REFERENCES

Akashike, S., Seki, T., Kan-no, H., and Nomura, T. 1981. Effect of γ-amino-butyric acid and Certain Neurotransmitters of the Settlement and the Metamorphosis of the Larvae of *Haliotis discus hannai* Ino. (Gastropoda). **Bull. Tohoku. Reg. Fish. Res. Lab.** 43: 37 pp.

Beaudry, C.G. 1989. Survival and Growth of the Larvae of *Haliotiskamtchatkana* Jonas. At Different Temperature. **Natl. Shellfish. Assoc.** 3 : 97-109.

Busarawit, S., Kawinlertwathana, P. and Nateewattana, A. 1990. Primary Study on Reproductive Biology of Abalone (*Haliotis varia*) at Phuket, Andaman Sea Coast of Thailand. **Kasets Journal.** 24: 529-539.

Chen, H.C. 1984. Recent Innovation in Cultivation of Edible Molluscs in Taiwan, with Special Reference to the Small Abalone, *Haliotis diversicolor supertexta* and the Hard Clam, *Meretrix lusovia*, **Aquaculture.** 39: 11-27.

————. 1982. Farming the Small Abalone, *Haliots diversicolor supertexta*, in Taiwan. In Hahn, K.O. (Ed.), **Handbook of Culture of Abalone and Other Marine Gastropods**, CRC Press Inc, Florida. p. 265-283.

Clavier, I. and Richard, O. 1986. Growth of Juvenile, *Haliois tuberculata*, (Mollusca ; Gastropoda) in the Natural Environment. **J. Mar. Biol. Assoc.** UK. 66 : 497-503.

Day, R.W. and Fleming, A.E. 1992. The Determinants and Measurement of Abalone Growth, In : Shepherd, S.A., Tegner, M.J. and Guzman Del Proo, S.A. (Eds.). **Abalone of the World**, Biology, Fisheries and Culture. Fishing News Books, Oxford. pp. 141-168.

Erbert, E.E. and Hamilton, R.M. 1983. Ova Fertility Relative to Temperature to time of Gamete Mixing in the Red Abalone, *Haliotis rufescens*. **Calif. Fish. Game.** 69(2) : 100-115.

————. and Houk, J.L. 1984. Element and Innovation in the Cultivation of Red Abalone, *Haliotis rufescens*. **Aquaculture**. (39) : 375-398.

Fallu, R. 1992. **Abalone Farming**. Fishing News Books, UK. 195 pp.

FAO. 1995. FAO **Yearbook of Fisheries Statistic Catches and Landing 1993**. (76) : 674 p.

————. 1995. FAO **Yearbook of Fisheries Statistic Product 1993**. (77) :425 p.

Fuze, D.M. 1981. Note on Biology of *Haliotis varia* and *Haliotis asinina*. **Fish. Res. J. Phillip.** 6 : 39-49.

Garland, C.D., Cooke, S.E., Grant, J.F. and Mcmeekin, T.A. 1985. Ingestion of the Bacteria on and the Cuticle of Crustose (non-articulate) Coralline Algae by Post-larval and Juvenile Abalone (*Haliotis rubra*, Leach) from Tasmanian Waters. **J. Exp. Mar. Biol. Ecol.** 91 : 137-149.

Grant, J.F. 1981. Abalone Culture in Japan : Development and Current Commercial Practice. **Tasmanian Fisheries Research.** No.23 : 17 p.

Hahn, K.O. 1989. **Handbook of Culture od Abalone Culture and Other Marine Gastropods.** CRC Press, Florida. 348 pp.

Hooker, N. and Morse, D.E. 1985. Abalone the Emerging Development of Commercial Cultivation in the United States, In **Crustacean and Mollusk Aquaculture in the United States,** Huner, J.V. and Brown, E.E. (Eds.), AVI Publishing Co. 365 pp.

Ino, T. 1952. Biological Study on the Propagation of Japanese Abalone, Genus *Haliotis*. **Bull. Tohoku. Reg. Fish. Res. Lab.** (5) : 1-102

———. 1980. Fisheries in Japan, Abalone and Oyster. **Japan Marine Products Photo Materials Assoc,** Tokyo. 165 pp.

Jarayabhand, P., Choonhabandit, S. and Jew, N. in preparation. A Study on Distribution od Thai Abalone, *Haliotis ovina* (Gmelin,1791) at Khang Kao Island.

———., Jew, N. and Choonhabandit, S. in preparation. Gametogenic Cycle of Thai Abalone, *Haliotis ovina* (Gmelin, 1791) at Khang Kao Island, Chonburi Province.

———.., Choonhabandit, S. and Rungsupa, S. 1991. Research and Development on some Aspects of Abalone Culture, *Haliotis ovina*, Gmelin, 1791. **A Final Report Submitted to the TORAY Science International Research Grant 1990.** 52 pp.

Kakhai, N. and Petjamrat, K. 1992. Survey on species and broodstock collection of abalone (*Haliotis* spp.) in Chonburi, Rayong and Trat Province. **Technical Report No.6/1992.** Coastal Aquaculture Division, Department of Fisheries. 31 pp.

Kan-no, H. 1995. Recent Advences in Abalone Culture in Japan. **Proceeding of The first International Conference on Aquaculture Nutrition.** October, 1975. p : 195-211.

Kikuchi, S. 1967. Food Value of Certain Marine Algae for Growth of Young Abalone, *Haliotis discus hannai*. **Bull. Tohoku Reg. Fish. Res. Lab.** (27) : 93-100.

———. and Uki, N. 1974b. Technical Study on Artificial Spawning of Abalone, Genus *Haliotis* II. Effect of irradiation sea water with Ultraviolet on inducing to spawn. **Ibid.** p. 79-86.

