

enhance its antioxidant defense capability and resistance to Ultraviolet stress. Astaxanthin dominated highly the body carotenoid indicating that this fish directly deposited most dietary astaxanthin in integument. The resulting fish were then exposed to UV-A and UVB stress for 24 h. Serum total antioxidant status [TAS], serum antioxidant enzymes (superoxide dismutase [SOD], glutathione peroxidases [GPX] and serum transaminases (alanine aminotransferase [ALT], aspartate aminotransferase [AST]) were chosen as indices of fish antioxidant and stress resistant capacity. When control fish and treatment fish were examined together, UV-A stress did not affect TAS and SOD, raised AST and ALT, reduced GPX. UV-B stress did not affect TAS, but raised SOD, AST, and ALT, reduced GPX. There were significant differences between

UV-B stress and normal condition. UV stresses reduced GPX in all fish fed pigmented diets.

The effect of pigmentation and reproduction of cherry shrimp, *Neocaridina denticulate* fed brine shrimp, mauxia shrimp and red worm
Sung-Po Wang¹, Pai-Wen Lin¹, Chih-Hung Pan¹

Hsu-Che Liang¹, Hung- Pin Chan¹, Chih-Hung Pan¹

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Natural carotenoids from astaxanthin containing alga *Haematococcus pluvialis*(H) and b-carotene containing alga *Spirulina* sp.(S) and b-carotene containing alga *Isochrysis galbana* (I) were supplemented in formulated diets at two concentrations, 80(1) and 160(2)mg kg⁻¹, resulting in six pigmented diets H1, S1, I1, H2, S2, and I2. Formulated diet without carotenoid supplementation served as a control(C). The different diets were fed to cherry shrimp, *Neocaridina denticulate* For 9 weeks. Dietary carotenoid effects on growth, survival, and pigmentation were compared by the treatment individually or collectively. After 9 weeks rearing, C-fed shrimp had significantly lower survival rate than the pigmented diets-fed shrimp. No difference in weight gain was found among all shrimps. The pigmentation of body of C-shrimp was significantly lower than that shrimp fed with pigmented diets. The pigmentation of body astaxanthin in I-diets were significantly higher than

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A trial was undertaken to investigate pigmentation and reproduction in ornamental shrimp by feeding brine shrimp nauplii(diet-B), minced Taiwan mauxia shrimp (diet- M) and red worm, *Tubifex hataai*(diet-W) and a control diet with no pigment added(diet-C) for comparison. The concentration of astaxanthin in B-shrimp were 390±50 mg/ g . There were significantly higher in astaxanthin content of B-shrimp than those of M- , W- and C-shrimp .Except B-shrimp, no significant differences in pigmentation were found among treatment groups. Ornamental shrimps fed pigmented diets had 57-70% survival rate. Survival rate of C-fed shrimp was significantly lower than that of the shrimp fed with pigmented diets. The spawning and hatching rate of B-shrimp were significantly higher than those of W- , M-, and C-shrimp. There were significantly higher in egg quantity of diet-C than those of B-, M-, and W -shrimp.

The effect of dietary supplementation of *Haematococcus pluvialis*, *spirulina* sp. and *Isochrysis galbana* on growth , survival, and pigmentation of cherry shrimp, *Neocaridina denticulate*

教學設備更新

- 漁管系**
95.11本系管1樓觀賞魚室增設「環流水槽」，日後將結合觀賞魚與漁具漁法教室。
- 水食系**
95 年度教育部補助「技專校院發展學校重點特色專案補助計畫」設備更新
核糖核酸分析系統
(Roche Light Cycler 1.5 System Real time PCR)
- 養殖系**
- ◆ 蛋白質純化系統
 - 1.凍結乾燥機
 - 2.離心式濃縮機
 - ◆ 餌料生物培養系統
 - 1.餌料生物培育裝置
 - 2.無菌無塵操作台
 - 3.固定式空氣品質偵測器
 - 4.攜帶型比色計



