PRELIMINARY NOTE ON THE PERFECT STAGE OF *EPHELIS ORYZAE* SYD. [*BALANSIA ORYZAE* (SYD.) COMB. NOV.]

Ephelis Oryzæ Syd. is a well-known parasite in the paddy-growing regions of South India, sometimes causing heavy damage. The type material on the basis of which Sydow erected the species *E. Oryzæ* was collected by McRae near Telungupalayam, Madras Presidency. The disease manifests itself in the inflorescence, where in the place of normal healthy grains, a gelatinous mass of spores which dries up into a greyish-white horny crust, is observed. In many cases the inflorescence fails to emerge out of the boot due to severe infection. The conidiospores are formed within the pycnidia differentiated from the mycelium. As development proceeds, the entire endosperm is destroyed, leaving a black hyphal mass covered by the persistent glumes. The conidiospores are acicular measuring 22-38 × 1 μ.

After the dispersal of the conidiospores, the grains become shrivelled up and spongy in texture. Some of these grains were collected, washed in sterile distilled water thoroughly, and placed in petri dishes containing moist silver sand, previously sterilized. Small bits of the material were often tested to study further developmental stages.

The formation of perfect stage was observed in many of the grains after 30 to 45 days. From the mycelium a clavate stipe measuring up to 0·5 mm. in length, cinnamon yellow in colour, with a sphæridium, was formed

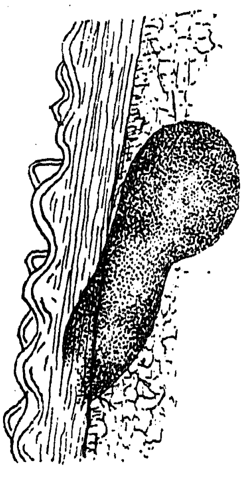

FIG. 1. Stipitate stroma with the spheridium × 200.

(Fig. 1). The stromata could be made out when the enveloping glumes were dissected out. Perithecia were ovate to cylindric and immature. The lack of true sclerotia and other characters clearly indicate that the fungus is a species of *Balansia*. It essentially differs with regard to conidiospcre measurements and other characters, from other species of *Balansia* so far recorded. The perfect stage having been observed, a new combination *Balansia Oryzæ* (Syd.) Narasimhan *et* Thirumalachar is proposed. A formal description of the species will be published separately.

Instances of the discovery of *Balansia* stage of species of *Ephelis* are known. Weber[2] for instance collected overwintering sclerotia of *Ephelis mexicana* which, on germination, developed stromata as in *Balansia hypoxylon*. Sydow[1] who recorded *Balansia Andropogonis* on *Andropogon aciculata* from India, stated that *Ephelis palladia* Pat. common in Tonkin and the Philippines, is doubtless the conidial stage.

Bangalore,
September 9, 1943.

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1. Sydow, H., and P., and Butler, E. J., *Ann. Mycol.*, 1911, **9**, 395. 2. Weber, G. F., *Phytopathology*, 1924, **14**.

ON THE EXTERNAL MORPHOLOGY OF THE LARVA OF THE GLOW-WORM, *DIAPHANES* SP. (LAMPY: COL.)

THE following description is prepared from a collection sent to me in February 1942 from Pampadampara Estate, S. India. I am deeply thankful to J. C. M. Gardner, Forest Entomologist, Dehra Dun, for helping me in identifying the larvæ. The collection consisted of only two larvæ besides males and so far as I know a detailed account of the external morphology of this form is not available. In fact, our present knowledge of Lampyridæ is very meagre and the larvæ as well as females of several species remain still undescribed.

Length—About 40 mm.
Colour—Dark brown.

Tergal plates are distinct, rugose and mid-dorsally sulcate, sulcations being feeble in the last two plates.