———. 1974c. Technical study on Artificial Spawning of Abalone, Genus *Haliotis* III. Reasonable sperm density for fertilization. **Bull. Tohoku Reg. Fish. Res. Lab.** (34) : 67-71.

Landau, M. 1992. **Introduction to Aquaculture.** John Wiley&Sons. Inc., Singapore. 440 pp.

Lewmanomomt, K. and Ogawa H., 1995. Commom Seaweeds and Seagrasses of Thailand. Integrated Promotion Technology Co., Ltd. 163 pp.

Linberg, D.R. 1992. Evoluiton, Distribution and Systemetics of Haliotidae. In : Shepherd, S.A., Tegner, M.J. and Guzman Del Proo, S.A. (Eds.). **Abalone of the World,** Biology, fisheries and Culture. Fishing News Books, Oxford. pp. 3-18.

Maruyama, S. 1935. On the Development of Japanese Abalone, *Haliotis gigantea*. **J. Coll. Agri.** , Tokyo, Imperial Univ. 8(3) : 227-232.

Mcshane, P.E. 1992. Early Life History of Abalone : A Review. In shepherd, S.A. Tegner, M.J. and Guzman Del Proo, S.A. (Eds.), **Abalone of the World** Biology, Fisheries and Culture. Fishing News Books, Oxford. 120-138.

Morse, D.E. 1984. Biochemical and genetic engineering for improve production of abalones and other valuable molluscs. **Aquaculture.** 39 : 263-267.

———., Duncan, H., Hooker, N. and Morse, A. 1977. Hydrogen Peroxide Induce Spawning in Molluscs, With Activation of Prostaglandin endo peroxide synthetase. **Science.** 196 : 298-306.

Morse, D.E., Hooker, N., Jansen, L. and Duncan, H. 1979. Induction of larval abalone settling and metamorphosis by γ-aminobutyric acid and its congeners from crustose and red algae II, Application to cultivation seed production and bioessays ; Principle causes from mortality and interference, **Proc. World Maricult. Soc.** p. 70-81

Naidenko, T.Kh. 1992. Spawning and Development of Abalone, *Haliotis ovina* (Linne) in a Ship Laboratory. **Fish. Res. Pap. Dep. Fish. (S. Aust)** 24 : 30-32.

Nateewattana, A. and Hylleberg, J. 1986. A survey on Thai Abalone around Phuket Island and Feasibility Study of Abalone culture in Thailand. **Thai Fisheries Gazette.** 39(2) : 177-192. (in Thai) .

———. and Busarawit, S. 1988. Abundance and Distribution of Abalone along the Andaman Sea Coast of Thailand. **Kasetsart J. Sci.** 22 : 8-15 (in Thai).

Norman-Boudreau, K. 1985. Study of Nutrition in Abalone Mariculture. **Pacific Trident Mariculture**, final report 1984-1985.

———., Burns, D., Cooke, C.A. and Austin, A. 1986. A simple Technique for Detection of Feeding in newly Metamorphosed Abalone. **Aquaculture.** 51 : 313-317.

Pena, J.B. 1986. Primary Study on the Induction of Artificial Spawning in *Haliotis coccinea canariensis* Novdsieck, 1975. **Aquaculture.** 52 : 35-41.

Purchon, R.D. and Purchon, D.E.A. 1981. The Marine Shell Mollusca Of West Malaysia and Singapore, Part I. General Introduction and Account of Collecting Station. **J. Moll. Stud.** 47 : 290-312.

Saito, K. 1981. The Appearance and Growth of 0-year old Ezo Abalone. **Bull. Jap. Soc. Fish.** 47 : 1393-1401.

Seki, T. and Kan-no, H. 1977. Synchronized Control of Early Life in Abalone, *Haliotidae* Gastropoda. **Bull. Tohoku Reg. Fish. Res. Lab.** (38) : 143-153.

———. 1981. Induce Settlement of Japanese Abalone, *Haliotis discus hannai* 's Viliger by the Mucus Trials of Juvenile and Adult Abalone. **Bull. Tohoku Reg. Fish. Lab.** (43) : 29 pp.

Shephard, S.A. and Turner, J.A. 1985. Studuies on Southern Australian Abalone (genus *Haliotis*) VI. Habitat Preference and Abundance and Predators of Juveniles. **J. Exp. Mar. Biol. Eco.** (93) : 285-298.

Shibu, T. 1972. On the Normal development of the Eggs of Japanese Abalone, *Haliotis discus hannai* Ino. and Ecological and Physiological Studies of its Larval and Young. **Bull. Iwate Pref. Fish. Exp. Sta.** (2) : 1-69.

Singhagraiwan, T. 1990. An Experiment on Feeding of Donkey's ear Abalone, *Haliotis asinina* Linne. **Technical Paper.** 17 pp.

———. and Sasaki, M. 1991a. Breeding and Early Development of Donkey's ear Abalone, *Haliois asinina* Linne. **Thai. Mar. Fish. Res. Bull.** (2) : 83-94.

———. 1991b. Growth of Donkey's ear Abalone, *Haliotis asinina* Linne. Culture in Tanks. **Thai. Mar. Fish. Res. Bull.** (2) : 95-100.

———. and Doi, M. 1993. Seed Production and Culture of Tropical Abalone, *Haliotis asinina* Linne. **The Research Project of Fisheries Resources Development in the Kingdom of Thailand.** 32 pp.

Sokal, R.R. and Rohlf, F.J. 1981. **Biometry**, The Principle and Practice of Statistic in biological Research, 2 nd. Edition., W.H. Freeman and Company, San Francisco. 839 pp.

Tantanasiriwong, K. 1978. An Illustrated Checklist of Marine Shell Gastropods from Phuket Island, Adjacent mainland and offshore, Western Peninsular Thailand **PMBC Res. Bull.** 21 : 1-22.

