachysoma* (Teleostei: Bagridae) and Genetic Stocks

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ACCESSION CODE.

A. SPECIES : INDIA_FINFISH_HORABAGRUS_31602

B. GENETIC STOCKS

1. MEENACHIL : INDIA_FINFISH_HORABAGRUS_31602_01
2. CHALAKKUDY : INDIA_FINFISH_HORABAGRUS_31602_02
3. NETHRAVATI : INDIA_FINFISH_HORABAGRUS_31602_03

I. GENERAL DESCRIPTION

1. **Name of the Finfish Species (Scientific Name)** *Horabagrus brachysoma* (Gunther)
2. **Name of the Variant/ Genetic Stocks** *Horabagrus brachysoma* (Gunther), Three genetic Stocks: Meenachil, Chalakkudy, Nethravathi.
3. **Local Name & Language** Manja Koori, yellow catfish
4. **Background of the local name** Bright yellow coloration over the body.
5. **Close related common species/variant** *Horabagrus brachysoma* (Gunther)
6. **Max. Size Reported** 485 mm TL/ 1.5 kg
7. **Common Habitat** Rivers, Freshwater Ponds, Acclimatized to Farm Conditions.
8. **Native Distribution** Endemic to West flowing rivers of the Southern Western Ghats
9. **River basin/ Major River** West flowing rivers of the Southern Western Ghats
10. **Reservoir/ Any other water body** Not Known Yet
11. **Local region of High Abundance (if any)** West flowing rivers of the Southern Western Ghats. 1. Meenachil River
2. Chalakkudy River
3. Nethravathi River
12. **Collection site (Name & Lat. - Long., Altitude)** 1) Meenachil River at Kumarakom, Kottayam, (09°33'N; 76°25'E);
2) Chalakkudy River at Kanakkankadavu (10°08'N; 76°07'E)

| | | |
|-----|---|---|
| | | 3) Nethravathi River at Kankanadi, Mangalore (12°52'N; 74°54'E) |
| 13. | Nearest Railway Station | Kottayam, Chalakkudy, Mangalore |
| 14. | Specific Gear Used | Cast net |
| 15. | Known Economic Importance | <p>a. The sun catfish as a food fish due its size and local acceptance</p> <p>b. The sun catfish can also be used as ornamental fish due to presence of attractive coloration</p> <p>c. The fish is potential aquaculture species.</p> <p>d. Captive breeding was successful through induced spawning and upto F₂ generations were produced. Captive bred individuals are being maintained at RARS, Kumarakom.</p> <p>The distinct genetic stock information indicate the need for stock specific breeding programme for stock enhancement for natural fishery and conservation.</p> |
| 16. | Local Importance | Table Fish, Fisher folk expect antimicrobial potency in the body mucus and use on small cuts and injuries. |
| 17. | Any specific use such as Medicinal / Local Dish & Recipe/Special occasions/Tribal | Not known |
| 18. | Traditional knowledge (Give Details): Ref. In Local/Community/tribal mythology: | Not known |
| 19. | Restrictions/Protection/ Conservation / under any local Community/ Regional/ Religious sentiments. | Not known |

| | | |
|----|---|---|
| i. | Morphologic al and Meristic Characters | <ul style="list-style-type: none"> ★ Body is moderately elongated, compressed body with a large head and wide sub terminal mouth. ★ Teeth in villiform bands on jaws; occipital process exposed, extending to predorsal plate; eyes are large, inferior and ventro- lateral in position, visible from under side of head. ★ The dorsal fin, consisting of the rayed fin with 5-7 rays, possesses a hard spine and is serrated from the softer smaller adipose dorsal fin. Adipose fin short, commencing over the last fourth of the anal. Pectoral just reaching or not reaching pelvic; its spine stronger than that of dorsal and as long as the head, excluding snout, serrated externally and with 16-18 strong teeth internally. Ventral fin about half as long as the pectoral and reaches the anal; the base of the anal fin almost equals the length of the head. Caudal fin slightly or deeply lunated or even forked. ★ It has 4 pairs of barbels: one nasal, two mandibulars and one maxillary. Maxillary barbels extend posterior to pectoral fin base, outer mandibulars an eye diameter shorter than maxillaries; inner mandibulars, 1/4 shorter than outer mandibulars, nasals nearly 1/2 as long as head. ★ Fin formula: D I 6-7; A iii 20-25; P I 8-9; V I 5. |
|----|---|---|

