COMPARATIVE SERUM ANALYSIS OF FREE-RANGING AND MANAGED GREEN MORAY EELS (*GYMNOTHORAX FUNEBRIS*) AND RELATIONSHIP TO DIET FED TO EELS UNDER HUMAN CARE

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Abstract

Green moray eels (*Gymnothorax funebris*) under human care are reported to have elevated plasma cholesterol and triglyceride concentrations with associated development of lipid keratopathy (Clode et al. 2012). Nevertheless, serum trace mineral and vitamin analyses have not been assessed, and the complete nutrient content (cholesterol, vitamins, and minerals) of managed eel diets has also not been reported (Clode et al. 2012; Greenwell & Vainisi 1994). Serum biochemical, trace mineral, and vitamin A and E analyses were performed for three green moray eels managed by Disney's The Seas® and 13 recently captured, fasted, free-ranging green morays. Complete nutrient analysis was performed for managed eel diet items and metabolizable energy was calculated (Smith 1980). Serum cholesterol, calcium, phosphorous, iron, and vitamin E concentrations were greater ($p < 0.05$) in managed versus free-ranging eels. Serum cholesterol and vitamin E positively correlated to body weight ($p < 0.01$). Both eel populations had greater concentrations of serum iodine and lower concentrations of vitamin A when compared with other carnivorous aquatic species. Atlantic herring (*Clupea harengus*) had the greatest metabolizable energy, crude fat, and iron content but the lowest cholesterol content compared to capelin (*Mallotus villosus*) and Ilex squid (*Ilex illecebrosus*). Squid had the lowest metabolizable energy and crude fat content but greatest cholesterol content. The vitamin supplement (Mazuri Vita-Zu 5TLC) provides 12g vitamin E/100g 'as fed' to the managed eel diet. The diet likely contributes to the development of hypercholesterolemia and influences other serum indicators of health in eels under human care. Furthermore, the crude fat content of diet items cannot be used to predict cholesterol concentration.

Acknowledgements

Literature cited

Clode AB, Harms C, Fatzinger MH, Young F, Colitz C, and Wert D (2012) Identification and management of ocular lipid deposition in association with hyperlipidaemia in captive moray eels, *Gymnothorax funebris* Ranzani, *Gymnothorax morina* (Cuvier) and *Muraena retifera* Goode and Bean. *J Fish Dis* 35:683-693.

Greenwell MG and Vainisi SJ (1994) Surgical management of lipid keratopathy in green moray eels (*Gymnothorax funebris*). *Proceedings of the American Association of Zoo Veterinarian Annual Conference*. Pittsburg, PA. pp. 179-181.

Smith RR (1980) Chapter 2: Nutrition Bioenergetics in Fish. In: Fish Feed Technology, FAO of United Nations. http://www.fao.org/docrep/x5738e/x5738e03.htm. Accessed May 5, 2017.