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ADMINISTRATION OF THE WEST LAKE WATER AREA, HANGZHOU

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Abstract

The comparison test of the function of aquatic biology, such as Viviparidae, *Hyriopsis Cvmingiilleal*, water spinach and underwater plants on the purification of the water body, has been made in the test area of West Lake. The result shows that the spiral is the test one to improve the transparency of the water body, then the *Hyriopsis Cvmingiilleal*, water spinach and underwater plant in succession. At the same time planting method, raising density, purification function of water body, and the possibility of planting, have been studied.

Key words: aquatic biology, purification of water quality, West Lake.

Introduction

For the improvement of the water body of the West Lake, a lot of projects and measures such as cut off sludge, barge building, removing the pollution factory, water diversion, etc. The implementation of these projects and measures has obviously controlled the further development of the eutrophication from the water of the West Lake and obtained better result. However, the water quality of the West Lake is still far away from the requirement of the tourism for the lake. At present, the average annual transparency of the West Lake water is about 50cm, with a minimum of 28cm. For further raising the water quality, what kind of measure should be taken will remain to carry out scientific study. The eutrophication of the water of the lake in fact makes the original ecology of the lake lost balance due to the factors of the nature and the people and promotes the ecological environment gradually to change in reverse.

The control of the aquatic means to utilize the aquatic animal and water plant (including microbe) which are featured by fine absorptivity of nutrition element of the water, convenient plantation and simple conservation to scramble for the nutrition from the water and inhibit the breeding of the algae to obstruct the bottom mud from exchanging with the boundary of the water body thereby decrease the content of the suspended substance in the water and purify the water body.

In order to explore the result of prophylaxis and treatment and method of plantation for the aquatic on the eutrophication from the water body of the West Lake, the possibility of utilization and environment effect. We have carried out the investigation and test of the purification of the water of the West Lake by the aquatic with the Department of the Life Science of the Hangzhou University from Sept.1994 to Oct 1996.

Main Features of the Selected Water plants and Animals.

1.1 Viviparidae 1.2 *Hyriopsis Cvmingiillea* 1.3 *Vallisnera spiralis*
1.4. *Hydrilla varticillata* 1.5. *Myriophyllum spicalum* 1.6. *Potrmogeton crispus*
1.7. Otteliaalis moicles

Processes and Methods of Test

Test will be taken four times

2.1 Test of the function of the Viviparidae on the improvement of the transparency of the water body.

Time: North Inner Lake from May 9,1993 to Oct: 10.1993 (North Inner Lake)

Method: Settle the four corners by bamboo piles. Surrounding 3 small carols (2.0x2.0m), with cotton cloth, respectively hanging and breeding 2.6kg and 2.0kg Viviparidae in bamboo baskets, another basket left will be taken as reference for comparison with the transparency.

2.2 Test of the function of Viviparidae and *Hyriopsis Cvmingiillea* on improvement of the transparency of the water body.

Time: Sept 29,1994 - Apr 5,1995 (Yue Lake)

Method: Settle all around by bamboo piles. Surround 6 carols (5.06.0m) by plastic-knitted cloth with film, for the Viviparidae d = 60cm, h = -70cm cylindrical mesh cage hanging and breeding on the bamboo shelf, and for the *Hyriopsis Cvmingiillea* hanging and breeding in the mesh bag.

2.3 Comparison test of the function of the various water plants on the purification of the water body.

Time: Apr.11,1995 - Oct 18,1995 (Yue Lake).

Time: Apr.11,1995 - Oct 18,1995 (Yue Lake).

Method: Respectively breeding in the 6 carols used in test 4.2

2.3.1 *Hyriopsis Cvmingiillea* 78cm, 650 pieces respectively put into 64 bags hanging and breeding.

2.3.2 Viviparidae 12kg, with 8pcs d = 50cm, h = 60cm cylindrical mesh cage, each put 1. 5kg (this breeding cage is smaller than that used in test 4.2)

2.3.3 Water spinach, first cultivating the seedling of it on the land, at the beginning of June, cutting of the seedling and plant on prepared polytene mesh piece which should be away from the under water 58cm.

