

WHAT IS THE STATUS OF THE MEXICAN AXOLOTL?

H.I. GRIFFITHS and D.H. THOMAS

*School of Pure and Applied Biology, University of Wales College of Cardiff,
P O Box 915, Cardiff CF1 3TL*

The Mexican Axolotl *Ambystoma mexicanum* Shaw 1789, is most certainly the most widely used research species of the urodela, having generated in excess of 3300 publications by 1971 alone (Smith and Smith, 1971). Despite this the natural history of the Axolotl and of the other Mexican members of the Ambystomatidae is almost totally unknown. Brandon (1970) undertook a short field study of *A. dumerilli* at Lake Patzcuaro in the mountains of Michoacan, but other than this field data for most species appears to consist of little more than records of captures made by Feder, Lynch, Shaffer and Wake (1982).

The situation for *A. mexicanum* is surprisingly little better. The species has been recorded from only two localities (Lake Xochimilco and Lake Chalco in the Valley of Mexico) though it may also have been previously present in the channels joining Lake Zumpango and Lake Texcoco (Frost, 1985; Fig. 1). First hand accounts of the species habitat are few and far between. Velasco made a series of observations at the site in October 1879 (Kranz, Smith and Smith, 1971) and interestingly recorded that the species did metamorphose at Lake Xochimilco in late October/early November. Hans Gadow also visited the site (Gadow, 1903) but his account, though giving a little information about Lake Xochimilco, falls short of real field observation. Feder et al. (1982) also visited Chalco, but have published only the ambient water temperature at the time of capture of some thirteen individuals.

Further observations are elusive. Lake Xochimilco lies near Mexico City at an altitude of 2240 metres and Palermo (1973) describes a wet season from May to October, followed by a cold period through until March with ground temperatures reaching freezing. No details of water conditions or of the lakes' ecology are available.

Lake Xochimilco forms part of a complex of five lakes (see Fig. 1). Lake Zumpango lies to the north, Xaltocan and Texcoco centrally, with Chalco and Xochimilco to the south (the latter two in reality being one lake divided by an Aztec causeway). In former days this complex would flood in the rainy season to form a single body known as the "Lake of the Moon" (Coe, 1964; Deevey, 1955). Velascos' field observations of metamorphosis would appear to correspond to the period of pond-drying subsequent to the rainy season, a situation fairly common in amphibian metamorphosis (Wilbur and Collins, 1972).

The lakes themselves are known to have been highly productive originally. Deevey, (1955) drawing heavily on archive sources such as the Codex Florentino, describes a variety of atheriniid and goodeid fishes, frogs and a rich invertebrate fauna of crayfish, dytiscid water beetles, ephydrid flies and corixid bugs, and points out that the egg masses of the corixids were formerly an important food resource for the local amer-indians. The Axolotl itself was once much prized for its soft flesh and eaten boiled and diced with chilies (Smith, 1969). Palermo (1973) further comments on an abundance of water snakes and "fowls" - indeed the egret was the symbol of the Aztec regional capital, formerly situated on the island of Telochtitlan-Tlatelolco in the west of Lake Texcoco (Coe, 1964).

Lake Xochimilco has long been famous for its "floating gardens" or chinampas, large-scale gardens produced by land reclamation through drainage. The land between the drainage channels would be buttressed, piled high with waterweed and mud and planted with maize, beans, chilies, tomatoes, vegetables and flowers for market. The channels themselves are rich in carp and other fishes and are also where the Axolotl was formerly taken (Coe, 1964).

The chinampas of western Texcoco and of Chalco and Xochimilco were protected from seasonal flooding with saline water from Lake Texcoco by the construction of enormous stone dykes by the Aztecs in the fifteenth century to form a freshwater system maintained by a number of springs to the south (Bradbury, 1971).



Figure 1. The state of the lakes in the sixteenth century. Coe (1964) shows the area to the west of the broken line as part of Mexico City

Modern times have entailed great changes for the Axolotl, however, principally through land drainage and the growth of Mexico City. The need to protect the chinampas from flooding and to dispose of sewage has led to attempts at draining the lake complex in the seventeenth century, in 1900, and most recently in 1945 with the construction of the Terquisquiae tunnel. These measures have apparently been fairly effective and have resulted in substantial diminution of Lake Texcoco and the loss of Lake Chalco (Deevey, 1955; Bradbury, 1971). Further habitat pressures stem from the drying of the valley through the digging of wells and tapping of springs. Coe (1964) estimated that of six billion cubic metres of water available in the valley each year, 744 million cubic metres were consumed by the population and industries of Mexico City and that much of the remainder evaporated off so that only "isolated puddles" remained of parts of Texcoco and Xochimilco. Presumably the situation has improved little in recent years.

