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A REPORTED CASE OF MALPIGMENTATION IN THE SPANGLED EMPEROR *LETHRINUS NEBULOSUS* (OSTEICHTHYES: LETHRINIDAE) COLLECTED FROM THE ARABIAN SEA COASTS OF OMAN

RIASSUNTO

I primi studi sulla descrizione delle anomalie dei pesci risalgono al sedicesimo secolo, con un crescente interesse per la materia, come dimostrato da numerosi e recenti lavori, che descrivono la presenza di anomalie sia in ambiente naturale, che in acquacoltura. Ad oggi sono riconosciuti tre tipi di anomalie: ambicolorazione, albinismo e xantocroismo.
In questo lavoro si analizza e descrive, da un punto di vista morfologico, il primo ritrovamento di un esemplare parzialmente melanizzato di *Lethrinus nebulosus*, una specie non migratrice che si distribuisce dal Mar Rosso fino al Giappone e l'arcipelago delle isole di Samoa.

SUMMARY

A case of malpigmentation is reported in the spangled emperor *Lethrinus nebulosus* collected in the Arabian Sea coasts of Oman. Difference in degrees of colour aberration, pattern and abnormal patches were observed on both sides ofthe body of the abnormal specimen. Genetic and epigenetic causes may be implicated in these anomalies

INTRODUCTION

Several investigators since the 16th century have become involved in studies dealing with fish anomalies. A great number of publications have documented the appearance of various cases of abnormalities in both the wild (LEMLY, 2002; AL-JUFAILY *et al*., 2005; JAWAD, 2005; BOGLIONE *et al*., 2006; JAWAD

and HOSIE, 2007; JAWAD and ÖKTONER, 2007; AL-MAMRY *et al*., 2010) and in aquaculture (JAWAD and KOUSHA, 2011).

Colour abnormalities in fishes are of three types: ambicolouration, albinism, and xanthochroism. Ambicolouration is an excess pigmentation on the blind side of flatfishes. Xanthochroism is a rare condition in which the melanophores are missing, though other pigment is present, typically producing a golden-orange colour (COLMAN, 1972). And melanism, as reported for *Cephalopholis fulva* (LINNAEUS, 1758) by SIMON *et al*. (2009; 2011), is the presence of an excessive amount of pigment in tissues and skin resulting on a darkness patches or areas on fish body. Most reports of these colour abnormalities have been recorded for various flatfish species (e.g., DIAZ DE ASTARLOA, 1995; BOLKER and HILL, 2000; CHAVES *et al*., 2002; PURCHASE *et al*., 2002; MACIEIRA *et al*., 2006). Reports of malpigmentation in other fish groups are scarce (HERNANDEZ and SINOVCIC, 1987; JAWAD *et al*., 2007), being rare for wild populations of teleosts (ARCHEY, 1924; NORMAN, 1934; COLMAN, 1972).

Lethrinus nebulosus is a non-migratory species that inhabits marine, brackish, reef-associated areas down to 75 m and sometimes occurs in seagrass beds and mangroves sloughs (RANDALL, 1995; FROESE and PAULY, 2010). It is distributed in the Indo-West Pacific region from the Red Sea through the seas around the Arabian Peninsula and East Africa to southern Japan and Samoa (FROESE and PAULY, 2010). It has pale yellowish or bronze colour body and lighter colour ventral side with dark brown edges on scales, shading to white ventrally. Scales have light blue spots on upper half of body; those on head are bronze, short, bright blue streaks (some radiating from eye) and spots. Irregular dark indistinct bars are present on sides and squarish black blotch occurs above pectoral fin. Fins are whitish or yellowish, pelvic dusky, dorsal fin with reddish edge (RANDALL, 1995; FROESE and PAULY, 2010). The present study describes the first recorded occurrence of partial melanism in the spangled emperor *Lethrinus nebulosus*.