2.3.4 Planting 18 pcs of *Myriophyllum spicatum* about 15kg, each root tied a small piece of stone to make it sink naturally.

2.3.5 Planting 16 pcs of *Myriophyllum spicatum* 4 pcs of *Hydrilla varticillata* totally about 4kg.

2.3.6. comparison

2.4 Function of Viviparidae with various density on the transparency of the water body.

Time: Oct,18,1995 - Dec.18,1995 (Yue Lake).

Method: use the carols in above mentioned test, the density of the spiral cultivation respectively 0.34kg/m^2 and 0.22kg/m^2.

Result and Discussion

3.1 Effect of Viviparidae on the improvement of the transparency of the water body (Table.1)

Table 1. Function of the transparency of the water body by Viviparidae (Viviparidae).

Test area	Test object	Area m^2	Breeding amount(kg)	Density kg/m^2	Transparency(cm)					
					6/9	10/9	18/9	20/9	22/9	30/9
Purse net 1	Viviparidae	4	2.6	0.65	38	96	140	140	140	130
Purse net 2	Viviparidae	4	2.0	0.50	38	88	140	140	140	120
Purse net 3	Reference	4	0	0	38	62	80	82	82	75

Note: In the test area, the water depth was 1.4m.

With smaller area of the carol, the inside of the carol was not affected by the wind wave and the suspended substance in the water sank quickly. At the same time, a part of algae would be changed into attachment from the suspended substance. The transparency of the water body in reference feather cockscomb would be increased greatly. However, as compared with the Viviparidae it would still have obvious difference as shown in Table 2. From the Table we can find the range of the transparency of the carols, and the two are very similar. It shows that the breeding (or raising) density of the Viviparidae is limited within 0.5kg/m^2.

It is unnecessary to increase again. After 5 days of the Viviparidae breeding, the transparency of the water body would obviously rise. The increasing range was more than once with reference group. After 13 days of breeding, the transparency would increase up to 2.68 times of the base and keep balance all the time. During this stage the increasing range of the transparency was 2.3times of the reference After one month, the transparency of the water body in the test was somewhat decreased. The other reason was the implement of the cotton cloth began to damage; and the bamboo basket obstructed the purification of the water body from Viviparidae.

Table2 Comparison of the increasing range of transparency (cm)

	5 days		13 days		15 days		17 days		25 days	
	Increasing value	Increasing range	Increasing value	Increasing range	Increasing value	Increasing range	Increasing value	Increasing range	Increasing value	Increasing range
Purse net 1	58	1.526	102	2.684	102	2.684	102	2.684	92	2.421
Purse net 2	50	1.316	102	2.684	102	2.684	102	2.684	82	2.158
Reference	24	0.632	42	1.105	44	1.158	44	1.158	37	0.974

3.2 Function of Various Water Animals and Plants on the Improvement of Transparency. of the Water Body.

This test employed the Viviparidae, *Hyriopsis Cvmingiillea*, water spinach, underwater plant (mainly *Myriophy llunspicatum, Hydrilla varticillata, Vallisnera spiralis, Potrmogeton crispus*) made comparison

test in 30m^2 carol without bottom. Since when in the first test it was found that the West Lake made great corrosion to the cotton cloth, the material of the carol was instead of the plastic knitted cloth. The lower network was inserted in the mud about 30 cm and pressed by bricks every two meters.

