

## **Distribution and movement of Chinese sturgeon, *Acipenser sinensis*, in spawning ground located downstream the Gezhouba Dam during spawning seasons**

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### **Summary**

Sonic tracking of 40 pre-spawning adult Chinese sturgeons (35 females, 5 males) in 8 spawning seasons (1996–2004) showed that most fish spent time close to the dam (within 7 km). A yearly mean of 64% of the tracking locations of pre-spawners was in the small area, that was 1.08 km downstream the dam (cell I-B of the tracking grid system). These movements indicated fish attempted to move farther upstream and pass the dam. Adults did not visit areas without major water spill or flow, i.e., the boat canal (the Sanjiang river), the spill gates, and 1# ship lock. Adults were not tracked in the tail waters with fast current of the Erjiang power plant and rarely in the Yichang port, although they ranged from 4 km to 10 km downstream of the dam, they were in the channel. Pre-spawning Chinese sturgeon used the Yichang reach in a non-random manner showed they seeked certain habitats and avoided others. Adults arrived at the spawning ground in a certain day before spawning. Adults moved quickly about spawning ground. After spawning, females quickly moved downstream, whereas males remained at the spawning ground for 12-21 days. During a spawning season, females moved less than males.

### **Introduction**

The length and quantity of water resource of Yangtze River are the third in the world. The total length of it is only shorter than the Nile in Africa and the Amazon River in South America. The distance from headstream to estuary is about 6,300 km. Yangtze River is also one of the rivers abundant in water resource in the world. The quantity of water containing is about  $9616 \times 10^8 \text{m}^3$ , and is less than that of the Amazon River in rain forest area along the equator and the Congo River (Zaire River) barely (Wen Fubo. 1999).

Chinese sturgeon (*Acipenser sinensis* Gray) is China's national listed endangered fish species (Office of Aquatic Wildlife Conservation of MoA, 2002; Wang, X. 1994). Its distribution is widespread in the Asian. They are found in the major coastal rivers from East Sea to Yellow Sea and sea area in the history (Anonymous. 1988; Chang and Cao, 1999). Chinese sturgeon is a representative species that is anadromous. They spawn in the Yangtze River and their larvae are incubated in the spawning ground. Then the larvae swim downstream into the East Sea and Yellow Sea and so on (Yang, D. et al. 2005). Chinese

sturgeons will keep living in the sea all along before they mature. They swim toward the estuary when they are mature. Then they swim into the Yangtze River and keep upstream along. The mature age of female and male is above 14 years and 9 years respectively. They arrived at the spawning ground after 18 months. Their gonads develop from stage III to stage IV in the course of moving upstream (Anonymous. 1988; Chang. 1999). The range of their spawning ground is from the Maoshui (lower reaches of the Jingsha River, Leibo County) to the Mudong (upper reaches of Yangtze River, Chongqin) before the construction of Gezhouba dam. There are about 16 spawning grounds of Chinese sturgeon been recorded clearly from Maoshui to Mudong. The distance of river is about 600 km. So the adults of Chinese sturgeon need swim upstream about 3000km for propagation before the construction of Gezhouba dam (Anonymous. 1988; Wei. et al, 1997). In 1981, Gezhouba dam was constructed and the pathway for propagation and migration of Chinese sturgeon was obstructed. So mature sturgeons were obstructed by the dam. It was firstly discovered that Chinese sturgeon naturally spawned at the lower reaches of Gezhouba dam in autumn, 1982 (Hu. et al. 1983; Yu Zhitang. et al. 1986). This indicated that obstructed Chinese sturgeon can naturally spawn at the lower reaches of Gezhouba dam. In later years, it was continually investigated that Chinese sturgeon naturally spawned at the lower reaches of Gezhouba dam. The result indicated that the spawning ground of Chinese sturgeon located from the downstream of Gezhouba dam to Yidu city, hubei province. It is 80 km long, while the exact spawning location and range were not clear (Hu. et al. 1985). (Fig.1)

