

# Citations

*The following references include papers organized into different sections and ranging from peer-reviewed publications to reports and theses. For ease of reference, some publications may occur in more than one category.*

*SECTIONS: General references, theoretical studies, studies by species or family (serranids, lutjanids, labrids, scarids, acanthurids, others), site-specific studies, connectivity and spawning aggregations, monitoring, management and conservation, traditional knowledge, live reef fish trade issues, economic analyses and spawning aggregations, reports, books, newsletters and theses.*

## General References

- Adams S., B.D. Mapstone, G.R. Russ and C.R. Davies. 2000. Geographic variation in the sex ratio, sex specific size, and age structure of *Plectropomus leopardus* (Serranidae) between reefs open and closed to fishing on the Great Barrier Reef. *Can J Fish Aquat Sci* 57:1448–1458.
- Aguilar-Perera, A. 2006. Disappearance of a Nassau grouper spawning aggregation off the southern Mexican Caribbean coast. *Marine Ecology Progress Series* 327: 289-296.
- Burton, M. L., K.J. Brennan, R. C. Munoz and R. O. Jr. Parker. 2005. Preliminary evidence of increased spawning aggregations of mutton snapper (*Lutjanus analis*) at Riley's Hump two years after establishment of the Tortugas South Ecological Reserve. *Fishery Bulletin* 103:404-410.
- Claro, R, and K.C. Lindeman. 2003. Spawning aggregation sites of snapper and grouper species (Lutjanidae and Serranidae) on the insular shelf of Cuba. *Gulf and Caribbean Research* 14(2): 91-106.
- Colin, P.L. 1996. Longevity of some coral reef fish spawning aggregations. *Copeia* 1996: 189-191.
- Domeier, M.L. and P.L. Colin. 1997. Tropical reef fish spawning aggregations: defined and reviewed. *Bull. Mar. Sci.* 60: 698-726.
- Gobert, B. 2005. Early stages of snapper–grouper exploitation in the Caribbean (Bay Islands, Honduras). *Fisheries Research* 73(1-2): 159-169.
- Graham, R. T. and D.W. Castellanos. 2005. Courtship and spawning behaviors of carangid species in Belize. *Fishery Bulletin* 103: 426-432.

- Heyman, W. D., B. Kjerfve, R.T. Graham, K.L. Rhodes and L. Garbutt. 2005. Spawning aggregations of Cubera snapper, *Lutjanus cyanopterus* (Cuvier), on the Belize Barrier reef over a six-year period. *Journal of Fish Biology* 67(1):83-101.
- Johannes, R.E. 1978. Reproductive strategies of coastal marine fishes in the tropics. *Environmental Biology of Fishes* 3:65-84.
- Johannes, R. E. 1981. Words of the lagoon: fishing and marine lore in the Palau District of Micronesia. University of California Press, Berkeley, CA, 245 pp.
- Kiflawi, M., A.I. Mazeroll, D. Goulet. 1998. Does mass spawning enhance fertilization in coral reef fish? A case study of the brown surgeonfish. *Mar. Ecol. Prog. Ser.* 172: 107-114.
- Korringa, P. 1947. Relations between the moon and periodicity in the breeding of marine animals. *Ecol. Monogr.* 17:349-381.
- Luckhurst, B.E. 1996. Trends in commercial fishery landings of groupers and snappers in Bermuda from 1975 to 1992 and associated fishery management issues. In: Arreguin-Sanchez F, Munro JL, Balgos, MC, Pauly D (eds), *Biology, fisheries and culture of tropical groupers and snappers*. ICLARM, pp 286–297.
- Luckhurst B.E. 2003. Development of a Caribbean Regional Conservation Strategy for Reef Fish Spawning Aggregations. *Gulf and Caribbean Fisheries Institute* 54: 668-679.
- Munro, J.L. and L. Blok. 2003. The status of stocks of groupers and hinds in the Northeastern Caribbean. *Proc 56<sup>th</sup> Gulf Caribb Fish Inst* 56:283–294.
- Nemeth, R. S. 2005. Population characteristics of a recovering US Virgin Islands red hind spawning aggregation following protection. *Marine Ecology Progress Series* 286:81-97.
- Pears, R., J. H. Choat, B. D. Mapstone and G. A. Begg. 2006 Demography of a large grouper, *Epinephelus fuscoguttatus*, from Australia's Great Barrier Reef: implications for fishery management. *Marine Ecology Progress Series* 307: 259-272.
- Pet, J. S., P.M. Mous, A.H., Muljadi, Y.J. Sadovy and L. Squire. 2005. Aggregations of *Plectropomus areolatus* and *Epinephelus fuscoguttatus* (groupers, Serranidae) in the Komodo National Park, Indonesia: monitoring and implications for management. *Environmental Biology of Fishes* 74:209-218.

- Rhodes, K. L., E. Joseph, D. Mathias, S. Malakai, W. Kostka and D. David. 2005. Reef fish spawning aggregation monitoring in Pohnpei, Federated States of Micronesia, in response to local management needs. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:20-24.
- Robertson, D.R. 1991, 'The role of adult biology in the timing of spawning of tropical reef fishes'. Pages 356-386 in P.F. Sale (ed.). The ecology of fishes on coral reefs. Academic Press, San Diego.
- Robinson, J., M. Isidore, M. A. Marguerite, M C. Ohman, and R. J. Payet. 2004. Spatial and temporal distribution of reef fish spawning aggregations in the Seychelles - an interview-based survey of artisanal fishers. Western Indian Ocean Journal of Marine Science 3(1):63-69.
- Russell, M. 2003. Reducing the impacts of fishing and tourism on fish spawning aggregations in the Great Barrier Reef Marine Park. Gulf and Caribbean Fisheries Institute 54: 681-688.
- Sadovy, Y.J. 1996. Reproduction of reef fishery species. Pages 15-60. In: N.V.C. Polunin and C.M. Roberts (eds). Reef fisheries, Chapman and Hall, London.
- Sadovy, Y.J. in press. The vulnerability of reef fishes to exploitation. Fish. Sci. 68 (Supplement).
- Sadovy, Y.J. and M. L. Domeier 2005. Are aggregation-fisheries sustainable: reef fish fisheries as a case study. Coral Reefs 24 (2): 254–262.
- Sala et al. 2004. Fishing down coastal food webs in the Gulf of California. Fisheries. 29(3):19-25.
- Sala, E., O. Aburto-Oropeza, G. Paredes and G.Thompson. 2003. Spawning aggregations and reproductive behaviour of reef fishes in the Gulf of California. Bull. Mar. Sci. 72:103—121.
- Sancho, G. 2000. Predatory behaviors of *Caranx melampygus* (Carangidae) feeding on spawning reef fishes: a novel ambushing strategy. Bull. Mar. Sci. 66: 487-496.
- Sedberry, G. R., O. Pashuk, D.M., Wyanski, J.A. Stephen and P. Weinbach. 2006. Spawning Locations for Atlantic Reef Fishes off the Southeastern U.S. 57th Gulf and Caribbean Fisheries Institute: 463-514.
- Semmens B. X., K. E. Luke, P. G. Bush, C. Pattengill-Semmens, B. Johnson, C. McCoy and S. Heppell. 2006. Investigating the reproductive

migration and spatial ecology of Nassau grouper (*Epinephelus striatus*) on Little Cayman Island using acoustic tags – an overview  
[http://cars.er.usgs.gov/posters/Coastal\\_Ecology/Grouper\\_Telemetry/grouper\\_telemetry.html](http://cars.er.usgs.gov/posters/Coastal_Ecology/Grouper_Telemetry/grouper_telemetry.html)

Shapiro, D.Y. 1987. Reproduction in groupers: Pages 295-328 in: J.J. Polovina and S. Ralston (eds), Tropical Snappers and groupers: biology and fisheries management. Westview Press, Boulder, Colorado.

Shapiro, D. Y., D. A. Hensley and R. S. Appledorn. 1988. Pelagic spawning and egg transport in coral-reef fishes: a skeptical overview. *Env. Biol. Fish.* 22:3-14.

Thresher, R. E. 1984. Reproduction in reef fishes. T.F.H. Publications, Neptune City, N.J. pp.399.

Ward T.M., J. Staunton-Smith and I.A. Halliday. 2003. Spawning patterns of four species of predominantly temperate pelagic fishes in the sub-tropical waters of southern Queensland. *Estuarine Coastal and Shelf Science* 56(5-6):1125-1140.

Whaylen, L., C.V. Pattengill-Semmens, B.X. Semmens, P.G. Bush and M.R. Boardman. 2004. Observations of a Nassau grouper, *Epinephelus striatus*, spawning aggregation site in Little Cayman, Cayman Islands, including multi-species spawning information. *Environmental Biology of Fishes* 70: 305-313.