A. mexicanum is only one of four urodele species currently protected under schedules 1 and 2 of the C.I.T.E.S. agreement, (C.I.T.E.S., 1987) though C.I.T.E.S. themselves have no details of the current status of the species in the wild and list the species at the request of the Mexican government (C.I.T.E.S. – pers. comm., 1987). However despite the recent comments of Mrosovsky (1988) on the listing of *Dendrobates* spp. in the absence of appropriate population status data, it does appear that the listing for the Axolotl is legitimate. In a recent report, Lazcano-Barrero and Gongora-Arones (1988) describe *A. mexicanum* as in immediate danger of extinction through over-exploitation and habitat destruction. It is unfortunate that our attempts to contact workers in Mexico have failed to yield any information on the species. However it would seem clear that there is a pressing need to examine the status of the animal in the field, to document its natural history and possibly to institute some form of conservation programme. Though a great many individuals do indeed exist in laboratory cultures throughout the world, the exact genetic make-up of these populations is open to question and probably very few represent the “wild-type” Axolotl.

All this would seem to bode ill for the Mexican Axolotl, a species that in having given so much to science would seem to merit a little attention in return.

ACKNOWLEDGEMENTS

We would like to thank Mrs. L. Barrientos for her help with Spanish literature and an anonymous reviewer for their comments.

REFERENCES

- Bradbury, P.J. (1971). Paleolimnology of Lake Texcoco, Mexico. Evidence from diatoms. *Limnol. Oceanog.* 16, (20), 180-200.
- Brandon, R.A. (1970). Size range at maturity and reproduction of *Ambystoma (Bathysiredon) dumerilli* (Duges), a paedogenetic Mexican Salamander endemic to Lake Patzcuaro, Michoacan. *Copeia* 1970, (2), 385-388.
- C.I.T.E.S. (1987). *Amendments to appendices 1 and 2 of the convention adopted by the conference of the parties at its sixth meeting in Ottawa, Canada, from 12 to 24 July 1987*. Secretariat du CITES; Lausanne, Switzerland.
- Coe, M.D. (1964). The chinampas of Mexico. *Sci. Amer.* 211, (1), 90-98.
- Deevey Jr., E.S. (1955). Limnologic studies in middle America with a chapter on Aztec limnology. *Trans. Conn. Acad. Arts. Sci.* 39, 217-328.
- Feder, M.E., Lynch, J.F., Shaffer, H.B. and Wake, D.B. (1982). Field body temperatures of tropical and temperate zone salamanders. *Smithsonian Herpetological Information Service* 52; Washington, U.S.A.
- Frost, D.R. (1985). *Amphibian species of the world – a taxonomic and geographic reference*. Kansas, U.S.A.: Allen Press and The Association of Systematics Collections. p.556.
- Gadow, H. (1903). The Mexican Axolotl. *Nature*, 37, 330-332.
- Kranz, F.M., Smith, H.M. and Smith, R.B. (1971). Velasco on the natural history of the ambystomatid salamanders of the Valley of Mexico. *Herpetology*, 5, (2), 1-26.
- Lazcano-Barrero, M.A. and Gongora-Aarones, E. (1988). *Lista preliminar se los anfibios y reptiles vulnerables, raros, amenazados y en peligro de extincion en Mexico*. Departamento de Herpetologia, Instituto Nacional de Investigaciones Sobre Recursos Bioticos; Chiampas, Mexico.
- Mrosovsky, N. (1988). The CITES conservation circus. *Nature*, 331, (6157), 563.
- Palmero, A. (1973). *Obras prehispanicas hidraulicos en el sistema lacustre del Valle de Mexico*. Instituto Nacional de Antropologiae Historia (I.N.A.N.), Mexico. p.238.
- Smith, H.M. (1969). The Mexican Axolotl: Some problems and misconceptions. *Biosci.*, 19, (7), 593-597.
- Smith, H.M. and Smith, R.B. (1971). *Synopsis of the herpetofauna of Mexico, Volume 1; Analysis of the literature on the Mexican Axolotl*. Eric Lundberg; Augusta, U.S.A.
- Wilbur, H.M. and Collins, J.P. (1973). Ecological aspects of amphibian metamorphosis. *Science*, 182, 1305-1314.