

Current Status of *Alligator sinensis* *

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ABSTRACT

The status about the resources of *Alligator sinensis* was investigated by sampling methods from August to September in 1994. In the National Nature Reserve for Chinese Alligator (ANNRCA) in Anhui, 156 marking caves of alligators were found, 77 alligators were seen by lighting-counting method and 253 by visiting. Analysing the results above, there were probably 667~740 alligators in ANNRCA and the population age pyramid was wide at the top and narrow at the base, which indicated that the survival situation of the population was serious. In the Chinese Alligator Reproduction Research Center of Anhui Province (CARRCAP), there were 4376 alligators by the end of the year 1994, of which 248 were breeding alligators, 1542 recently hatched and 2586 of different ages. The population with an age pyramid that is narrow at the top and wide at the base shows that it has fast growing potential.

Key words *Alligator sinensis*, distribution, survival situation

1 Introduction

Alligator sinensis is a kind of valuable but rare animal which is distributed only in China. Chinese alligators live in reservoirs and ponds in the hillsides between the middle and upper reaches of the Yangtze River. Historically, the distribution area of the Chinese alligators reached 34.5 million hectares and the number reached the level of being "too easy to get and disgust" during the Western Han Dynasty(206 B.C. ~ 24 A.D.). With the interruption of human activities, the distribution area of *A. sinensis* is decreasing continuously and the number is reducing gradually. At present, there is a small population of alligators in nature which distribute only in part of the Anhui Province: Xuanzhou, Langxi, Guangde and Jinxi-an Counties in Xuancheng Region, Nanling County in Wuhu City, and etc. In 1981, W E Watanabe, who joined the China-America expedition and had a survey on the habitats and population size of Chinese alligator, drew a conclusion that the existing number of Chinese alligator in the wild were 300~500 and predicted that this species would be extinct in about 10 years. For this reason, in 1982 the Chinese government catalogued it as a rare and valuable animal to have the priority for national protection and the International Union catalogued it as an endangered and trade-forbidden species. Afterwards, the Chinese government invested heavily in the natural distribution areas of Chinese alligator to build CARRCAP and ANNRCA one after another.

Chinese alligator is a kind of ancient animal. There were historical records of species in

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China more than three thousand years ago. It was not known until Fauvel A named it as *A. sinensis*. Many investigators both at home and abroad have done a tremendous amount of work on it. For instance Hsiao (1934) described its natural history, Xiao Zhide (1934) surveyed its living situation, Zhu Chenguan (1954, 1957) made nearly systematic investigations on its distribution, foods, reproduction, cave and movement regularity, Huang Zhujian (1959) described its morphology and living regularity, and Cheng Bihui researched Chinese alligator from 1975 and made the most systematic achievements in many aspects including its distribution, population size, ecology, morphology, artificial raising, and breeding.

In order to let the endangered species *A. sinensis* survive, CARRCAP has gained experience in the artificial raising and breeding of this species through the effort of many years. The artificial cyclic turning from alligators to their eggs and from their eggs to alligators has been realized and the population has increased greatly. In ANNRCA, the population size in the wild keeps growing steadily by these methods, such as building protection stations, protecting and improving the habitats, artificial mating, putting into breeding, etc. The great increase of Chinese alligator in population was recognized by the international organization. In 1992, in Kyoto of Japan, the representative of the Chinese government referred to the CITES conference a proposal "Requesting to register a list for commercial reproduction of captive Chinese alligators—a species planning proposal" (as 8.39 discussion item), which was one of the more than ten proposals agreed by the representatives on behalf of 103 countries. Especially Webb, as an expert of alligator studies, highly appreciated our proposal. Thereafter, CARRCAP continuously improved the raising technique, enlarged the raising number, and at the same time, carried out studies on practical utilization of Chinese alligator with other relative departments. By now, we have succeeded in making leather with the skin of Chinese alligator.

2 Method of investigation

From August to September in 1994, we investigated the resources of *A. sinensis* by the following methods:

2.1 Use of quadrats

In ANNRCA, some typical areas (ca. 30% of all the known distribution areas) were chosen for investigation by sampling methods, and the total number of the alligators was calculated.

2.2 Light-counting method

Chinese alligators like to float above the surface of water at higher temperature nights from August to September. The eyes of alligators can be seen like small red lamps when lit by light-beam. This direct counting method is suitable for investigation in ponds along banks, and the visible ratio of alligators is 80% (special observation analysis has been made in this investigation).

2.3 Cave-counting method

During the summer and autumn in 1994, many ponds and dams in the hillsides were nearly dry or short of water, and the lighting-counting method was unsuitable, but the cave entrances of alligators were easily discovered. In the daytime, alligators were counted at the caves with newly-produced marks, then, the total number was obtained according to the wild alligator's living rule. One cave was considered to contain one alligator.