Tong, L.J. 1982. The Potential of Aquaculture paua in New Zealand, In Proc. Paua. Fish. workshop, Fish. Res. Div. Pub. No. 41, Akroyd, J. M., Murray, T.E. and Tyler, J.L. (Eds.). **N.Z. Min. Agri. Fish.,** Wellington. 36 pp.

Tookvinas, S., Leknim, P., Donyadol, Predalamlert, Y. and Paengmark, P. 1986. A survey of Species and Distribution of Abalone (*Haliotis spp.*) in Surat Thani, Nakorn Si Thammarat and Songkla. **Tech. Rep. No. 1/1986** NICA. 16 pp.

Uki, N. 1981. Food Value of Marine Algae of Order Laminariales for Growth of Abalone, *Haliotis discus hannai* , **Bull. Tohoku Reg. Fish. Res. Lab.** (42) : 19 pp

———. 1989. Abalone Seeding Production and Its Theory (2). **Int. J. Aq. Fish.Technol.** 1 : 125-132.

———., Sakiara, M. and Watanabe, T. 1981. Dietary Value of Seaweed Ocurring on the Pacific Coast of Tohoku for Growth of Abalone, *Haliotis discus hannai* . **Bull. Jpn. Soc. Sci Fish.** 52(2) : 257-268.

———. and Kikuchi, S. 1982. Technical study on Artificial Spawning of Abalone, Genus *Haliotis* VII, Characteristics of Spawning Behavior of *Haliotis discus hannai* Induced by Ultraviolet Irradiation Stimulus. **Bull. Tohoku Reg. Fish. Res. Lab.** (44) : 83-93.

———— . and Kikuchi, S. 1984. Regulation of Maturation and Spawning of Abalone, *Haliotis* (Gastropod) by External Environmental Factors. **Aquaculture**. 39 : 247-261.

———— . , Grant, J.F. and Kikuchi, S. 1981. Juvenile Growth of the Abalone, *Haliotis discus hannai* , Fed Certain Benthic Microalgae Related to Temperature. **Bull. Tohoku Reg. Fish. Res. Lab.** (43) : 59-63.

Viana, M.T., Lopez, M.L. and Salas, A. 1993. Diet Development for Juvenile Abalone, *Haliotis fulgens*, Evaluation of Two Artificial Diets and Macroalgae. **Aquaculture**. (117) : 149-156.

Viana, M.T., Lopez M.L., Garcia-Esquivel, Z. and Mendez E. in preparation. The Use of Silarge Made from Fish and Abalone Viscera an Ingredient in Abalone Food. 22 pp.

Wilkinson, L. 1988. **SYSTAT** : The System Statistic, Evanson, IL : SYSTAT Inc.

APPENDICES

Appendix 1 Raw data

tag1	lt0a	lt1a	lt2a	lt3a	wd0a	wd1a	wd2a	wd3a	wt0a	wt1a
A1	28.3	28.5	28.6	30.8	22.4	22.4	22.4	24.1	3.24	3.5
A2	31.7	31.7	31.7	32	24.3	24.3	24.8	25.8	5.25	5.48
A3	33.9	33.9	34.9	34.9	24.3	27.8	28.5	28.5	6.49	7.04
A4	27	27.1	27.5	27.5	21.8	21.8	21.9	21.9	3.21	3.35
A5	25.2	27	27.4	29	20.5	22.1	22.1	22.4	3.18	3.14
A6	33.8	33.8	34.1	34.2	26	26.3	26.3	26.3	6.12	6.41
A7	25.5	27.5	28.1	28.3	20.7	22.6	22.6	22.6	3.54	3.68
A8	29.5	29.5	29.5	29.6	23.1	23.2	23.2	23.2	4.28	4.34
A11	28.7	28.9	29.8	29.8	22.4	23.2	23.4	23.6	4.6	4.57
A12	29.6	29.6	29.8	29.8	23	23	23	23.2	4.42	4.59
A13	32.5	32.6	32.7	34	26.4	26.4	26.7	26.7	5.94	6.12
A14	28.4	28.6	28.6	28.6	22.8	22.9	22.9	22.9	4.11	4.37
A15	32.4	32.6	32.6	33.6	25.1	25.1	25.1	25.1	5.8	5.97
E1	21.1	21.2	21.6	22	16.8	17.6	17.6	17.6	1.82	1.96
E2	30.8	31.1	31.2	31.3	24.4	24.4	24.6	24.7	5.53	5.49
E3	31.8	31.8	32.4	32.4	25.1	25.1	25.1	25.2	5.75	5.74
E4	28	28.5	28.6	28.8	22.3	22.7	22.7	22.7	4.24	4.48
E5	30	30	30.1	30.1	23.5	23.7	23.8	23.8	4.43	4.77
E6	28.6	28.6	29.9	29.9	22.5	22.7	23.2	23.2	4.35	4.71
E7	30.5	30.5	30.7	31.4	23.6	24	24	24.4	5.69	5.78
E8	30.3	30.3	30.5	30.5	24.3	24.3	24.4	24.7	5.5	5.44
E9	31.9	32	32.2	32.3	25	25.1	25.3	25.3	6.18	6.75
E10	24.5	24.6	24.6	25	19.7	19.7	19.8	19.8	2.6	2.62
E11	31.7	31.7	31.9	32.3	24.8	25	25	25	5.68	6.11
E12	29.3	30.7	30.7	31.4	24	24	24.2	24.2	5.17	5.16
E13	33	33.3	33.3	33.3	26.1	26.1	27	27	6.29	6.63
E14	25.9	26.8	28	28.2	20.7	20.7	21.2	22	3.1	3.56
E15	22.8	26.4	26.8	27	20.1	20.3	21.4	21.4	3.22	3.25