3.2.1. Comparison of Viviparidae and *Hyriopsis Cvmingiillea.*

When the Viviparidae and *Hyriopsis Cvmingiillea* were bred on Step. 29. the water surface of the feather cockscomb of the Viviparidae and *Hyriopsis Cvmingiillea* had a layer of the water surface of obvious water bloom and compared with the water surface of the feather cockscomb without water bloom. This might be after the water body cut into small ranges, the change of the ecology made part of algae from the suspended substance turned into plankton higher than the reference feather cockscomb. One week after on Oct. 5 the transparency of the Viviparidae obviously increased 27cm water bloom of the water surface appeared. This was after breeding of Viviparidae fought for the nutrition with the water bloom to make the water bloom die and the transparency of the *Hyriopsis Cvmingiillea* feather cockscomb increased less only 4cm water surface still found water bloom until Oct 13 (after 15days breeding) water bloom disappeared so the function of the *Hyriopsis Cvmingiillea* for purificafion of the water body was weaker than the Viviparidae but much better than the reference group. After 79 days breeding, the transparency of the water body of the Viviparidae feather cockscomb on the average increased 49cm. The increasing range was 73.13%, for the *aHyriopsis Cvmingiillea* feather cockscomb, the average transparency increased 18.5cm, the range increasing 30.33%,for the reference group only increased 5.75cm the range only 11.5%, only sixth of the Viviparidae and one third of the *Hyriopsis Cvmingiillea.*

Table 3 Comparison of function of Viviparidae and *Hyriopsis Cvmingiillea* on transparency (1994)

Test area	Test object	Area m^2	Breeding kg	Density kg/m^2	Transparency					
					29/9	5/10	13/10	25/10	14/12	5/4/95
Purse net 1	Viviparidae	30	12	0.4	67	94	120	120	130	90
Purse net 2	*Hyriopsis Cvmingiillea*	30	25	0.83	61	65	78	75	100	90
Purse net 3	Reference	30	0	0	50	51	54	53	65	55
Outside the purse net.					30	32	40	35	58	

From Dec. 14 it began to continue breeding to next year. Apr.15. The breeding period was up to 190 days. at that time the breeding cage of the Viviparidae was full of attached algae, the meshes basically were blocked, and the cage was too high, the Viviparidae almost touched the bottom of the lake thereby make greatly the purification decreased. In 190 days, the measured transparency of the water body for the Viviparidae and *Hyriopsis Cvmingiillea* was the same; both 90cm, respectively increased 23cm and 29cm than the background, increased range 34.3% and 47.5%, higher 24.3% and 37.5% than the reference group.

After 190 days breeding of the Viviparidae, they basically didn't die. The weight increased from 12kg to 13.5kg for the *Hyriopsis Cvmingiillea* growing from 56cm to 78cm. the weight increased from 25kg.to 46kg (increased 84%). The growing speed for the *Hyriopsis Cvmingiillea* was much quicker than the Viviparidae.

3.2.2. Comparison between Different water Plants.

The time for this test was Apr 11Sept 15 totally 156 days, just passed a whole summer. As for the result, see table 4.

Table 4 Function of different water plants on transparency of the water body.

Test Area	Test object	Area m^2	Quantity kg	Density kg/m^2	Transparency (cm)							
					11/4	25/4	9/5	9/6	19/6	17/7	14/8	15/9
1	Viviparidae	30	32	1.07	80	180	120	122	135	130	60	100
2	Hyriopsis Cvmingiillea	30	12	0.4	70	200	134	125	135	140	89	100
3	Water Spinach	30	4	0.13	68	110	125	80	108	125	76	70
4	Under water plant	30	5	0.17	68	105	114	105	118	95	45	91

5	Under water plant	30	4	0.13	75	115							
6	Reference	30	0	0	68	90	78	65	68	95	42	90	

As the Viviparidae and *Hyriopsis Cvmingiillea* feather cockscomb was the continuation of the previous test, the empty feather cockscomb between twice only over one week. The water quality had not yet recovered to normal level. The initial transparency was slightly higher than the other feather cockscomb. The test began from Apr. 11 passed whole summer totally 156 days.8 times of measurement for water quality respectively compared with the initial transparency (the background) (see table 5) increased the range of the Viviparidae 87.3%, *Hyriopsis* 51.3% water spinach 46. 1%, underwater plants 41.4%, reference 10.9%. It can be seen that the result of four kinds of water plants to improve the transparency of the water body were obvious, especially the Viviparidae was the best one then the *Hyriopsis Cvmingiillea*, water spinach and underwater plants. During the test due to under the blazing sun for quite a long time in summer the bamboo rod for hanging breeding the Viviparidae and *Hyriopsis Cvmingiillea* broken in early Aug to make them sink in the water bottom to decrease the function of the purification of the water quality and the transparency fell quickly. At the same time resulting in the death of the underwater plant due to the rainstorm in July and affection of the growing of the water spinach caused the water quality of the above two tests obviously descended until Sept could it became better. From the other viewpoint, it means that the above mentioned four kinds of water plants could take important part in purification of the water quality, while the Viviparidae and Hyriopsis Cvmingiillea. hanging could make purification.

