Table 2 *Chromosome analysis in the various cytologically known species of the family Cydnidae.*

Species	Diploid number	Haploid chromosome formula	Reference
Cydnus maurus Dall.	12, S	5+XY	4
Cydnus varians Fabr.	12, S	5+XY	4
Cydnus nitritus Fabr.	12, S	5+XY	5
Lactistes truncato serratus Sign.	12, S	5+XY	Present report
Legnotus picipes Fall.	14, S	6+XY	9
Macroscytus japonensis Scott.	—, S	6+XY	7
	14, O	— —	7
Macroscytus subaëneus Dall.	12, S	5+XY	1, 2
Microporus nigritus Fabr.	14, S	6+XY	6
Scaptocoris castaneus Perty.	26, S	12+XY	3
Stibaropus molginus Schiödt.	31, S	14+XXY	1, 2

S = testicular cells. O = ovarian cells.

From table 2, it appears that a modal number of 10+XY chromosomes can be suggested for the family Cydnidae.

It seems that the cydnids have evolved from the pentatomids, through decrease or increase in the number of their chromosomes, as suggested by other workers[10–12]. The retention of the ancestral diploid number of 12 chromosomes by some of the cydnid species further suggests that they are more primitive than pentatomids.

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BLOOD-WATER DIFFUSION BARRIER AT THE SECONDARY GILL LAMELLAE IN *ANABAS TESTUDINEUS* (BLOCH) DURING EARLY ONTOGENESIS

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THE measurement of thickness of blood-water diffusion barrier at secondary gill lamellae of fish has been worked out both at light and electron microscopic levels[1–10]. However, studies on diffusion distance during early ontogenesis of the fish are scanty. Thickness of the diffusion barrier(T) at the secondary gill lamellae during the early life of an air breathing fish is important since the fish depends exclusively on gill respiration in the beginning and at the same time weight specific metabolism remains very high. In *Anabas testudineus* the air breathing habit starts only after 22–25th day of hatching and after onset of the bimodal gas exhange machinery, a sharp decline in VO_2 through the gills occurs[11]. As the diffusion distance increases with increasing body weight[4] it is, therefore, interesting to know the changes in the thickness of the diffusion barrier and its impact on fish metabolism particularly on O_2 uptake during early life. Besides measurements of diffusion distance its relationship to the body weight and length has been established in this communication.

Spawners were selected on the basis of sexual dimorphism[12] during rainy season and induced breed-

ing was performed in the laboratory by pituitary hypophysation method[11]. Spawning and hatching took place in aquaria water having $7+1$ ppm O_2 at 27°C. Larvae of different size (from 2nd day of hatching to 3 months) were fixed in alcoholic Buins and neutral formalin fixatives. Permanent slides using haematoxylin-eosin were prepared in customary manner. Measurements were taken at different places of the secondary gill lamellae of the first gill arch with the help of a rotatory micrometer and an average value for blood-water diffusion barrier was calculated.

Data were analysed by logarithmic transformation on the basis of least squares using the exponential equation, $T = aW^b$ and $T = aL^b$ where, T = thickness of blood-water diffusion barrier; a = intercept, W = weight of the fish (mg), L = length (mm), b = slope of the regression coefficient. Significant difference of the slopes were examined by the student's t-test.

In the beginning, the increase in diffusion distance was almost uniform and the equations derived against body weight or length were, $\log T = -0.6146 + 0.5268 \log W$, and $\log T = -0.7810 + 0.8562 \log L$ for an average body weight of 14.6 mg and length 7.7 mm.

After functioning of bimodal gas exchange machinery the diffusion distance increased considerably and slopes of the regression line changed accordingly in relation to body weight and length. The relationship obtained were as follows: $\log T = 0.3267 + 0.1248 \log W$ and $\log T = 0.1042 + 0.5159 \log L$. The diffusion distance changed from 1.37 to 4.96 μm for the fish having 1233 mg body weight and 39.21 mm body length.