MATERIAL AND METHODS

One specimen of *L. nebulosus* (age 1^{+}, TL 370 mm, SL 245 mm) showing colour abnormality was captured on 16 February 2012 in the waters of Salalah City from the Arabian Sea coasts of Oman. The specimen was collected by local fishermen using deep gill net. One specimen with normal colouration (TL 360 mm, SL 335 mm) was obtained from the same fishing lot at the same fishing locality to make comparison. The specimens are deposited in the fish collection of the Marine Science and Fisheries Centre, Ministry of Agriculture and Fisheries Wealth, Muscat, Oman, under catalogue numbers OMMSFC 1094.

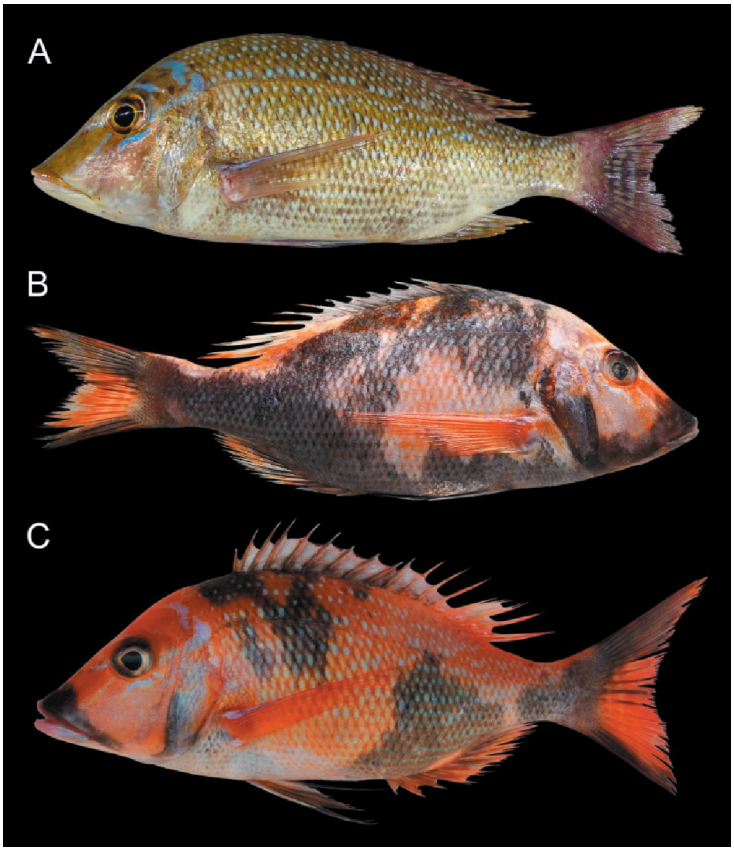

Fig.1 - *Lethrinus nebulosus,* OMMSFC 1094, 370 mm TL, collected in the waters of Salalah City on the Arabian Sea coasts of Oman, 16 II 2012, by hand–line, a, normal colouration (360 mm TL); b, abnormal colouration right side; c, abnormal colouration left side.

The specimen with abnormal colouration is compared with a normal specimen (Figure 1a, b, c). The right side of the specimen with abnormal colouration (Figure 1b) exhibits the natural normal colouration in the following areas: as a broad band extending backward from the snout to the corner of the mouth and upward to almost the top of the operculum; big patch with two parts, the dorsal part extending from the anterior base of the dorsal fin backward reaching the caudal peduncle and covers the 2/3 of the upper part of the dorsal lobe of the caudal fin, the ventral part of the normal colouration patch extends backward from just anterior of the pectoral fin to the lower lobe of caudal fin where it covers 1/3 of its surface. It also covers the whole pelvic fins and some stripes with normal colouration on the anal fin.

RESULTS

The abnormal orange colouration covers the whole dorsal and both sides of head, nape and mid part of the body side. Another three patches of different sizes lies diagonally across the side of body from the anterior end of the dorsal fin base and toward the posterior end of body. The orange colour batch covers the posterior part of the dorsal fin, the whole pectoral fin, the lower 1/3 and upper 2/3 of the dorsal and lower lobes of caudal fin respectively, and most of the anal fin.

