INTRODUCTION

Taxonomists measuring haplochromine cichlids are confronted with allometry (Greenwood, 1956, 1973; Barel et al., 1977). Any difference in proportion (e.g. eye-diameter as a percentage of the length of the head) between specimens of different absolute size therefore had to be judged on its origin. Differences can be due to size-correlated change of shape (allometry) alone or to variation among species. Generally both factors act together. Allometric growth of several elements in the head of haplochromine cichlids and its methodological implications are widely acknowledged by both taxonomists and morphologists (Greenwood, 1956, 1973; Barel et al., 1976; Barel et al., 1977; Galis & Barel, 1980; Hoogerhoud & Witte, 1981; Otten, 1981, 1983). However, quantitative calculations (regression-analysis) conducted to detect interspecific differences are scarce (Galis & Barel, 1980; Strauss, 1984).

On the other hand, Strauss (1984) has refuted the generally held belief, that the effect of allometric growth was sufficiently eliminated by functional morphologists comparing head-shape of differently sized cichlid species. Reanalysing data from Barel and Voogt-Kokx (published in Dullemeier & Barel (1977)) and amplified with some new data, Strauss (1984: 217) using regression-analysis tries to prove that 1) "Rather than being specific structural reorganizations in response to trophic adaptations, the relative sizes and shapes of cephalic components lie in simple allometric relationships with one another and represent simple scalings of shape based on size" and 2) "The allometric relationships among species in many cases are simple extensions of those within species, indicating that no inferences can be made about the evolutionary plasticity of various components". As these statements affect numerous comparative morphological studies on cichlids the need to compare several ontogeny series, even when one is not primarily interested in ontogeny or fishery-biology, will be clear. To analyse allometry
effects, extensive ontogeny series are required but collecting such series is hampered by the difficulties to identify small specimens (Van Oijen et al., 1981). However, due to striking features, such identification is possible for a few species of which extensive series are now at our disposal.

This paper will test Strauss's (1984) assertions by allometry calculations on data obtained from ontogeny series of three haplochromine species from Lake George (Uganda).

MATERIALS AND TECHNIQUES

Materials

The species measured are Haplochromis squamipinnis, H. nigripinnis and H. angustifrons feeding on fish, phytoplankton and insects respectively. All three are endemics of the Lakes George and Edward Basin (Greenwood, 1973). Except for some larger specimens from the BM(NH) paratype series, the majority belongs to the Barel-collection caught in Lake George in 1972. The latter series was identified in the field by the experienced cichlid-ecologist Dr. J. J. Gwahaba. All specimens are labelled individually and, with some exceptions, are still intact. The entire series has been stored on alcohol 70%.

Measures

Of the various measurements, only Head-Length (HL), Eye-Length (EyL), Interorbital-Width (IOW), Preorbital-Depth (POD) and Lower-Jaw-Length (LJL) are presented here. The measurements are taken according to the precise definitions of Barel et al. (1977). Repeated measuring by a skilled investigator yield deviations of only 0.2 mm. These are noticeable smaller than intraspecific variability at most sizes (ca. ± 1 mm in large H. squamipinnis and ca. ± 0.5 mm in small H. angustifrons and H. nigripinnis). In this paper measurements are presented in 0.25 mm units. To avoid damage to small H. angustifrons, 56 specimens have been measured partly from exposures on X-ray-slides yielding data of 0.1 mm accuracy. Systematic differences in techniques did not appear. Measuring was conducted in 1976 and 1977. Specimens were selected such that all Standard-Length classes were approximately equally represented. The specimens and their basic data are listed in table 1.

Calculations

Transformation to log-data and calculations have been executed using an APL programme designed to match exactly all properties of Model I Regression (i.e. X-values controlled by the investigator) according to Sokal & Rohlf (1969: Box 14.4). In this way regression yields best estimates for a and b in the formula: Log Y = a + b.Log X or transformed to lineair data: Y = A.X^b when A = e^a. To adopt the terminology of Strauss (1984), A stands for “slope” and b for “allometric coefficient”. The applicable significance tests (Sokal & Rohlf, 1969: Boxes 14.5 and 14.9) have been executed at α = 0.05 one-sided.