研究計畫及成果

編號	年度	期刊論文	參與教師
47	95	Ho, P. H., Y. H. Tsai* , C. C. Hwang, P. A. Hwang, J. H. Hwang and D. F. Hwang (2006). Paralytic toxins in four species of coral reef crabs from Kenting National Park in southern Taiwan. Food Control, 17(6), 439-445 (SCI)	蔡永祥
48	95	Tsai Y. H.* , P. H. Ho, C. C. Hwang, P. A. Hwang, C. A. Cheng and D. F. Hwang (2006). Tetrodotoxin in several species of xanthid crabs in Southern Taiwan. Food Chemistry, 95(2), 205-212 (SCI)	蔡永祥
49	95	Li-Jung Yin , Pei-Chien Wu, Hsiu-Ho Cheng, and Shann-Tzong Jiang. 2006. Conditions for the induction of some selective enzymes from <i>Bacillus subtilis</i> and their hydrolysis ability against mackerel and asparagus. Submitted to the J. Fish. Sci. for publication	殷儷容
50	95	Li-Jung Yin , Chien-Wei Wu and Shann-Tzong Jiang. 2006. Biopreservative Effect of Pediocin ACCEL on the Refrigerated Seafood. Submitted to the J. Fish. Sci. for publication	殷儷容
51	95	J. J. Hwang , T. Yamakawa and I. Aoki (2007). Growth of wild pearl oysters <i>Pinctada fucata</i> , <i>Pinctada margaritifera</i> and <i>Pinctada sugillata</i> (Bivalvia: Pteriidae) in Taiwan. <i>Fisheries Science</i> . 73:132-141.	黃娟娟
52	95	J. J. Hwang (2007). Reproductive cycles of the pearl oysters <i>Pinctada fucata</i> (GOULD) and <i>Pinctada margaritifera</i> (LINNAEUS) (BIVALVIA: PTERIIDAE) in Southwestern Taiwan waters. <i>Journal of Marine Science and Technology</i> .(已接受).	黃娟娟
53	95	Twan, W. H., Hwang, J. S., Lee, Y. H., Jeng, S. R. , Yueh, W. S., Tung, Y. H., Wu, H. F., Dufour, S., and Chang, C. F. (2006). The Presence and Ancestral Role of Gonadotropin-Releasing Hormone in the Reproduction of Scleractinian Coral, <i>Euphyllia ancora</i> . Endocrinology. 147, 397-406 (SCI).	鄭絢如
54	95	Wang, Y. C., Chang, P. S. and Chen, H. Y. (2006). Tissue distribution of prophenoloxidase transcript in the Pacific white shrimp <i>Litopenaeus vannamei</i> . <i>Fish & Shellfish Immunology</i> . 20, 414-418.	張朴性
55	95	Yeh, T. Y., P. W. Hsueh., and J. F. Huang (2006) On new record of three majid crabs (Decapoda, Brachyura) from Taiwan. <i>Crustaceana</i> 79(6) : 699-705.	黃榮富
56	95	Huang, J. F. and P. W. Hsueh (2006) On new of <i>Haptosquilla glyptocerus</i> (Wood – Mason, 1875) (Stomatopoda: Protosquillidae) from Taiwan. <i>Endemic species research</i> 8:(2) 97-101.	黃榮富
57	95	Huang, J. F. (2006) Biology of <i>Xenograpsus testudinatus</i> , an endemic Taiwanese species (Crustacea : Brachyura : Grapsidae). <i>Journal of the fisheries society of Taiwan</i> 33: (1)	黃榮富
58	95	Huang, J. F. (2006) The influence of <i>Calappa philargius</i> infected by Rhizocephala from the coastal water of southwestern Taiwan. <i>Journal of the fisheries society of Taiwan</i> 33:(1)	黃榮富
59	95	Huang, J. F. (2006) The Harvest composition of commercial bottom beam trawler from the waters adjacent to Taiwan. <i>Journal of the fisheries society of Taiwan</i> 33:(1)	黃榮富
60	95	Chitsan Lin, Chien-Chuan Shern, Chun-Lan Huang , Fan-Leng Kuo (2006). The Presence and Ancestral Role of Gonadotropin-Releasing Hormone in the Reproduction of Scleractinian Coral, <i>Euphyllia ancora</i> . <i>Journal of Environmental Engineering and Management</i> . 16(6) : 699-705	黃春蘭
61	95	Wang, Y. J., Chien Y. H., and Pan C. H. (2006) . Effects of dietary supplementation of carotenoids on survival, growth, pigmentation, and antioxidant capacity of characins, <i>Hyphessobrycon callistus</i> , <i>Aquaculture</i> , 261 : 641-648. (SCI)	潘志弘