Appendix 1 (continue)

wt2a	wt3a	code1	dilt1a	dilt2a	dilt3a	dilt4a	diwd1a	diwd2a	diwd3a	diwd4a
3.77	3.86	1	6.666667	3.333333	73.33333	27.77778	0	0	56.66667	18.88889
5.49	5.59	1	0	0	10	3.333333	0	16.66667	33.33333	16.66667
7.26	7.3	1	0	33.33333	0	11.11111	116.6667	23.33333	0	46.66667
3.84	3.87	1	3.333333	13.33333	0	5.555556	0	3.333333	0	1.111111
4.03	4.21	1	60	13.33333	53.33333	42.22222	53.33333	0	10	21.11111
7.08	7.1	1	0	10	3.333333	4.444444	10	0	0	3.333333
4.41	4.12	1	66.66667	20	6.666667	31.11111	63.33333	0	0	21.11111
4.6	4.85	1	0	0	3.333333	1.111111	3.333333	0	0	1.111111
5.21	5.33	1	6.666667	30	0	12.22222	26.66667	6.666667	6.666667	13.33333
4.88	4.9	1	0	6.666667	0	2.222222	0	0	6.666667	2.222222
6.78	6.82	1	3.333333	3.333333	43.33333	16.66667	0	10	0	3.333333
4.75	4.79	1	6.666667	0	0	2.222222	3.333333	0	0	1.111111
6.32	6.22	1	6.666667	0	33.33333	13.33333	0	0	0	0
2.25	2.23	1	3.333333	13.33333	13.33333	10	26.66667	0	0	8.888889
5.73	5.88	1	10	3.333333	3.333333	5.555556	0	6.666667	3.333333	3.333333
6.11	6.31	1	0	20	0	6.666667	0	0	3.333333	1.111111
4.87	4.9	1	16.66667	3.333333	6.666667	8.888889	13.33333	0	0	4.444444
5.08	5.09	1	0	3.333333	0	1.111111	6.666667	3.333333	0	3.333333
5.43	5.39	1	0	43.33333	0	14.44444	6.666667	16.66667	0	7.777778
5.97	6.04	1	0	6.666667	23.33333	10	13.33333	0	13.33333	8.888889
5.56	5.78	1	0	6.666667	0	2.222222	0	3.333333	10	4.444444
6.88	6.82	1	3.333333	6.666667	3.333333	4.444444	3.333333	6.666667	0	3.333333
2.87	2.93	1	3.333333	0	13.33333	5.555556	0	3.333333	0	1.111111
6.56	6.46	1	0	6.666667	13.33333	6.666667	6.666667	0	0	2.222222
5.13	5.25	1	46.66667	0	23.33333	23.33333	0	6.666667	0	2.222222
6.94	6.88	1	10	0	0	3.333333	0	30	0	10
4.26	4.26	1	30	40	6.666667	25.55556	0	16.66667	26.66667	14.44444
3.36	3.58	1	120	13.33333	6.666667	46.66667	6.666667	36.66667	0	14.44444

Appendix 1 (continue)

tag2	lt0b	lt1b	lt2b	lt3b	wd0b	wd1b	wd2b	wd3b	wt0b	wt1b	wt2b	wt3b	code2	dilt1b	dilt2b	dilt3b
B1	25	25.5	26.5	26.7	21.4	21.4	21.5	21.5	3.65	3.68	3.86	3.9	2	16.66667	33.33333	6.666667
B2	30	30	30.1	30.1	22.7	23	23	24	4.72	4.76	4.92	4.84	2	0	3.333333	0
B3	17.4	22.3	22.3	22.5	12.2	17.4	17.7	17.7	2.29	2.27	2.39	2.41	2	163.3333	0	6.666667
B6	35.1	35.1	35.2	35.5	27.4	27.4	27.4	27.4	7.07	7.03	7.27	6.87	2	0	3.333333	10
B8	33	33.1	33.1	33.1	25.5	25.8	25.8	25.8	6.13	6.11	6.08	6.41	2	3.333333	0	0
B9	31	31.3	31.6	31.6	24.8	25.2	25.2	25.2	4.65	5.03	5.27	5.17	2	10	10	0
B13	27	27	27	27	21	21.7	21.7	21.7	3.61	3.63	3.99	4	2	0	0	0
B14	35	35	35	35.3	26.9	27.3	27.3	27.3	7.67	7.69	7.95	8.04	2	0	0	10
D1	31.4	31.4	31.5	31.8	24.8	25.6	25.6	25.6	5.54	5.59	5.65	5.71	2	0	3.333333	10
D3	29.8	30.3	33.3	33.3	24.2	26	26	26	4.45	5.65	4.47	4.52	2	16.66667	100	0
D6	29.4	30	30	30	22.8	22.8	22.9	22.9	4.18	4.17	4.28	4.26	2	20	0	0
D8	29.9	29.9	29.9	29.9	23.6	23.6	23.6	23.6	4.43	4.59	4.65	4.88	2	0	0	0
D10	29	29.5	29.5	29.5	22.5	22.5	22.8	23.3	4.18	4.36	3.99	4.25	2	16.66667	0	0
D11	22.4	22.4	22.8	23	17.9	18.2	18.5	18.5	2.09	2.13	2.28	2.3	2	0	13.33333	6.666667
D13	32.4	33.3	33.3	33.4	24.4	24.4	24.5	25	5.91	5.98	5.61	5.71	2	30	0	3.333333

