for providing necessary facilities and to The Director, C.M.I., England, for helping in the identification of the fungus.

October 29, 1980.

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A NOTE ON THE OCCURRENCE OF *OBERONIA FALCONERI* HOOK. F. AND *O. PACHYPHYLLA* KING AND PANTL. IN KHASI HILLS (MEGHALAYA)

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THE family Orchidaceae has been considered as one of the endangered taxa of the tropical biotas, because of the large scale destruction of the humid tropical forests, its native habitats. The tropical and subtropical mountainous tracts in India support a great diversity of orchids, and localities are subjected to intense habitat pressures, threatening several endemic orchidaceous plants. The present paper deals with the distributional records of two epiphytic orchids inhabiting Eastern Himalayas.

Oberonia pachyphylla King and Pantl. was hitherto reported only in Salgurra in Sikkim Himalaya. *O. falconeri* Hooker F. has a wider range of distribution, and is found in moist deciduous forests of the Himalayas, Eastern and Western Ghats, and Chotanagpur plateau[1-4]. The presence of both the species in open deciduous forests of Nongpho (alt. 650 m) and Umarangdairy (alt. 850 m) is the first record from Khasi hills[5,6]. These species appear to be restricted to lower elevations, and have not been reported from areas located at higher elevations (1250 to 1700 m). Further, the frequencies of both the taxa even at Nongpho and Umarangdairy are very low, implying that they are endangered at least in Khasi hills—an ideal home for orchids.

To facilitate easy identification of *O. falconeri* and *O. pachyphylla*, concise descriptions are given below :

Oberonia falconeri Hooker F.—Epiphytes. Leaves 3-9 ovate-lanceolate or ensiform, 0·5–3·2 × 0·5–1 cm. Spikes slightly recurved, 3–6·5 cm long (incl. peduncle). Bracts ovate-lanceolate, 1·5 × ·06 cm. Flowers orange coloured, 0·2 mm across. Sepals broadly ovate, 1 × 0·5 mm, slightly longer than the corolla. Petals ovate-lanceolate; lip 3-lobed with a 2-fid median lobe, lateral lobes not erose.

Oberonia pachyphylla King and Pantl.—Epiphytes. Leaves 4–8, broadly lanceolate, 0·8–3 × 0·4–1·5 cm. Spikes up to 3·5 cm long (incl. peduncle), curved, with a flattened rachis. Bracts 2 mm long. Flowers brown-yellow, 1·7 mm across. Sepals broadly ovate, 0·4 mm broad. Petals ovate-lanceolate; lip light yellow, with a pit at the base and a crescent-shaped dark coloured band in the centre, 3-lobed with erose lateral lobes and an entire median lobe.

October 31, 1980.

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THE OLFACTORY ORGAN IN A FEW INDIAN TELEOSTS

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THE morphology of the olfactory organ has been described by many workers[1-5], however, no detailed work has been done on Indian teleosts. Only recently a few Indian species have been studied[6-10]. The present authors have studied the functional morphology and histology of the olfactory organs in some freshwater (*Anabas testudineus, Colisa fasciatus* and *Nandus nandus*) and marine (*Otolithus argenteus, Ephippus orbis* and *Caranx oblongus*) species. The olfactory chamber in each of these species is located in the ethmoidal region and it opens outside by two nasal openings. In *A. testudineus, C. fasciatus, N. nandus* and *E. orbis*, the anterior nasal pore is in the form of a tube. In *O. argenteus* the tube is absent and in its place a well-demarcated circular rim is present. In *C. oblongus* tube or rim is absent but a poorly developed nasal flap is present in the posterior margin of the anterior pore which deflects water towards the anterior pore. Kapoor and Ojha[8-10] observed

that the olfactory surface is relatively much more developed (macrosmatic condition) in those fishes which possess tubular anterior openings. Our findings do not support this view because two of the fishes which have tubular openings (*i.e.*, *C. fasciatus* and *N. nandus*) possess poorly developed olfactory area and hence are microsmatic.

A. testudineus has quadrangular, *O. argenteus* has circular and the remaining four species have oval rosette. Teichmann[3] tried to correlate the shape of the rosette with the olfactory faculty of the fish. He claims that fishes with oval rosettes have well-developed optical and olfactory faculties (Eye-nose fishes), fishes having circular rosette have predominantly developed optical faculty (Eye fishes) and elongated rosette means that olfactory faculty is greater (Nose fish). The present authors could not find any such correlation. The number of lamellae increases with the size of the fish till the specific number of the species is reached. After maturity, the increase in the olfactory surface is chiefly through enlargement of the individual lamella. Rapheless fishes (*A. testudineus*, *C. fasciatus* and *N. nandus*) have fewer number of lamellae in comparison to those species which have raphe (*C. olblongus*, *O. argenteus* and *E. orbis*).