On the left side of the abnormal specimen (Figure 1c), the natural colouration of the species is restricted in the following areas: dorsal side of snout and sides of mouth; operculum; nape; anterior base of dorsal fin and extending on sides passing the lateral line; anterior base of anal fin and extending dorsally on body sides passing the lateral line; ventral side of caudal peduncle and extending backward to the base of caudal fin and covers dorsal 2/3 and lower 1/3 of the dorsal and ventral lobes of the caudal fin respectively.

The big patch of abnormal orange colouration covers the whole head and preoperculum, most of the anterior part of the body side and extending backward to cover the dorsal side of the caudal peduncle, the lower 1/3, the upper 2/3 of the dorsal and lower lobes of the caudal fin. The orange colouration covers the whole pectoral fin, anal fin and posterior part of the dorsal fin. The ventral fins have partial orange colouration. Reminiscence of the normal bright blue streaks that radiate from and around the eye is present.

DISCUSSION

The abnormal pigmentation in fishes is due to several factors. These factors depends on the type of pigmentation disorder. Studies on this issue concentrated on the ambicolouration in flat fishes. Such pigmentation disorder in flat fish groups might be as results of wounds or bites (MOE, 1963; COLMAN, 1972); might have genetic bases (HERNANDEZ and SINOVCIC, 1987); might be due to local tissue environment (SEIKAI, 1992; SEIKAI and MATSUMOTO, 1994); might be related to diet deficiency (KANAZAWA, 1993). Increasing water temperature during the larval development might have direct effect on development of skin pigmentation (ARITAKI and SEIKAI, 2004); and disorder in the level of the thyroid hormone might be behind this abnormality (OKADA, 2005).

On the other hand, causes of abnormal pigmentation and malpigmentation in Perciformes might be due to the cellular interaction that interferes with the regulation of the pigment cell arrangements on the fish body (LUEKEN *et al*., 1973). Scuticociliatosis and other ciliatosis are considered the

cause of depigmentation in sea bass (FAO, 2005-2012). Parasitic infestations by *Cryptobia* sp, *Scyphidia* sp. *Vorticella* sp. *Dactylogyrus* sp. *Neobenedenia girellae*, *Gnathia* sp. cause depigmentation in the grouper *Epinephelus coioides* (FAO, 2010-2012). LOVELL (1973) correlated the level of vitamin C in the food of the caged fish species with the depigmentation. On the other hand, ELERAKY *et al*. (1994) suggested that deficiency in vitamin E might cause depigmentation among other abnormalities. The deficiency in fat level in the food content might lead to depigmentation in Chinook salmon (FAO, 1980). Except for the deficiency in vitamin C and E, the other causative factors mentioned above might be behind the depigmentation case described in the present study. Nothing is known of the specific diet or environmental stressors affecting the sampled specimen of *L. nebulosus*. Clearly, more detailed investigation is required to determine the cause of depigmentation observed here, but the present record is nevertheless significant owing to the rarity of the phenomenon in wild populations.

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REFERENCES

AL-JUFAILY S. M., JAWAD L.A., AL-AZRI A.N., 2005 – Wild Siamese-twins in black tip sea catfish, *Arius dussumieri* (Valencienes, 1840) from Gulf of Oman. Anales de Biología 27: 223-225.

AL-MAMRY J.M., JAWAD L.A., AL-RASADY I.H., AL-HABSI S.H., 2010 – First record of dorsal and anal fin deformities in silver pomfrets, *Pampus argenteus* (Stromateidae, Actinopterygii). Anales de Biología 32: 73-77.

ARCHEY G., 1924 – An abnormality coloured specimen of the yellow belly (*Rhombosolea millari* Waite). New Zealand Journal of Science and Technology 6: 342.