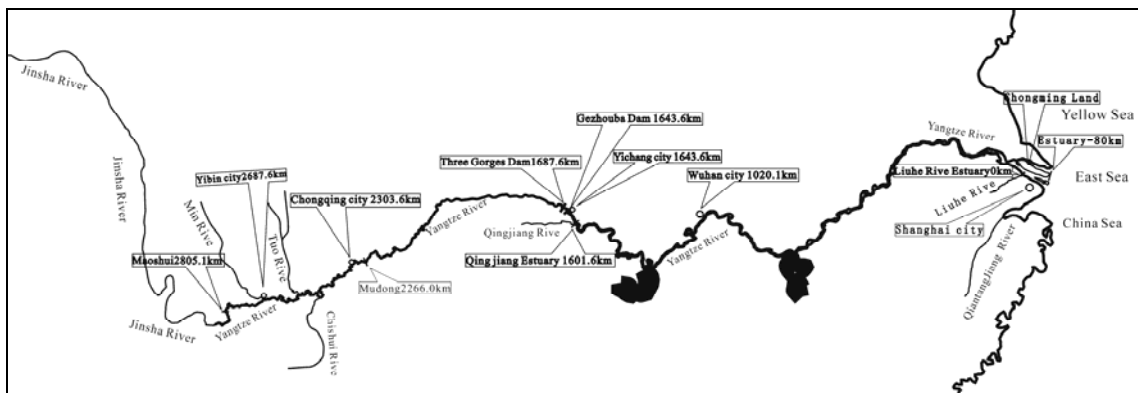


Figure.1: Map of the Yangtze River showing the location of the spawning grounds for Chinese sturgeon before and after the construction of Gezhouba dam. The range of study area is from 1601.6rkm to 1643.6rkm.

The observations and investigations of actuality of Chinese sturgeon spawning downstream the Gezhouba dam had been done for more than ten years continuously after construction of the dam. The result indicated that the number of matured Chinese sturgeons returning to spawning ground descended year after year. The population abundance of Chinese sturgeon declined badly because of overfishing, pollution of water and dam construction (Chang J. 1999; Chang J. Cao W. 1999; Wei Q. 2003; Wei Q., Yang D. 1998;

2003). But we observed spawn of Chinese sturgeon every year, and that the site of spawning ground did not change remarkably (Wei Q. 2003). This indicated that the new spawning ground downstream the dam was steady relatively. But the location of spawning ground and the behavior of Chinese sturgeon during spawning seasons are not known. The biotelemetry is a mainly method to study behaviors and ecology of aquatic animal (Kieffer, M., and B. Kynard. 1993; 1996; Kynard B., Suci R., and Horgan M. 2002). We got a tracking way by ultrasonic telemetry from 1993 to 1995. It can be used to research the behavior of Chinese sturgeon under the complex environmental condition of Yangtze River (Kynard B., Wei Q., and Ke. F., 1995; Wei Qiwei, Yang Deguo, Ke Fuen, et al. 1998). Since then we researched distribution and movement of Chinese sturgeon in spawning ground locating downstream the Gezhouba dam during spawning seasons from 1996 to 2004 (the research is not done in 2002). The thesis is a summary on the investigations.

## Materials and Methods

### Study Area

The original spawning ground of Chinese sturgeon ranged from the lower reaches of the Jingsha River to the upper reaches of Yangtze River. The migration pathway for propagation of Chinese sturgeon was obstructed by construction of Gezhouba dam in 1981. Then the reproductive population of Chinese sturgeon could not swim upstream to the original spawning ground. So they assembled compulsorily and formed a high-density distribution and those facts that they spawned have been favored at the lower reaches of Gezhouba dam since 1982. The primary conclusion is that the spawning ground of Chinese sturgeon located from the downstream of Gezhouba dam to Yidu city. The area of distribution and movement of mature Chinese sturgeon in spawning seasons was in the section from the Gezhouba dam to Gulaobei. So our research was caught through mainly in this area (**Fig.2**). A section of river about 8km long was marked off many cases factitiously referring to length of river and different buildings on the riverside to record and locate definitely (**Fig. 3**).