| | | |
|------|--|--|
| ii. | Coloration | Colour: In life, greenish yellow above, the flanks brilliant golden, belly white, with a large round black mark on shoulder surrounded by a light yellow ring. Dorsal and anal fins yellowish orange stained darker at their margins. Caudal fin yellow with black base and dark edges. |
| iii. | Ref. Taxonomic Key | Jayaram, K .C. (1999) <i>The freshwater fishes of the Indian region</i> . Narendra Publ. House, New Delhi, pp. 551. (For yellow catfish) |
| iv | Source/ Reference | Three distinct genetic stocks of <i>Horabagrus brachysoma</i> (Gunther) were identified based on 25 allozyme and 8 microsatellite loci under National Agricultural Technology Project, Indian Council of Agricultural Research, New Delhi entitled" Germplasm inventory, evaluation and gene banking of freshwater fishes" . Abdul Muneer, P. M., A. Gopalakrishnan, K. K. Musammilu, Vindhya Mohindra, K. K. Lal, V. S. Basheer, W. S. Lakra (2009) Genetic variation and population structure of endemic yellow catfish, <i>Horabagrus brachysoma</i> (Bagridae) among three populations of Western Ghat region using RAPD and microsatellite markers. Molecular Biology Reports , DOI 10.1007/s11033-008-9381-6. |
| v | Collected by Genetic Stock Identification | Dr. A. Gopalakrishnan & V.S. Basheer, National Bureau of Fish Genetic Resources, Cochin Unit, Kochi 682 018. Dr. A. Gopalakrishnan Abdul Muneer, P. M., Vindhya Mohindra, K. K. Lal, K. K. Musammilu, V. S. Basheer, W. S. Lakra |

II. DIAGNOSTIC TAXONOMIC CHARACTER (Description)

iv. Morphometric characters and measurements of sun catfish, *Horabagrus brachysoma*.

| | |
|---|--|
| Total length (mm.) | 320 (Maximum observed: 480mm) |
| Total body weight (g) | 900 (Maximum observed: 1500g) |
| Standard length (mm.) | 270 |
| Head Length (mm.) | 86 |
| Lateral transverse rows | -- |
| Lateral line scale | -- |
| Pre-dorsal scale | -- |
| Insertion of 1 st dorsal fin | Closer to tip of snout than to the caudal base |
| Barbels | 4 pairs (1 nasal, 2 mandibular and 1 maxillary). |
| | In relation to % of standard length (SL) |
| Head Length | 34 |
| Pre-dorsal length | 41 |
| Snout to pelvic base | 59 |
| Snout to anal origin | 70 |
| Length of caudal peduncle | 14 |
| Adipose to caudal fin | 19 |
| Depth of caudal fin | 12 |
| Dorsal to adipose | 37 |
| Anal fin base | 30 |
| Length of dorsal fin | 25 |
| Dorsal spine length | 20 |
| Length of pectoral fin | Does not reach pelvic fin base |
| Length of caudal fin | 16.7 |
| | In relation to % of head length (HL) |

III. Molecular Descriptors for the Genetic Stocks identified in sun catfish, *Horabagrus brachysoma*

In *Horabagrus brachysoma*, three distinct genetic stocks were identified inhabiting three river systems in Western Ghats, native distribution range of the species. Two types of molecular markers, allozyme and microsatellite DNA were used in analysis for the samples collected from wild populations. The detailed information on molecular descriptors and parameters leading to identification of three distinct genetic stocks is given below.