AEITAKI M., SEIKAI T., 2004 – Temperature effects on early development and occurrence of metamorphosis-related morphological abnormalities in hatchery-reared brown sole Pseudopleuronectes herzensteini. Aquaculture 240: 517-530.

BOGLIONE C., MARINO G., BERTOLINI B., ROSSI A., FERRARI F., CATAUDELLA S., 1993 – Larval and postlarval monitoring in sea bass: morphological approach to evaluate fin fish seed quality. In: Production, Environment and Quality. Bordeaux Aquaculture '92. G. Bamabe and P. Kestemont (Eds.). European Aquaculture Society. Special Publication No. 18, Ghent, Belgium.

BOLKER J.A., HILL C.R., 2000 – Pigmentation development in hatchery-reared flatfishes. Journal of Fish Biology 56: 1029-1052.

CHAVES P.T., GOMES I.D., FERREIRA E.A., AGUIAR K.D., SIRIGATE P., 2002 – Ambicolouration in the flatfish *Symphurus tessellates* (Cynoglossidae) from southern Brazil. Acta biologica Paranaense, Curitiba 31: 59-63.

COLMAN J. A., 1972 – Abnormal pigmentation in the sand flounder. New Zealand Journal of Marine and freshwater Research 6: 208-213.

DIAZ DE ASTARLOA J.M., 1995 – Ambicolouration in two flounders, Paralichthys patagonicus and Xystreuris rasile. Journal of Fish Biology 47: 168-170.

ELERAKY W., SALEH G., GROPP J.M., 1994 – Studies on the vitamin E requirement of *Tilapia nilotica* (*Orechromis niloticus*)- Effects in health and growth. EIFAC SESSION 7/VITAMINS/P/7. In: GROPP J.M., TACON A.G.J. (eds.) Report of the EIFAC Workshop on Methodology for Determination of Nutrient Requirements in Fish, Eichenau, Germany, 29 June-1 July 1993. EIFAC Occasional Paper. No. 29. Rome, FAO. 1994: 92.

FAO 1980 – Aquaculture development and coordination programme. Fish feed technology. Lectures presented at the FAO/UNDP Training Course in Fish Feed Technology, Seattle,Washington, 9 October - 15 December 1978. ADCP/REP/80/11. (http://www.fao.org/docrep/X5738E/X5738E00.htm).

FAO 2005-2012 – Cultured Aquatic Species Information Programme. Dicentrarchus labrax. Cultured Aquatic Species Information Programme. Text by Bagni, M. In: FAO Fisheries and Aquaculture Department [online]. Rome. Updated 18 February 2005. (http://www.fao.org/fishery/culturedspecies/Dicentrarchus_labrax/en).

FAO 2010-2012 – Cultured Aquatic Species Information Programme. Epinephelus coioides. Cultured Aquatic Species Information Programme.Text by Shams, A. J. In: FAO Fisheries and Aquaculture Department[online]. Rome. Updated 2010. [Cited 11 July 2012]. (http://www.fao.org/fishery/culturedspecies/Epinephelus_coioides/en).

FROESE R., PAULY D., (Editors) 2010 – FishBase. World Wide Web electronic publication. www.fishbase.org, version (02/2012).

HERNANDEZ V.A., SINOVCIC G., 1987 – A note on a partial albino specimen of the species *Liza* (*Liza*) *ramada* (Risso, 1826) caught from the middle Adriatic. Institut Za Oceanografiji I Ribarstvo - Split 68: 1-4.

JAWAD L.A., 2005 – Scale deformities in Nile tilapia, *Oreochromis niloticus* (Actinopterygii: Cichlidae) from Sudan. Acta Ichthyologica et Piscatoria 35: 61-63.

JAWAD L.A., HOSIE A., 2007 – on the record of pug-headedness in snapper, *Pagrus auratus* (Forster, 1801)(Perciformes, Sparidae) from New Zealand. Acta Adriatica 48: 205-210.

