

CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES  
OF WILD FAUNA AND FLORA

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Twelfth meeting of the Conference of the Parties  
Santiago (Chile), 3-15 November 2002

Interpretation and implementation of the Convention

Species trade and conservation issues

REPORT ON THE CAPTIVE BREEDING OF TORTOISES AND FRESHWATER TURTLES IN CHINA

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## Captive Breeding of Freshwater Turtles and Tortoises in the People's Republic of China

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September 2002

Chinese have used freshwater turtles and tortoises as foods and as ingredients for Traditional Chinese Medicine for thousands of years. Wild populations of freshwater turtles and tortoises in the country have declined quickly in recent decades as a result of an increasing demand. A great number of Southeast Asian species of freshwater turtles and tortoises especially are therefore imported into China. On the other hand, the massive demand and the high prices for freshwater turtles and tortoises encouraged the establishment of captive breeding facilities in China. The number of freshwater turtle and tortoise farms has grown gradually. Some farms in the Guangxi, Guangdong and Hainan provinces, which have in the mean time become large-scale operations, were established as early as in the 1980s. Since the 1990s, the creation of new farms increased. Some companies invested large amounts of money to set up large-scale freshwater turtle and tortoise farms. Initially, the captive breeding of *Pelodiscus sinensis* developed rapidly and intensely. Due to the massive scale and successful breeding techniques, the production exceeded the demand. Many farmers therefore changed to rear hard-shelled turtles, especially *Cuora trifasciata* and *Mauremys mutica*.

The captive breeding of freshwater turtles and tortoises in China is different from what happens in western countries, where breeders usually raise more than one species in small numbers as pets or for pet market. Information on and techniques for breeding species are frequently exchanged and shared amongst breeders. In China, on the contrary, the owners of freshwater turtle and tortoise farms raise a small number of species in large quantities for commercial purposes. In this competitive business, farmers will seldom be prepared to share their experience with others. They are even reluctant to let the public know of their operations because they are afraid of the theft of animals and of having to reveal commercial secrets. In these circumstances, some could easily think that there is no captive breeding of freshwater turtles and tortoises in China, and that all animals on Chinese markets come from the wild. To clarify the situation, the Endangered Species Import and Export Management Office of P. R. China surveyed the freshwater turtle and tortoise farms in China by means of questionnaires and field visits.

Because of the time limitation and for technical reasons, this survey is only preliminary. But it provides useful information on the level of breeding of tortoises and freshwater turtles in China (see Table 1).

The questionnaires received from a part of China's provinces show that the captive breeding facilities are mainly located in middle and south China (see Table 2). According to the preliminary analysis, there are 530 farms in Hunan Province only, and nearly 100 in Hainan Province. The major species of freshwater turtles and tortoises that are farmed include *Pelodiscus sinensis*, *Palea steindachneri*, *Chinemys reevesii*, *Ocadia sinensis*, *Mauremys mutica*, *Pyxidea mouhotii*, and *Cuora trifasciata* (see Table 2), all of which are bred in large numbers (cfr. the populations of adults and sub-adults, and the eggs laid per year). In Guangxi Province, recent estimations the captive populations of the main species is as follows: *Pelodiscus sinensis*: 1.5 billion; *Palea steindachneri*: 240,000; *Ocadia sinensis*: 815,000; *Mauremys mutica*: 180,000; *Pyxidea mouhotii*: 140,000; *Cuora trifasciata*: 110,000. Other important Provinces concerning the breeding of tortoises and freshwater turtles are Hainan and Guangdong.

