# SYSTEMATIC STUDIES ON ANABAS TESTUDINEUS (B1, 1792) AND A. OLIGOLEPIS BLKR., 1855

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#### Received February 21, 1968

(Communicated by Prof. P. N. Ganapati, F.A.Sc.)

### Abstract

Anabas testudineus (Bloch, 1792) and A. oligolepis Bleeker, 1855 are c'escribed, the latter being recorded for the first time from India. Juveniles and adults were collected from the market at Bhimavaram (W. G. District, Andhra Pradesh). A. testudineus can be distinguished from A. oligolepis by: (a) less deep body; (b) longer pectorals; (c) shorter snout; (d) dark spot at base of caudal fading with age.

#### INTRODUCTION

THE Anabantoid fishes of genus Anabas commonly known as "Indian climbing perch" are well known for their air-breathing habit. There has however, been considerable confusion in regard to the systematics of the genus, because little attention has been paid to intraspecific variation in number of spines and rays in dorsal and anal fins, number of lateral line scales and to body proportions in the different species.

It was felt that a systematic study of the locally available species *Anabas* should prove useful; it is an economically important fish, much favoured for its taste and nutritive value. Its air-breathing habit and tolerance to pollution are availed of to transport it live over long distances to places like Calcutta. Smith (1945) has made some interesting observations on its habits.

The history of Anabas in this country can be traced back to 1791, when Daldorff saw a fish enjoying itself in the rain water that had collected in the fissure of a palmyrah palm near a pond and described it (1797) as *P. scandens*; earlier Bloch (1795) had recorded it as Anthias testudineus. Cuvier (1817) brought it under the new genus Anabas. Guenther (1861) described four species, A. scandens (= A. testudineus), A. oligolepis, A. macrocephalus, and A. microcephalus. Day (1878) described Anabas scandens.

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Recently Alfred (1966) has recorded A. testudineus from Singapore. The present contribution describes Anabas testudineus (Bloch) and Anabas oligolepis Bleeker, the latter for the first time from India.

# MATERIAL AND METHODS

Live juveniles and adults of Anabas testudineus (89–146 mm. s.l.) and A. oligolepis (60–125 mm. s.l.) from neighbouring ponds and paddy fields were collected in the market at Bhimavaram (West Godavari District, Andhra Pradesh) during the years 1966–67. In taking linear measurements total length was measured from tip of snout to longest caudal ray; standard length from tip of snout to mid-base of caudal fin; head length from tip of snout to hindmost point of operculum including spinous portion; depth : maximum depth.

Order : PERCIFORMES

Sub-order : ANABANTOIDEI

Family : ANABANTIDAE

Anabas testudineus (Bloch, 1792)

Anthias testudineus Bloch, 1792

Anabas scandens : Cantor 1849 ; Blecker, 1865 ; Day, 1878.

Anabas macrocephalus : Karoli, 1822 ; Guenther, 1861.

Anabas testudineus : Alfred, 1966.

Description based on 25 specimens, between 89 mm. and 146 mm. s.l.

D XVI-XVI<sub>1</sub>I, 8-10; A VIII-XI, 9-11; P 14-15; V I, 5; C 16-17; scales in lateral line series 11-18+8-13 (total 21 to 29); in transverse series 2-3+1+8-10 (total 11-14).

Depth  $3 \cdot 7 - 4 \cdot 3$ , Head  $3 \cdot 6 - 4 \cdot 1$ , in total length.

Depth  $3 \cdot 1 - 3 \cdot 5$ , Head  $3 \cdot 0 - 3 \cdot 3$ , in standard length.

In percentage of standard length.—Total length 120.9-127.0; depth 28.1-32.2; head 29.6-33.3, snout 5.7-7.7; eye 5.7-8.0; interorbital space 10.1-12.5; base of spinous dorsal 42.0-48.3; base of soft dorsal 8.3-12.3; base of spinous anal 22.1-29.1; base of soft anal 9.3-12.3; height of spinous dorsal 10.1-13.7; height of soft dorsal 13.6-17.0; length of pectoral 20.3-24.1; length of ventral 13.0-17.0; depth of

caudal peduncle  $13 \cdot 5 - 17 \cdot 9$ ; predorsal distance  $28 \cdot 7 - 35 \cdot 5$ ; preventral distance  $33 \cdot 0 - 41 \cdot 0$ ; prepectoral distance  $28 \cdot 7 - 35 \cdot 3$ .

Depth nearly equals head. Maxilla reaches to below half diameter of eye. Pre-orbital strongly spinous, 9–13 spines, first spine strongest, projecting towards anteromedian line. Pre-opercular smooth; edge of opercular, sub-opercular, and interopercular strongly spinous; opercular bears about 25 spines, two of which are elongate; sub-opercular bears abcut 15–17 spines, first spine small followed by three longest spines, thereafter decreasing in krgth progressively to last spine; interopercular tears about 4–5 moderate spines. Villiform teeth in jaws, a patch of small teeth on vomer. Pharyngeal teeth present.