### **Theoretical Studies Related to Spawning Aggregations**

Alonzo, S. H. and M. Mangel. 2004. The effects of size-selective fisheries on the stock dynamics of and sperm limitation in sex-changing fish. *Fishery Bulletin* 102(1):1-13.

Aronov, A. and M. Goren. 2003. Variation in aggregation behavior and anatomy resulting from differences in degree of sperm competition in groupers (*Epinephelinae*, *Serranidae*). *Israel Journal of Zoology* 49(1): 72.

Bekkevold, D. 2006. Male size composition affects male reproductive variance in Atlantic cod *Gadus morhua* L. spawning aggregations. *Journal of Fish Biology* 69:945-950.

Claydon, J. 2004. Spawning Aggregations of Coral Reef Fishes: Characteristics, Hypotheses, Threats and Management. *Oceanography and Marine Biology: An Annual Review* 42: 265–302.

- Cowen R.K., R. Claro and K.C. Lindeman. 2005. Larval transport pathways from Cuban snapper (Lutjanidae) spawning aggregations based on biophysical modeling. *Mar Ecol Prog Ser* 296:93-106.
- Graham, R. T., and D. W. Castellanos. 2005. Courtship and spawning behaviors of carangid species in Belize. *Fishery Bulletin* 103(2):426-432.
- Hunter, J. R. and B.J. Macewicz. 1985. Measurement of spawning frequency in multiple spawning fishes. In *An Egg Production Method for Estimating Spawning Biomass of Pelagic Fish: Application to the Northern Anchovy, Engraulis mordax* (Lasker, R.,ed.), pp. 79–94. NOAA Technical Report NMFS 36.
- Levitan, D.R. and C. Petersen. 1995. Sperm limitation in the sea. *Trends Ecol. Evol.* 6: 228-231.
- Lowerre'Barbieri, S. K., Vose, F. E. and Whittington, J A. 2003. Catch-and-release fishing on spawning aggregation of common snook: does it affect reproductive output? *American Fisheries Society Transactions* 132(5): 940-952.
- Marconato, A., D.Y. Shapiro, C.W. Petersen, R.R. Warner and T. Yoshikawa. 1997. Methodological analysis of fertilization rate in the bluehead wrasse *Thalassoma bifasciatum*: pair versus group spawning. *Mar. Ecol. Prog. Ser.* 161: 61-70.
- Petersen, C.W., R.R. Warner, S. Cohen, H.C. Hess and A.T. Sewell. 1992. Variable pelagic fertilization success: implications for mate choice and spatial patterns of mating. *Ecology* 73: 391-401.
- Rand, P., C. Taylor, D. Eggleston. 2005. A video method for quantifying size distribution, density and three dimensional spatial structure of reef fish spawning aggregations. *Proc Gulf Caribb Fish Inst* 56:429–430.
- Reaka, M.L. 1976. Lunar and tidal periodicity of molting and reproduction in stomatopod crustacea: a selfish herd hypothesis. *Biol. Bull.* 150: 468-490.
- Rowe S. and J.A. Hutchings. 2003. Mating systems and the conservation of commercially exploited marine fish. *Trends Ecol Evol* 18:567–572.
- Sala et al. 2004 Fishing down coastal food webs in the Gulf of California. *Fisheries.* 29(3):19-25.
- Shapiro, D.Y. and L.A. Giraldeau. 1996. Mating tactics in external fertilizers when sperm is limited. *Behav. Ecol.* 7: 19-23.

- Smith, P.J., R.I.C.C. Francis and M. McVeagh. 1991. Loss of genetic diversity due to fishing pressure. *Fish. Res.* 10: 309-316.
- Taborsky, M. 1998. Sperm competition in fish: 'bourgeois' males and parasitic spawning. *Trends in Ecology and Evolution* 13, 222–227.
- Trippel E.A., O.S. Kjesbu and P. Solemdal. 1997. Effects of age and size structure on reproductive output in marine fishes. In: Chambers CR, Trippel EA (eds) *Early life history and recruitment in fish populations*. Chapman & Hall, New York, pp 31–62.
- Warner, R. R. 1988. Traditionality of mating-site preference in a coral reef fish. *Nature* 335: 719-721.
- Warner, R. R. 1990. Resource assessment versus tradition in mating-site determination. *Am. Nat.* 135: 205-217.
- Warner, R.R., D.Y. Shapiro, A. Marconato and C.W. Petersen. 1995. Sexual conflict: males with highest mating success convey the lowest fertilization benefits to females. *Proc. R. Soc Lond. B* 262: 135-139.
- Whiteman, E.A., C.A. Jennings, R.S. Nemeth. 2005. Sex structure and potential female fecundity in a red hind (*Epinephelus guttatus*) spawning aggregation: applying ultrasonic imaging. *J Fish Biol* 66:983–995.
- Zeller, D.C. 1999. Ultrasonic telemetry: its application to coral reef fisheries research. *Fish Bull* 97:1058–1065.

## **Studies of Specific Species**

### **Serranids**

- Adams S., B.D. Mapstone, G.R. Russ and C.R. Davies. 2000. Geographic variation in the sex ratio, sex specific size, and age structure of *Plectropomus leopardus* (Serranidae) between reefs open and closed to fishing on the Great Barrier Reef. *Can J Fish Aquat Sci* 57:1448–1458.
- Aguilar-Perera, A. 1994. Preliminary observations of the spawning aggregation of Nassau grouper, *Epinephelus striatus*, at Mahahual, Quintana Roo, Mexico. *Proc. 43rd Gulf Carib. Fish. Inst.*: 112-122.
- Aguilar-Perera, A. 2006. Disappearance of a Nassau grouper spawning aggregation off the southern Mexican Caribbean coast. *Marine Ecology Progress Series* 327: 289-296.

- Aguilar-Perera, A. and W. Aguilar-Davila. 1996. A spawning aggregation of Nassau grouper *Epinephelus striatus* (Pisces: Serranidae) in the Mexican Caribbean. *Env. Biol. Fish.* 45: 351-361.
- Andrade, A.B., L.F. Machado, M.H. Silva and J.P. Barreiros. 2003. Reproductive biology of the dusky grouper (*Epinephelus marginatus*, Lowe, 1834) Perciformes: Serranidae, Epinephelinae) in Santa Catarina, Brazil. *TECPAR* vol. 46(3).
- Aronov, A. and M. Goren. 2003. Variation in aggregation behavior and anatomy resulting from differences in degree of sperm competition in groupers (Epinephelinae, Serranidae). *Israel Journal of Zoology* 49(1): 72.
- Beets, J. and A. Friedlander. 1992. Stock analysis and management strategies for red hind, *Epinephelus guttatus*, in the U.S. Virgin Islands. *Proc. Gulf Carib. Fish. Inst.* 42: 66-80.
- Burnett-Herkes, J., 1975. Contribution to the biology of the red hind, *Epinephelus guttatus*, a commercially important serranid fish from the tropical western Atlantic. PhD thesis, University of Miami, Coral Gables, pp 154.
- Carter, J., G. J. Marrow and V. Pryor. 1994. Aspects of the ecology and reproduction of Nassau grouper, *Epinephelus striatus*, off the coast of Belize, Central America. *Proc. Gulf Carib. Fish. Inst.* 43:65-111.
- Colin, P.L. 1992. Reproduction of the Nassau grouper, *Epinephelus striatus* (Pisces: Serranidae) and its relationship to environmental conditions. *Env. Biol. Fish.* 34: 357-377.
- Colin, P. L. 1994. Preliminary investigations of reproductive activity of the jewfish, *Epinephelus itajara* (Pisces: Serranidae). *Proc. Gulf Carib. Fish. Inst.* 43:138-147.
- Colin, P. L., D. Y. Shapiro and D. Weiler. 1987. Aspects of the reproduction of two groupers, *Epinephelus guttatus* and *E. striatus* in the West Indies. *Bull. Mar. Sci.* 40: 220-230.
- Contreras, M., Moreno, V., Burgos, R., Valdes, R., 1996. Population dynamics and stock assessment of red grouper (*Epinephelus morio*) fishery on Campeche Bank, Mexico. *ICLARM Conf. Proc.* 48, 202-217.
- Cummings, N.J., M.L. Parrack, J.W. Zweifel. 1997. The status of red hind and coney in the U.S. Virgin Islands between 1974 and 1992. *Proc 49th Gulf Caribb Fish Inst* 49:354–397.