In few adult *A. testudineus* a small gap called 'window' is present in the middle lamellae which helps in the circulation of water between the two adjacent interlamellar spaces. Such a window has not been reported so far in any fish. Minor and branched lamellae are present in *C. fasciatus* and *O. argenteus*. Minor lamellae are developed to effectively utilize the space between the two adjacent major lamellae. Secondary lamellae are developed in *A. testudineus* which increase the olfactory surface like the villi of intestine.

In *C. oblongus* and *E. orbis*, the lamellae are compactly arranged and interlamellar spaces are narrow (330 μm each), while in *O. argenteus* interlamellar space is wide (1330 μm). Dø.ing *et al.*[11] have shown that the spacing of the corridors (interlamellar spaces) must reach an optimal value since too large a width will create local water currents and too narrow a width will increase resistance to water flow and make the cilia on the two opposite walls interfere with each other. The corridors reach its optimal width in those species in which water circulation is chiefly through ciliary beats while in those species in which the accessory nasal sacs help in water circulation (*e.g.*, *O. argenteus*, *A. testudineus*, *N. nandus* etc.) corridors may be wide. Nevertheless, the average width of the interlamellar spaces in small specimens is equal to that of the larger ones though this width should have also increased with the overall growth of the rosette. Optimum width of the interlamellar spaces is maintained by swelling of the lamellae. It is, therefore, suggested here that the main purpose of the swelling of the lamellae in large specimens is to maintain the optimum workable distance between two lamellae for proper circulation of water.

The presence of the accessory sacs has been reported in numerous fishes[1–10]. These sacs act as nasal aspirators or pumps to facilitate the circulation of water in the olfactory chamber[1–11]. In *A. testudineus*, *N. nandus* and *C. oblongus* both ethmoidal (dorsal) and lachrymal (ventral) sacs are present while in *E. orbis* the former is absent. *C. fasciatus* and *O. argenteus* have well-developed ethmoidal but moderately developed lachrymal sacs.

The present authors found that working of the two sacs is independent to each other. The ethmoidal sac expands when the premaxillary moves forward while the lachrymal sac expands when the musculus adductor maxillaris moves downward and maxillary moves rostro-ventrally. However, since the jaws open almost simultaneously, expansion of the two sacs also occur synchronously.

No ecological or phyletic correlation is found between the presence or absence of the accessory sacs. However, the presence of the sacs is perhaps dependent on the protrusibility of the mouth as well as on the general configuration of the head. The jaws are slightly (*C. fasciatus*, *A. testudineus*, *C. oblongus* and *O. argenteus*) or greatly (*N. nandus*) protrusible. All these fishes have well-developed ethmoidal sac. In *E. orbis* owing to the peculiar structure of the face and the presence of weak jaws, the olfactory chamber lies far above and behind the premaxillary, so no mechanism is left to inflate and deflate the sac and thus, this sac is absent.

The brain topography reveals that in all the six fishes the olfactory bulb is sessile type, *i.e.*, the bulb is attached with the forebrain. In few fishes, *e.g.*, *Wallago attu*[8] and *Labeo rohita*[9] the olfactory bulb is attached with the rosette (pedunculate type). No correlation is found between the pedunculate or sessile olfactory bulb with the sensitivity of olfaction. However, a definite relationship exists between the size of the brain lobes and the extent of olfactory and visual faculty. Microsmatic fishes have small olfactory bulb and lobe but bear large optic lobe, while the macrosmatic forms have just the reverse condition.

The ecological coefficient (*i.e.*, the area of the olfactory epithelium as a percentage of the area of the retina) is calculated by Teichmann's method[3]. It is found that this method is not satisfactory because it does not take into consideration the presence of secondary and branched lamellae. So a new method was adopted to calculate the ecological coefficient by taking the relative lengths of the telencephalon and

mesencephalon as parameters. This method also has one drawback—it is not fully applicable in laterally compressed fishes (*e.g., E. orbis*) in which the lobes increase in dorso-ventral direction and the length alone might not reflect the true allometric growth of the lobes. Nevertheless, a fairly correct deduction can be predicted regarding the olfactory capacity of the species by studying the two methods.

Histology of the olfactory epithelium of *A. testudineus* and *C. fasciatus* has been studied in detail and it is found that it does not differ from the basic vertebrate plan. Ciliated and non-ciliated supporting cells are present. Unidirectional beating of cilia creates a gentle flow of water current inside the olfactory chamber. The ethmoidal and lachrymal sacs do not differ in their cellular arrangements.

This study shows that *A. testudineus* and *E. orbis* are nose fishes (macrosmat), while *C. oblongus* is eye-nose fish, and *C. fasciatus*, *N. nandus* and *O. argenteus* are eye-fishes (microsmat). The conclusions drawn by morphological and histological studies can be corroborated by behavioural and ecological findings.

May 19, 1980.