1. General Information

1.1 Sample collection details and sample size analysed

| | | | | |
|--|---------------------------|------------------------------|--------------------|--------------------|
| Sampling Location and Sample Size | Region | Western Ghats, Kerala, India | | |
| | Rivers | Meenachil | Chalakkudy | Nethravathi |
| | Locality | Kumarakom | Kanakkankadavu | Kankanadi |
| | (Lat. & Long.) | 09_33°N; 76_25° E | 10_08° N; 76_07° E | 12_52° N; 74_54° E |
| | Sample Size | 70 | 70 | 70 |
| | Total Sample Size | 210 | | |
| For Both the Markers, Allozyme and Microsatellite DNA, same sample size from the above locations was analysed. | | | | |

1.2 Overview of the two type of markers used in analysis

| | Allozyme, | Microsatellite |
|--|---|---|
| Total Sample Size | 210 | 210 |
| Total Loci Examined | 25 | 8 |
| Polymorphic Loci | 13 (56%) | 8 |
| Significant Loci Over all the Three Populations. (P < 0.0001) | 10 <i>AAT-2* EST-1* EST-3* G₃PDH* G₆PDH* GLDH* LDH-2* ODH-2* SOD* XDH-1*</i> | 7 <i>Phy01 Phy05 Cma3 Cma4-2 Cga06-1 D33-2 D38-1</i> |
| Coefficient of Genetic Differentiation(Fst) Over all the Three Populations. (P < 0.0001) | 0.1537 | 0.1055 |

| | | |
|---|--|--|
| | | |
| No significant linkage disequilibrium was detected between any pair of loci in each population sample or over all the populations | | |

2. Molecular Descriptors:

2.1. Allele Frequencies of Thirteen Polymorphic Allozyme Loci, Private Alleles and Parameter of Genetic Variation for *Horabagrus brachysoma* from Three Rivers.

| 1. Allele Frequencies | | | | | |
|-----------------------|--------------------------|---------|-----------|------------|-------------|
| | Locus | Alleles | Meenachil | Chalakkudy | Nethravathi |
| <i>i.</i> | <i>AAT-2*</i> | 100 | 0.7571 | 0.4500 | 0.6214 |
| | | 117 | 0.2429 | 0.5500 | 0.2929 |
| | | 126 | ----- | ---- | 0.0857 |
| <i>ii.</i> | <i>EST-1*</i> | 083 | ---- | ----- | 0.8429 |
| | | 100 | 1.0000 | 1.0000 | 0.1571 |
| <i>iii.</i> | <i>EST-2*</i> | 100 | 0.7214 | 0.8500 | 0.9143 |
| | | 106 | 0.2786 | 0.1500 | 0.0857 |
| <i>iv.</i> | <i>EST-3*</i> | 095 | ---- | 0.1857 | ---- |
| | | 100 | 1.0000 | 0.8143 | 1.0000 |
| <i>v.</i> | <i>G₃PDH*</i> | 088 | 0.5000 | 0.5929 | 0.2571 |
| | | 100 | 0.5000 | 0.4071 | 0.7429 |
| <i>vi.</i> | <i>G₆PDH*</i> | 086 | 0.7071 | 0.2786 | 0.4786 |
| | | 100 | 0.2929 | 0.7214 | 0.5214 |
| <i>vii.</i> | <i>GLDH*</i> | 080 | ---- | 0.0571 | ----- |
| | | 089 | 0.5357 | 0.7214 | ----- |
| | | 100 | 0.4643 | 0.2214 | 0.4071 |
| | | 117 | ---- | ---- | 0.5929 |
| <i>viii.</i> | <i>GPI-2*</i> | 096 | 0.1714 | 0.2571 | 0.2143 |
| | | 100 | 0.8286 | 0.7429 | 0.7857 |
| <i>ix.</i> | <i>LDH-2*</i> | 100 | 0.8286 | 0.6643 | 0.9429 |