- Bolden, S. K. 2000. Long-distance movement of a Nassau grouper (*Epinephelus striatus*) to a spawning aggregation in the central Bahamas. *Fish. Bull.* 98:642–645
- Eklund, A-M., D.B. McClellan and D.E. Harper. 2000. Black grouper aggregations in relation to protected areas within the Florida Keys National Marine Sanctuary. *Bull. Mar. Sci.* 66: 721-728.
- Erisman, B.E. and L.G. Allen. 2006. Reproductive behaviour of a temperate serranid fish, *Paralabrax clathratus* (Girard), from Santa Catalina Island, California, U.S.A. *Journal of Fish Biology* 68, 157–184.
- Eristhee, N., E. Kadison, P.A., Murray, A. Llewelyn. 2006. Preliminary investigations into the red hind fishery in the British Virgin Islands. *Proc 57th Gulf Caribb Fish Inst* 57:373–384.
- Fennessy S.T. and Y. Sadovy. 2002. Reproductive biology of a diandric protogynous hermaphrodite, the serranid *Epinephelus andersoni*. *Mar Freshw Res* 53:147–158.
- Ferreira, B.P. 1995. Reproduction of the common coral trout *Plectropomus leopardus* (Serranidae:Epinephelinae) from the Central and Northern Great Barrier Reef. *Bull. Mar. Sci.* 56: 653-669.
- Frisch, A. J., M. I. McCormick and N. W. Pankhurst. 2006. Reproductive periodicity and steroid hormone profiles in the sex-changing coral-reef fish, *Plectropomus leopardus*. *Coral Reefs*.
- Gilmore, R.G. and R.E. Jones. 1992. Color variation and associated behavior in the ephinepheline groupers, *Mycteroperca microlepis* (Goode and Bean) and *M. phenax* Jordan and Swain. *Bull. Mar. Sci.* 51:83-103.
- Gobert, B. 2005. Early stages of snapper–grouper exploitation in the Caribbean (Bay Islands, Honduras). *Fisheries Research* 73(1-2): 159-169.
- Goeden, G.B. 1978. A monograph of coral trout. *Queensland Fish. Res. Bull.* 1: 1–42.
- Government of Belize. 2003. Statutory Instrument No. 161 of 2003. Fisheries (Spawning Aggregation Site Reserves) Order, 2003. Belize: Government of Belize.

- Guitart, D. and F. Juarez. 1966. Desarrollo embrioario y primeros estadios larvales de la cherna criolla, *Epinephelus striatus* (Bloch) Perciformes: Serranidae. Acad. Gen Cuba Estud. Inst. Oceanol. (Havana) 1: 35-45.
- Hamilton, R. J., M. Matawai, T. Potuku, W. Kama, P. Lahui, J. Warku and A. Smith. 2005. Applying local knowledge and science to the management of grouper aggregation sites in Melanesia. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:7-19.
- Hanson, P. J., C.C. Koenig and V.S. Zdanowicz. 2004. Elemental composition of otoliths used to trace estuarine habitats of juvenile gag *Mycteroperca microlepis* along the west coast of Florida. Marine Ecology Progress Series 267: 253-265.
- Harris, P.J., Wyanski, D.M., White, D.B., & Moore, J. L. 2002. Age, growth and reproduction of scamp, *Mycteroperca phenax*, in the southwestern North Atlantic, 1979-1997. Bulletin of Marine Science 70(1):113-132.
- Heyman, W. 2001. A report generated for the workshop "Towards a sustainable management of Nassau groupers in Belize". The Nature Conservancy.
- Huntsman, G.R. and W. E. Schaaf. 1994, Simulation of the impact of fishing on reproduction of a protogynous grouper, the graysby. N. Amer. J. Fisher. Manage. 14: 41-52.
- Jimenez, A.R. and M.F. Fernandez. 2001. Tag and recapture study of red hind and coney at three spawning aggregation sites off the west coast of Puerto Rico. *Proceedings of the Gulf and Caribbean Fisheries Institute* 52:15-25.
- Johannes, R.E. 1988. Spawning aggregations of the grouper *Plectroomus areolatus* (Ruppell) in the Solomon Islands: 751-755. In Proc. 6th Int. Coral Reef Symp. Vol. 2, Townsville.
- Koenig, C. C., F. C. Coleman, L. A. Collins, Y. Sadovy and P. L. Colin. 1996. Reproduction in gag, *Mycteroperca microlepis* (Pisces: Serranidae) in the eastern Gulf of Mexico and the consequences of fishing spawning aggregations: Pages 307-323. *in*: F. Arreguin-Sanchez, J.L. Munro, M.C. Balgos and D. Pauly (eds), Biology, fisheries and culture of tropical groupers and snappers, ICLARM Conf. Proc. 48.
- Levin, P.S., and C. B. Grimes. 2002. Reef fish ecology and grouper conservation and management. In: Coral reef fishes: dynamics and diversity in a complex ecosystem. (Sale, P.F. ed), pp. 377-389, Academic Press, Amsterdam, Boston.

- Louisy, P. and J.M. Culioli. 2002. Review of present knowledge on the reproductive activity of the dusky grouper *Epinephelus marginatus* (Lowe, 1834) in the north-western Mediterranean. *Marine Life* 9(1): 47-57.
- Luckhurst, B.E., J. Hateley and T. Trott. 2006. Estimation of size of spawning aggregations of Red Hind (*Epinephelus guttatus*) using a tag-recapture methodology at Bermuda. In: *Proceedings of 57th Gulf and Caribbean Fisheries Institute*, pp. 535-542.
- Medina –Quej, A., A.R. Herrera-Pavón G., Poot-López E., Sosa-Cordero, K. Bolio-Moguel, W. and W. Haddad. 2004. Estudiopreliminar de la agregación del mero *Epinephelus striatus* en 'El Blanquizal' en la costa sur de Quintana Roo, México. *Proc Gulf Carib Fish Inst* 55:557–569.
- Nemeth, R. S. 2005. Population characteristics of a recovering US Virgin Islands red hind spawning aggregation following protection. *Marine Ecology Progress Series* 286:81-97.
- Nemeth, R. S., J. Blondeau, S. Herzlieb and E. Kadison. 2007. Spatial and temporal patterns of movement and migration at spawning aggregations of red hind, *Epinephelus guttatus*, in the U.S. Virgin Islands. *Environmental Biology of Fishes* 78:365-381.
- Nemeth, R.S, S. Herzlieb J., Blondeau. 2006. Comparison of two seasonal closures for protecting red hind spawning aggregations in the US Virgin Islands. *Proc 10<sup>th</sup> Int Coral Reef Conf* 4:1306–1313.
- Olsen, D. A. and J. A. LaPlace. 1978. A study of a Virgin Islands grouper fishery based on a breeding aggregation. *Proc. Gulf Carib. Fish. Inst.* 31:130-144.
- Pears, R., J. H. Choat, B. D. Mapstone and G. A. Begg. 2006. Demography of a large grouper, *Epinephelus fuscoguttatus*, from Australia's Great Barrier Reef: implications for fishery management. *Marine Ecology Progress Series* 307: 259-272.
- Pelaprat, C. 2002. Observations on the spawning behaviour of the dusky grouper, *Epinephelus marginatus* (Lowe, 1834) in the north of Corsica (France). *Marine Life* 9(1): 59-65.
- Pet, J. S., P.M. Mous, A.H., Muljadi, Y.J. Sadovy and L. Squire. 2005. Aggregations of *Plectropomus areolatus* and *Epinephelus fuscoguttatus* (groupers, Serranidae) in the Komodo National Park, Indonesia: monitoring and implications for management. *Environmental Biology of Fishes* 74:209-218.

- Rhodes, K. L., R.I. Lewis, R.W. Chapman and Y. Sadovy. 2003. Genetic structure of camouflage grouper, *Epinephelus polyphekadion* (Pisces: Serranidae), in the western central Pacific. *Marine Biology*. 142 (4):771-776.
- Rhodes, K.L. and Y. Sadovy. 2002. Reproduction in the camouflage grouper, *Epinephelus polyphekadion* (Pisces: Serranidae), in Pohnpei, Federated States of Micronesia. *Bull. Mar. Sci.* 70:851-869.
- Rhodes, K.L. and Y. Sadovy. 2002. Temporal and spatial trends in spawning aggregations of camouflage grouper, *Epinephelus polyphekadion*, in Pohnpei, Micronesia. *Env. Biol. Fish.* 63: 27-39.
- Robertson, D.R. 1991, 'The role of adult biology in the timing of spawning of tropical reef fishes'. Pages 356-386 in P.F. Sale (ed.). *The ecology of fishes on coral reefs*. Academic Press, San Diego.
- Rudd, M.A. and M.H. Tupper. 2002. The Impact of Nassau Grouper size and abundance on scuba dive site selection and MPA economics. *Coastal Management*.
- Sadovy, Y.J. 1994. Grouper stocks of the western central Atlantic: the need for management and management needs. *Proc. Gulf Carib. Fish. Inst.* 43: 43-65.
- Sadovy, Y.J. 1997. The case of the disappearing grouper: *Epinephelus striatus*, the Nassau grouper in the Caribbean and western Atlantic. *Proc. Gulf and Carib. Fish. Inst.* 45: 5-22.
- Sadovy, Y.J. 2005. Troubled times for trysting trio: three aggregating groupers in the live reef food-fish trade. *Secretariat for the Pacific Community Live Reef Fish Bulletin* 14:3-6.
- Sadovy, Y.J. and A-M. Eklund. 1999. Synopsis of Biological Data on the Nassau Grouper, *Epinephelus striatus* (Bloch, 1792) and the Jewfish, *E. itajara* (Lichtenstein. 1822). NOAA Technical Report 146.
- Sadovy, Y.J. and P.L. Colin. 1995. Sexual development and sexuality in the Nassau grouper. *J. Fish. Biol.* 46: 961-976.
- Sadovy, Y.J., P.L. Colin and M.L. Domeier. 1994. Aggregation and spawning of the tiger grouper, *Mycteroperca tigris* (Pisces: Serranidae). *Copeia* 1994: 511-516.
- Sadovy, Y.J., P. Colin and M. Domeier. 2005. Monitoring and managing spawning aggregations: methods and challenges. *Secretariat for the Pacific Community Live Reef Fish Bulletin* 14:25-29.