Table 5. Comparison of the test result of water animal and plant on improvement of the transparency of the water body

		Viviparidae		*Hyriopsis Cvmingiillea*		Reference		Water spinach		Under water plant	
		SD (cm)	Times for the background	SD (cm)	Times for the background	SD (cm)	Times for the background	SD(cm)	Times for the background	SD (cm)	Times for the background
First	Background	67		61		50					
	7	94	1.403	65	1.0656	51	1.02				
	15	120	1.791	78	1.2788	54	1.08				
	28	120	1.791	75	1.2295	53	1.06				
	79	130	1.9403	100	1.6393	65	1.30				
	190	90	1.3433	90	1.4754	55	1.10				
	Average		1.6537		1.3377		1.112				
Second	Background	70		80		68		68		68	
	15	200	2.857	180	2.25	90	1.324	110	1.168	105	1.544
	28	134	1.914	120	1.50	78	1.147	125	1.838	114	1.676
	58	125	1.786	122	1.525	65	0.956	80	1.176	105	1.544
	68	135	1.929	135	1.688	68	1.00	108	1.588	118	1.735
	96	140	2.000	130	1.625	95	10397	125	1.838	95	1.397
	124	89	1.271	60	0.75	42	0.618	76	1.118	45	0.662
	156	95	1.357	100	1.25	90	1.323	70	1.048	91	1.338
	Average		1.873		1.513		1.109		1.461		1.414
Third	Background	62		64		70					
	7	68	1.097	70	1.094	67	0.957				
	28	120	1.935	100	1.563	42	0.60				
	68	100	1.613	130	2.031	95	1.357				
	Average		1.548		1.563		0.971				

3.2.3. Result of different breeding density of Viviparidae on the improvement of the transparency of the water body.

In the first test, preliminary conclusion was obtained that the breeding density for the Viviparidae was unnecessary larger than 0.5kg/m^2 . In later several tests used the density 0.48kg/m^2 . but if it could be continuously decreased or not? Now, take a test again with o.33kg/m^2 and 0.22kg/m^2 , for the result see

table 6.

Table 6 Function of Viviparidae with different density on the transparency of the water body

Object	Area m^2	Quantity kg	Density kg/m^2	Transparency (cm)				
				18/10	23/10	16/11	20/11	18/12
Viviparidae No.1	30	10	0.33	74	68	113	85	100
Viviparidae No.1	30	6.5	0.22	62	68	120	110	100
Reference	30	0	0	70	67	42	70	95

*Description: (1) Duck weeds growing in the reference area on Dec18.

(2)For the Viviparidae No.1 using old cage. For the spiral No.2 using new cage.

It can be seen in Table 6 under the condition of using new cage, $0.22kg/m^2$ and $0.33kg/m^2$ breeding density functioned on the transparency of the water body had similar result. The more suitable breeding density was $0.220.44kg/m^2$.

3.3 Absorptivity of several water plants for the nutrition of the water body.

Since the planting of the underwater plant started from April and died partially in December, the water spinach was planted in the end of May and died in November, the measurement of the nutrition salt for the water spinach was carried out from May to November, the measurement of the nutrition salt for the water spinach was carried out from May to November, others from April to December. When testing, comparison with the absorptivity of phosphorous, ammonia, nitrogen and nitrate between the Viviparidae, *Hyiopsis Cvmingiillea*, underwater plant and water spinach. The result can be seen in Table 7.

