the importance of temperature and ecologically relevant reinforcements in the design of this research. Philip Regal discusses how both perceptions of lizard behavior and adaptive functions of the nervous system relate to the diversity of foraging "strategies" among lizards. Stimulating arguments are developed concerning behavioral differences between reptiles and mammals as related to evolutionary aspects of circulatory design, activity energetics and endothermy. However one regards the hypothetical aspects of Regal's arguments, there are some practical messages. For example, a strong case is made that teiids and varanids may provide better "models for the organization of mammal-like behavior" than do the more commonly studied iguanids or other less active reptiles. Regal's attention to an ecological and evolutionary perspective of reptile foraging activities helps to integrate the theme relating behavior and neural organization to evolution and function. Gary Ferguson and Charles Bohlen illustrate the potential usefulness of demographic ecological studies to reveal the selective pressures associated with the evolution of certain behaviors, and this paradigm is complemented by several other papers dealing with field studies and experimental analysis of lizard behaviors.

In general, the content and organization of this volume are of good quality, and the contributors are reputable and innovative scientists. It is apparent from the examples discussed by these contributors that lizards share numerous behaviors and mental capacities with other vertebrates, including primates. This is an important point, since it is knowledge which may not be appreciated by students specializing in mammalian behavior or brain evolution. This publication is significant because it provides the basis for a broader perspective of reptilian behavior and neuroanatomical organization. Hopefully it will enhance communication between herpetologists and other vertebrate biologists.—H. B. LILLYWHITE, *Division of Biological Sciences, University of Kansas, Lawrence, Kansas 66045.*

Copeia, 1979 (3), pp. 560–562

ANATOMIE DE *LATIMERIA CHALUMNAE*, TOME III. By J. Millot, J. Anthony and D. Robineau. 1978. Editions du Centre National de la Recherche Scientifique, Paris. 450 Francs.—The publication of this volume marks the completion of the series of monographs on the anatomy of *Latimeria chalumnae* initiated by J. Millot and J. Anthony nearly thirty years ago. Volume one covers the skeletal and muscular anatomy (Millot and Anthony, 1958), volume two, the nervous system and sense organs (Millot and Anthony, 1965) and this final volume includes chapters on the digestive system, respiratory apparatus and blood vasculature, endocrine glands, skin and squamation. The last chapter of volume three concisely summarizes conclusions from all three monographs and a useful bibliography (by subject) appears after this chapter although many of the listed references are not cited in the text.

Millot, Anthony and Robineau open the volume with a reconsideration of the feeding mechanism of *Latimeria* in light of the papers published since the jaw mechanics were first described in volume one. The model they present is essentially the one developed by Robineau and Anthony (1973) and involves mandibular depression by co-contraction of the sternohyoideus and coracomandibularis muscles. As the mandible is depressed, the elements of the hyoid arch articulating with the posteroventral aspect of the mandible, the symplectic and interhyal, will be compressed. This compression results in an anterodorsally directed force through the inferior quadratohyoid ligament which elevates the anterior (ethmosphenoid) portion of the cranium and palatoquadrate. This mechanism requires that the inferior quadratohyoid ligament act as a compression member and that a posteroventral force applied at the mandibular symphysis be transformed into an anterodorsal force acting to elevate the anterior portion of the skull. This mechanism will not work (Lauder, 1980) as the reader can verify by constructing a simple cardboard model from their Fig. 3. Lauder (1980) will show that co-contraction of the coracomandibularis and sternohyoideus will actually close the mouth.

The suggestion (p. 11) that notochordal elasticity in *Latimeria* functions effectively as an antagonist to the subcephalic muscles during low amplitude respiratory movements is an important one and may explain the bone movement pattern noted by Thomson (1973) in a living (but expiring) individual.

Rather than attempt to review each chapter seriatum, I will focus on two noteworthy ana-

tomical features of the circulatory system and on a recent report of urogenital anatomy which is not in agreement with the presentation in this volume.

A set of five small "organs" having a complex internal architecture (including, apparently, intrinsic muscles) serve as arteriovenous shunts in the branchial vasculature. Two of these structures are located on or connected to efferent branchial arteries, one is attached to the jugular vein, and two connect the fourth efferent branchial artery to the inferior jugular vein. In addition, six anastomotic loops (three dorsal and three ventral) occur between successive efferent branchial arteries.

Also noteworthy is the discovery of what appears to be a posterior vena cava in *Latimeria.* This large abdominal vessel originates posteriorly from the caudal vein where blood vessels also enter from the kidney [located ventrally (sic), behind the rectum]. The vena cava then passes anteriorly through the enlarged right lobe of the liver to emerge and drain into the sinus venosus. On the left side there is a posterior cardinal vein that drains into the common cardinal. An inferior vena cava is found elsewhere only in dipnoans and tetrapods and the discovery of an apparently homologous vessel in *Latimeria* provides an important new character uniting these three taxa into a monophyletic group. Millot, Anthony and Robineau discuss in detail the relations of the vena cava in *Latimeria* and tentatively conclude that it is homologous to the tetrapod and dipnoan vena cava. Ontogenetic evidence would, however, provide a key test of the proposed homology. In dipnoans and tetrapods the posterior vena cava forms by a joining of the posterior part of the right posterior cardinal vein to a neomorphic posterior outgrowth of the hepatic vein. This connection effectively short circuits the posterior venous return to the common cardinals and shunts blood directly into the sinus venosus. Evidence of a similar developmental process in *Latimeria* embryos would provide a convincing corroboration of homology.

Millot, Anthony and Robineau describe the urogenital system of *Latimeria* in detail and state that the male has a cloaca and that both the ducti deferenti and the urethras enter the rectum at a common urogenital papilla. The female is described as having a common urogenital orifice located posterior to the rectal opening. Both of these descriptions are in conflict with the recent report of Dingerkus et al. (1978) who state that the left and right deferent ducts anastomose and emerge posterior to the rectum while the urethras extend anteriorly to enter the rectum. According to this description the male has a common uro-rectal opening anterior to the genital opening and the female has separate rectal, urinary, and genital openings. In view of the rather dramatic conflict between the two descriptions of urogenital anatomy and the tremendous morphological variability of the internal organs of *Latimeria,* further work is clearly necessary to resolve the conflicting reports.

I found relatively few errors in the text. *Amia* (p. 18) is included in the Brachiopterygii and it is stated that the five embryos found in the oviduct of the American Museum coelacanth were oriented with their heads toward the genital opening (p. 52) whereas in fact the reverse is true (Smith et al., 1975). I did, however, locate over twenty errors in the bibliography.

This final volume of the Anatomie de *Latimeria chalumnae* is clearly written and beautifully illustrated. An index to the entire three volume set would have been a very useful addition since many anatomical areas are treated from a slightly different perspective in each volume. I would also have liked a more comprehensive description of gill anatomy, especially at the histological level. All in all, the Anatomie de *Latimeria chalumnae* provides an excellent basis for future studies of coelacanth anatomy and will undoubtedly greatly stimulate comparative investigations of osteichthyian morphology.

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