Head is black, prognathous, depressed and completely retractile into the prothorax. Head-capsule is incomplete beneath, where it leaves a gap in which is placed the labiomaxillary plate. The Y-shaped epicranial suture is impressed dorsally and represented internally by strong ridges. The eyes are anterior and lateral, immediately behind the antennæ, which are retractile into the extensive antacoria. Antenna is 3-jointed, apical joint being very small and papilla-like while the sub-apical as well as basal are long with few tactile setæ. The basal joint is very long and almost retracted into the head. Anterior margin of the head-capsule is continued beyond the antennal base and it gives off on each side a rounded process which probably represents the precoila which exactly fits into a slight concave depression or preartis on the dorsal aspect of the base of the mandible. The precoila of each side bears a very conspicuous long spine. Another very long spine springs from immediately behind each antenna. Clypeus is deeply and widely foveate medially. Ventrally the gena of the head-capsule is produced anteriorly into a genal process, the postcoila, whose apical surface bears an acetabulum which receives the condylar postartis of the mandible. The genal process runs anteriorly and inwards, its outer margin forming the ventral border for the antennal base. Dorsally the base of the antenna is bordered by the margin of the precoila. The mandible is strongly falcate with the basal half broad and flattened inwards. The broad basal area of the mandible is produced anteriorly into another strongly falcate secondary tooth, the retinaculum. The mandible is pierced by a long canal whose external opening is sub-terminal and internal opening placed at the base just internal to the pre-articular acetabulum. Ventrally just outside the internal opening of the mandibular canal is the rounded post-articular condyle which articulates with the genal acetabulum. The inner border of the mandibular base is beset with a very fine brush of hairs. There is also a large tuft of stiff hairs forming a conspicuous sheath at the base of the mandible. The mandible is finely pubescent on the ventral side. The labio-maxillary plate is formed by the median labium and the lateral maxillæ. The Cardo is small and sub-quadrate with the posterior and outer borders straight and the inner border slightly convex. The stipes is very large, stout, basally narrowed and carries distally the maxillary palp. The maxillary palp is 4-jointed, the basal joint being the longest and almost as large as all the remaining joints put together. The second and third are very narrow while the apical is least chitinised, strongly compressed and bears a sensory streak. All the joints carry setæ, some of which are very long. Each stipes bears ventrally four long spines. Just on the inner side of each maxillary palp is the two-jointed galea, whose stout basal joint bears a long ventral supporting process and the small apical joint carries a very long spine. Lacinia is in the form of a brush supported by sclerites and presents a sharp cutting tooth for the animal. It is placed dorsally and both face each other. On the inner side it is supported by a triangular sclerite whose apex is attached to the inner border of the stipes. Dorsally it is supported by a broad sclerite whose anterior end is pointed, posterior and inner margins convex and outer margin concave. The narrow labium is differentiated anteriorly into a prelabium which carries the two palpigers bearing the labial palpi. Each labial palp is 2-jointed, the distal joint being narrow, slender and tactile. Dorsally the prelabium carries a white brush formed of fine bristles. The postlabium is formed of a single elongate flask-shaped sclerite which represents probably the fused mentum and sub-mentum. The dilated basal region of the sclerite carries two long symmetrically placed spines.