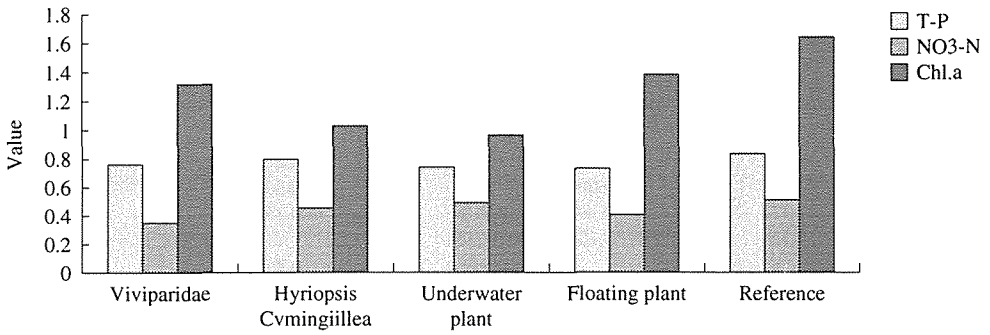
Table 7 Result of absorptivity of water animals on the nutrition of the water body

		T-P		T-N		NH_4-N		NO_3-N		Chl.a	
		mg/L	Background times	mg/L	Background times	mg/L	Background times	mg/L	Background times	ug/L	Background times
Spiral Shell	4					0.257		0.634		35.9	
	5			2.085		0.091	0.3541	0.465	0.7334		
	6	0.207		1.72	0.8249	0.199	0.7743	0.250	0.3943	44.8	1.2479
	7	0.180	0.8698	2.017	0.9674	0.674	2.6226	0.281	0.4432	26.8	0.7465
	8	0.163	0.7874	2.652	1.2719	0.858	3.3385	0.074	0.1167	63	1.7549
	9	0.132	0.6377	2.824	1.3544	0.242	0.9416	0.134	0.2114	84.1	2.3426
	10	0.235	1.1353	3.066	1.4705	0.565	2.1984	0.083	0.1309	31.1	0.8663
	11	0.123	0.5942	2.430	1.1655	0.810	3.1518	0.261	0.4117	39.0	1.0864
	12	0.101	0.4879	2.234	1.0715	1.140	4.4358			40.0	1.1142
	Average		.07520		1.1609		2.2271		0.3488		1.3084
Fresh water mussel	4					0.209		0.576		43.3	
	5			2.235		0.025	0.1196	0.501	0.8698		
	6	0.224		1.852	0.8286	0.545	2.6077	0.435	0.7552	17.9	04134
	7	0.144	0.6429	2.621	1.727	0.127	0.6077	0.260	0.4514	18.7	0.4319
	8	0.245	1.0938	2.152	0.9629	0.981	4.6938	0.120	0.2083	87.9	2.03
	9	0.137	0.6116	2.796	1.251	0.222	1.0622	0.123	0.2135	83.9	1.9376
	10	0.225	1.0045	2.986	1.336	0.600	2.7808	0.175	0.3038	67.7	1.5635
	11	0.203	0.9062	2.133	0.9544	0.160	5.0718	0.225	0.3906	23.2	0.5358
	12	0.101	0.4509	2.3	1.0291	1.180	0.6459			14.8	0.3418
	Average		0.7850		1.0764		2.8349		0.4561		0.0363
Under water plants	4					0.228		0.548		46.3	
	5			2.072		0.325	1.4254	0.478	0.8723		
	6	0.228		2.122	1.0241	0.313	1.3728	0.377	0.6880	24.7	0.5335
	7	0.144	0.6316	2.277	1.0963	0.735	3.2237	0.293	0.5347	16.1	0.3477
	8	0.204	0.8947	1.270	0.6109	0.304	1.333	0.129	0.2354	65.4	1.4125
	9	0.117	0.5132	2.587	1.2486	0.262	1.1491	0.125	0.2281	88	1.9006