Appendix 1 (continue)

dilt4b	diwd1b	diwd2b	diwd3b	diwd4b	sgr1b	sgr2b	sgr3b	sgr4b
18.88889	0	3.333333	0	1.111111	0.027285	0.159181	0.034365	0.07361
1.111111	10	0	33.33333	14.44444	0.02813	0.110203	-0.05465	0.027895
56.66667	173.3333	10	0	61.11111	-0.02924	0.171712	0.027778	0.05675
4.444444	0	0	0	0	-0.01891	0.111899	-0.18864	-0.03188
1.111111	10	0	0	3.333333	-0.01089	-0.01641	0.176182	0.049627
6.666667	13.33333	0	0	4.444444	0.261843	0.155368	-0.06386	0.117784
0	23.33333	0	0	7.777778	0.018416	0.315195	0.008344	0.113985
3.333333	13.33333	0	0	4.444444	0.008681	0.110837	0.037524	0.052347
4.444444	26.66667	0	0	8.888889	0.029949	0.035588	0.035212	0.033583
38.88889	60	0	0	20	0.795838	-0.78089	0.037079	0.017342
6.666667	0	3.333333	0	1.111111	-0.00798	0.08679	-0.01561	0.021064
0	0	0	0	0	0.118268	0.043291	0.160927	0.107495
5.555556	0	10	16.66667	8.888889	0.140536	-0.2956	0.210426	0.018453
6.666667	10	10	0	6.666667	0.063193	0.226845	0.029112	0.106383
11.11111	0	3.333333	16.66667	6.666667	0.039249	-0.2129	0.058894	-0.03825

Appendix 1 (continue)

sgr1a	sgr2a	sgr3a	sgr4a
0.257299	0.247707	0.078641	0.194549
0.142923	0.006077	0.06017	0.069724
0.271152	0.102572	0.018315	0.13068
0.142298	0.45504	0.02594	0.20776
-0.04219	0.831812	0.145654	0.311757
0.154324	0.331382	0.009403	0.165036
0.129287	0.603206	-0.22674	0.168585
0.046404	0.19394	0.176408	0.138917
-0.02181	0.436889	0.075905	0.163661
0.125801	0.204217	0.013633	0.114551
0.09951	0.341383	0.019608	0.1535
0.204467	0.277939	0.027953	0.170119
0.096297	0.189908	-0.05316	0.07768
0.247027	0.459952	-0.02976	0.225739
-0.0242	0.142624	0.086137	0.068188
-0.0058	0.208225	0.107363	0.103262
0.183533	0.278236	0.020471	0.160747
0.246489	0.209883	0.006555	0.154309
0.26504	0.474171	-0.02465	0.238188
0.052311	0.107811	0.038857	0.066326
-0.03656	0.07273	0.129352	0.055173
0.294081	0.063587	-0.0292	0.10949
0.025543	0.303792	0.068968	0.132768
0.243252	0.236879	-0.0512	0.142976
-0.00645	-0.01944	0.077075	0.017062
0.175479	0.152323	-0.02894	0.09962
0.461195	0.598362	0	0.353186
0.030912	0.110953	0.211406	0.117757

Appendix 1 (continue)

lt0c	lt1c	ilt2c	lt3c	wd0c	wd1c	wd2c	wd3c	wt0c	wt1c	wt2c
30	30.1	30.2	30.4	24.2	24.9	24.9	24.9	5.34	5.53	5.86
27.9	27.9	28.3	28.9	22.7	22.7	22.8	22.8	4.74	4.81	5.45
31.2	31.6	33.6	34.8	25	25	26.2	28	5.58	6.18	7.54
35.8	36	36.2	36.3	27.6	27.6	27.6	28.6	8.4	8.45	8.6
33	33.1	33.1	33.3	25.1	25.1	25.1	25.1	6.75	6.97	7.02
33.8	33.9	33.9	33.9	25.1	25.2	25.2	25.2	6.75	7.14	7.24
32.9	32.9	33	33	25.9	25.9	25.9	26.1	6	6.42	6.85
36.2	37.6	37.6	38.1	27	28.1	28.3	28.3	8.81	8.96	9.76
25	25.1	25.3	26.6	20.5	20.5	20.8	20.8	3.13	3.46	3.48
23.5	23.8	25.1	27.4	19	19	19.6	21	2.3	2.45	3.14
30.5	30.5	30.5	31	23.8	24	24.5	24.5	4.82	5.06	5.55
30.1	30.1	30.4	30.4	23.9	23.9	23.9	23.9	5.6	5.7	5.7
33.6	33.6	33.6	33.9	25.7	25.8	26.1	26.1	6.15	6.35	7.18
25.1	25.1	26	27.2	21	21.2	21.2	21.2	2.58	2.84	3.44
24.8	26	30.5	31.8	20.2	23.2	23.2	23.3	4.65	4.65	5.2
30.7	30.7	31.2	32	22.5	24.5	24.5	24.5	5.16	5.53	5.73
29.9	30.2	31.3	31.4	23	23	23	23.2	4.69	4.9	5.29
35.2	35.4	35.4	35.4	27.7	27.7	27.7	27.7	7.53	7.65	8.01
29.2	29.2	29.2	29.7	22.9	23.1	23.4	23.4	4.89	5.23	5.36
26.9	26.9	29	30.5	21	21	22.5	22.5	3.35	3.47	4.12
33.4	33.4	33.5	33.5	24.5	24.7	25.6	25.6	6.54	6.58	6.84
21.5	21.5	21.8	22.1	17	17.2	17.2	17.3	1.83	2.06	2.26
31.4	31.5	31.5	31.5	23.7	23.7	23.9	24	6.02	6.16	6.54
27.3	27.3	27.3	28	21.5	21.7	22	22	3.73	3.88	4.36
32	32	32.3	32.7	25.5	25.5	25.6	25.7	5.39	5.79	6.39
30.6	30.6	31.5	33.8	25	25	25.2	25.7	5.35	5.75	6.85
30.7	30.7	31	31.4	23.8	23.8	24	24.8	4.93	4.91	5.23
32.9	32.9	33.4	33.4	25	26	26	26	6.41	6.42	7.63
32.1	32.2	32.5	32.8	24.3	24.3	24.5	24.5	5.61	5.76	6.27
27.1	27.4	27.5	27.6	21.8	21.8	21.8	21.8	3.56	3.79	4.27