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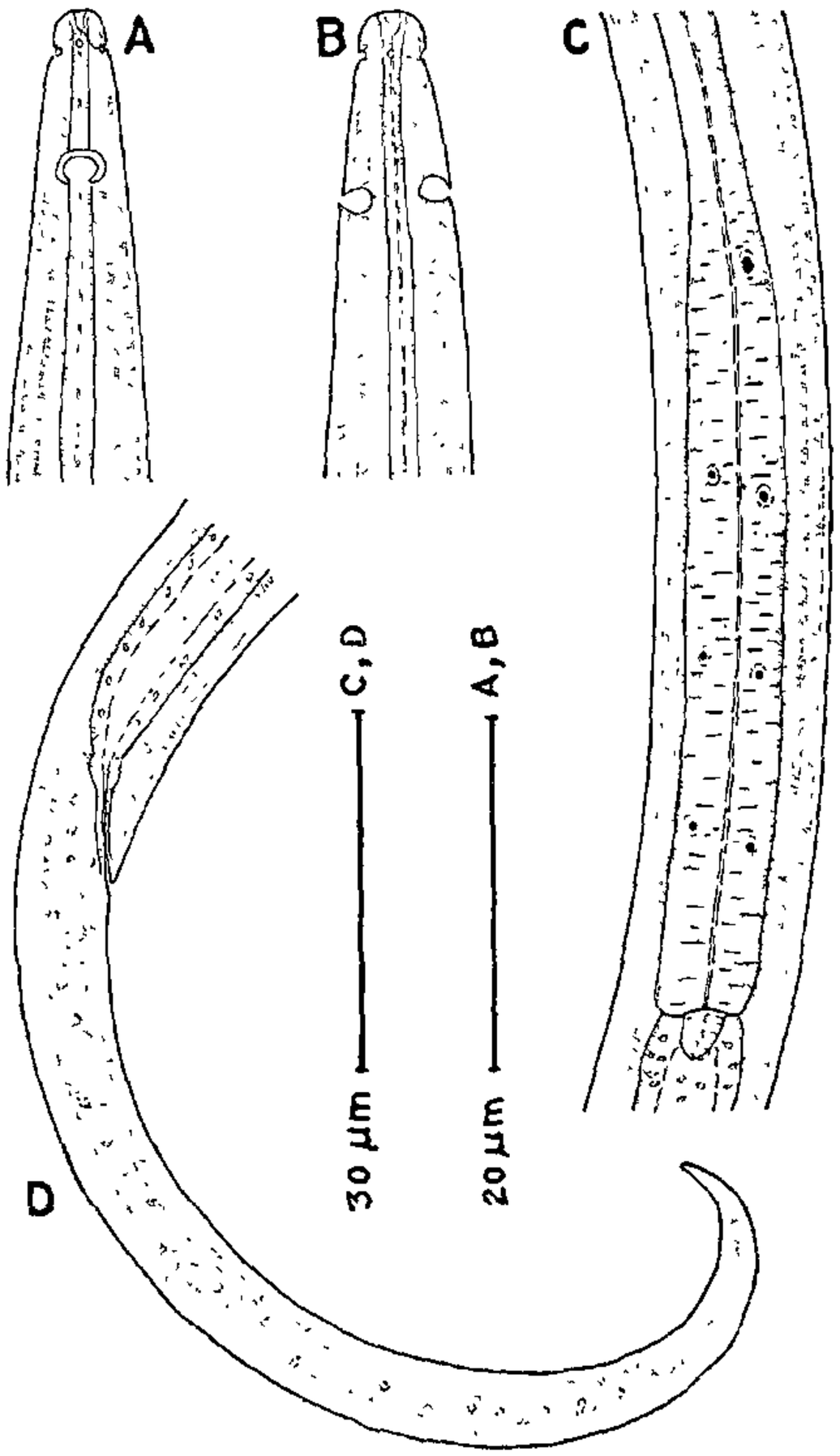

FIG. 1. A : Anterior end, lateral view; B : Anterior end, ventral view; C : Expanded part of oesophagus; D : Tail region.

FIRST RECORD OF THE GENUS *ETAMPHIDELUS* ANDRÁSSY, 1977 (NEMATODA) FROM INDIA

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ANDRÁSSY[1] proposed the genus *Etamphidelus* with the type species, *E. japonicus* and based its description on females and one male specimen collected in Japan. Five females of *E. japonicus* were found in the soil from around the roots of tea plants, *Camellia sinensis* L. from Maranda, district Palampur, Himachal Pradesh. This is the first record of the genus from India. The dimensions and description of the species are given below.

Etamphidelus japonicus Andrássy, 1977
(Fig. 1)

Dimensions

Females (5) : $L = 0{\cdot}90$–$1{\cdot}10$ mm;
$a = 75$–82; $b = 3{\cdot}6$–$4{\cdot}0$;
$c = 10$–12; $c' = 10$–17; $V = 62$–64.

Description

Body almost C-shaped upon fixation and tapering towards both extremities. Cuticle about 1 µm thick, finely striated. Lip region rounded, 3 µm or 1/5th–1/4th of midbody width. Stoma very small measuring