	10	0.220	0.9649	3.006	1.4508	0.535	2.3465	0.249	0.4544	54.4	1.1749
	11	0.195	0.8553	2.593	1.2514	0.890	3.9035	0.214	0.3905	30	0.648
	12	0.134	0.5877	2.131	1.0285	0.760	3.3333			31.4	0.6782
	Average		0.7412		1.1018		2.2610		0.4862		0.9565
Floating plants	4										
	5			2.124		0.386		0.508		42	
	6	0.247		1.742	0.8202			0.441	0.8681		
	7	0.160	0.6478	1.955	0.9204	0.171	0.43	0.240	0.4724	25.5	0.6071
	8	0.257	1.0405	2.040	0.9605	1.429	3.702	0.090	0.1772	75.9	1.8071
	9	0.096	0.3887	2.306	1.0857	1.232	0.601	0.116	0.2283	80.2	1.9095
	10	0.200	0.8097	3.045	1.4336	0.627	1.6244	0.083	0.1634	52.6	1.2524
	11			2.339	1.1012	1.070	2.772	0.261	0.5138	58.6	1.3952
	12										
	Average		0.7217		1.0536		1.8285		0.4039		1.3943
Refere-nce	4					0.237		0.612		38.8	
	5			2.198		0.112	0.4726	0.493	0.8056		
	6	0.236		1.646	0.4789	0.418	1.7637	0.413	0.6748	54.8	1.4124
	7	0.184	0.7797	2.430	1.1056	0.149	0.6287	0.536	0.8758	31.3	0.8067
	8	0.261	1.1059	1.470	0.6688	0.500	2.1097	0.128	0.2092	140.3	3.616
	9	0.111	0.4703	2.768	1.2593	0.270	1.1392	0.136	0.2222	104.4	2.6907
	10	0.210	0.8898	2.964	1.3485	0.643	2.7131	0.209	0.3415	49.7	1.2809
	11	0.198	0.8390	2.418	1.1001	1.130	4.7679	0.263	0.4279	31	0.7990
	12	0.218	0.9237	2.454	1.1165	1.090	4.5992			34.4	0.8866
	Average		0.8347		1.0479		2.2743		0.5084		1.6388

Figure 1. Mean values for the concentrations of T-P, NO_3-N and Chl. a in several test feather cockscombs

From Table 7, it can be seen that the absorptivity of the nutrition salt of the four water plants in the test is very similar. They almost have no absorption of total nitrogen. The mean value of the background times was very near the reference group. For the absorption of ammonia and nitrogen, only the water spinach group was obvious. The mean value of the background times was lower 19.6 than the reference group. The other three groups were not obvious, but the absorptivity of total phosphorous and nitrate as more outstanding. The total phosphorous of four test feather cockscombs was lower than the reference group. The total phosphorous of the water spinach was lower 13.54 than the reference group, the underwater plant lower 11.20, the Viviparidae and *Hyriopsis Cvmingiillea* respectively lower 9.91 and 5.95. For the absorption of the nitrate, the Viviparidae was the best the mean value of the background was lower 31.4 than the reference group; the water spinach and the *Hyriopsis Cvmingiillea* respectively 20.55 and 10.29, the underwater plant was the lowest only 4.37. All the chlorophyll values of the water bodies of the four



test feather cockscombs were lower than the reference group (Table 7 and Figure 1), the underwater plant was the most obvious. The mean value of background times was lower 41.63% than that of the reference group, That mean value of *Hyriopsis Cvmingiillea* lower 36.77%, Viviparidae and Floating plant lower 20.16% and 14.86%, respectively.

Prospect and problems of purification by aquatic plants in the West Lake

Through more than one year's practical test, it is found that the aquatic such as Viviparidae, *Hyriopsis Cvmingiillea* water spinach and underwater plant have obvious purification function on the water body they are featured by great range increase of the transparency of the water body, powerful absorptivity, fine visual result of water color in cost, durable effect, etc, but have some limitation .