Of the 40 native species of tortoises and turtles in China most can be fed and bred successfully, with the exception of sea turtles. At least 12 species breed in captivity in large numbers (see Tables 3 to 9). *Pelodiscus sinensis* is widely bred for food markets in Guangdong, Guangxi, Hainan, Hunan, Hubei, Fujian, Liaoning, Hebei, Jiangxi, Zhejiang provinces. Recent estimations put the captive population at 3.03 billion, including 37,2679 million individuals kept as reproduction groups, which can lay 3.75 billion eggs per year. The output in 2002 is estimated to reach 68 million kg. Except as foods, some species are produced as ingredient for Traditional Chinese Medicine, such as *Palea steindachneri*, *Chinemys reevesii*, *Mauremys mutica*, *Cuora trifasciata*, and others. And some species are bred for the pet market, such as *Mauremys mutica* or *Chrysemys scripta elegans*. *Palea steindachneri* is bred mainly in Guangdong, Guangxi and Hainan

Provinces. It was recently estimated that the population is 252,600 animals laying 315,500 eggs per year, and that 68,200 individuals will be in trade in 2002. The population of *Chinemys reevesii* raised in Hunan Province is estimated to be nearly 2.72 million. This species is also bred in Guangdong, Hainan, Jiangxi, Jiangsu, Fujian Provinces, and others. *Ocadia sinensis* is mainly bred in Guangxi and Hubei Provinces. The current population is about 1.49 million animals and the number of eggs laid per year is about 2.85 million. *Mauremys mutica* is mostly reared in Guangxi, Hainan, Guangdong, Zhejiang, Jiangxi, Jiangsu Provinces as medicine, food and pets. The current population is nearly 223,500 and the number of eggs laid per year is 288,500. The population of *Cuora trifasciata* is estimated to be 115,900 animals; of *Pyxidea mouhotii* 140,100; and of *Platysternon megacephalum* 6,600. But for some species, such as *Cuora flavomarginata* and *Indotestudo elongata*, the numbers kept in captivity are small. This is not only due to their limited adaptability, but also to their overall market value.

With increasing demand for freshwater turtles and tortoises, some exotic species have been introduced into China as species to be farmed. *Chrysemys scripta elegans* has been introduced since 1986 and bred at large scale. Now this species is widely reared in Guangxi, Hainan, Hubei, Jiangsu, Liaoning, Shanghai, etc. The captive population is estimated to be around 941,400 animals, including some 428,200 hatchlings, 125,100 adults, and 375,600 commercial individuals. Nearly 718,300 hatchlings can be produced per year. The estimate output in 2002 is 521,700 individuals. The numbers of *Chelydra serpentina* in captivity are nearly 32,000, including 21,000 parent individuals that can lay 14,000 eggs per year. Recently, *Macrolemys temminckii* was introduced from the United States of America. The species is commercially very attractive because of its high content of muscle, quick growth and high reproduction rate. Breeding has started in several provinces, but the quantity is still small.

From this survey, it can be concluded that the number of freshwater turtles and tortoises in captivity in China has been greatly underestimated. There are a lot of large breeding farms in China that produce ten or more different species of freshwater turtles and tortoises. Detailed information on the fresh water turtle and tortoise facilities needs to be collected, which will be useful to manage the trade and to protect these species in wild more effectively. The next step in the survey will consist in giving the farmers some advice and guidance on the selection of parent individuals, on techniques of artificial feeding and breeding, and on prophylaxis and therapy of diseases. The support to large scale farming efforts and the further development of captive breeding facilities will reduce the pressures on wild populations of freshwater turtles and tortoises.

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Table 1. The captive breeding of freshwater turtles and tortoises in the major Provinces in China (Units: ten thousands)