Appendix 1 (continue)

wt3c	code3	dilt1c	dilt2c	dilt3c	dilt4c	diwd1c	diwd2c	diwd3c	diwd4c	sgr1c
5.86	3	3.333333	3.333333	6.666667	4.444444	23.33333	0	0	7.777778	0.116541
5.48	3	0	13.33333	20	11.11111	0	3.333333	0	1.111111	0.048866
8.38	3	13.33333	66.66667	40	40	0	40	60	33.33333	0.340432
9.06	3	6.666667	6.666667	3.333333	5.555556	0	0	33.33333	11.11111	0.019782
7.05	3	3.333333	0	6.666667	3.333333	0	0	0	0	0.106909
7.5	3	3.333333	0	0	1.111111	3.333333	0	0	1.111111	0.187234
6.86	3	0	3.333333	0	1.111111	0	0	6.666667	2.222222	0.225529
9.76	3	46.66667	0	16.66667	21.11111	36.66667	6.666667	0	14.44444	0.056276
3.87	3	3.333333	6.666667	43.33333	17.77778	0	10	0	3.333333	0.334119
3.34	3	10	43.33333	76.66667	43.33333	0	20	46.66667	22.22222	0.210596
5.64	3	0	0	16.66667	5.555556	6.666667	16.66667	0	7.777778	0.161975
5.64	3	0	10	0	3.333333	0	0	0	0	0.058999
7.53	3	0	0	10	3.333333	3.333333	10	0	4.444444	0.106676
3.62	3	0	30	40	23.33333	6.666667	0	0	2.222222	0.320049
5.51	3	40	150	43.33333	77.77778	100	0	3.333333	34.44444	0
6.29	3	0	16.66667	26.66667	14.44444	66.66667	0	0	22.22222	0.230837
5.35	3	10	36.66667	3.333333	16.66667	0	0	6.666667	2.222222	0.146009
8.06	3	6.666667	0	0	2.222222	0	0	0	0	0.052702
5.45	3	0	0	16.66667	5.555556	6.666667	10	0	5.555556	0.224063
5.36	3	0	70	50	40	0	50	0	16.66667	0.117314
7.18	3	0	3.333333	0	1.111111	6.666667	30	0	12.22222	0.020325
2.41	3	0	10	10	6.666667	6.666667	0	3.333333	3.333333	0.394633
6.57	3	3.333333	0	0	1.111111	0	6.666667	3.333333	3.333333	0.076632
4.47	3	0	0	23.33333	7.777778	6.666667	10	0	5.555556	0.131423
6.5	3	0	10	13.33333	7.777778	0	3.333333	3.333333	2.222222	0.238623
7.45	3	0	30	76.66667	35.55556	0	6.666667	16.66667	7.777778	0.240344
5.39	3	0	10	13.33333	7.777778	0	6.666667	26.66667	11.11111	-0.01355
7.64	3	0	16.66667	0	5.555556	33.33333	0	0	11.11111	0.005196
6.36	3	3.333333	10	10	7.777778	0	6.666667	0	2.222222	0.087956
4.73	3	10	3.333333	3.333333	5.555556	0	0	0	0	0.208685

Appendix 1. (continue)

sgr2c	sgr3c	sgr4c
0.193206	0	0.103249
0.416395	0.018298	0.161187
0.663013	0.352086	0.451843
0.058653	0.17369	0.084042
0.023827	0.014215	0.048317
0.046361	0.117606	0.117067
0.216102	0.004863	0.148831
0.285074	0	0.113783
0.019212	0.354074	0.235802
0.827116	0.205827	0.414513
0.308105	0.05362	0.174567
0	-0.03527	0.007908
0.409482	0.158652	0.224937
0.638891	0.170009	0.376316
0.372638	0.19302	0.188553
0.118426	0.310818	0.220027
0.255277	0.037594	0.146293
0.153284	0.020743	0.075576
0.081842	0.055505	0.12047
0.572329	0.877036	0.522226
0.129177	0.161706	0.103736
0.308863	0.214206	0.305901
0.199535	0.015256	0.097141
0.38879	0.083055	0.201089
0.328673	0.056893	0.208063
0.583496	0.279885	0.367908
0.210458	0.100447	0.099118
0.575566	0.004366	0.195043
0.282796	0.047507	0.13942
0.397493	0.341038	0.315739

Appendix 2. Statistical analysis

One Way Analysis of Variance

Normality Test: Failed (P = <0.0001)

Test execution ended by user request, ANOVA on Ranks begun

Friday, May 10, 1996, 17:32:38

Kruskal-Wallis One Way Analysis of Variance on Ranks

Group	N	Missing
dilt1a	28	0
dilt1b	15	0
dilt1c	30	0

Group	Median	25%	75%
dilt1a	3.33	0.00	10.00
dilt1b	3.33	0.00	16.67
dilt1c	0.00	0.00	6.67

H = 2.58 with 2 degrees of freedom. (P = 0.2757)

The differences in the median values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.276)

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test:	Failed	(P = <0.0001)
Equal Variance Test:	Passed	(P = 0.3864)

Group	N	Missing
dilt3a	28	0
dilt3b	15	0
dilt3c	30	0

Group	Mean	Std Dev	SEM
dilt3a	12.14	18.28	3.46
dilt3b	3.56	4.27	1.10
dilt3c	19.00	21.69	3.96

Power of performed test with alpha = 0.0500: 0.5124

The power of the performed test (0.5124) is below the desired power of 0.8000.
You should interpret the negative findings cautiously.