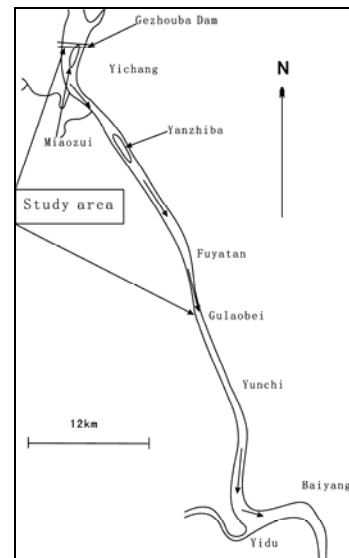


Figure2: Map of study area downstream the Gezhouba dam

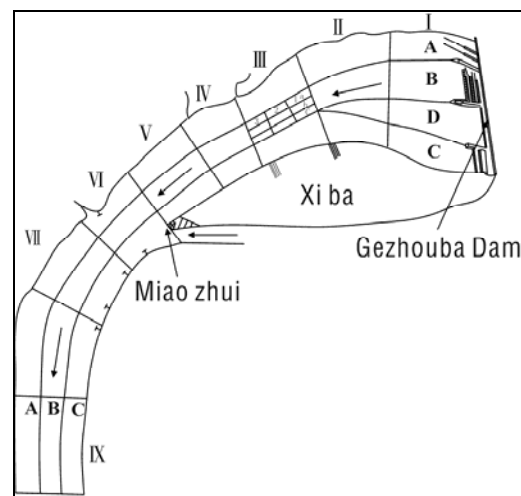


Figure3: Map of Yichang section of Yangtze River showing the location of case

## Equipment

Equipment included all items needed to do field research on sturgeon movements and habitats. Acoustic telemetry equipment included ultrasonic emitter (tag) and ultrasonic receiver system. The later is composed of hydrophone and ultrasonic receiver. The other equipment included Global Position System (GPS) receiver and yacht.

The ultrasonic emitter (tag) is cylindraceous and the size is 18×110 mm. weight 38 g in the air (13g in water). It was sealed by waterproof material with polarity switch. The useful-life working of its interior battery is 18 month continually. Ultrasonic signal made up of code of exclusive digital could be emitted incessantly after being switched on. So the fish with tag can be tracked and located. Frequency of emission wave of tag was 40 KHz and 78 KHz respectively. The ultrasonic emitter was made in Sonotronic Corporation Inc (USA).

Hydrophone is a key component of the receiver system. A special directional hydrophone which was high sensitive and good at single location was used. It was made by Sonotronic Corp Inc. The hydrophone is like a bugle with a diameter of 15 cm. It was fitted on the steel tube fixed on the wing of yacht. It can keep underwater about 100cm. There is an artificial blade behind the hydrophone to control the direction of it in order to track effectively. The ultrasonic receiver was USR-5W. The frequency range of signal it can receive was 28-88 KHz. Ranges of signal detection relative to river conditions were 500-1000 m.

The type of Global Position System (GPS) receiver was Meridian before 1997. Its position precision is 15m. We replaced it by GARMIN 12XL with different function since 1997. Its precision was improved to 5m.

The length of tracking yacht was 630 cm. The power of engineer is 63.4kw. It could be controlled easily with high speed and low noise.

## Fish Capture and tagging

Adult Chinese sturgeons were captured with roll-draw by fishermen in the autumn from 1996 to 2004 (except 2002). The river range that Chinese sturgeon was captured was from dam to Miaozui (**Fig.2**). We checked the fish body to be certain that the sturgeon was healthy and had no damnification at first when we got fish from the fisherman. Then we could confirm the sex and developmental stage of gonad of sturgeon. The male and female sturgeons whose gonad development were better (the stage of gonad is in the middle or late stage IV) were tagged with both ultrasonic emitter and stainless steel tag ( size is 5cm×10cm, number and address & Yangtze River Institute were on it ) .

Tags were fitted on the fifth or sixth dorsal scute of the body by stainless steel wire or brass wire which diameter was 1.5-2.0 mm. Then the sturgeons with tag were released into Yangtze River immediately. The site released was in the section of Miaozui, Yichang city, Hubei province (**Fig.2**). Total time of the process that from sturgeon arrived at the tagged spot to tagging and releasing were finished was no longer than 45 min in a general way. Forty

Chinese sturgeons were tagged from 1996 to 2004 (except 2002). Thirty –five of them were female and five were male (**Table.1**).

**Table 1. data on Capture and tagging of adult Chinese sturgeon in Yangtze River from 1996 to 2004 (exception 2002)**

Years	Number of tagged Chinese sturgeon		
	Sum	Female (ranger of total length, cm )	Male ( ranger of total length, cm )
1996	10	9 (280-342)	1 (246)
1997	6	4 (279-345)	2 (257-270)
1998	10	9 (285-330)	1 (270)
1999	3	3 (320-360)	0
2000	3	3 (275-330)	0
2001	2	2 (325-345)	0
2003	3	2 (291-326)	1 (265)
2004	3	3 (293-335)	0
Sum	40	35	5

### Tracking and locating

Then begin the tracking immediately after sturgeon with tag was released. Thereafter, we tracked it for four times every day. We started tracking at 6:00(Beijin time zone), 10:00, 14:00 and 18:00 o'clock commonly. We did not track at night usually. It lasted 1-2hr for one tracking. We are close to the best of one's abilities the build of Gezhouba dam before tracking. Then we drove tracking yacht downstream slowly and adjusted the direction of yacht frequently. The data of location spot and sturgeon were recorded once immediately when the code signal coming from tag was detected. The recording data included serial number of tagged sturgeon (code of tag), spot information of sturgeon located in and water depth.

