CHAPTER 35

An Alligator Farm in Israel

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THE alligator farm at the Hammat Gader Hot Springs, in northern Israel, is located 7 km from the Sea of Galilee at the southern tip of the Golan Heights. It was inaugurated in August 1981. The farm was established to augment existing tourist facilities and attractions at the Hot Springs, and to serve a secondary function of spreading out the crowd during days of maximum visitor attendance. However, the alligator farm has already become a major attraction in its own right, and is partly responsible for Hammat Gader becoming the second most important tourist attraction in Israel, with more than 500,000 visitors annually. This chapter briefly summarizes the way in which the farm is structured and operates.

THE ORIGINAL STOCK

The original stock of 120 American alligators *(Alligator mississippiensis)* came from the alligator farm of Joel Smith in northern Florida, USA; they were flown to Israel by commercial jet (Boeing 747) in 1980. The alligators ranged in size from 35-295 cm total length (TL), with 70 being 1-5 years of age and 50, 6-12 years of age. All had been bred and raised in captivity and none of the females had previously laid eggs.

In 1982 we received eight additional crocodilians from Tel-Aviv University, which were captive bred offspring from adults held at the University's Zoological Garden. Four were Nile crocodiles *(Crocodylus niloticus)* originally from Niger, and according to some authorities (Wermuth and Fuchs 1978), these can be allocated to the subspecies *C. n. suchus*, the smallest of the *C. niloticus* complex. The others were four African dwarf crocodiles, *Osteolaemus tetraspis*.

FARM MANAGEMENT

Pens

There are five small pools for animals 100-160 cm TL. These are cement-lined, have a 1.5 m^3 water capacity and are surrounded by 25 m^2 of lawn with small trees for shade. The main pond has an earthen bottom and a water area of 4000 m^2. It is divided by fences into three sections, each of which is stocked with different sized alligators: 160-200 cm TL; 200-250 cm TL; and, >250 cm TL. The entire pond is surrounded by lawn, 5-10 metres from the water's edge to the external wall. The pond contains two grass-covered islands, and a wooden foot-bridge spanning the entire pond facilitates viewing by the public.

Hatchlings are housed in a "hothouse" with seven cement pools, each 300 × 280 cm and with 60% water and 40% land. The hothouse is covered with special plastic sheeting that assists temperature control and protects the hatchlings from local predators (hawks, eagles, buzzards, palestinian vipers, mongooses, wild cats, etc.).

All pools and the main pond have a constant throughflow of water from a spring that has a constant temperature of 28°C. This helps maintain clean, hygienic conditions and also alleviates any need for heating during the winter months.

During summer (May to October), when there is rarely a cloud in the sky over Israel, we use a mild algal suppressant (ammonia based) when cleaning the cement pools. No chemicals are used to control algae or other possible pollutants in the main pond. Here an ecological "balance" approach has proved remarkably effective. The pond is stocked with: carp, which devour algae from the surface and pond bottom; guppies, which eat algae from the alligators' bodies and occasionally from their teeth; St. Peter's fish, a local cichlid that consumes left-over meat; and, a variety of bottom scavengers, including eels, fresh water shrimps, pond crabs, clams and snails, which contribute to the established "ecosystem". The pond has remained remarkably clean during its four years of operation, and has been essentially maintainance free. Clearly, it is possible to keep large ponds relatively free of algae and other pollutants without having to use chemicals such as copper nitrate. For us, this has improved efficiency and may have contributed to the generally good state of health amongst our animals.

Diet

Alligators and crocodiles are fed a mixture of 50% poultry, 30% beef and 20% fish. For the two months prior to egg-laying (April-May), these proportions

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are switched to 50% beef, 30% poultry and 20% fish. This diet gives a lower calcium intake during the period of ovulation and oviducal development of the eggs, and it has led to higher rates of spontaneous hatching. Before changing the diet, 50% of fully developed eggs needed to be opened by hand, because the eggshells were extremely hard.

Breeding

The alligators in Israel have apparently not been greatly affected by the change in climate (wet winter, dry summer), which is the inverse of that which occurs in their native American habitats. Nowhere is this better exemplified than in their breeding biology; the first bellowing, courtship, copulation, egg-laying and hatching all take place within a week of when these activities take place in Florida.

Breeding success to date has been variable, and sometimes affected by situations over which we had little control. In June 1982, some 600 eggs were laid during hot weather (maximum temperatures ≥42°C), at a time when the entire male staff of Hammat Gader was involved in a military emergency — only four eggs hatched successfully. In 1983 some 400 eggs were laid and 184 hatched. After a year, 175 of these were in good health and averaged about 70 cm TL. In 1984 a drought, combined with an unusually warm winter, prevented the alligators from going dormant. However, late rains and cold weather in April stimulated dormancy, when courtship should have been underway. Copulation occurred, but it was late, and egg-laying continued for six weeks (June 1 to July 14) rather than for three weeks. Of 550 eggs laid, 70% were infertile, which suggests that spermatogenesis and ovulation were out of synchrony due to the abnormal weather patterns. In that season 98 hatchlings were produced, bringing the total alligator population to about 400.

Eggs are incubated in a large, walk-in incubator with a capacity for 3000 eggs. Temperature is maintained at 31.5°C and relative humidity at 94%. In July 1984, with assistance from Professor Mark Ferguson, we sexed the one-year olds from the 1983 hatch and found the sex ratio to be two females: one male.

Disease

No serious disease problems have occurred on the farm. Early in the operation a skin problem developed (cracking on the backs and tails) which was diagnosed as a vitamin A deficiency. The fish quota in the diet was increased to 20% and a vitamin supplement was added to the food, which effectively solved the problem.

During the courtship season fighting occurs and this sometimes results in wounds. We use a chloromphenicol/iodine spray on any particularly severe ones (to ward off infection), and on two occasions have successfully used surgery on torn limbs.

Research

Research has not played a major part in the management of what is primarily a tourist attraction. However, daily weather records are maintained and data on the "timing" of some behaviours are kept for comparison with the parent population in Florida. Since all animals are tagged on the tail with a large cattle ear-tag, individual identification is easy. Clutches can and are related to specific females, and a reproduction file is maintained on each female; this contains details of clutch size, date of laying, location of nest, fertility rate and hatching rate. Of the seven females that have nested twice already, six have laid their eggs in the exact same location each year.

Ten percent of the eggs produced at the farm are given to Tel-Aviv University for research. These are currently being used within a broader programme of research on reptilian eggs under the directorship of Professor Amos Ar. The emphasis at present is on embryonic metabolism and egg weight fluctuation throughout incubation.

For the last three years we have averaged 20 students per year, ranging from 4th grade school pupils to 3rd year university students. All have elected to do projects on reptiles in general or specifically on crocodilians. Having an alligator farm in Israel (the only one of its kind in the Middle East) has made such endeavours possible.

THE FUTURE

Like most establishments that exhibit crocodilians, we will probably be expanding the number of species on display. However, unlike many other crocodilian farms, we have no intention of producing skins and/or meat commercially. Our breeding programme is in part an extension of the tourist and educational facilities we offer. Surplus one-year-olds may eventually be sold to commercial farms, where hopefully they will contribute to the legal trade in crocodilian skins, thereby reducing the gains to be made through trade in illegal skins.

REFERENCES

WERMUTH, H. AND FUCHS, K., 1978. "Bestimmen von Krokodilen und ihrer Haute". Gustav Fischer Verlag: Stuttgart and New York.