Scientific name	<i>Pelodiscus sinensis</i>	<i>Palea steindachneri</i>	<i>Chinemys reevesi</i>	<i>Ocadia sinensis</i>	<i>Mauremys mutica</i>	<i>Pyxidea mouhotii</i>	<i>Cuora trifasciata</i>	<i>Geoemyda spengleri</i>	<i>Platysternon megacephalum</i>	<i>Indotestudo elongata</i>	<i>Sacalia quandrocellata</i>	<i>Cuora flavomarginata</i>	<i>Chrysemys scripta elegans</i>	<i>Chelydra serpentina</i>	<i>Macrolemys temminckii</i>
Current population	30307.67	25.26	279.60	148.74	22.95	14.01	11.59	2.61	0.660	0.531	0.320	0.078	94.14	3.20	0.474
Number of parent individuals	3726.79	2.10	23.43	39.61	2.76	1.00	1.42	0.60	0.040	0.110	0.038	0.039	5.77	2.13	0.135
Number of hatchling	11829.66	8.64	120.41	43.94	10.41	8.00	5.12	0.50	0.234	0.230	0.025	0.040	42.82	0.70	0.200
Number of subadults	7321.93	7.32	70.89	41.67	5.81	3.00	3.08	0.50	0.090	0.150	0.014	0.004	24.51		0.090
Number of adults	7958.89	7.16	97.32	31.29	3.94	2.00	2.05	0.50	0.122	0.040	0.062	0.021	12.51	2.16	0.040
Number of commercial individuals	7282.34	4.07	77.46	42.20	4.61	2.00	2.06	0.50	0.375	0.400	0.054	0.025	37.56	0.41	0.045
Number of eggs laid per year	37518.24	31.53	188.40	285.05	28.85	10.00	8.19	1.00	0.030	0.002	0.020	0.043	87.04	1.40	0.598
Number of hatchling hatched per year	28572.82	16.25	91.05	229.45	22.98	8.00	6.14	0.50	0.024	0.001	0.016	0.028	71.83	0.72	0.335
Number of subadults reproduced per year	15988.00	12.52	60.46	30.51	16.70	6.00	4.07	0.50	0.005	0.001	0.003	0.018	37.51	0.15	0.170
Number of commercial individuals per year	12484.98	8.07	56.58	180.44	4.57	5.00	2.06	1.00	0.005		0.004	0.015	50.01	0.41	0.160
Weight of commercial individuals per year (kg)	9138.23	5.23	32.03	88.57	2.58	8.00	2.11	0.50	0.004		0.001	0.002	20.53	0.23	0.280
Output in 2000 (Individuals)	8877.35	6.30	63.91	155.70	3.90	5.00	1.06	1.00	0.012	0.061	0.015	0.022	47.42	0.35	0.220
Output in 2000 (weight in kg)	5239.67	5.30	26.64	77.34	2.12	6.00	1.09	0.50	0.006		0.001	0.002	13.54	0.25	0.120
Output in 2001 (Individuals)	9102.79	7.51	70.82	183.12	5.80	6.00	0.50	1.00	0.012	0.055	0.016	0.011	51.52	0.65	0.340

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Scientific name	<i>Pelodiscus sinensis</i>	<i>Palea steindachneri</i>	<i>Chinemys reevesi</i>	<i>Ocadia sinensis</i>	<i>Mauremys mutica</i>	<i>Pyxidea mouhotii</i>	<i>Cuora trifasciata</i>	<i>Geoemyda spengleri</i>	<i>Platysternon megacephalum</i>	<i>Indotestudo elongata</i>	<i>Sacalia quandrocellata</i>	<i>Cuora flavomarginata</i>	<i>Chrysemys scripta elegans</i>	<i>Chelydra serpentina</i>	<i>Macroclmys temminckii</i>
Output in 2001 (kg)	6249.29	6.52	29.83	90.54	2.43	5.00	0.61	0.50	0.007		0.001	0.001	13.55	0.46	0.210
Output in 2002 (Individuals)	9800.54	6.82	92.74	192.59	5.83	5.00	0.62	1.00	0.025	0.167	0.064	0.013	52.172	0.92	0.392
Output in 2002 (kg)	6764.63	6.73	42.69	95.58	2.85	4.00	0.74	0.50	0.012		0.001	0.002	17.52	0.75	0.345

**Table 2. The population of freshwater turtles and tortoises of captive breeding (units : ten thousands) and the number of the captive breeding farms in the major province in China**