2.4 Visiting method

Statistical data was adopted according to the number of alligators seen by local people who had been visited their natural habitats.

3 Status about natural habitats, reproduction, and existence

At present, *A. sinensis* in nature is distributed only in ANNRCA with a total area of 43 300 hectares, including Xuanzhou, Langxi, Guande and Jinxian Counties in Xuancheng Region, and Nanling County in Wuhu City. They also live and reproduce in the dike areas and hillsides beside the banks of the Zhanhe, Qinyi, Shuiyang and Langchuan Rivers in ANNPCA, which are the branches of the Yangtze river (Fig. 1).

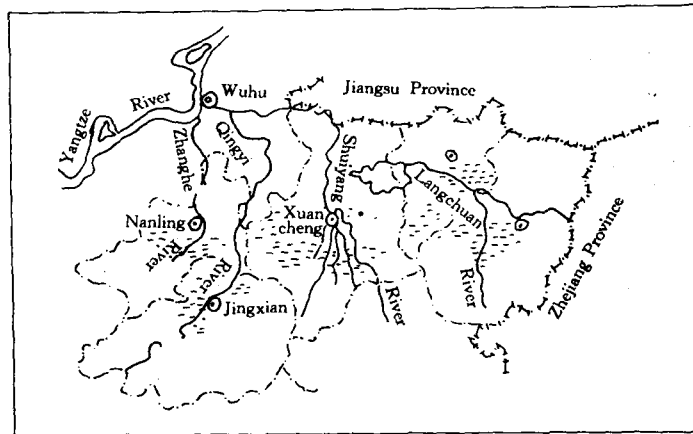


Fig. 1 The natural distribution of *Alligator sinensis*

3.1 Status of natural habitats

Habitats of *A. sinensis* in ANNRCA can be divided into two types. One is the ponds and reservoirs beside hillsides where the altitude is higher, with rich plants, less people, and less traffic. In this area, alligators are seldom influenced by human activities, but often are forced to immigrate because of the shortage of water and food. The animal often looks for food in rice fields beyond ponds. Young alligators are more difficult to survive in these areas. So, the number of alligators in these areas is relative small, mostly one or two alligators at each site, though the habitats are rarely destroyed. Another type of the habitat is the ponds along the banks of the Yangtze River, which is early reclaimed farming lands. These areas with a relatively low altitude are densely populated and often influenced by human activities. But alligators can live better and reproduce easily in these areas because of the abundant food supply from fishes, shrimps, river snails and clams and domestic fowl, etc. So we can find clusters of alligators in these areas. In this type of habitats, the key work is to avoid direct artificial harm by stressing propaganda and by educating the people around for using pesticide with great care and giving better protection to breeding areas in egg-laying seasons.

3.2 Population size

In 30% area of the distribution range, the population size of *A. sinensis* was investigated by visiting method, light-counting method and cave-counting method. The results are shown in Table 1.

Table 1 Statistical data about the number of *Alligator sinensis* investigated in ANNRCA

County and city	Number of Investigation site		Investigation quantity (number)		
	Number of villages and towns	Number of villages	Number of the sites visited	Light-counting along dikes	Cave-counting in ponds beside hillsides
Xuanzhou	4	7	68	29	18
Langxi	5	6	47	19	6
Guande	4	5	29	8	11
Jinxian	5	7	56	9	36
Nanling	4	6	53	12	33
Total	22	31	253	77	104

Estimated according to the visible ratio 65 ~ 80 % of light-counting method, there are actually 96 ~ 118 alligators along dikes, plus the number obtained in ponds of hillsides by cave-counting method, there are 200 ~ 222 alligators in the whole area investigated. Calculated by the sampling ratio, the population size of *A. sinensis* in the whole ANNRCA is 667 ~ 740, increased by 48 % compared with that in 1981 when predicted that *A. sinensis* in the wild would be extinct after thirteen years.

3.3 Status of existence and reproduction

In 1994, no nests of eggs were found in other areas, such as Yantan and Zhongqiao in Jinxian County, Zhaling in Nanling County and Hongxi in Xuanzhou City. It can be seen that the birth rate of *A. sinensis* is about 8 %, but not more than 10 %. Crahame Webb (1989) thought that the conservation rate of fresh- and salt-water alligators in the wild was about 1 %. According to this result, the population size of *A. sinensis* in the wild can hardly grow.

According to another investigation, the adult alligators in the wild accounted for more than 55 % of the total individuals in the population. The population death rate was theoretically higher than the birth rate because the population age pyramid was wide at the top and narrow at the base. The death rate of alligators, especially young alligators rose greatly due to the big flood in 1991 and serious drought in 1994.