- Sadovy, Y.J. and M. Domeier. 2005. Perplexing problems of sexual patterns in the fish genus *Paralabrax* (Serranidae, Serraninae). *Journal of Zoology*, London 267:121-133.
- Sadovy, Y.J. and M. Figuerola. 1992. The status of red hind fishery in Puerto Rico and St. Thomas, as determined by yield-per-recruit analysis. *Gulf Caribb Fish Inst* 42:23–38.
- Sadovy, Y.J., M. Figuerola and A. Roman. 1992. Age and growth of red hind *Epinephelus guttatus* in Puerto Rico and St. Thomas. *Fish Bull* 90:516–528.
- Sadovy, Y.J., A. Rosario and A. Román. 1994. Reproduction in an aggregating grouper, the red hind, *Epinephelus guttatus*. *Env. Bio. Fish.* 41:269-286.
- Samoilys, M.A. 1997. Periodicity of spawning aggregations of coral trout *Plectropomus leopardus* (Pisces: Serranidae) on the northern Great Barrier Reef. *Mar. Ecol. Prog. Ser.* 160: 149-159.
- Samoilys, M. A. and L. C. Squire. 1994. Preliminary observations on the spawning behavior of coral trout, *Plectropomus leopardus* (Pisces: Serranidae), on the Great Barrier Reef. *Bull. Mar. Sci.* 54:332-342.
- Semmens B. X., K. E. Luke, P. G. Bush, C. Pattengill-Semmens, B. Johnson, C. McCoy and S. Heppell. 2006. Investigating the reproductive migration and spatial ecology of Nassau grouper (*Epinephelus striatus*) on Little Cayman Island using acoustic tags – an overview [http://cars.er.usgs.gov/posters/Coastal\\_Ecology/Grouper\\_Telemetry/grouper\\_telemetry.html](http://cars.er.usgs.gov/posters/Coastal_Ecology/Grouper_Telemetry/grouper_telemetry.html)
- Shapiro, D.Y., Y. Sadovy and M.A. McGehee. 1993. Size, composition, and spatial structure of the annual spawning aggregation of the red hind, *Epinephelus guttatus* (Pisces: Serranidae). *Copeia* 1993: 399-406.
- Shapiro, D.Y., Y. Sadovy and M.A. McGehee. 1993b. Periodicity of sex change and reproduction in the red hind, *Epinephelus guttatus* a protogynous grouper. *Bull. Mar. Sci.* 53:399-406.
- Sluka, R., M. Chiappone, K.M. Sullivan and R. Wright. 1997. The benefits of a marine fishery reserve for Nassau grouper *Epinephelus striatus* in the Central Bahamas. *Proc 8th Int Coral Reef Sym 2* :1961-1964.
- Smith, C. L. 1972. A spawning aggregation of Nassau grouper, *Epinephelus striatus* (Bloch). *Trans. Am. Fish. Soc.* 101:257-261.

- Sosa-Cordero, E. and J. Cárdenas-Vidal. 1996. Estudio preliminary de la pesquería de mero *Epinephelus striatus* del sur de Quintana Roo. Proc Gulf Carib Fish Inst 44:56–72.
- Starr, R.M., E. Sala, E. Ballesteros and M. Zabala. 2007. Spatial dynamics of the Nassau grouper (*Epinephelus striatus*) in a Caribbean atoll. Marine Ecology Progress Series (in press).
- The Grouper Moon Project  
<http://www.reef.org/data/groupermoon.html>
- Tucker, J. W., Jr., P. G. Bush and S. T. Slaybaugh. 1993. Reproductive patterns of Cayman Islands Nassau grouper (*Epinephelus striatus*) populations. Bull. Mar. Sci. 52: 961-969.
- Turnbull, C.T., and M. Samoily. 1997. Effectiveness of spawning closures in managing the line fishery on the Great Barrier Reef. Report to the ReefMAC of QFMA. pp28.
- Tuz-Sulub, A., K. Cervera-Cervera, T. Colon-Marrufo and T. Brule. 2003. Primeros Indicios sobre la Formacion de Agregaciones de Reproduccion de Meros (Epinephelinae; Epinephelini) en el Banco de Campeche, Mexico 'First Evidences on the Formation of Spawning Aggregations of Groupers (Epinephelinae; Epinephelini) from the Campeche Bank, Mexico.' Gulf and Caribbean Fisheries Institute 54: 652-667.
- Vacchi, M., G. La-Mesa, M.G. Finoia, P. Guidetti and S. Bussotti. 2002. Protection measures and juveniles of dusky grouper, *Epinephelus marginatus* (Lowe, 1834) (Pisces, Serranidae), in the Marine Reserve of Ustica Island (Italy, Mediterranean Sea). Marine Life 9(2): 63-70.
- White D.B., D.M., Wyanski B.M. Eleby and C.G. Lilyestrom. 2002. Tiger grouper (*Mycteroperca tigris*): Profile of a spawning aggregation. Bulletin of Marine Science 70(1): 233-240.
- Whiteman, E.A., C.A. Jennings, R.S. Nemeth. 2005. Sex structure and potential female fecundity in a red hind (*Epinephelus guttatus*) spawning aggregation: applying ultrasonic imaging. J Fish Biol 66:983–995.
- Wyanski D.M., D.B. White and C.A. Barans. 2000. Growth, population age structure, and aspects of the reproductive biology of snowy grouper, *Epinephelus niveatus*, off North Carolina and South Carolina. Fish Bull 98:199–218.
- Zabala, M., A. Garcia-Rubies, P. Louisy and E. Sala. 1997. Spawning behaviour of the Mediterranean dusky grouper *Epinephelus marginatus*

(Lowe, 1834)(Pisces, Serranidae) in the Medes Islands Marine Reserve (NW Mediterranean, Spain). *Sci. Mar.* 61: 65-77.

Zabala, M., P. Louisy, A. Garcia-Rubies and V. Gracia. 1997. Socio-behavioural context of reproduction in the Mediterranean dusky grouper *Epinephelus marginatus* (Lowe, 1834)(Pisces, Serranidae) in the Medes Islands Marine Reserve (NW Mediterranean, Spain). *Sci. Mar.* 61: 79-89.

Zeller, D.W. 1997. Home range and activity patterns of the coral trout *Plectropomus leopardus* (Serranidae). *Mar. Ecol. Prog. Ser.* 154: 65-77.

Zeller, D.W. 1998. Spawning aggregations: Patterns of movement of the coral grouper *Plectropomus leopardus* (Serranidae) as determined by ultrasonic telemetry. *Mar. Ecol. Prog. Ser.* 162: 253-263.

Zeller, D.W. and G.R. Russ. 1997. Marine reserves: patterns of adult movements of the coral trout (*Plectropomus leopardus* (Serranidae)). *Can. J. Fish. Aquat. Sci.* 55:917-924.

## Lutjanids

Burton, M. L. K.J. Brennan, R.C. Munoz and R.O. Parker Jr. 2005. Preliminary evidence of increased spawning aggregations of mutton snapper (*Lutjanus analis*) at Riley's Hump two years after establishment of the Tortugas South Ecological Reserve. *Fishery Bulletin* 103:404-410.

Carter, J. and D. Perrine. 1994. A spawning aggregation of dog snapper, *Lutjanus jocu* (Pisces: Lutjanidae) in Belize, Central America. *Bull. Mar. Sci.* 55:228-234.