Analyses of mixed data for the fish, one respiring exclusively through water and the other using both gills and air breathing organs in relation to average body weight (745.8 mg) and length (26.6 mm) showed the slopes of 0.3611 and 0.9862. The equations obtained were, $\log T = -0.3849 + 0.3611 \log W$ and $\log T = 0.8502 + 0.9862 \log L$ respectively.

Plotting of thickness of blood-water barrier on log/log co-ordinate against body weight and length (figure 1) resulted in a two-component curve, one for fully aquatic phase and the other for bimodal phase, intersecting each other at 225 mg body weight and 70 mm length. The two regression lines differed significantly at 1% ($P < 0.01$) and 5% ($P < 0.05$) levels. All the equations either in relation to body weight or length have been summarised in table 1.

The thickness of blood-water barrier forms a limit-

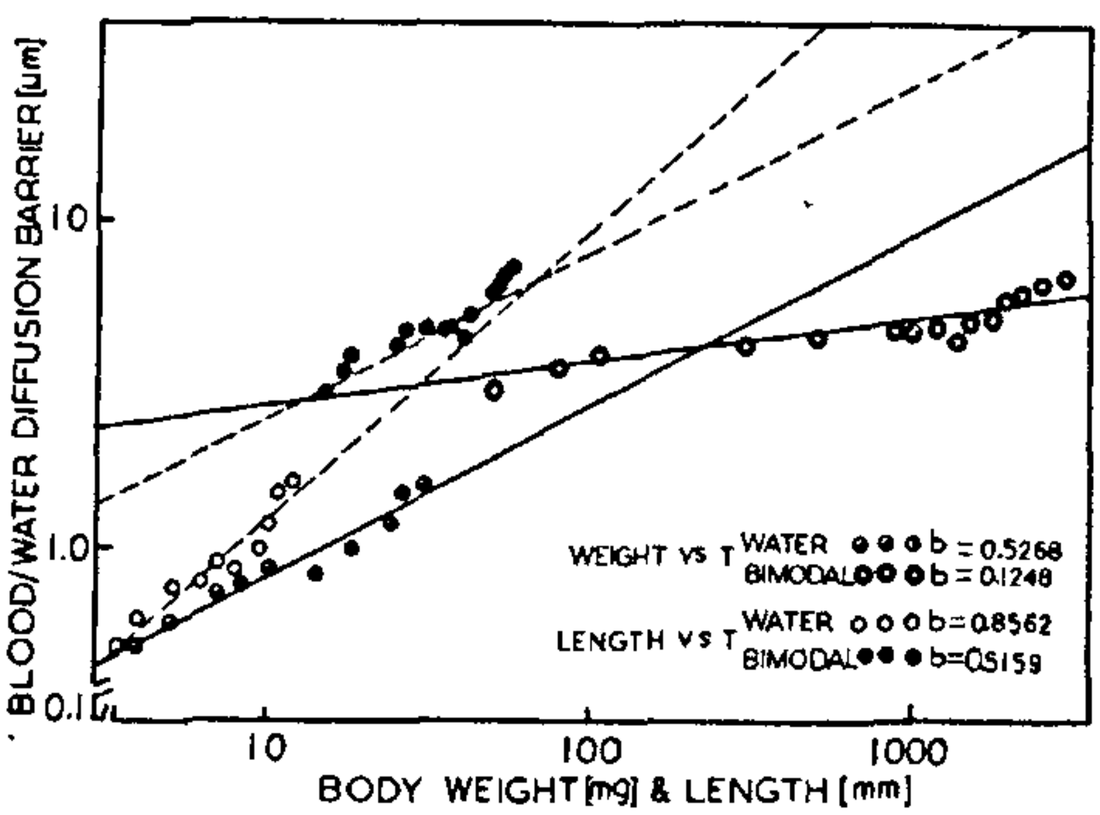

Figure 1. Log/log graph showing blood-water diffusion barrier (T) and its relationship to the body weight and length of the fish.