Provinces	Guangdong	Hainan	Hunan	Liaoning	Tianjin	Jiangxi	Hebei	Hubei	Zhejiang	Beijing	Jiangsu	Guangxi	Fujian	Shanghai
<b>Species</b>														
<i>Pelodiscus sinensis</i>	71.227	534.193	1675.88	1.636	31.60	30.00	202.80	197.00	12000.00			15000.00		563.33
<i>Palea steindachneri</i>	0.055	1.20										24.00		
<i>Chinemys reevesii</i>		2.00	271.895			5.00				0.0015	0.553		0.15	
<i>Ocadia sinensis</i>		1.59						64.00	1.60			81.55		
<i>Mauremys mutica</i>	0.788	1.2008				0.20			2.00	0.002	0.16	18.00	0.60	
<i>Pyxidea mouhotii</i>		0.0065										14.00		
<i>Cuora trifasciata</i>	0.187	0.105										11.00	0.30	
<i>Geoemyda spengleri</i>		0.005										2.50	0.10	
<i>Platysternon megacephalum</i>		0.05				0.05				0.0024	0.358		0.20	
<i>Indotestudo elongata</i>		0.001										0.53		
<i>Sacalia quandrocellata</i>		0.02				0.10							0.20	
<i>Cuora flavomarginata</i>		0.006								0.0567	0.015			
<i>Chrysemys scripta elegans</i>		2.50	0.0582	21.00				4.20			0.021	60.00		6.36
<i>Chelydra serpentina</i>		0.20							3.00					
<i>Macrolemys temminckii</i>		0.108								0.20				0.1663
<b>Number of captive turtle farms</b>		98	530	9	4			20		5	7			37





Table 3. *Pelodiscus sinensis* bred in the major provinces in China

Province	Guangdong	Hainan	Hunan	Liaoning	Tianjian	Jiangxi	Hebei	Hubei	Zhejiang	Guangxi	Shanghai	Total (ten thousands)
Current population	712270	5341930	16758800	16360	316000	300000	2028000	1970000	120000000	150000000	5633340	30307.67
Number of parent individuals	8674	87870	9388250	1252	30000	20000		1360000	20000000	6200000	171890	3726.79
Number of hatchling	457471	2048400	6124400	4600	220000	120000		300000	50000000	56800000	2221700	11829.66
Number of subadults	156120	2037650	4619700	2570	80000	30000		100000	20000000	46000000	193300	7321.93
Number of adults	94450	1168010	5559500	810	16000	40000		210000	30000000	41000000	1500100	7958.89
Number of commercial individuals	196771	5254060	4944400	11510	10000	230000		220000	30000000	30800000	1156650	7282.34
Age of commercial individual (month)	10-24	14-24	9-36	8-36	10			8-12	8-24			0.00
Weight of commercial individual (kg)	0.2-1.2	0.45-0.75	0.5-1.2	0.4-1.5	0.6			0.4-0.6	0.5-2			0.00
Number of eggs laid per year	600900	4675900	23430000	16200	778000			5884000 0	80000000	204000000	2841400	37518.24
Number of hatchling hatched per year	460680	3514200	13571000	4900	540000			5184000 0	50000000	163200000	2597400	28572.82
Number of subadults reproduced per year	74400	3140930	3514500	3480	410000				30000000	122500000	236700	15988.00
Number of commercial individuals per year	134630	4708600	8424000	2500	325000			2700000 0	30000000	52000000	2255100	12484.98
Weight of commercial individuals per year (kg)	200330	2286700	2580050	4530	195000			1340700 0	30000000	41600000	1108700	9138.23
Output in 2000 (individuals)	358910	5743300	11309982	30700	179999		1396000	2580000 0	25000000	17200000	1754600	8877.35
Output in 2000 (kg)	395075	2808600	5792912	7950	103479		698000	1288900 0	20000000	8900000	801658	5239.67
Output in 2001 (individuals)	269000	4814400	12239000	7700	316906		1690000	2690000 0	30000000	13000000	1790925	9102.79
Output in 2001 (kg)	288410	2349360	6224180	2470	154000		845000	1407000 0	30000000	7800000	759510	6249.29
Output in 2002 (individuals)	211000	4576600	13431500	7100	253000	250000	2028000	2800000 0	35000000	10800000	3448150	9800.54
Output in 2002 (kg)	233590	2230515	7086800	2390	148800	118000	1014000	1400000 0	35000000	6500000	1312175	6764.63