| | | | | | |
|--|---------------------------|-----|--------|-------------------------------------|---|
| | | 112 | 0.1714 | 0.2857 | 0.0571 |
| | | 134 | ----- | 0.0500 | ---- |
| <i>x.</i> | <i>MDH*</i> | 086 | 0.3571 | 0.4000 | 0.2357 |
| | | 100 | 0.6429 | 0.6000 | 0.7643 |
| <i>xi.</i> | <i>ODH-2*</i> | 091 | 0.2571 | 0.3714 | 0.7857 |
| | | 100 | 0.7429 | 0.6286 | 0.2143 |
| | <i>PGM*</i> | 093 | 0.3143 | 0.2429 | 0.2786 |
| | | 100 | 0.6857 | 0.7571 | 0.7214 |
| <i>xii.</i> | <i>SOD*</i> | 093 | 0.1929 | 0.5786 | 0.7286 |
| | | 100 | 0.8071 | 0.4214 | 0.2714 |
| <i>xiii.</i> | <i>XDH-1*</i> | 091 | 0.4071 | 0.5571 | 0.3714 |
| | | 100 | 0.5929 | 0.4429 | 0.5143 |
| | | 114 | ---- | ---- | 0.1143 |
| 2. Private Alleles (Population Specific Alleles) | | | | | |
| | | | | <i>GLDH*080</i> <i>LDH-2*134</i> | <i>EST-1*083</i> <i>AAT-2*126</i> <i>GLDH*117</i> <i>XDH-1*114</i> |
| 3. Parameters of Genetic Variation | | | | | |
| <i>i.</i> | H obs | | 0.1724 | 0.1908 | 0.1704 |
| <i>ii.</i> | H exp | | 0.3465 | 0.3969 | 0.3475 |
| <i>iii.</i> | P_(0.95) | | 0.48 | 0.52 | 0.52 |
| <i>iv.</i> | P_(0.99) | | 0.48 | 0.52 | 0.52 |
| <i>v.</i> | A_n | | 1.857 | 2.071 | 2.071 |

2.2. Allele Frequencies of Eight Polymorphic Microsatellite Loci, Private Alleles and Parameter of Genetic Variation for *Horabagrus brachysoma* from Three Rivers.

| |
|------------------------------|
| 1. Allele Frequencies |
|------------------------------|

| | Locus | Allele size (bp) | Meenachil | Chalakkudy | Nethravathi |
|------|----------------|------------------|-----------|------------|-------------|
| i. | <i>Phy01</i> | 162 | 0.0643 | 0.1071 | 0.0143 |
| | | 170 | 0.0286 | 0.1214 | 0.0357 |
| | | 176 | 0.1500 | 0.1500 | 0.6500 |
| | | 180 | 0.5357 | 0.2143 | 0.0643 |
| | | 184 | 0.1500 | 0.1714 | 0.1500 |
| | | 190 | 0.0357 | 0.1571 | 0.0857 |
| | | 196 | 0.0357 | 0.0786 | 0.0000 |
| ii. | <i>Phy05</i> | 146 | 0.0286 | 0.1643 | 0.4214 |
| | | 150 | 0.0429 | 0.1071 | 0.1286 |
| | | 155 | 0.1857 | 0.3071 | 0.3571 |
| | | 162 | 0.5643 | 0.3143 | 0.0786 |
| | | 166 | 0.1143 | 0.1000 | 0.0143 |
| | | 170 | 0.0643 | 0.0071 | 0.0000 |
| iii. | <i>Phy07-1</i> | 270 | 0.2071 | 0.1786 | 0.3143 |
| | | 275 | 0.6071 | 0.6000 | 0.4214 |
| | | 280 | 0.0786 | 0.1143 | 0.1500 |
| | | 285 | 0.1071 | 0.1071 | 0.1143 |
| iv. | <i>Cma3</i> | 147 | 0.0857 | 0.0500 | 0.0786 |
| | | 151 | 0.1071 | 0.0286 | 0.3857 |
| | | 155 | 0.1929 | 0.0357 | 0.2643 |
| | | 159 | 0.2143 | 0.3071 | 0.1643 |
| | | 163 | 0.1571 | 0.2643 | 0.0214 |
| | | 166 | 0.2286 | 0.2643 | 0.0857 |
| | | 170 | 0.0143 | 0.0500 | 0.0000 |
| v. | <i>Cma4-2</i> | 172 | 0.2286 | 0.0286 | 0.0357 |
| | | 175 | 0.4643 | 0.4357 | 0.2143 |
| | | 178 | 0.2929 | 0.5214 | 0.6500 |
| | | 182 | 0.0143 | 0.0143 | 0.1000 |
| vi. | <i>Cga06-1</i> | 218 | 0.0000 | 0.0071 | 0.2571 |