Cowen R.K., R. Claro and K.C. Lindeman. 2005. Larval transport pathways from Cuban snapper (Lutjanidae) spawning aggregations based on biophysical modeling. *Mar Ecol Prog Ser* 296:93-106.

Davis, T.L.O. and G.J. West. 1993, 'Maturation, seasonality, fecundity, and spawning frequency in *Lutjanus vittus* (Quoy and Gaimard) from the North West Shelf of Australia', *Fisheries Bulletin*, 91: 224–236.

Domeier, M.L. 2004. A potential larval recruitment pathway originating from a Florida marine protected area. *Fish. Ocean.* 13:in press.

Domeier, M. L., C. Koenig and F. Coleman. 1996. Reproductive biology of the gray snapper (Lutjanidae: *Lutjanus griseus*) with notes on spawning for other western Atlantic lutjanids. Pages 189-201 *in*: F. Arreguin-

- Sanchez, J.L. Munro, M.C. Balgos and D. Pauly (eds). Biology, fisheries and culture of tropical groupers and snappers. ICLARM Conf. Proc, 48.
- Gobert, B. 2005. Early stages of snapper–grouper exploitation in the Caribbean (Bay Islands, Honduras). *Fisheries Research* 73(1-2): 159-169.
- Heyman, W. D., B. Kjerfve, R.T. Graham, K.L. Rhodes and L. Garbutt. 2005. Spawning aggregations of Cubera snapper, *Lutjanus cyanopterus* (Cuvier), on the Belize Barrier reef over a six-year period. *Journal of Fish Biology* 67(1):83-101.
- McPherson, G.R., L.C. Squire and J. O'Brien. 1992, Reproduction of three dominant *Lutjanus* species of the Great Barrier Reef. *Asian Fisher. Sci.* 5: 15–24.
- Paris, C. B. et al. 2005. Larval transport pathways from Cuban snapper (*Lutjanidae*) spawning aggregations based on biophysical modeling. *Marine Ecology Progress Series* Vol. 296: 93–106.
- Reshetnikov, Yu. S. and R. M. Claro. Cycles of biological processes in tropical fishes with reference to *Lutjanus synagris*. *J. Ichthyol.* 16: 711-721.
- Rojas, L.E. 1960. Estudios estadísticos y biológicos sobre el pargo criollo, *Lutjanus analis*. *Cent. Invest. Pesq., Notas Sobre Invest.* 2: 16.

## Labrids

- Colin, P.L. 1982. Spawning and larval development of the hogfish, *Lachnolaimus maximus*, (Pisces: Labridae). *Fish. Bull.* 76: 117-124.
- Colin, P. L. and L. J. Bell. 1991. Aspects of the spawning of labrid and scarid fishes (Pisces: Labroidei) at Enewetak Atoll, Marshall Islands with notes on other families. *Env. Biol. Fish.* 31: 229-260.
- Donaldson, T.J. 1995. Courtship and spawning of nine species of wrasses (Labridae) from the western Pacific. *Japn. J. Ichthyol.* 42: 311-319.
- Donaldson, T.J. and Y. Sadovy. 2001. Threatened fishes of the world: *Cheilinus undulatus* Rüppell, 1835 (Labridae). *Env. Biol. Fish.* 62: 428.
- Hunt von Herbing, I. and W. Hunte. 1991. Spawning and recruitment of the bluehead wrasse *Thalassoma bifasciatum* in Barbados, West Indies. *Marine Ecology Progress Series* 72, 49–58.

- Kuwamura, T. 1981. Diurnal periodicity of spawning activity in free-spawning labrid fishes. *Japan. J. Ichthyol.* 28: 343-348.
- Nakazono, A. 1979. Studies of sex reversal and spawning behavior of five species of Japanese labrid fishes. *Rpt. Fish. Res. Lab., Kyushu Univ.*, 4:1-64.
- Ross, R.M. 1983. Annual, semilunar, and diel reproductive rhythms in the Hawaiian labrid *Thalassoma duperrey*. *Mar. Biol.* 72: 311-318.
- Warner, R.R. 1995. Large mating aggregations and daily long-distance spawning migrations in the blue-head wrasse, *Thalassoma bifasciatum*. *Env. Biol. Fish.* 22: 3-14.

### **Scarids/Acanthurids**

- Colin, P.L. 1978. Daily and summer-winter variation in mass spawning of the striped parrotfish, *Scarus croicensis*. *Fish. Bull.* 76:117-124.
- Gladstone, W. 1986. Spawning behavior of the bumphead parrotfish *Bolpometopon muricatum* at Yonge Reef, Great Barrier Reef. *Japan. J. Ichthyol.* 33: 326-328.
- Graham, R. T. and D.W. Castellanos. 2005. Courtship and spawning behaviors of carangid species in Belize. *Fishery Bulletin* 103: 426-432.
- Mazeroll, A. and W.L. Montgomery. 1995. Structure and organization of local migrations in brown surgeonfish (*Acanthurus nigrofuscus*). *Ethology* 99: 89-106.
- Myrberg, A. A., W. L. Montgomery and Fishelson. 1988. The reproductive behavior of *Acanthurus nigrofuscus* (Forsk.) and other surgeonfishes (Fam. Acanthuridae) off Eilat, Israel (Gulf of Aqaba, Red Sea). *Ethology* 79: 31-61.
- Randall, J.E. 1961. A contribution to the biology of the convict surgeonfish of the Hawaiian Islands, *Acanthurus triostegus sandvicensis*. *Pacific Science* 15: 215-272.
- Randall, J.E. 1961. Observations on the spawning of surgeonfishes (Acanthuridae) in the Society Islands). *Copeia* 1961: 237-238.

Randall, J. E. and H. A. Randall. 1963. The spawning and early development of the Atlantic parrot fish, *Sparisoma rubripinne*, with notes on other scarid and labrid fishes. *Zoologica* 48: 49-60.

Robertson, D. R. 1983. On the spawning behavior and spawning cycles of eight surgeonfishes (Acanthuridae) from the Indo-Pacific. *Env. Biol. Fish.* 9:193-223.

## Other Families

Anderson, W.W. 1957. Early development, spawning, growth, and occurrence of the silver mullet (*Mugil curema*) along the south Atlantic coast of the United States. *Fish. Bull.* 119: 397-414.

Arnold, E. L., Jr. and J. R. Thompson. 1958. Offshore spawning of the striped mullet, *Mugil cephalus*, in the Gulf of Mexico. *Copeia* 1958:130-132.

Bekkevold, D. 2006. Male size composition affects male reproductive variance in Atlantic cod *Gadus morhua* L. spawning aggregations. *Journal of Fish Biology* 69:945-950.

Bell, L.J. and P.L. Colin. 1986. Mass spawning of *Caesio teres* (Pisces: Caesionidae) at Enewetak Atoll, Marshall Islands. *Env. Biol. Fish.* 15: 69-74.

Colin, P.L. and I. E. Clavijo. 1978. Mass spawning by the spotted goatfish, *Pseudupeneus maculatus* (Bloch) (Pisces: Mullidae). *Bull. Mar. Sci.* 28:780-782.

Ebisawa, A. 1990. Reproductive biology of *Lethrinus nebulosus* (Pisces: Lethrinidae) around the Okinawa waters. *Nippon Suisan Gakkai* 56: 1941-1954.

Graham, R. T., and D. W. Castellanos. 2005. Courtship and spawning behaviors of carangid species in Belize. *Fishery Bulletin* 103(2):426-432.

Hamilton, R. J. 2005. Indigenous ecological knowledge (IEK) of the aggregating and nocturnal spawning behaviour of the longfin emperor, *Lethrinus erythropterus*. Secretariat for the Pacific Community Traditional Marine Resource Management and Knowledge Information Bulletin No. 18, August 2005: 9-17.

Helfrich, P. and P. M. Allen. 1975. Observations on the spawning of mullet, *Crenimugil crenilabis* (Forsk.) at Enewetak, Marshall Islands. *Micronesica* 11:219-225.