### Result

#### Tagging and Tracking Procedures

We tagged forty Chinese sturgeons in 8 years and located the position for 1619 times from 1996 to 2004 (**Table.2**). We tagged and tracked ten Chinese sturgeons (9 females and 1 male) in 1996. Seven tagged sturgeons (6 females and 1 male) of them were located at the spawning ground when they spawned. We tagged and tracked six sturgeons (4 female and 2 male) and all of them were located in 1997. The number of tagged sturgeons was ten in 1998. Nine of them wer female and one was male. One female sturgeon (fish code is 249) had not been detected after being released.

**Table2. Capture and tagging histories of adult Chinese sturgeons tagged and tracked during the telemetry study at the lower reaches of Gezhouba dam in the Yangtze River.**

Fish code	Sex	TL (cm)	Capture/tag date	Number of tracking days	located times	Number of located days	The result of located spawning day
999	f	280	Oct 10, 1996	45	120	39	Yes
239	f	342	Oct 11, 1996	17	34	13	Yes
248	f	310	Oct 11, 1996	15	67	15	Yes
338	f	320	Oct 12, 1996	43	108	36	Yes
285	f	330	Oct 12, 1996	17	65	15	Yes
294	f	320	Oct 12, 1996	15	48	14	Yes
357	f	304	Oct 13, 1996	9	21	8	
257	f	295	Oct 13, 1996	6	11	5	
347	f	342	Oct 14, 1996	13	31	12	
339	m	246	Oct 15, 1996	15	67	15	Yes
555	m	257	Oct 9, 1997	32	53	27	Yes
456	f	345	Oct 9, 1997	15	24	10	Yes
267	m	270	Oct 9, 1997	33	56	30	Yes
258	f	279	Oct 10, 1997	12	30	11	Yes
249	f	338	Oct 14, 1997	10	19	8	Yes
348	f	305	Oct 14, 1997	10	19	8	Yes
357	f	330	Oct 8, 1998	62	123	50	Yes
447	f	299	Oct 8, 1998	19	46	17	
339	m	270	Oct 8, 1998	32	72	28	Yes
258	f	322	Oct 9, 1998	13	10	6	
249	f	330	Oct 9, 1998	13	0		
267	f	300	Oct 10, 1998	18	37	16	Yes
348	f	315	Oct 18, 1998	52	104	41	Yes
446	f	330	Oct 22, 1998	17	22	13	Yes
245	f	330	Oct 23, 1998	4	15	4	Yes
365	f	291	Oct 23, 1998	4	7	4	Yes
339	f	360	Oct 7, 1999	41	91		
5	f	344	Oct 18, 1999	30	63		
12	f	320	Oct 21, 1999	26	52		
8	f	275	Oct 11, 2000	60	88		
9	f	310	Oct 14, 2000	40	78		
11	f	330	Oct 19, 2000	16	9		
7	f	323	Oct 16, 2001	39	0		
6	f	345	Oct 20, 2001	35	0		
335	f	326	Oct 9, 2003	39	2		
243	f	291	Oct 10, 2003	38	0		
333	m	265	Oct 19, 2003	39	9		
4567	f	310	Oct 14, 2004	33	5		
333	f	335	Nov 5, 2004	23	8		
234	f	293	Nov 6, 2004	22	1		

We considered that the data of research were not credible in 1999 and 2000. Because we discovered that the tag signal detected from the river came from the same position at all times when tagged sturgeon was released for few days, and the located spot did not change for a

long time in 1999 and 2000. For example, the sturgeon with tag code 5 (fish 5#) was released in Oct. 18th, 1999. The code signal was detected at the case I2-Bb (**Fig.3**) all along from Oct 23rd to Nov 16th, 1999. And we found it again at the same position in the autumn of 2000 and 2001 respectively. The case of fish 339# and fish 12# resembled that of fish 5# in 1999. As well as the research data of three tagged sturgeons in 2000 showed similar character. We thought that the tags may be brushed off from the body of tagged sturgeon.