Dorsal origin above, slightly in front of, or behind origin of pectoral; base of spinous dorsal larger than base of spinous anal. Height of soft dorsal greater than spinous dorsal. One of the dorsal spines between 7th and 10th is largest. Origin of ventrals behind origin of pectorals. Base of soft dorsal, soft anal and caudal scaly. Scales large.

Lateral line of 21 to 29 large scales, interrupted at between 11th and 18th scale. Pyloric caecae 2-3.

Colour.—Adults greenish- to dark grey on the dorsal side and on flanks becoming pale yellow on abdomen. Dorsal and caudal dark grey. Ventrals pale orange. Pectorals and anal pale yellow with dark pigment spots all over, edge of caudal and soft anal dark. Anal usually grey. The largest two spines of the opercular are connected by black membrane. Dark spot at base of caudal fades with age.

Juvenilcs greenish on the dorsal side and on flanks; abdomen, pcctorals, ventrals and anal pale yellow. Distinct dark spot at base of caudal. Four or more vertical bands on flanks may be present.

Note.—A sample of ten specimens (87-122 mm. s.l.) colleted on 10th July 1966, and another sample of seven specimens collected on 14th July 1967 (104-137 mm. s.l.) differed in colour from the majority of the specimens examined. These seventeen specimens were light grey on dorsal side and on flanks with a deep orange abdomen. Dorsal and caudal fins were light grey, anals and pectorals yellowish with dark grey pigmentation. Margins of caudal and soft anal were dark, ventrals a deep orange and iris yellowish. Lateral line was not distinct in live specimens due to small dots on all scales. Day (1878) recorded a similar variety from Ganjam District in Orisea. These specimens however do not differ in any other character from the other samples of A. testudineus.

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# Anabas oligolepis Bleeker, 1855

Description based on 45 specimens measuring from 60 to 125 mm. s.l.

D XVI-XVIII, 9-10; A IX-XI, 9-11; P 14-16; V I, 5; C 15-17; scales in lateral line series 14-17 + 8-13 (total 23-28); in transverse series 3-4 + 1 + 8-10 (total 12-15).

Depth  $3 \cdot 0 - 3 \cdot 4$ , head  $3 \cdot 2 - 3 \cdot 9$ , in total length.

Depth  $2 \cdot 5 - 2 \cdot 9$ , head  $2 \cdot 7 - 3 \cdot 5$ , in standard length.

In percentage of standard length.—Total length  $108 \cdot 4-120 \cdot 0$ ; depth  $31 \cdot 9-39 \cdot 1$ ; head  $28 \cdot 5-36 \cdot 6$ ; snout  $8 \cdot 0-9 \cdot 5$ ; eye  $5 \cdot 9-9 \cdot 0$ ; interorbital space  $9 \cdot 2-11 \cdot 8$ ; base of spinous dorsal  $42 \cdot 8-50 \cdot 0$ ; base of soft dorsal  $7 \cdot 1-11 \cdot 5$ ; base of spinous anal  $22 \cdot 6-29 \cdot 8$ ; base of soft anal  $9 \cdot 6-11 \cdot 8$ ; height of spinous dorsal  $7 \cdot 1-11 \cdot 9$ ; height of soft dorsal  $13 \cdot 4-16 \cdot 3$ ; length of pectoral  $17 \cdot 6-20 \cdot 6$ ; length of ventral  $14 \cdot 2-16 \cdot 0$ ; depth of caudal peduncle  $13 \cdot 6-16 \cdot 3$ ; predorsal distance  $29 \cdot 6-34 \cdot 5$ ; preventral distance  $34 \cdot 4-39 \cdot 2$ ; prepectoral distance  $29 \cdot 0-35 \cdot 7$ .

Depth nearly equals head. Maxilla reaches to below half diameter of eye. Pre-orbital strongly spinous, 9–13 spines, first spine longest. Preopercular smooth; edge of opercular, sub-opercular, and interopercular strongly spinous. Villiform teeth in jaws, a patch of teeth on vomer. Pharyngcal teeth present.

Dorsal origin above, slightly in front of or behind origin of pectoral. Height of soft dorsal greater than that of spinous dorsal. Ease of spinous dorsal lorger than base of spinous anal. Origin of ventrals behind origin of pectorals. Bases of soft dorsal, soft anal and caudal scaly. Scales large.

Lateral line consisting of 25-28 large scales, interrupted at 14th to 17th scales. Scales in transverse series 3-4 + 1 + 8-10. Pyloric caecae 2-4.

*Colour*.—Greenish on dorsal side and flanks, pale yellow on abdomen. Pectorals yellowish with grey pigmentation. Ventrals yellow, base paler. Soft anal and caudal pale yellow with dark grey margins. Margin of dorsal dark. The two longest spines of the opercular are connected by black membrane. Distinct dark spot on base of caudal. Usually more than four vertical bands on flanks which may disappear with age.