- Johannes, R.E. and B. Yeeting. 2001. I-Kiribati knowledge and management of Tarawa's lagoon resources. *Atoll Res. Bull.* 489: 1-24.
- Lobel, P. S. 1978. Diel, lunar, and seasonal periodicity in the reproductive behavior of the pomacanthid fish, *Centropyge potteri*, and some other reef fishes in Hawaii. *Pac. Sci.* 32:193-207.
- Moyer, J.T. and M.J. Zaiser. 1981. Social organization and spawning behavior of the pteroinid fish *Dendrochirus zebra* at Miyake-Jima, Japan. *Jap. J. Ichthyol.* 28:52-69.
- Phelan, M. J. Sciaenid aggregations in northern Australia: an example of successful outcomes through collaborative research. *Putting Fishers' Knowledge to Work - Conference Proceedings* 100-109.
- Sadovy, Y.J. and M.L. Domeier. 2005. Are aggregation-fisheries sustainable: reef fish fisheries as a case study. *Coral Reefs* 24 (2): 254–262.
- Stevens, P. W., C.K. Bennett and J.J. Berg. 2003. Flyingfish spawning (*Parexocoetus brachypterus*) in the northeastern Gulf of Mexico. *Environmental Biology of Fishes* 67(1):71-76.
- Takemura A., M.S. Rahman, S. Nakamura, Y.J. Park and K. Takano. 2004. Lunar cycles and reproductive activity in reef fishes with particular attention to rabbitfishes. *Fish Fish* 5:317–328.
- Ward T.M., J. Staunton-Smith and I.A. Halliday. 2003. Spawning patterns of four species of predominantly temperate pelagic fishes in the sub-tropical waters of southern Queensland. *Estuarine Coastal and Shelf Science* 56(5-6):1125-1140.
- Young, P.C. and R. B. Martin. 1982. Evidence for protogynous hermaphroditism in some lethrinid fishes. *J. Fish Biol.* 21: 475–484.

### **Studies of Specific Sites**

- Armstrong, R.A, H. Singh, J. Torres, R.S. Nemeth, A. Can, C. Roman, R. Eustice, L. Riggs and G. Garcia-Moliner. 2006. Characterizing the deep insular shelf coral reef habitat of the Hind Bank marine conservation district (US Virgin Islands) using the Seabed autonomous underwater vehicle. *Continental Shelf Res* 26:194–205.

- Belize Fisheries Department. 2005. Report on the spawning aggregations of multi-species at Cave Glory, Nicholas Caye, Rocky Point and Sandbore Belize.
- Bolden, S. K. 2000. Long-distance movement of a Nassau grouper (*Epinephelus striatus*) to a spawning aggregation in the central Bahamas. *Fish. Bull.* 98:642–645
- Claro, R., J.A. Baisre, K.C. Lindeman and J.P. Garcia-Arteaga. 2001. Cuban Fisheries: Historical trends and current status. In: *Ecology of the Marine Fishes of Cuba* (edited by Claro, R., Lindeman, K. C., and Parenti, L. R.). Smithsonian Institution Press, Washington and London. pp. 194-219.
- Coleman, F. C., P.B., Baker and C.C. Koenig. 2004. A review of Gulf of Mexico marine protected areas: successes, failures, and lessons learned. *Fisheries* 29(2): 10-21.
- Colin, P. L. and L. Clavijo. 1988. Spawning activity of fishes producing pelagic eggs on a shelf edge coral reef, southwestern Puerto Rico. *Bull. Mar. Sci.* 43: 249-279.
- Craig, A.K. 1966. Geography of fishing in British Honduras and adjacent coastal waters. Tech. Rep. Coastal Studies Lab., Louisiana State Univ. 28, 143 pp.
- Craig, P.C. 1998. Temporal spawning patterns of several surgeonfishes and wrasses in American Samoa. *Pac. Sci.* 52: 35-39.
- Cummings, N.J., M.L. Parrack, J.W. Zweifel. 1997. The status of red hind and coney in the U.S. Virgin Islands between 1974 and 1992. *Proc 49th Gulf Caribb Fish Inst* 49:354–397.
- Daw T. 2004. Reef fish aggregations in Sabah, East Malaysia. *Western Pacific Fisher Survey Series, Volume 5 (confidential appendix)*. Society for the Conservation of Reef Fish Aggregations. 63 p.
- Erisman, B.E. and L.G. Allen. 2006. Reproductive behaviour of a temperate serranid fish, *Paralabrax clathratus* (Girard), from Santa Catalina Island, California, U.S.A. *Journal of Fish Biology* 68, 157–184.
- García-Cagide, A., R. Claro, and B. V. Koshelev. 2001. Reproductive patterns of fishes of the Cuban shelf. In *Ecology of the marine fishes of Cuba* (R. Claro, K. C. Lindeman and L. R. Parenti, eds.), p.73–114. Smithsonian Institution Press, Washington DC.

- Hamilton R.J. and Kama W. 2004. Spawning aggregations of coral reef fish in Roviana Lagoon, Western Province, Solomon Islands – A local knowledge field survey report. Report prepared for The Nature Conservancy, Pacific Island Countries Coastal Marine Program. 54 pp.
- Hamilton R.J., P. Lahui, J. Warku, J. Aitsi, A. Sapul and S. Seeto. 2005. Local knowledge of reef fish spawning aggregations in Kimbe Bay, Papua New Guinea. Report prepared for The Nature Conservancy, Pacific Island Countries Coastal Marine Program. (Draft). 41p.
- Hamilton R.J., M. Matawai and T. Potuku. 2004. Spawning aggregations of coral reef fish in New Ireland and Manus Provinces, Papua New Guinea: Local knowledge field survey report (unrestricted access version). Report prepared for the Pacific Island Countries Coastal Marine Program, TNC Pacific Island Countries Report No. 4/04 (Unrestricted). The Nature Conservancy. 99 + iv p.
- Hamilton, R. J., M. Matawai, T. Potuku, W. Kama, P. Lahui, J. Warku and A. Smith. 2005. Applying local knowledge and science to the management of grouper aggregation sites in Melanesia. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:7-19.
- Heyman, W. D., Kjerfve, B., Graham, R. T., Rhodes, K. L. and Garbutt, L. 2005. Spawning aggregations of Cubera snapper, *Lutjanus cyanopterus* (Cuvier), on the Belize Barrier reef over a six-year period. *Journal of Fish Biology* 67(1):83-101.
- Hunt von Herbing, I. and W. Hunte. 1991. Spawning and recruitment of the bluehead wrasse *Thalassoma bifasciatum* in Barbados, West Indies. *Marine Ecology Progress Series* 72, 49–58.
- Jimenez, A.R. and M.F. Fernandez. 2001. Tag and recapture study of red hind and coney at three spawning aggregation sites off the west coast of Puerto Rico. *Proceedings of the Gulf and Caribbean Fisheries Institute* 52:15-25.
- Luckhurst, B.E., J. Hateley and T. Trott. 2006. Estimation of size of spawning aggregations of Red Hind (*Epinephelus guttatus*) using a tag-recapture methodology at Bermuda. In: *Proceedings of 57th Gulf and Caribbean Fisheries Institute*, pp. 535-542.
- Medina –Quej, A., A.R. Herrera-Pavón G., Poot-López E., Sosa-Cordero, K. Bolio-Moguel, W. and W. Haddad. 2004. Estudiopreliminar de la agregación del mero *Epinephelus striatus* en 'El Blanquizal' en la costa sur de Quintana Roo, México. *Proc Gulf Carib Fish Inst* 55:557–569.

- Moyer, J.T. 1990. Reef channels as spawning sites for fishes on the Shiraho coral reef, Ishigake Island, Japan. *Japan J. Ichthyol.* 36: 371-375.
- Nemeth, R. S. 2005. Population characteristics of a recovering US Virgin Islands red hind spawning aggregation following protection. *Marine Ecology Progress Series* 286:81-97.
- Nemeth, R. S., J. Blondeau, S. Herzlieb and E. Kadison. 2007. Spatial and temporal patterns of movement and migration at spawning aggregations of red hind, *Epinephelus guttatus*, in the U.S. Virgin Islands. *Environmental Biology of Fishes* 78:365-381.
- Nemeth, R.S, S. Herzlieb J., Blondeau. 2006. Comparison of two seasonal closures for protecting red hind spawning aggregations in the US Virgin Islands. *Proc 10<sup>th</sup> Int Coral Reef Conf* 4:1306–1313.
- Pet, J. S., P.M. Mous, A.H., Muljadi, Y.J. Sadovy and L. Squire. 2005. Aggregations of *Plectropomus areolatus* and *Epinephelus fuscoguttatus* (groupers, Serranidae) in the Komodo National Park, Indonesia: monitoring and implications for management. *Environmental Biology of Fishes* 74:209-218.
- Rhodes, K. L., E. Joseph, D. Mathias, S. Malakai, W. Kostka and D. David. 2005. Reef fish spawning aggregation monitoring in Pohnpei, Federated States of Micronesia, in response to local management needs. *Secretariat for the Pacific Community Live Reef Fish Bulletin* 14:20-24.
- Robinson, J., M. Isidore, M. A. Marguerite, M C. Ohman, and R. J. Payet. 2004. Spatial and temporal distribution of reef fish spawning aggregations in the Seychelles - an interview-based survey of artisanal fishers. *Western Indian Ocean Journal of Marine Science* 3(1):63-69.
- Russell, M. 2003. Reducing the impact of fishing and tourism on fish spawning aggregations in the Great Barrier Reef marine park. *57th Gulf and Caribbean Fisheries Institute*: 680-688.
- Sadovy Y. 2004. A report on the current status and history of exploited reef fish aggregations in Fiji. *Western Pacific Fisher Survey Series: Society for the Conservation of Reef Fish Aggregations*, volume 4.
- Sadovy Y. and M. Liu M. 2004. Report on the current status and exploitation history of reef fish spawning aggregations in eastern Indonesia. *Western Pacific Fisher Survey Series: Society for the Conservation of Reef Fish Aggregations*, volume 6.