**Table 4** *Mauremys mutica* bred in the major provinces in China

Province	Guangdong	Hainan	Jiangxi	Zhejiang	Beijing	Jiangsu	Guangxi	Fujian	Total (ten thousands)
Current population	7880	12008	2000	20000	20	1600	180000	6000	22.95
Number of parent individuals	680	1300	500	4000		1100	20000		2.76
Number of hatchling	7200	6000	380	10000		500	80000		10.41
Number of subadults	5000	3000	120		10		50000		5.813
Number of adults	2200	1200		6000	10		30000		3.941
Number of commercial individuals	5000	500	600	10000			30000		4.61
Age of commercial individual (month)	18	48			12				
Weight of commercial individual (kg)	1	0.75		0.02-0.06	0.2				
Number of eggs laid per year	8000	8000		16000		6500	250000		28.85
Number of hatchling hatched per year	7200	7200		10000		5400	200000		22.98
Number of subadults reproduced per year	5000	2000					160000		16.7
Number of commercial individuals per year	5000	700		10000			30000		4.57
Wight of commercial individuals per year (kg)	5000	525		300			20000		2.58
Output in 2000 (individuals)		3000		6000	10		30000		3.90
Output in 2000 (kg)		1000		200	2		20000		2.12
Output in 2001 (individual)	2000	6000		10000	20		40000		5.8
Output in 2001 (kg)	2000	2000		300	4		20000		2.43
Output in 2002 (individuals)	5000	7000	300	16000	30		30000		5.83
Output n 2002 (kg)	5000	3000		500	6		20000		2.85



Table 5 *Chrysemys scripta elegans* and *Chinemys reevesii* bred in the major provinces in China

Species	<i>Chrysemys scripta elegans</i>								<i>Chinemys reevesii</i>						
	Province	Hainan	Hunan	Liaoning	Hubei	Jiangsu	Guangxi	Shanghai	Total (ten thousands)	Hainan	Hunan	Jiangxi	Beijing	Jiangsu	Fujian
Current population	25000	582	210000	42000	210	600000	63600	94.14	20000	2718950	50000	15	5530	1500	279.60
Number of parent individuals	2000	49				60	50000	5.77	2000	229050	2000		1250		23.43
Number of hatchling	8000	166	170000				250000	42.82	15000	1184700	2800		1600		120.41
Number of subadults	5000	122	40000				200000	24.51	2000	705500	1200	13	210		70.89
Number of adults	25000	100					100000	12.51	500	971550	1000	2	120		97.32
Number of commercial individuals	7500	95	210000				100000	37.56	500	770900	3000	13	150		77.46
Age of commercial individual (month)	24	10	5	12-16			6		36	12-60		12	16		
Weight of commercial individual (kg)	0.5	0.6	0.15	0.4-0.6			0.5		0.4	0.4-0.6		0.2	0.5		
Number of eggs laid per year	10000	266	200000	110000	100	500000	50000	87.04	20000	1823000			41000		188.40
Number of hatchling hatched per year	8000	212	170000	100000	50	400000	40000	71.83	18000	859950			32500		91.05
Number of subadults reproduced per year	5000	144	40000				300000	37.51	2000	582350			20220		60.46
Number of commercial individuals per year	5000	95	210000	60000			200000	50.01	500	546125			19180		56.58
Weight of commercial individuals per year (kg)	2500	110	31000	31000			100000	20.53	200	312450			7600		32.03
Output in 2000 (individuals)	10000	180	210000	54000			200000	47.42	500	628500		15	10120		63.91
Output in 2000 (kg)	4000	110	31000	290			100000	13.54	200	262150		5	4062		26.64
Output in 2001 (individuals)	8000	200	210000	45000			250000	51.52	500	695500		15	12150		70.82
Output in 2001 (kg)	3200	122	31000	220			100000	13.55	200	293050		8	5075		29.83
Output in 2002 (individuals)	8000	220	210000	42000			200000	52.17	1000	903325	2800	50	20200		92.74
Output in 2002 (kg)	3200	140	31000	210			100000	17.52	400	418400		10	8100		42.69

Table 6. *Sacalia quadriocellata*, *Ocacia sinensis* and *Chelydra serpentina* bred in the major provinces in China