Thorax.—Pronotum is longer than broad, anteriorly narrowed and anterolateral margins rounded. The median longitudinal sulcus terminates anteriorly in a very slight notch. Lateral margins are straight and the disc is raised medially and strongly punctate. The posterolateral angles are tipped with yellow. The lateral margin is raised into a *marginal carina*. The area between the disc and marginal carina is depressed. The mesonotum is nearly as long as broad and sub-quadrate with a *lateral carina* on either side of the disc. Lateral margins are sub-parallel. The median longitudinal sulcus is present. The anterior notch is conspicuous. Posterolateral angles are tipped with yellow. The metanotum is slightly broader than long and sub-quadrate with both lateral and marginal carinæ. Anterior notch is well formed and posterior border convex. There are three pairs of thoracic legs. Coxa is black, long and cylindrical. Trochanter is large and very feebly constricted. The coxo-trochanteral joint is distinctly dicondylic and conspicuously creamy white. Distal half of the trochanter is brownish and setose. Femur is long and cylindrical and carries ventrally a median light brown line which is continuous with a similar line on the distal half of the trochanter as well. On either side of this line is a row of spines, which are longer and stouter and more on the distal half than on the basal. The tibiotarsus is slightly shorter than femur and carries on the inner surface a profuse growth of very long and strong spines. The femur and tibiotarsus are black except at the femoro-tibio tarsal joint which is creamy white. The tibiotarsus is narrowed distally into a pale rufous area which bears a strong single claw. At the base of the claw is another pair of small lateral claws. Both coxa and femur carry on their outer surface a faint longitudinal streak.

Abdomen.—The tergal plates are distinct, rugose and mid-dorsally sulcate, sulcations being feeble in the last two plates. There are nine visible abdominal terga. The abdominal terga 1-7 are all broader than long, anteriorly narrowed, posterior margin more or less convex, posterolateral angles tipped with yellow and longitudinally sulcate. The lateral carinæ are broken up into irregular pits and elevations. Eighth tergum is without the disc and lateral carinæ. Median sulcus is feeble, lateral margins yellow and the anterior and posterior border slightly concave. Ninth tergum is strongly concave posteriorly and the median sulcus is feeble. The lateral carinæ are absent but the posterolateral angles are sharply pointed and each carries a cluster of about five pale rufous flexible pointed spines. The sternal plates are devoid of the movable sternal spines so abundant in *Lamprophorus* larvæ. The abdominal sterna are provided with a row of from four to eight pale reddish brown spots on each side. These spots vary considerably in number and arrangement as evident from the following table:—

Abdominal sterna	Larva I		Larva II	
	Right	Left	Right	Left
I	8	6	6	5
II	8	8	8	8
III	8	6	6	6
IV	6	6	6	5
V	6	7	7	7
VI	6	6	6	6
VII	6	7	4	6
VIII & IX	Indistinct			

A median ochreous basal streak is present in the abdominal sterna V to VIII. Eighth sternum is sub-triangular and bears two pairs of blunt processes, the outer posterolateral and the inner posterior which is smaller than the former. The ninth sternum is very narrow.

Typically four pairs of pleurites are present in each abdominal segment. A long narrow plate almost touching the tergum but separated from it by distinct suture, forms the dorsalmost plate. The second is small but more or less continuous with the spiracle bearing third plate. The spiracle is borne anteriorly but the posterior surface is studded with a cluster of about a dozen round spots. Ventral to the spiracular pleurite is another narrow strip close to the sternum. The eighth pair of spiracular pleurites are eburated and photogenic.

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RIVER MEANDERING AND THE EARTH'S ROTATION

THE literature dealing with rivers is full of conflicting explanations of the origin of meanders in unrestricted natural rivers. Geologists and geomorphologists often explain the occurrence of the sinuosities and the associated phenomena in terms of the earth's rotation, which is well-known as Baer's Law or Coriolis' Effect.

If ω be the angular velocity of the earth's rotation and λ the latitude of the place, a water body with mean velocity U_m will be acted upon by a deviating force of magnitude $2\omega \sin\lambda \bar{U}_m$ per unit mass, which, it is quite easy to show, acts at right angles to the flow direction and is to the right in the northern hemisphere and to the left in the southern hemisphere. And as the tendency of some of the rivers flowing in the two respective hemispheres is towards developing curves in the above sense, it is argued that the earth's rotation is the cause of river meandering.