Source of Variance	DF	SS	MS
Between Treatments	2	2435.7	1217.9
Residual	70	22929.6	327.6
Total	72	25365.3	

Source of Variance	F	P
Between Treatments	3.72	0.0292
Residual		
Total		

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = 0.0292).

All Pairwise Multiple Comparison Procedures (Student-Newman-Keuls Method) :

Comparison	Diff of Means	p	q
dilt3c vs dilt3b	15.44	3	3.82
dilt3c vs dilt3a	6.86	2	2.04
dilt3a vs dilt3b	8.59	2	2.10

Comparison	P<0.05
dilt3c vs dilt3b	Yes
dilt3c vs dilt3a	No
dilt3a vs dilt3b	No

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test: Failed (P = <0.0001)

Equal Variance Test: Passed (P = 0.5180)

Group	N	Missing
diwd1a	28	0
diwd1b	15	0
diwd1c	30	0

Group	Mean	Std Dev	SEM
diwd1a	12.9	25.8	4.87
diwd1b	22.7	44.6	11.52
diwd1c	10.2	22.4	4.10

Power of performed test with alpha = 0.0500: 0.0488

The power of the performed test (0.0488) is below the desired power of 0.8000.
You should interpret the negative findings cautiously.

Source of Variance	DF	SS	MS
Between Treatments	2	1588.2	794.1
Residual	70	60374.4	862.5
Total	72	61962.6	

Source of Variance	F	P
Between Treatments	0.921	0.4030
Residual		
Total		

The differences in the mean values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.403).

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test: Failed (P = <0.0001)

Equal Variance Test: Passed (P = 0.9693)

Group	N	Missing
diwd2a	28	0
diwd2b	15	0
diwd2c	30	0

Group	Mean	Std Dev	SEM
diwd2a	6.79	9.92	1.87
diwd2b	2.67	4.02	1.04
diwd2c	7.89	12.39	2.26

Power of performed test with alpha = 0.0500: 0.0980

The power of the performed test (0.0980) is below the desired power of 0.8000.
You should interpret the negative findings cautiously.

Source of Variance	DF	SS	MS
Between Treatments	2	279.7	139.9
Residual	70	7337.0	104.8
Total	72	7616.7	

Source of Variance	F	P
Between Treatments	1.33	0.2699
Residual		
Total		

The differences in the mean values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.270).

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test: Failed (P = <0.0001)

Equal Variance Test: Passed (P = 0.9016)

Group	N	Missing
diwd3a	28	0
diwd3b	15	0
diwd3c	30	0

Group	Mean	Std Dev	SEM
diwd3a	6.07	12.90	2.44
diwd3b	4.44	9.89	2.55
diwd3c	7.00	15.02	2.74

Power of performed test with alpha = 0.0500: 0.0488

The power of the performed test (0.0488) is below the desired power of 0.8000.
You should interpret the negative findings cautiously.

Source of Variance	DF	SS	MS
Between Treatments	2	65.4	32.7
Residual	70	12401.6	177.2
Total	72	12467.0	

Source of Variance	F	P
Between Treatments	0.185	0.8318
Residual		
Total		

The differences in the mean values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.832).

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test: Failed (P = <0.0001)

Equal Variance Test: Passed (P = 0.8539)

Group	N	Missing
diwd4a	28	0
diwd4b	15	0
diwd4c	30	0

Group	Mean	Std Dev	SEM
diwd4a	8.57	9.96	1.88
diwd4b	9.93	15.18	3.92
diwd4c	8.37	9.31	1.70

Power of performed test with alpha = 0.0500: 0.0488

The power of the performed test (0.0488) is below the desired power of 0.8000.
You should interpret the negative findings cautiously.

Source of Variance	DF	SS	MS
Between Treatments	2	25.9	13.0
Residual	70	8415.0	120.2
Total	72	8440.9	

Source of Variance	F	P
Between Treatments	0.108	0.8979
Residual		
Total		

The differences in the mean values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.898).

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test:	Failed	(P = 0.0331)
Equal Variance Test:	Passed	(P = 0.9091)

Group	N	Missing
sgr1a	28	0
sgr1b	15	0
sgr1c	30	0

Group	Mean	Std Dev	SEM
sgr1a	0.1342	0.125	0.0235
sgr1b	0.0976	0.207	0.0536
sgr1c	0.1485	0.111	0.0203

Power of performed test with alpha = 0.0500: 0.0488

The power of the performed test (0.0488) is below the desired power of 0.8000.
You should interpret the negative findings cautiously.

Source of Variance	DF	SS	MS
Between Treatments	2	0.0260	0.0130
Residual	70	1.3791	0.0197
Total	72	1.4051	

Source of Variance	F	P
Between Treatments	0.660	0.5200
Residual		
Total		

The differences in the mean values among the treatment groups are not great enough to exclude the possibility that the difference is due to random sampling variability; there is not a statistically significant difference (P = 0.520).

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test:	Passed	(P = 0.5542)
Equal Variance Test:	Passed	(P = 0.8437)

Group	N	Missing
sgr2a	28	0
sgr2b	15	0
sgr2c	30	0

Group	Mean	Std Dev	SEM
sgr2a	0.2722	0.198	0.0373
sgr2b	0.0147	0.270	0.0696
sgr2c	0.3021	0.215	0.0393

Power of performed test with alpha = 0.0500: 0.9650

Source of Variance	DF	SS	MS
Between Treatments	2	0.901	0.4504
Residual	70	3.413	0.0488
Total	72	4.314	

Source of Variance	F	P
Between Treatments	9.24	0.0003
Residual		
Total		

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = 0.000275).