Species	<i>Sacalia quadriocellata</i>				<i>Ocacia sinensis</i>					<i>Chelydra serpentina</i>		
	Province	Hainan	Jiangxi	Fujian	Total (ten thousands)	Hainan	Hubei	Zhejiang	Guangxi	Total (ten thousands)	Hainan	Zhejiang
Current population	200	1000	2000	0.32	15900	640000	16000	815500	148.74	2000	30000	3.2
Number of parent individuals	80	300		0.038	1100	340000	4000	50980	39.61	300	21000	2.13
Number of hatchling	45	200		0.0245	10000	120000	6000	303400	43.94	1500	5500	0.7
Number of subadults	20	120		0.014	3000	160000	0	253700	41.67	50		
Number of adults	20	600		0.062	500	100000	6000	206400	31.29	50	21500	2.155
Number of commercial individuals	35	500		0.0535	1300	200000	10000	210700	42.20	100	4000	0.41
Age of commercial individual (month)	36				36	12-16				36	1-36	
Weight of commercial individual (kg)	0.3				2	0.4-0.6				3	0.05-5	
Number of eggs laid per year	200			0.02	15000	2320000	12000	503500	285.05	4000	10000	1.4
Number of hatchling hatched per year	160			0.016	13500	1920000	8000	353000	229.45	3200	4000	0.72
Number of subadults reproduced per year	25			0.0025	3000			302050	30.51	1500		0.15
Number of commercial individuals per year	35			0.0035	2500	1600000		201850	180.44	100	4000	0.41
Weight of commercial individuals per year (kg)	10			0.001	5000	780000		100740	88.57	300	2000	0.23
Output in 2000 (individuals)	150			0.015	8000	1340000	8000	201030	155.70	1500	2000	0.35
Output in 2000 (kg)	10			0.001	3000	670000		100420	77.34	1500	1000	0.25
Output in 2001 (individuals)	160			0.016	8000	1560000	12000	251230	183.12	2500	4000	0.65
Output in 2001 (kg)	10			0.001	5000	780000		120440	90.54	2600	2000	0.46
Output in 2002 (individuals)	160	480		0.064	8000	1700000	16000	201900	192.59	3200	6000	0.92
Output in 2002 (kg)	10			0.001	5000	850000		100780	95.58	3500	4000	0.75

Table 7. *Macrolemys temminckii*, *Cuora flavomarginata* and *Platysternon megacephalum* bred in the major provinces in China

Species	<i>Macrolemys temminckii</i>				<i>Cuora flavomarginata</i>				<i>Platysternon megacephalum</i>					
	Hainan	Beijing	Shanghai	Total (ten thousands)	Hainan	Beijing	Jiangsu	Total (ten thousands)	Hainan	Jiangxi	Beijing	Guangxi	Fujian	Total (ten thousands)
Current population	1080	2000	1663	0.474	60	567	150	0.078	500	500	24	3580	2000	0.660
Number of parent individuals	35	150	1163	0.135	10	250	130	0.039	100	300				0.040
Number of hatchling	500	1000	500	0.200	10	365	20	0.040	250	220		1870		0.234
Number of subadults	400	500		0.090	30	5		0.004	80	80		735		0.090
Number of adults	45	350		0.040	10	197		0.021	20	200	24	975		0.122
Number of commercial individuals	100	350		0.045		250		0.025	50	200		3500		0.375
Age of commercial individual (month)	40	12				3			40		6			
Weight of commercial individual (kg)	3	2				0.1			0.7		0.4			
Number of eggs laid per year	480	500	5000	0.598	30	200	200	0.043	300					0.030
Number of hatchling hatched per year	400	450	2500	0.335	25	150	100	0.028	240					0.024
Number of subadults reproduced per year	200	1500		0.170	30	150		0.018	50					0.005
Number of commercial individuals per year	100	1500		0.160		150		0.015	50					0.005
Weight of commercial individuals per year (kg)	300	2500		0.280		15		0.002	35					0.004
Output in 2000 (individuals)	200	1000	1000	0.220	10	205		0.022	100		24			0.012
Output in 2000 (kg)	200	1000		0.120	2	21		0.002	50		12			0.006
Output in 2001 (individuals)	400	1500	1500	0.340	25	80		0.011	100		21			0.012
Output in 2001 (kg)	400	1700		0.210	5	8		0.001	55		11			0.007
Output in 2002 (individuals)	420	2500	1000	0.392	25	100		0.013	100	120	30			0.025
Output in 2002 (kg)	450	3000		0.345	5	10		0.002	60	46	15			0.012