In 2001, we tagged and released two female sturgeons at a same site but we did not detect any signal of tag (code is 7 and 6 respectively) the second day after release. The reason was not known for us.

In 2003, we tagged and released three sturgeons but only located for 11 times Fish 335# (female) were recaptured 7 days after being released. It had been located for two times before it was been recaptured. Fish 333# (male) was located for 8 times. Fish 243# (female) was not found after being released. We located the position of fish for a little times too in 2004. So we made used of the data got from 1996 to 1998 in this study.

### **Distribution of Chinese sturgeon**

Total number of location times was 1209 in three years (1996-1998). The result indicated area coverage of distribution of mature Chinese sturgeon was very narrow as a whole at the spawning ground in spawning seasons. The most section which tagged sturgeons appeared was I-B every year (**Fig.3**). It lay in the center of river and downstream the Dajiang power plant of Gezhouba dam. It was closed to the building of Gezhouba dam and the range of distance was about 250-500 m. The percent of location times in this case was 53.7% in 1996. In 1997 and 1998, the percent was 83.6% and 51.9% respectively. There were no significant differences among different years by t-test. (**Table.3**)

It was likely that both the female and the male appeared more in I-B and II-B area before they spawned. The percent of location times of the female in I-B area was 60.4% and that in II-B area was 19.4% before spawned. The total was 79.8%. The percent of male in I-B 64.2% and II-B 7.5%. There was not obvious difference in distribution location of tagged sturgeons in different years and between the male and the female by t-test. But the percent of location of the male in lower river was a little higher than that of the female. (**Table.4**)

The tagged sturgeon distributed in two mainly areas during propagation. For example, we got location of nine tagged mature sturgeons during the first propagation (20th, Oct.) of Chinese sturgeon in 1996. They all arrived at I-II – Bb area in 1-2 days before they spawned. Five of them were in this area while the other 4 were downstream to III-IV – B area when they spawned. We can make sure that the area where Chinese sturgeon copulated and spawned was in I2-3 – Bb area according to result of location and collection of Chinese sturgeon eggs in the bottom of river. In the second propagation (27th, Oct.) of this year, eight sturgeons (7 females and 1 male) were located (one female coded 357 left after the first spawning). Their spawning spot was in III2-IV3 – Bb area. Six of them (5 females and 1 male)

were detected in III-IV – Bb area when they spawned, but the other two sturgeons (fish codes were 239 and 347) were detected in I – B area.

**Table3. Times and proportion of the tagged sturgeon that were located per case at spawning ground from 1996 to 1998.**

Position of case	1996		1997		1998		
	located times	Proportion (%)	located times	Proportion (%)	located times	Proportion (%)	
I	A	8	1.4	1	0.5	3	0.7
	B	307	53.7	168	83.6	227	51.9
	C	5	0.9			1	0.2
II	A	6	1.0	4	2.0	1	0.2
	B	132	23.1	10	5.0	11	2.5
	C	3	0.5			1	0.2
III	D	2	0.3				
	A	6	1.0			2	0.5
	B	30	5.2	5	2.5	6	1.4
IV	C	1	0.2	1	0.5		
	A	6	1.0	1	0.5	3	0.7
	B	29	5.1			104	23.8
V	C	1	0.2			1	0.2
	A	19	3.3	1	0.5	21	4.8
	B	9	1.6	2	1.0	12	2.7
VI	C	1	0.2	2	1.0	15	3.4
	A	2	0.3			8	1.8
	B	3	0.5			10	2.3
VII	C			2	1.0	1	0.2
	A	2	0.3	2	1.0	4	0.9
	B			1	0.5	2	0.5
VIII	C			1	0.5		
	A					2	0.5
	B					1	0.2
	C					1	0.2

Six sturgeons (4 females and 2 males) were tagged and released in 1997. Three females of them were detected in spawning ground (III2-IV3 – Bb area) during the first propagation (22nd, Oct.). And other three (1 female and 2 males) were located in I1 – Bb area. In the second propagation, a male coded 267 was still located in I2-Bb area in 18th, Nov.