The Viviparidae and *Hyriopsis Cvmingiillea* need hanging shelf. It cannot be spread in the lakes area where boats and ships always move. Furthermore in the hanging area, the water depth should be over 1.2m,or the hanging space is too small and the Viviparidae and *Hyriopsis Cvmingiillea* are liable to sink in the bottom of the water thereby weaken the function of purification. The water spinach can grow thickly in the west lake. The covering layer of the plant can be over 0.5m, forming a certain quantity of production but the water spinach is somewhat bitter, only used as forage. It is somewhat bitter, only used as forage. It is ideal to use the water spinach to make up words and put together the flower bed, and use in the mandarin duck pool of the zoo.

The plant in the deep water has *Myriophyllum spicatum* with long stem and root which is suitable to grow in the West Lake, but when it grows over the water surface, around it, will grow water cotton and collect rubbish, which affect enjoying, so it is not suitable to spread widely. We can plant a small amount of them in the Three Pools Mirroring the Moon and the North Inner Lake. The *Potamogeton crispus* has powerful fertility. It can grow thickly due to the rich mud at the bottom of the West Lake, so it should be carefully to do planting.

The *Vallisnera spiralis* has thick leaves with bluish green colour. It is not tall without standing stem, the excellent kind for growing at the bottom of water and makes green in the parks, because its leaves touch great area of the water and absorb a lot of nutrition. It is tidy, good for enjoying. However. it likes to grow in the place with sand and water. It is difficult to plant in the West Lake. It can be planted around the small south lake, the Three Pools, Quyne and along the lake.

The *Eloa* and *Otlelia alismoides* also are the excellent variety. It is easier to plant them in the West Lake than the *Vallisnera spiralis* but there are few planting sources.

The gold fish algae, *Hydrilla varticillata*, are more suitable for growing in the West Lake, but less beautiful than the *Vallisnera spiralis*. It should be planted in proper proportions.

The nut grass flat edge has higher economic value and powerful capability to purify the water body, but not suitable to grow in the deep water place, so it is only planned to plant along the shallow water place. In SUWA Lake of Japan, they plant reed with plan having a particular flavor.

Conclusion

5.1 Among the Viviparidae, *Hyriopsis Cvmingiillea*, water spinach and underwater plant, the Viviparidae is the best one to improve the transparency of the water body, then the *Hyriopsis Cvmingiillea*, water spinach and underwater plant in succession. For the increased range of the transparency, the Vivparidae is 87.3%. the *Hyriopsis Cvmingiillea* 51. 3%, the water spinach 46.1%. The obvious period for the Viviparidae to improve the transparency of the water body within 3- 5 days, and 15 days later it can reach to the peak. In the test the feather ockscomb without management it can obtain improvement result keeping 2-3 months in summer, 3-4 months in winter.

5.2 Only the Viviparide and *Hyriopsis Cvmingiillea* hanging in the water body, can they have purification function. If they sink in the bottom of the water, the purification function will be weakened. The purification function of the *Hyriopsis Cvmingiillea* is not larger than the Viviparidae, but it grows very fast. and it has high economic value, so it is an ideal product. The Viviparidae is suitable to grow in the raising density 0.2-0.4kg/m^2 water surface. The purification means to absorb the organic chips, organism and eat the small algae in the water body, but it should be managed regularly, cleaning the attachment in the mesh cage and changing part of Viviparidae, etc, or, they are easy to die.

5.3 The water spinach can grow well in the West Lake and has good absorptivity of ammonia, nitrogen and nitrate and lower the total phosphorus. It also can be used for making up words and putting together the picture, flower bed. It is suitable for planting in the small water body of the zoo thus making the lake beautiful and improving the water quality.

5.4 Appropriate underwater plants are *Vallianera spiralis, Othslia alismoide*. They can be matched with *Hylrilla vartiaillata* gold fish algae. The *Myriophyllum spicarum* can be used as pioneer plant The *Nynthea tetragona* can beautify and embellish plants. The *Potrmobdton crispus* needs to be used carefully various The *Najas najor* belong to unsuitable plant.

References

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