In addition, the inhabitation environment of *A. sinensis* was destroyed continuously with the extension of agricultural production range. Because nearly all of small fishes and shrimps died of chemical fertilizer and pesticide used frequently by local peasants, it is difficult for alligators, especially young alligators to look for food, which will directly endanger alligator's life.

On the whole, the survival situation of *A. sinensis* is still very serious although a lot of conservation measures have been taken in ANNRCA for many years, such as propaganda and education, setting up key protection areas, mating for breeding alligators, allocating breeding alligators from CARRCAP into the wild, and etc., by which the population size of *A. sinensis* at present is much greater than that thirteen years ago. A list for commercially reproducing alligators artificially has passed by during the Eighth Conference on International Trade on Endangered Species of Wild Animals and Plants, but *A. sinensis* is still an additional record species and needs to be protected continuously with great care.

4 Research activities in CARRCAP

CARRCAP is a close, semi-naturally raising and breeding test base with an area of 100 hectares, in which a lot of reproduction and research facilities have been built for alligators to live and lay eggs, for artificial egg hatching, for raising different-aged alligators, and etc.

4.1 Research on raising and breeding

In the early days when CARRCAP was just set up, the investigation on breeding and artificial raising under the man-made situation was done with about 100 adult alligators from the wild. It was a success that alligators were raised artificially, and they laid eggs in 1981. Afterwards, we used the technique for artificial hatching and young alligator's raising one after another and improved it gradually. By now, the artificial hatching rate and young alligator's survival rate are all more than 90%.

In order to speed up the growth rate of alligators, shorten production cycle and develop utilization of alligators, CARRCAP, from the years 1989~1991, carried out and completed the research for raising super-alligators whose hibernation was broken up to improve the growth rate. In addition, we have obtained valuable results in morphological and ecological studies of *A. sinensis*.

4.2 The situation of population survival capacity

The young alligators hatched in 1993 and 1994 are raised artificially in the room. Other different-aged alligators grew under semi-natural situation. It was convenient to count the number of the population, and the total was 4376:76 breeding alligators from the wild in the early years of CARRCAP; 172 breeding alligators from artificial reproduction; 555 young alligators hatched in 1993; 1542 young alligators hatched in 1994; 2279 of varying ages. It can be seen from the above that the population of *A. sinensis* in CARRCAP is growing fast because its age pyramid is wide at the base and narrow at the top.

At present, there are 248 breeding alligators in CARRCAP. A larger breeding population will form gradually because more and more alligators are becoming sexually mature. Comparing the hatching and death number in 1993 with that in 1994, we can see that survival capacity of Chinese alligator population in CARRCAP is high (Table 2).

4.3 Expansion of the data in Table 2:

4.3.1 Reproduction situation of breeding alligators in CARRCAP. The nests of eggs, number of eggs and young alligators hatched in 1994 all had a greater increase than that in 1993, and the increasing ratio is 69.0%, 38.1% and 44.9% respectively. The reproduction capacity of breeding alligators hatched artificially had the greatest increase in nests of eggs, number of eggs and young alligators hatched in 1994 compared with that in 1993, and the increasing ratio is 83.3%, 100.8% and 146.0% respectively.

4.3.2 In CARRCAP, the population birth rate of *A. sinensis* is 37.3% in 1993, and 45.3% in 1994, which increases by 8 percent points, but the population death rate is 13.4% in 1993, and 10.3% in 1994. Comparing the birth rate and death rate, the birth rate was 23.9% greater than the death rate in 1993, and the birth rate is 35% greater than the death rate in 1994. We can see that the population size of *A. sinensis* in CARRCAP is increasing at a very high speed.

Table 2 Statistical data on the reproduction and death situation of *Alligator sinensis* in CARRCAP from 1993 to 1994

Year		1993	1994
Population quantity at the beginning of the year		2882	3405
The reproduction situation of breeding alligators from the wild	Number of breeding alligators	76	76
	Nests of eggs	30	37
	Number of eggs*	863	970
	Number of alligators hatched	816	932
The reproduction situation of breeding alligators hatched and raised artificially	Number of breeding alligators	173	172
	Nests of eggs	12	34
	Number of eggs	353	709
	Number of alligators hatched	248	610
Total	Number of breeding alligators	249	248
	Nests of eggs	42	71
	Number of eggs	1216	1679
	Number of alligators hatched	1064	1542
Number of death**		530	508
hatching rate(%)		37.3	45.3
death rate		13.4	10.3

* The eggs mean complete and fertilized eggs

** The number of death in 1994 was counted by the end of September

The main reason causing death of alligators (most of them are young alligators) is due to the bad raising conditions, such as old-fashioned facilities, too high raising density, and etc. So, it is a major problem for CARRCAP to renew raising equipment, enlarge raising areas and further improve raising method. At the same time, it is also an important task for CARRCAP to carry out research on practical utilization of *A. sinensis* and for exportation trade.

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