Table 1 *Equation denoting relationship between thickness of blood-water diffusion barrier (T) (µm) and body weight (mg) and length (mm) of Anabas testudineus during early ontogenesis.*

Condition	Relationship	Equation	Slope (b)	SD of slope	Correlation coefficient (r)
A. Fish respiring exclusively through gills (10)	Weight *vs* T	$\log T = -0.6146 + 0.5268 \log W$ $T = 0.2429\ W^{0.5268}$	0.5268	0.1782	0.9756
	Length *vs* T	$\log T = -0.7810 + 0.8562 \log L$ $T = 0.1656\ L^{0.8562}$	0.8562	0.0236	0.9430
B. Fish respiring bimodally (15)	Weight *vs* T	$\log T = 0.3267 + 0.1248 \log W$ $T = 2.1218\ W^{0.1248}$	0.1248	0.0227	0.6830
	Length *vs* T	$\log T = -0.1042 + 0.5159 \log L$ $T = 0.7867\ L^{0.5159}$	0.5159	0 0293	0.9383

ing factor for O_2 diffusion at the secondary gill lamellae of fish, the increase in thickness lowers the O_2 uptake capacity of the gills resulting 40 % drop in VO_2 through the gills[11]. Anatomical studies[13] showed the development of air-breathing organs at the same age and size of the fish which is responsible for the fulfilment of decreased amount of O_2. Hughes *et al.*,[14] while determing the diffusion capacity of *A. testudineus* concludes that the thickness of water-blood or air-blood barrier is of much importance since it particularly influences the O_2 tension difference (PO_2) which provides the driving force for the diffusion of the O_2 into the blood.

Duffusion distance (6 μm) obtained in this study for a fish of 2 g is far greater than the value 2.07 μm reported[4] for a fish of 10 g. This difference in thickness of the diffusion barrier for the same species of fish might be counted for the occurrence of two varieties of fish even in the same species (narrow-trunked and broad trunked[4].) In the present study, the fish taken was of broad-trunked variety in which the diffusion distance has been reported to be 15–20 μm in adult specimens[7,10]. Very thin diffusion distance (0.5 μm) in the beginning is quite logical since at this stage the fish is very active and inactive fish this distance is reported[2] to be as low as 0.553 to 0.598 μm.

The diffusion distance increased by a fractional power of 0.3611 and 0.9862 in relation to body weight and length. After achieving a body weight of 30 mg and 12 mm length, the gills become incapable of meeting the total O_2 demand of the body as growing body size reduces the functional efficiency of gaseous exchange by increasing the blood-water pathways. Similar suggestions for weight specific metabolism have been made in *Tench*,[3] *Anabas*[4] and *Saccobranchus*[15].

In spite of increasing body size the decrease in slope values for weight and length after functioning of the air breathing organs, is suggestive of a rapid growth in weight and length of the fish as compared to increase in the diffusion distance.

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SOME OBSERVATIONS ON THE ACTION OF URETHANE IN CHICK EMBRYOS CULTIVATED *IN VITRO*

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URETHANE is well known for its diverse biological effects. Studies on its action on nucleic acid metabolism assume a special significance as these play an important role in animal growth and differentiation[1]. Lombardi[2] stated that urethane inhibits DNA and RNA synthesis. Prodi *et al*[3] showed that urethane exerts a strong inhibitory effect on DNA synthesis in lymphoid organs and the bone marrow of the rat. Diwan and Mulherkar[4] along with others[1,3] while studying the effects of urethane on chick embryos also suggested the possible urethane interference with DNA synthesis. The present studies underline the mechanism of action of urethane and certain steps to understand the effects on nucleic acids.

Fresh fertilized eggs of white leghorn hens were incubated to obtain the mid-primitive streak stage or definitive primitive streak stage[5] (stages 3$^+$ and 4). The