Table 8 *Cuora trifasciata* and *Geoemyda spengleri* bred in the major provinces in China

Species	<i>Cuora trifasciata</i>					<i>Geoemyda spengleri</i>			
	Guangdong	Hainan	Guangxi	Fujian	Total (ten thousands)	Hainan	Guangxi	Fujian	Total (ten thousands)
Current population	1870	1050	110000	3000	11.59	50	25000	1000	2.61
Number of parent individuals	865	300	10000	3000	1.42	8	5000	1000	0.60
Number of hatchling	1008	150	50000		5.12	16	5000		0.50
Number of subadults	518	300	30000		3.08	15	5000		0.50
Number of adults	320	200	20000		2.05	11	5000		0.50
Number of commercial individuals	598	50	20000		2.06		5000		0.50
Age of commercial individual (month)	12--24								
Weight of commercial individual (kg)	0.6-1.5								
Number of eggs laid per year	1280	600	80000		8.19	20	10000		1.00
Number of hatchling hatched per year	920	500	60000		6.14	18	5000		0.50
Number of subadults reproduced per year	525	200	40000		4.07	15	5000		0.50
Number of commercial individuals per year	542	50	20000		2.06		10000		1.00
Weight of commercial individuals per year (kg)	974	90	20000		2.11		5000		0.50
Output in 2000 (individuals)	400	200	10000		1.06	18	10000		1.00
Output in 2000 (kg)	600	300	10000		1.09	1	5000		0.50
Output in 2001 (individuals)	465	500	4000		0.50	18	10000		1.00
Output in 2001 (kg)	720	400	5000		0.61	1	5000		0.50
Output in 2002 (individuals)	621	600	5000		0.62	18	10000		1.00
Output in 2002 (kg)	840	600	6000		0.74	1	5000		0.50



**Table 9** *Indotestudo elongata*, *Pyxidea mouhotii* and *Palea steindachneri* bred in the major provinces in China

Species	<i>Indotestudo elongata</i>			<i>Pyxidea mouhotii</i>			<i>Palea steindachneri</i>				
	Province	Hainan	Guangxi	Total (ten thousands)	Hainan	Guangxi	Total (ten thousands)	Guangdong	Hainan	Guangxi	Total (ten thousands)
Current population		10	5300	0.53	65	140000	14.0065	550	12000	240000	25.255
Number of parent individuals		3	1100	0.11	15	10000	1.0015	40	1000	20000	2.104
Number of hatchling		4	2300	0.23	15	80000	8.0015	400	6000	80000	8.64
Number of subadults		3	1500	0.15	10	30000	3.001	150	3000	70000	7.315
Number of adults			400	0.04	10	20000	2.001	50	1500	70000	7.155
Number of commercial individuals			4000	0.4	15	20000	2.0015	150	500	40000	4.065
Age of commercial individual (month)					40			18	36		
Weight of commercial individual (kg)					0.6			2	2.5		
Number of eggs laid per year		15		0.0015	45	100000	10.0045	250	15000	300000	31.525
Number of hatchling hatched per year		9		0.0009	35	80000	8.0035	500	12000	150000	16.25
Number of subadults reproduced per year		5		0.0005	15	60000	6.0015	150	5000	120000	12.515
Number of commercial individuals per year					15	50000	5.0015	150	500	80000	8.065
Weight of commercial individuals per year (kg)					9	80000	8.0009	300	12000	40000	5.23
Output in 2000 (individuals)		5	600	0.0605	35	50000	5.0035		3000	60000	6.3
Output in 2000 (kg)		1			5	60000	6.0005		3000	50000	5.3
Output in 2001 (individuals)		4	550	0.0554	35	60000	6.0035	100	5000	70000	7.51
Output in 2001 (kg)		1			8	50000	5.0008	200	5000	60000	6.52
Output in 2002 (individuals)		5	1660	0.1665	35	50000	5.0035	150	8000	60000	6.815
Output in 2002 (kg)		2			9	40000	4.0009	300	7000	60000	6.73