JAWAD L.A., KOUSHA A., 2011 – A case of vertebral coalescence and lateral line deformity in *Hypophthalamichthys nobilis* (Richardson, 1844) obtained from aquaculture activity in Iran. Bolletino Museo regionale de Science naturale Torino 28: 29-36.

JAWAD L.A., ÖKTONER A., 2007 – Incidence of lordosis in the freshwater mullet *Liza abu* (Heckel, 1843) collected from Ataturk Dam Lake, turkey. Anales de Biologia 29: 105-113.

JAWAD L. A., AHYONG S.T., HOSIE A. 2007 – Malformation of the lateral line and ambicolouration in the triplefin *Grahamina capito* (Jenyns, 1842) (Pisces: Tripterygiidae) from New Zealand. Annale Museo civico Storia natural de Ferrara 9/10: 89-97.

KANAZAWA A., 1993 – Nutritional mechanisms involved in the occurrence of abnormal pigmentation in hatchery-reared flatfish. *Journal of the World Aquaculture Society* 24: 162-166.

LEMLY A.D., 1993 – Teratogenic effects of selenium in natural populations of freshwater fish. Ecotoxicol. Environmental Safety 26: 181-204.

LOVELL R.T., 1973 – Essentiality of vitamin C in feeds for intensively fed caged catfish. *Journal of Nutrition* 103: 134-138.

LUEKEN W., SCHMIDT E. R., LEPPER K., 1973 – Regulation of the pigment cell arrangements in species and interspecies hybrids of *Xiphophorus* (Pisces, Poeciliidae) by cellular interactions on the fish body. In: Genetics and Mutagenesis of Fish. (J. H. Schröder ed.). 139-160, Springer-Verlag Berlin-Heidelberg-New York.

MACIEIRA R.M., JOYEUX J.C., PEREIRA CHAGAS L., 2006 – Ambicolouration and morphological aberration in the sole *Achirus declivis* (Pleuronectiformes: Achiridae) and two other cases of colour abnormalities in a chrid soles from south eastern Brazil. Neotropical Ichthyology 4: 287-290.

MOE M., 1963 – Partial albinism in a xanthic specimen of *Epinephelus morio* (Valenciennes) from the Gulf of Mexico. Copeia 1963: 703.

NORMAN J.R., 1934 – A systematic monograph of the flatfishes (Heterosomata), Vol. 1. Lsettodidae, Bothidae, Pleuronectidae. British Museum, London, 459.

OKADA N., 2005 – Development of tissues involved in eye migration and role of thyroid hormone in metamorphosing Japanese flounder (*Paralichthys olivaceus*). Scientific Reports of Hokkaido Fisheries Experimental Station 68: 1-43.

PURCHASE C.F., BOYCE D.L., BROWN J.A., 2002 – Occurrence of hypomelanization in cultured yellowtail flounder *Limanda ferruginea*. Aquaculture Research 33: 1191-1193.

RANDALL J.E., 1995 – *Coastal fishes of Oman*. Bathurst, Australia: Crawford House Publishing Pty Ltd, 439.

SEIKAI T., 1992 – Process of pigment cell differentiation in skin on the left and right sides of the Japanese flounder, *Paralichthys olivaceus*, during metamorphosis. Japanese Journal of Ichthyology 39: 85-92.

SEIKAI T., MATSUMOTO J., 1994 – Mechanism of pseudoalbinism in flatfish: an association between pigment cell and skin differentiation. Journal of the World Aquaculture Society 25: 78-85.

SIMON T., JOYEUX J.C., MACIEIRA R.M., 2009 – First record of partial melanism in the coney *Cephalopholis fulva* (Perciformes: Epinephelidae). Brazilian Journal of Oceanography 57: 145-147.

SIMON T., JOYEUX J.C., GASPARINI J.L., 2011 – Are melanic coney *Cephalopholis fulva* getting common? Marine Biodiversity Records 4: e 51.