- Sala, E., O. Aburto-Oropeza, G. Paredes and G. Thompson. 2003. Spawning aggregations and reproductive behaviour of reef fishes in the Gulf of California. *Bull. Mar. Sci.* 72:103—121.
- Sala, E.O., et al. 2004 Fishing down coastal food webs in the Gulf of California. *Fisheries*. 29(3):19-25.
- Sancho, G., C.W. Petersen, and P.S. Lobel. 2000. Predator-prey relations at a spawning aggregation site of coral reef fishes. *Mar. Ecol. Prog. Ser.* 203: 275-288.
- Sancho, G., A.R. Solow and P.S. Lobel. 2000. Environmental influences on the diel timing of spawning in coral reef fishes. *Mar. Ecol. Prog. Ser.* 206: 193-212.
- Sedberry, G. R., O. Pashuk, D.M., Wyanski, J.A. Stephen and P. Weinbach. 2006. Spawning Locations for Atlantic Reef Fishes off the Southeastern U.S. 57th Gulf and Caribbean Fisheries Institute: 463-514.
- Sluka, R., M. Chiappone, K.M. Sullivan and R. Wright. 1997. The benefits of a marine fishery reserve for Nassau grouper *Epinephelus striatus* in the Central Bahamas. *Proc 8th Int Coral Reef Sym 2* :1961-1964.
- Starr, R.M., E. Sala, E. Ballesteros and M. Zabala. 2007. Spatial dynamics of the Nassau grouper (*Epinephelus striatus*) in a Caribbean atoll. *Marine Ecology Progress Series* (in press).
- Stevens, P. W., Bennett, C. K. and Berg, J. J. 2003. Flyingfish spawning (*Parexocoetus brachypterus*) in the northeastern Gulf of Mexico. *Environmental Biology of Fishes* 67(1):71-76.
- Tupper, M. and Rudd, M.A. 2002. Species-specific impacts of a small marine reserve on reef fish production and fishing productivity in the Turks and Caicos Islands. *Environmental Conservation* 29 (4): 484–492.
- Turnbull, C.T., and M. Samoilys. 1997. Effectiveness of spawning closures in managing the line fishery on the Great Barrier Reef. Report to the ReefMAC of QFMA. pp28.
- Tuz-Sulub, A., K. Cervera-Cervera, T. Colon-Marrufo and T. Brule. 2003. Primeros Indicios sobre la Formacion de Agregaciones de Reproduccion de Meros (Epinephelinae; Epinephelini) en el Banco de Campeche, Mexico 'First Evidences on the Formation of Spawning Aggregations of Groupers (Epinephelinae; Epinephelini) from the Campeche Bank, Mexico.' *Gulf and Caribbean Fisheries Institute* 54: 652-667.

Whaylen, L., C.V. Pattengill-Semmens, B.X. Semmens, P.G. Bush and M.R. Boardman. 2004. Observations of a Nassau grouper, *Epinephelus striatus*, spawning aggregation site in Little Cayman, Cayman Islands, including multi-species spawning information. *Environmental Biology of Fishes* 70: 305-313.

Wyanski D.M., D.B. White and C.A. Barans. 2000. Growth, population age structure, and aspects of the reproductive biology of snowy grouper, *Epinephelus niveatus*, off North Carolina and South Carolina. *Fish Bull* 98:199–218.

### **Connectivity Related to Reef Fish Spawning Aggregations**

Appeldoorn, R.S., D.A. Hensley, D.Y. Shapiro, S. Kioroglou and B.G. Sanderson. 1994. Egg dispersal in a Caribbean coral reef fish, *Thalassoma bifasciatum*. II. Dispersal off the reef platform. *Bull. Mar. Sci.* 54: 271-280.

Bolden, S.K. 2000. Long-distance movement of a Nassau grouper (*Epinephelus striatus*) to a spawning aggregation in the central Bahamas. *Fish. Bull.* 98: 642-645.

Chapman, R.W., G.R. Sedberry, C.C. Koenig and B.E. Eleby. 1999. Stock identification of gag, *Mycteroperca microlepis*, along the southeast coast of the United States. *Mar. Biotechnol.* 1: 137-147.

Colin, P.L. 1995. Surface currents in Exuma Sound, Bahamas and adjacent areas with reference to potential larval transport. *Bull. Mar. Sci.* 56: 48-57.

Colin, P.L., W.A. Laroche and E.B. Brothers. 1997. Ingress and settlement in the Nassau grouper, *Epinephelus striatus* (pisces: Serranidae), with relationship to spawning occurrence. *Bull. Mar. Sci.* 60: 656.

Cowen R.K., R. Claro and K.C. Lindeman. 2005. Larval transport pathways from Cuban snapper (Lutjanidae) spawning aggregations based on biophysical modeling. *Mar Ecol Prog Ser* 296:93-106.

Cowen, R.K., K.M.M. Lwize, S. Sponaugle, C.B. Paris and D.B. Olsen. 1999. Connectivity of marine populations: Open or closed? *Science* 287: 857-859.

Davies, C.R. 2000. Inter-reef Movement of the Common Coral Trout, *Plectropomus leopardus*. Res. Publ. No. 61, Great Barrier Reef Marine Park Authority, Townsville.

- Doherty, P.J., A.J. Fowler, M.A. Samoilyis and D.A. Harris. 1994. Monitoring the replenishment of coral trout (Pisces: Serranidae) populations. *Bull. Mar. Sci.* 54: 343-355.
- Domeier, M.L. 2004. A potential larval recruitment pathway originating from a Florida marine protected area. *Fish. Ocean.* 13:in press.
- Hensley, D.A., Appeldoorn, R.S., D.Y. Shapiro, M. Ray and R.G. Turingan. 1994. Egg dispersal in a Caribbean coral reef fish, *Thalassoma bifasciatum*. I. Dispersal over the reef platform. *Bull. Mar. Sci.* 54: 256-270.
- Heyman, W.D., R.T. Graham, B. Kjerfve and R.E. Johannes. 2001. Whale sharks *Rhincodon typus* aggregate to feed on fish spawn in Belize. *Mar. Ecol. Prog. Ser.* 215: 275-282.
- Hunter E., J.D. Metcalfe and J.D. Reynolds. 2003. Migration route and spawning area fidelity by North Sea plaice. *Proc R Soc Lond B*270:2097–2103.
- Keener, P., G.D. Johnson, B.W. Stender and E.B. Brothers. 1988. Ingress of postlarval gag, *Mycteroperca microlepis* (Pisces: Serranidae) through a South Carolina barrier island inlet. *Bull. Mar. Sci.* 42: 376-396.
- Leis, J.M. 1987. Review of the early life history of tropical groupers (Serranidae) and snappers (Lutjanidae): 189-238 *in*: Polovina, J.J. and S. Ralston (eds), *Tropical Snappers and Groupers: Biology and Fisheries Management*. Westview Press, Boulder, Colorado, USA.
- Lobel, P.S. 1989. Ocean current variability and the spawning season of Hawaiian reef fishes. *Env. Biol. Fish.* 24: 161-171.
- Luckhurst, B.E. 1998. Site fidelity and return migration of tagged red hind (*Epinephelus guttatus*) to a spawning aggregation site in Bermuda. *Proc. Gulf and Carib. Fish. Inst.* 50: 750-763.
- Moe, M.A., Jr. 1966. Tagging fishes in Florida offshore waters. *Tech. Ser. Fla. Board Conserv.* 49:1-40.
- Paris, C. B. et al. 2005. Larval transport pathways from Cuban snapper (Lutjanidae) spawning aggregations based on biophysical modeling. *Marine Ecology Progress Series* Vol. 296: 93–106.
- Roberts, C.M. 1997. Connectivity and management of Caribbean coral reefs. *Science* 278: 1454-1457.