We tagged and released ten Chinese sturgeons (9 females and 1 male) in 1998 and 8 of them (7 females and 1 male) were located in 26th, Oct. And 7 (6 females and 1 male) of the tagged sturgeons were located in IV – Bb area, one female (code 267) was in I1 – Bb area.



**Table4. Times and proportion of the tagged female and male sturgeon that were located per case at spawning ground from 1996 to 1998.**

Position of case		female		male		Female and male	
		located times	Proportion (%)	located times	Proportion (%)	located times	Proportion (%)
I	A	8	1.3			8	1.1
	B	361	60.4	102	64.2	463	61.2
II	A	3	0.5	3	1.9	6	0.8
	B	116	19.4	12	7.5	128	16.9
	C	3	0.5	1	0.6	4	0.5
III	A	7	1.2			7	0.9
	B	20	3.3	2	1.3	22	2.9
	C	1	0.2			1	0.1
IV	A	6	1.0	1	0.6	7	0.9
	B	9	1.5	6	3.8	15	2.0
	C			1	0.6	1	0.1
V	A	22	3.7	6	3.8	28	3.7
	B	12	2.0	5	3.1	17	2.2
	C	15	2.5	2	1.3	17	2.2
VI	A	4	0.7	7	4.4	11	1.5
	B	3	0.5	9	5.7	12	1.6
	C	1	0.2	1	0.6	2	0.3
VII	A	3	0.5	1	0.6	4	0.5
	B	1	0.2			1	0.1
VIII	A	3	0.5			3	0.4

### Water depth of the location of Chinese sturgeon

We recorded the water depth of location when the tagged sturgeon was located. We made a statistical analysis for pre-spawn and spawning respectively (**Table.5**). 25 tagged sturgeons were located for 790 times before spawning in 1996-1998. The mean value of water depth of location was from 9.7 to 14.5m pre-spawn. But the changing range of mode was a little. The value of mode was 7.9-9.8 m. It indicated that the value of water depth which tagged

sturgeons most appeared was 8-12m. There were distinct sexual differences in water depth in 1996 and 1998 but the differences were not distinct in 1997.

**Table5. Water depth of locations of tagged sturgeon detected before spawning and during the course of spawning every year from 1996 to 1998. a: pre-spawn; b: spawning**

Item	Water depth (Mean±SD) (M)	Range (M)	Median (M)	Mode (M)	Number of fish located	located times	T-test	
1996 <sup>a</sup>	female	13.1±7.0	3.0-40.0	10.1	8.2	9	362	P<0.01
	male	9.7±4.8	3.0-23.8	8.2	7.9	1	49	
1997 <sup>a</sup>	female	11.0±4.7	4.3-30.8	9.1	9.1	4	85	P>0.05
	male	11.2±5.2	5.5-32.6	9.4	8.8	2	70	
1998 <sup>a</sup>	female	11.9±4.4	2.7-28.9	10.7	8.8	8	153	P<0.01
	male	14.5±5.4	7.3-25.0	14.0	9.8	1	71	
1996 <sup>b</sup>	female	15.2±8.7	5.2-36.3	12.8	8.5	6	23	P>0.05
	male	12.3±4.1	8.8-18.6	11.0	8.8	1	5	
1997 <sup>b</sup>	female	10.3±4.5	5.8-17.1	8.4	7.6	4	6	P>0.05
	male	7.8±0.9	6.7-8.5	8.1	8.5	2	4	
1998 <sup>b</sup>	female	10.2±3.8	6.7-19.2	9.1	9.4	6	17	P>0.05
	male	14.6±5.2	9.8-20.1	14.0		1	3	

The mean value of water depth of location was from 7.8 to 15.2 m during propagation of Chinese sturgeon in 1996 - 1998. The mode value was 7.6-9.4 and only changed a little.. Both the female and male stayed at a water depth of 8-12 m frequently. Comparatively, percent of male in deeper water was higher than that of female. It was probably concerned that those males were smaller and moved more frequently. There were no sexual differences in water depth by t-test when they spawned. This differed from that of pre-spawn.

## Discussion

### Behavior and movement of mature Chinese sturgeons during propagation

The tagged Chinese sturgeon expressed three behaviors usually when they were released into Yangtze River. Some of them swam upstream. Some swam downstream and the other stayed around the released spot for no longer than 24 hrs and then swam upstream. For example, five of ten tagged sturgeons released in 1996 were upstream immediately with different speed. Two of them were downstream in short distance. The other three were not recorded instantly, while they appeared in I-II area two or three days later.