## DISCUSSION

A. testudineus and A. oligolepis are closely related species that cannot be distinguished without careful comparison. Adults of A. testudineus can

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# TABLE I

Distinguishing characters of Anabas testudineus and A. oligolepis

Sl. No. Character				A. testudineus	A. oligolepis					
(a) Morphometric data										
1.	Depth in total le	engtl	n	3.7-4.3	3.0-3.5					
2.	Depth in standa	rd le	ength	3 • 1 - 3 • 5	2.5-2.9					
In j	percentage of star	idara	l length:							
1.	Total length		••	120.9-127.0	108 • 4-120 • 0					
2.	Snout		••	5.7-7.7	8.0-9.5					
3.	Length of pecto	ral	••	20.3-24.1	17.6-20.6					
			(b)	Meristic data						
SI.	No. Character		A. testudineus	A. testudineus*	A. oligolepis					
1.	Dorsal fin	••	XVIXVIII, 8-10	XVII–XVIII, 8–9	XVI-XVIII, 9-10					
2.	Anal fin	• •	<b>VIII-XI</b> , 9-11	IX-X, 8-10	IX-IX, 9-11					
3.	Pectoral fin	••	14-15	i, 13–15	14-16					
4.	Ventral fin	••	I + 5	I + 5	I + 5					
5.	Scales in latera lines series	1	11-18+8-13 (21-29)	15-19+10-13 (···)	14-17+8-13 (23-28)					
6.	Scales in trans- verse series		2-3+1+8-10 (11-14)		3-4+1+8-10 (12-15)					

\* Data from Alfred (1966) for specimens from Singapore.

be distinguished from adults of A. oligolepis by differences in body proportions (Table I a, Figs. 1 a and b): A. oligolepis is deeper bodied and more compressed; caudal and pectoral fins are relatively shorter, but snout relatively longer in A. oligolepis than in A. testudineus. Colour also is useful to some extent; generally adults of A. testudineus are dark grey with greenish tinge on the dorsal side (including dorsal, caudal and anal fins) while adults of A. oligolepis are greenish on dorsal side and on flanks. The dark spot on caudal base which is invariably present in juveniles of A. testidineus generally fades with age (only a few adults retain it), but it is always present in A. oligolepis. Caudal, soft anal and ventrals pale yellow in A. oligolepis, darker in A. testudineus. A few (about four) vertical bands present on flanks of juveniles of both species, absent in adults of A. testudineus but present in some adults of the other species. Guenther (1861) described two brown streaks on the sides of the head in both species. These are not present in either of the two species from Bhimavaram. The two species show considerable overlap in the range of the meristic characters (Table I b).



FIG. 1. (a) Anabas testudineus from Bhimavaram, s.t. 1. 115 mm. (b) A. oligolepis from Bhimavaram, s.t. 1. 90 mm.

In the course of collection of material for the present study it was observed that specimens caught in Kolleru lake about 20 miles from Bhimavaram were darker than specimens caught in neighbouring shallow tanks and paddy fields. The Kolleru lake is a large but little investigated lake and from an ecological viewpoint a most interesting area. Although essentially a fr shwater lake it receives a small amount of sea-water through a narrow can I between it and the Bay of Bengal. The colour difference between the fishes from this lake and those from the ponds and paddy fields could possibly be due to a combination of factors like differences in habitat, food, salinity (?), etc, which are being investigated.

An attempt was made to investigate the colour pattern especially the disappearance of the black spot on caudal base in A. testudineus in specimens maintained in the laboratory. Juveniles of A. oligolepis and A. testudineus were maintained in a glass aquarium and fed on cooked rice, raw rice and on paddy (unhusked rice) grains. They were exposed only to indirect sunlight. A second sample of specimens was maintained in an earthernware pot, covered with a lid to cut off light, but leaving a slight gap for flow of air. In a period of three months from 16-9-1966, of the specimens maintained in the aquarium, those of A. testudineus turned dark grey on the dorsal side and the caudal spot disappeared in a few, but the specimens of A. oligolepis retained their greenish colour on dorsal side and on flanks and the vertical bands, as well as the two dark spots, one on operculum and the other on caudal base. All the specimens of both species maintained in the pot without practically any light turned light grey on dorsal side and on flanks, but the dark spots were retained along with the vertical bands. In both species the ventral fins turned a deeper orange, while pectorals, soft anal and caudal did not show any change in colour.

The specimens maintained in the aquarium became quite tame and whenever I approached the aquarium they immediately moved to the side nearest to me and when the wire-mesh lid was lifted for feeding them, they rose to the surface and very frequently jumped out to snatch the focd being sprinkled.

When the fish were fed on uncooked rice or paddy grains, they produced a distinct sound in the process of crushing them with the pharyngeal teeth. There is no doubt that these fish crush the paddy grains before swallowing them, because they invariably eject the husk through the mouth.

# ACKNOWLEDGEMENTS

The author expresses grateful thanks to Prof P. N. Ganapati, M.A., D.SC., F.N.I., F.A.SC., F.Z.S.I., for encouragement and for kindly going through the manuscript and to Dr. S. Dutt for suggesting the problem and for valuable guidance. Te Mr. S. Rama Rao, M.Sc., the author is greatly indebted for providing all facilities and assistance in the course of the investigation.

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