All Pairwise Multiple Comparison Procedures (Student-Newman-Keuls Method) :

Comparison	Diff of Means	p	q
sgr2c vs sgr2b	0.2874	3	5.820
sgr2c vs sgr2a	0.0299	2	0.729
sgr2a vs sgr2b	0.2575	2	5.153

Comparison	P<0.05
sgr2c vs sgr2b	Yes
sgr2c vs sgr2a	No
sgr2a vs sgr2b	Yes

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test: Failed (P = 0.0031)

Equal Variance Test: Passed (P = 0.0728)

Group	N	Missing
sgr3a	28	0
sgr3b	15	0
sgr3c	30	0

Group	Mean	Std Dev	SEM
sgr3a	0.0341	0.0841	0.0159
sgr3b	0.0329	0.0994	0.0257
sgr3c	0.1462	0.1810	0.0331

Power of performed test with alpha = 0.0500: 0.8170

Source of Variance	DF	SS	MS
Between Treatments	2	0.224	0.1120
Residual	70	1.280	0.0183
Total	72	1.504	

Source of Variance	F	P
Between Treatments	6.13	0.0035
Residual		
Total		

The differences in the mean values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = 0.00354).

All Pairwise Multiple Comparison Procedures (Student-Newman-Keuls Method) :

Comparison	Diff of Means	p	q
sgr3c vs sgr3b	0.11335	3	3.7494
sgr3c vs sgr3a	0.11215	2	4.4642
sgr3a vs sgr3b	0.00120	2	0.0394

Comparison	P<0.05
sgr3c vs sgr3b	Yes
sgr3c vs sgr3a	Yes
sgr3a vs sgr3b	No

Appendix 2. (continue)

One Way Analysis of Variance

Normality Test: Failed (P = 0.0005)

Test execution ended by user request, ANOVA on Ranks begun

Friday, May 10, 1996, 17:58:18

Kruskal-Wallis One Way Analysis of Variance on Ranks

Group	N	Missing
sgr4a	28	0
sgr4b	15	0
sgr4c	30	0

Group	Median	25%	75%
sgr4a	0.1409	0.1014	0.1694
sgr4b	0.0496	0.0191	0.0982
sgr4c	0.1679	0.1037	0.2358

H = 22.5 with 2 degrees of freedom. (P = <0.0001)

The differences in the median values among the treatment groups are greater than would be expected by chance; there is a statistically significant difference (P = 0.0000129)

To isolate the group or groups that differ from the others use a multiple comparison procedure.

All Pairwise Multiple Comparison Procedures (Dunn's Method) :

Comparison	Diff of Ranks	p	Q
sgr4c vs sgr4b	31.40	3	4.68
sgr4c vs sgr4a	6.47	2	1.16
sgr4a vs sgr4b	24.93	2	3.67

Comparison	P<0.05
sgr4c vs sgr4b	Yes
sgr4c vs sgr4a	No
sgr4a vs sgr4b	Yes

Appendix 2. (continue)

```
>ca code                                                                  Shell.
>covariate lnw0
>anova sgr4
>estimate
LEVELS ENCOUNTERED DURING PROCESSING ARE:
CODE
      1.000          2.000          3.000
```

```
DEP VAR:    SGR4      N:      73   MULTIPLE R: 0.712   SQUARED MULTIPLE R: 0.507
```

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
CODE	0.278	2	0.139	22.360	0.000
LNW0	0.214	1	0.214	34.411	0.000
ERROR	0.429	69	0.006		

```
Press ENTER <-' or RETURN

>covariate lnw0                                                           Shell.
>anova sgr4
>estimate
LEVELS ENCOUNTERED DURING PROCESSING ARE:
CODE
      2.000          3.000
```

```
DEP VAR:    SGR4      N:      45   MULTIPLE R: 0.735   SQUARED MULTIPLE R: 0.541
```

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
CODE	0.277	1	0.277	35.176	0.000
LNW0	0.163	1	0.163	20.697	0.000
ERROR	0.331	42	0.008		

Appendix 2. (continue)

```
>covariate lnw0                                                          Shell.
>anova sgr4
>estimate
LEVELS ENCOUNTERED DURING PROCESSING ARE:
CODE
        1.000        2.000
```

DEP VAR: SGR4 N: 43 MULTIPLE R: 0.735 SQUARED MULTIPLE R: 0.540

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
CODE	0.094	1	0.094	29.564	0.000
LNWO	0.055	1	0.055	17.256	0.000
ERROR	0.128	40	0.003		

```
LEVELS ENCOUNTERED DURING PROCESSING ARE:
CODE
        1.000        3.000
```

Press ENTER <-' or RETURN

DEP VAR: SGR4 N: 58 MULTIPLE R: 0.639 SQUARED MULTIPLE

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
CODE	0.072	1	0.072	10.385	0.002
LNWO	0.225	1	0.225	32.343	0.000
ERROR	0.383	55	0.007		

BIOGRAPHY

Mr. Monthon Kaenmanee was born on May, 17, 1967 in Bangkok. He grauated with the Bachelor Degree in Aquatic Science from Department of Aquatic sciene, Fuculty of Science, Burapha University (Sri Nakarinwirote University, Bangsaen Campus formally) Chonburi Province. During undergraduated study, he joined with Coral Reef Ecology Study Team (CREST), a subproject in the ASEAN-Australia Coastal Living Resources to study coral reef ecology in eastern part of Thailand.

During his study in Department of Marine Science, Faculty of Science, Chulalonglorn University. He recieved a teaching assistant scholarship from Faculty of Science to worked as teacher assistant in Natural Science and Scince Problem Solving courses for two years.