The mature sturgeons began expressing more active movement for 2-3 days before spawning base on tracking and locating of tagged sturgeons and on the evidence that it was very true especially for male Chinese sturgeon. Further research was needed to make sure if mature sturgeons were searching for suitable spawning spot or not. Commonly, female mature sturgeon left for spawning ground one day before spawning. The distance from habitat to

spawning ground was not long and the female swam fast to spawning ground when they began to spawn. Propagation was recorded for 4 times in III-IV – Bb area in 1996-1998. The tagged sturgeons appeared in I-II – B area one day before spawning. And during propagation in 1996, 5 mature sturgeons moved from I-II – B area to III-IV – Bb (spawn ground) in 20 min – 16 hrs.

How many hours did Chinese sturgeon need to stay in spawning ground? We estimate the hours that the female stayed in spawning area is shorter than 24 hrs and the time the male stayed there maybe reach 75 hrs. The estimated hours were not precise because tracking and locating were not done continuously.

There was some difference in movement between the female and the male after spawning. Usually, tagged female sturgeons disappeared at once after spawning. Even we tracked farther to Gulaobei section, (Yichang city), we still did not find them. Thereby, we thought the female left spawning ground for ocean at once after spawning. And several of them swam upstream to the lower river of the dam (I-II area) and stayed there where was not the spawning ground. Maybe these sturgeons did not vent all of eggs. There were 8 females tracked and tagged in 1996 and 6 of them disappeared immediately after spawning. The other two females stayed at the section downstream dam after spawning. The main habitat area was I-II – B area. There were 7 female tagged sturgeons in 1998 and 4 of them disappeared after spawning. The other three females stayed at the lower river of the dam and one of the three (code 446) stayed in I area, frequently moving between I area and VIII area. This sturgeon disappeared 13 days after spawning (7th, Nov.1998). Another two sturgeons (code 357 and 348) were in IV2 – Bb and I3 – Bb area respectively. The location by detected signal of tag did not change until 8th; Dec. We considered that the tags were probably lost in the area.

Male Chinese sturgeons finished spawning didn't swim downstream immediately. Four tagged male sturgeons in three years stayed at section downstream the dam after spawning. They mainly inhabited in I – B area. Three of them moved frequently between I area and VII area. The males remained here for 12-21 days.

### **Relation between sturgeon's distribution and ecological environment during propagation**

The spawning grounds of Chinese sturgeon mostly distribute from the lower of Gezhouba dam to Yanzhiba section of Yangtze River (Wei Q., 2003). The area coverage of spawning ground has been located exactly by our investigation from 1996 to 2004. The upriver boundary of spawning ground of Chinese sturgeon is at the downstream of Dajiang hydro-power plant electricity and the lower boundary is Miaozui section of the Yangtze River. The length of distance from upriver to lower boundary is about 5 km. Result from track and locating in these years indicated that mature Chinese sturgeons swam upstream to spawnin ground around every October. They inhabited near their spawning spot and moved in a shorter distance. We discovered that the area mature Chinese sturgeon distributed and moved at spawning ground in their spawn seasons was very narrow. They mostly inhabited from the

water outlet of Dajiang hydro-power plant to Miaozui section during their propagation period. They didn't arrive at the area that it is downstream the Erjiang hydro-power plant along with spillway which has quick water all the time. Likewise they didn't appear in area of Sanjiang River which has slow stream all along. Sometimes a little mature adults of Chinese sturgeon would appear in the main riverway of the Yangtze River from Miaozui to Yanzhiba. But that area is only a pathway of spawning migration of Chinese sturgeon so they didn't stay there for a long time.

Hydrokinetics of water and type of riverbed are mostly important factor for spawning of Chinese sturgeon (Wei Q., 2003). Spawning habitat of sturgeons has two important physical components: rocky substrate and a moderate water velocity (Bemis and Kynard, 1997). The fact that Chinese sturgeon didn't appear in the water of Erjiang always can give us a clue. The connatural biological character of Chinese sturgeons that they need swim upstream to spawn in the upper of Yangtze River still affects their behavior. They tried hard to swim upstream after construction of Gezhouba dam. But they can't overstep this building and are obstructed at lower reaches of Gezhouba dam. Fortunately, Chinese sturgeon has found the section from the water outlet of Dajiang hydro-power plant to Miaozui suitable for them with similar condition. So this area is very important to maintain Chinese sturgeon stock.

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