研究計畫及成果

編號	年度	期刊論文	參與教師
62	95	Wang, Y. J., Chien Y. H., and Pan C. H. (2006) . Effects of dietary vitamin A or b-carotene concentrations on growth of juvenile hybrid tilapia, <i>Oreochromis niloticus</i> × <i>O. aureus</i> , <i>Aquaculture</i> , 253 : 602-607. (SCI)	潘志弘
63	95	Twan, W. H., Hwang, J. S., Lee, Y. H., Jeng, S. R., Yueh, W. S. , Tung, Y. H., Wu, H. F., Dufour, S., and Chang, C. F. (2006). The Presence and Ancestral Role of Gonadotropin-Releasing Hormone in the Reproduction of Scleractinian Coral, <i>Euphyllia ancora</i> . <i>Endocrinology</i> . 147, 397-406 (SCI)	岳文勛
64	95	蟹類養殖與進口管制。海洋高雄期刊。11:26-29.	黃榮富
65	95	Enhanced viability of a nervous necrosis virus-infected stable cell line over-expressing a fusion product of the zfbcl-xL and green fluorescent protein genes. <i>J. Fish Diseases</i> 29 (SCI)(4th author)	陳鳴泉
66	95	An endothelial-cell-enriched primary culture system to study vascular endothelial growth factor (VEGF A) expression in a teleost, the Japanese eel (<i>Anguilla japonica</i>). <i>Comp. Biochem. Physiol. (A)</i> 145(SCI)(4th author)	陳鳴泉
67	95	<i>Burkholderia mimosarum</i> sp. nov., isolated from root nodules of <i>Mimosa</i> spp. from Taiwan and South America. <i>International Journal of Systematic and Evolutionary Microbiology</i> 8:56(SCI)(the other author)	許世宜
68	95	<i>Schlegelella aquatica</i> sp. nov., a novel thermophilic bacterium isolated from a hot spring. <i>International Journal of Systematic and Evolutionary Microbiology</i> 12:56.(SCI) (2nd author)	許世宜
69	95	Apoptosis-inducing active components from <i>Corbicula fluminea</i> through activation of caspase-2 and production of reactive oxygen species in human leukemia HL-60 cells. <i>Food Chem. Toxicol</i> 8:44.(SCI)(1st author)	黃胤唐
70	95	Pyrrolidine dithiocarbamate inhibition of luteolin-induced apoptosis through up-regulated phosphorylation of Akt and caspase-9 in human leukemia HL-60 cells. <i>J Agric Food Chem</i> 12:54. (SCI) (the other author)	黃胤唐
71	95	<i>Schlegelella aquatica</i> sp. nov., a novel thermophilic bacterium isolated from a hot spring. <i>International Journal of Systematic and Evolutionary Microbiology</i> 12:56. (SCI) (3rd author)	許德賢

教師研究成果分享

Effects of dietary vitamin A or b-carotene concentration on growth of juvenile hybrid tilapia, *Oreochromis niloticus* × *O. aureus*
Chih-Hung Pan

A series of two 10-week feeding trials was conducted to evaluate the effects of dietary vitamin A or b-carotene supplementation on the growth of hybrid tilapia. In trial I, tilapia of 1.6 g body weight were fed diets supplemented with 0 to 50,000 IU vitamin A(as retinyl acetate) kg⁻¹. In trial II, basal diets without vitamin A supplementation were supplemented with 0 to 200mg b-carotene /kg and fed to tilapia of 0.48 g initial weight. Growth performance of fish fed diets without vitamin A or b-carotene supplementation was significantly (p<0.05) lower than other groups within the trial. Analyzed by the broken-line regression model, dietary vitamin A required for optimal growth of juvenile tilapia was 5850 to 6970 IU kg⁻¹ based on the weight gain and liver vitamin A retention. Further, dietary b-carotene for optimal growth of juvenile tilapia was 28.6 to 44.3 mg kg⁻¹ at a dietary vitamin A content of 84 IU kg⁻¹. Tilapia is able to

utilize b-carotene to fulfill the dietary vitamin A requirements. The conversion ratio by weights of b-carotene to vitamin A was approximately 19:1.