| | | | | | |
|---|---------------------------|-----|--------|------------------------|--------|
| | | 226 | 0.0143 | 0.0000 | 0.0643 |
| | | 234 | 0.6429 | 0.4000 | 0.5429 |
| | | 240 | 0.2929 | 0.3357 | 0.0857 |
| | | 244 | 0.0500 | 0.2571 | 0.0500 |
| vii | <i>D33-2</i> | 192 | 0.0000 | 0.0214 | 0.0000 |
| | | 200 | 0.0929 | 0.1357 | 0.4071 |
| | | 212 | 0.9071 | 0.8429 | 0.5929 |
| viii. | <i>D38-1</i> | 252 | 0.2929 | 0.1929 | 0.0786 |
| | | 272 | 0.1071 | 0.2214 | 0.3857 |
| | | 295 | 0.6000 | 0.5786 | 0.5357 |
| | | 310 | 0.0000 | 0.0071 | 0.0000 |
| 2. Private Alleles (Population Specific Alleles) | | | | | |
| | | | | D33-2-192 D38-1-310 | |
| 3. Parameters of Genetic Variation | | | | | |
| i. | H obs | | 0.4179 | 0.5018 | 0.4964 |
| ii. | H exp | | 0.5710 | 0.6287 | 0.6079 |
| iii. | Fis | | - | - | - |
| iv. | P_(0.95) | | 1.000 | 1.000 | 1.000 |
| v | P_(0.99) | | 1.000 | 1.000 | 1.000 |
| vi | A_n | | 4.6250 | 4.8750 | 4.3750 |

Abbreviations used in the table:

H obs = Observed heterozygosity

H exp = Expected heterozygosity

Fis = Inbreeding coefficient

P_{HW} = Probability value of significant deviation from HWE

Pscore = Probability value of significant heterozygosity deficiency

P_(0.95) = Polymorphism at 0.95 criteria

P_(0.99) = Polymorphism at 0.99 criteria

A_n = Mean number of alleles per locus

2.3. Parameters of Genetic Divergence; Alleleic Heterogeneity at Allozyme and Microsatellite Loci and Coefficient of Genetic Differentiation (Fst) between Three Population Pairs

| S. No. | Population Pair | Loci Exhibiting Significant Allelic Heterogeneity (P<0.0001) | Fst (P<0.0001) |
|----------------------------|--------------------------|---|----------------|
| Microsatellite loci | | | |
| 1 | Meenachil & Chalakkudy | <i>Phy01, Phy05, Cma4-2, Cga06-1</i> | 0.0454 |
| 2 | Meenachil & Nethravathi | <i>Phy01, Phy05, Cma3, Cma4-2, Cga06-1, D33-2</i> | 0.2189 |
| 3 | Chalakkudy & Nethravathi | <i>Phy01, Phy05, Cma3, Cga06-1, D33-2, D38-1</i> | 0.1865 |
| Allozyme Loci | | | |
| 1 | Meenachil & Chalakkudy | <i>AAT-2*, EST-3*, G₆PDH*, GLDH*, SOD*</i> | 0.0952 |
| 2 | Meenachil & Nethravathi | <i>EST-1*, EST-2*, GLDH*, ODH-2*, SOD*</i> | 0.2640 |
| 3 | Chalakkudy & Nethravathi | <i>AAT-2*, EST-1*, EST-3*, G₃PDH*, GLDH*, LDH-2*, ODH-2*</i> | 0.2418 |



Lateral view of Sun Catfish, *Horabagrus brachysoma*