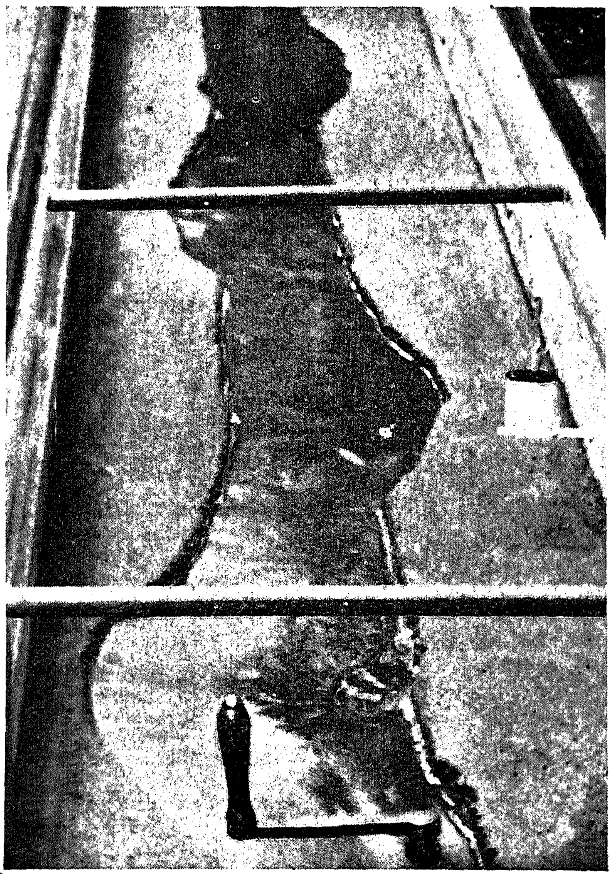

FIG. 1.—The Meandering Stream

However carefully conducted experiments by the writer at the Hydraulics Laboratory of the Imperial College of Science and Technology, London, show that the predominance of curves on the left or the right is merely a chance phenomenon, having hardly anything to do with the terrestrial rotation.

Fig. 1 is the photograph of a stream with well-developed curves situated alternately to the left and the right and the water is seen flowing smoothly through it. The channel had initially been moulded straight in an incoherent sand of mean grain diameter 0·70 mm., with the mean velocity equal to about 30 cm./sec., the sediment to water discharge ratio equal to about 1:700 and the width to depth ratio of the order of 20·0.

Before the bights arose, the stream bed changed into skew shoals such as are illustrated in Fig. 2, where the arrows depict the direction and the manner of motion of the sediment particles. Observations showed the particle paths to be inclined at an angle of from 45° to 60° to the main flow direction. So, transversely, a drag varying between 1 and 1·732 times the drag in the flow direction, must have acted upon the particles.

← *Direction of Flow*

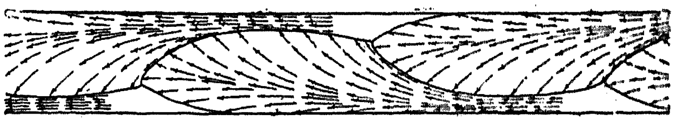

FIG. 2.—Illustrating the Skew Shoals

Taking $\lambda = 51° \ 31 \cdot 1'$ (value for the University of London), we find that a unit mass of water under the influence of the deviating force will describe a circular path whose radius of curvature is $2 \cdot 626 \times 10^5$ cm. So there will be a transverse gradient roughly equal to 1:300,000. The drag arising out of this is, however, seen to be quite trivial compared with even 50 gm./m.^{2} required for general motion of the particles in the flow direction.[1]

To increase the effect, a channel with transverse slope 3,000 as great, *i.e.*, 1:100, but with less slope and less sediment to discharge ratio, was run for about four hours. It failed to produce skew shoals or even any regular bights.

So, if the model experiments are any clue to large-scale phenomena, which ought to be the case, the conclusion is strongly against the terrestrial rotation being taken as the cause of river meandering.

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August 10, 1943.

1. Quraishy, M. S., *J. Univ. Bomb. Phys. Sci. No.*, Nov. 1943 (being published).