Effects of dietary supplementation of carotenoids on survival, growth, pigmentation, and antioxidant capacity of characins, *Hyphessobrycon callistus*
Yi-Juan Wang, Yew-Hu Chien and Chih-Hung Pan

This study aimed to find out if dietary carotenoid (CD) supplement could make differences in survival, growth, pigmentation, and antioxidant capacity of characins *hyphessobrycon callistus*, an ornamental fish. Two types of CD and its combination(AX-astaxanthin, BC-b-carotene, MX-1:1 combination of AX and BC) and three concentrations(10, 20, 40 mg/kg) were used resulting in nine pigmented diets. A diet without CD supplement served as control. No differences in growth and survival of the fish among treatments were found after 8 weeks rearing. Disregarding the types of dietary CD, AX dominated (98%)

the body CD, indicating that this fish converted most dietary BC into body AX for storage. Body AX and BC content increased with increasing dietary CD concentration. Body AX in BC-fed fish was lower than that in both AX and MX-fed fish. No difference in body AX was found between AX- and MX-fed fihs, and in body BC in all pigmented fish. Serum total antioxidant status [TAS], serum antioxidant enzymes (superoxide dismutase [SOD], glutathione peroxidases[GPx], and serum transaminases(alanine aminotransferase[ALT], aspartate aminotransferase[AST], were chosen as indices of fish antioxidant capacity. Antioxidant activities changed with dietary CD type and concentration. Pigmented fish had lower SOD, GPx and ALT than control fish; dietary CD types only affected SOD and ALT in fish. AX-fed fish had the lowest SOD. Dietary AX had more numbers of negative correlations with antioxidant parameters in fish than BC.

The effects of dietary supplementation of alga *Haematococcus pluvialis*, synthetic astaxanthin and beta-carotene on survival, growth, and pigment distribution of red devil, *Cichlasoma citrinellums*
Chih-Hung Pan^a, Yew-Hu Chien^b

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with synthetic astaxanthin. The average fin b-carotene content of the fish fed with 80 mg kg⁻¹ dietary astaxanthin supplement (AI) was 28.5% less than fish fed diets supplemented with 180 mg kg⁻¹ (AII). Pigmentation of b-carotene in intestine of HII-fish was significantly higher than those of the HI-fish.

The effect of dietary supplementation astaxanthin on pigmentation of blood parrot, *Cichlasoma* var. in water hardness and resistance to anesthetic stress
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² Department of Aquaculture, National Kaohsiung Marine University

This study was aimed at determining if the effect of dietary supplementation astaxathin on growth, survival, and pigmentation of blood parrot in water hardness . To increase body astaxanthin content of fish enhance its antioxidant defense capability and resistance to anesthetic stress. No differences in growth and survival of the fish

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Natural carotenoids from astaxanthin containing alga *Haematococcus pluvialis*(H) and a synthetic astaxanthin carophyll pink(A), and a synthetic beta-carotene carophyll yellow(B) were supplemented in formulated diets at tow concentrations, 80(I)and 160(II)mg kg⁻¹, resulting in six pigmented diets HI, AI, BI, HII, AII, and BII. Formulated diet without carotenoid supplementation served as a control (C). The different diets were fed to red devil, *Cichlasoma citrinellum* for 8 weeks. Dietary carotenoid effects on survival, growth, and pigmentation were compared by the treatment individually or collectively. After 8 weeks rearing, C-fed fish had not significantly lower survival rate than the pigmented diets-fed fish. No difference in weight gain was found among all fish. The pigmentation of body astaxanthin in fin, skin, and muscle of C-fish was significantly lower than that fish fed with pigmented diets. The pigmentation of body astaxanthin in fin, skin and gonad in astaxanthin-fed were significantly higher than b-carotene-fed. The average skin astaxanthin of the fish fed 80 mg kg⁻¹ dietary natural astaxanthin (HI) was 40.6% less than those fed 180 mg kg⁻¹ (HII). The pigmentation of b-carotene in the fin and skin of natural astaxanthin-fed fish was higher than those of fish fed

among treatments were found after 12 weeks rearing. The fish fed with astaxanthin, pigmentation were better in the hard water than those of group in the soft water. There were significantly different in pigmentation between pigmented group in hardwater and softwater. In hardwater, there were significant difference in TAS, AST and TBARS value under anesthetic stress. Astaxanthin supplement in diet at 160 and 320ppm improved antioxidative ability of fish subjected anesthetic stress (2-Phenoxyethanol 200 ppm, 1 hr). When the fish under anesthetic stress, ALT and GSH-Px in the soft and hard water have significantly different.

Protection of dietary supplementation of astaxanthin on pigmentation and against Ultraviolet Illumination in Cichlid *Cichlasoma citrinellum*
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This study was aimed at determining if the increase of body astaxanthin content through dietary astaxanthin supplementation in Cichlid *Cichlasoma citrinellum* could