- Sancho, G., D. Ma and P.S. Lobel. 1997. Behavioural observations of an upcurrent reef colonization event by larval surgeonfish *Ctenochaetus strigosus* (Acanthuridae). *Mar. Ecol. Prog. Ser.* 153: 311-315.
- Shenker, J.M., E.D. Maddox, E. Wishinski, A. Pearl, S.R. Thorrold and N. Smith. 1993. Onshore transport of settlement-stage Nassau grouper, *Epinephelus striatus* and other fishes in Exuma Sound, Bahamas. *Mar. Ecol. Prog. Ser.* 98: 31-43.
- Stevenson, D.E., R.W. Chapman and G.R. Sedberry 1998. Stock identification in Nassau grouper, *Epinephelus striatus*, using microsatellite DNA analysis. *Proc. Gulf Carib. Fish Inst.* 50: 727-749.
- Thorrold, S.R., J.M. Shenker, E.D. Maddox, R. Mojica and E. Wishinski. 1994. Larval supply of shorefishes to nursery habitats around Lee Stocking Island, Bahamas. II. Lunar and oceanographic influences. *Mar. Biol.* 118: 567-578.
- Tremain, D. M., C.W. Harnden and D. H. Adams. 2004. Multidirectional movements of sportfish species between an estuarine no-take zone and surrounding waters of the Indian River Lagoon, Florida. *Fishery Bulletin* 102:533-313.
- Walsh, W.J. 1987. Patterns of recruitment and spawning in Hawaiian reef fishes. *Env. Biol. Fish.* 18: 257-276.
- Warner, R.R. 1997. Evolutionary ecology: how to reconcile pelagic dispersal with local adaptation. *Coral Reefs* 16 (suppl): 115-120.

### **Monitoring: Methods and Experience**

- Bell, J.D., G.J.S. Craik, D.A. Pollard and B.C. Russell. 1995. Estimating length frequency distributions of reef fishes underwater. *Coral Reefs* 4: 41-44.
- Matos-Caraballo, D. J., Posada and B. Luckhurst. 2006. Fishery-dependent evaluation of a spawning aggregation of Tiger grouper (*Mycteroperca tigris*) at Vieques Island, Puerto Rico. *Bulletin of Marine Science* 79:1-16.
- Pears, R., J. H. Choat, B. D. Mapstone and G. A. Begg. (2006) Demography of a large grouper, *Epinephelus fuscoguttatus*, from Australia's Great Barrier Reef: implications for fishery management. *Marine Ecology Progress Series* 307: 259-272.

Samoilys, M.A. (ed.) 1997. Manual for assessing fish stocks on Pacific coral reefs. Dept. Primary Indust, Queensland, Training Series QE97009, 75 pp.

Watson, R.A., G. M. Carlos and M.A. Samoilys. 1995. Bias introduced by the non-random movement of fish in visual transect surveys. *Ecol. Modelling* 77: 205-214.

## **Fisheries Management and Conservation**

Aburto-Oropeza, E., O., G. Paredes, I. Parra, J.C. Barrera and P.K. Dayton. 2002. A general model for designing networks of marine reserves. *Science* 298(6): 1991-1993.

Appeldoorn, R. S., and K.C. Lindeman. 2003. A Caribbean-wide survey of marine reserves: spatial coverage and attributes of effectiveness. *Gulf and Caribbean Research* 14(2): 139-154.

Bannerot, S.P., W.W. Fox, Jr., and J.E. Powers. 1987. Reproductive strategies and the management of snappers and groupers in the Gulf of Mexico and Caribbean: Pages 561-603 *in*: J.J. Polovina and S. Ralston (eds.). *Tropical snappers and groupers: biology and fisheries management*. Westview Press, Boulder, Colorado.

Beets, J. and A. Friedlander. 1992. Stock analysis and management strategies for the red hind, *Epinephelus guttatus*, in the US Virgin Islands. *Proc. Gulf and Carib. Fish. Inst.* 42: 66-79.

Beets, J. and A. Friedlander. 1999. Evaluation of a conservation strategy: a spawning aggregation closure for red hind, *Epinephelus guttatus*, in the U.s. Virgin Islands. *Env. Biol. Fish.* 55: 91-98.

Coleman, F.C., C.C. Koenig and A. Collins. 1996. Reproductive styles of shallow-water groupers (Pisces: Serranidae) in the eastern Gulf of Mexico and the consequences of fishing spawning aggregations. *Env. Biol. Fish.* 47: 129-141.

Coleman, F., C.C. Koenig, G.R. Huntsman, J.A. Musick, A.M. Eklund, J.C. McGovern, R.W. Chapman, G.R. Sedberry and C.B. Grimes. 2000. Long-lived reef fishes: the grouper-snapper complex. *Fisheries* 25: 14-20.

Contreras, M., Moreno, V., Burgos, R., Valdes, R., 1996. Population dynamics and stock assessment of red grouper (*Epinephelus morio*) fishery on Campeche Bank, Mexico. *ICLARM Conf. Proc.* 48, 202-217.

- Eristhee, N., E. Kadison, P.A., Murray, A. Llewelyn. 2006. Preliminary investigations into the red hind fishery in the British Virgin Islands. Proc 57th Gulf Caribb Fish Inst 57:373–384.
- Fulton, E., D. Kaualt, B. Mapstone and M. Sheaves. 1999. Spawning season influences on commercial catch rates: computer simulations and *Plectropomus leopardus*, a case in point. Can. J. Fish. Aquat. Sci. 56: 1096-1108.
- Gobert, B. 2005. Early stages of snapper–grouper exploitation in the Caribbean (Bay Islands, Honduras). Fisheries Research 73(1-2): 159-169.
- Government of Belize. 2003. Statutory Instrument No. 161 of 2003. Fisheries (Spawning Aggregation Site Reserves) Order, 2003. Belize: Government of Belize.
- Hamilton, R. J., M. Matawai, T. Potuku, W. Kama, P. Lahui, J. Warku and A. Smith. 2005. Applying local knowledge and science to the management of grouper aggregation sites in Melanesia. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:7-19.
- Heyman, W. 2003. Session introduction: conservation of multi-species reef fish spawning aggregations. Proc. Gulf Caribb. Fish. Inst. 54:650–651.
- Johannes, R.E. 1980. Using knowledge of the reproductive behaviour of reef and lagoon fishes to improve fishing yields. *in*: J.E. Bardach, J.J. Magnuson & R.C. May (eds.). Fish behaviour and its use in the capture and culture of fishes, ICLARM Conference Proceedings, 5th edition, Manila.
- Koenig, C.C., F.C. Coleman, C.B. Grimes, G.R. Fitzhugh, K.M. Scanlon, C.T. Gledhill and M. Grace. 2000. Protection of fish spawning habitat for the conservation of warm-temperate reef fish fisheries of shelf-edge reefs of Florida. Bull. Mar. Sci. 66: 593-616.
- Lindeman, K. C., R. Pugliese, G.T. Waugh and J.S. Ault. 2000. Developmental patterns within a multispecies reef fishery: management applications for essential fish habitats and protected areas. Bulletin of Marine Science 66(3): 929-956.
- Luckhurst, B.E. 2004. Current status of conservation and management of reef fish spawning aggregations in the Greater Caribbean. Proceedings of the Gulf and Caribbean Fisheries Institute 55:530-542.

- Nemeth, R. S. 2005. Population characteristics of a recovering US Virgin Islands red hind spawning aggregation following protection. *Marine Ecology Progress Series* 286:81-97.
- Nemeth, R.S, S. Herzlieb J., Blondeau. 2006. Comparison of two seasonal closures for protecting red hind spawning aggregations in the US Virgin Islands. *Proc 10<sup>th</sup> Int Coral Reef Conf* 4:1306–1313.
- MPANews: The Science and Policy of Protecting Spawning Aggregations- Interview with Yvonne Sadovy - [http://depts.washington.edu/mpanews/issues.html#Jun 2004](http://depts.washington.edu/mpanews/issues.html#Jun%202004) (see below for extracts).
- Pears R.J. et al. 2006. Demography of a large grouper, *Epinephelus fuscoguttatus*, from Australia's Great Barrier Reef: implications for fishery management. *Marine Ecology Progress Series* Vol. 307: 259–272.
- Pet, J. S., P.M. Mous, A.H., Muljadi, Y.J. Sadovy and L. Squire. 2005. Aggregations of *Plectropomus areolatus* and *Epinephelus fuscoguttatus* (groupers, Serranidae) in the Komodo National Park, Indonesia: monitoring and implications for management. *Environmental Biology of Fishes* 74:209-218.
- Rhodes, K. L., E. Joseph, D. Mathias, S. Malakai, W. Kostka and D. David. 2005. Reef fish spawning aggregation monitoring in Pohnpei, Federated States of Micronesia, in response to local management needs. *Secretariat for the Pacific Community Live Reef Fish Bulletin* 14:20-24.
- Robertson, D.R. 1991, 'The role of adult biology in the timing of spawning of tropical reef fishes'. Pages 356-386 in P.F. Sale (ed.). *The ecology of fishes on coral reefs*. Academic Press, San Diego.
- Robinson, J., M. Isidore, M. A. Marguerite, M C. Ohman, and R. J. Payet. 2004. Spatial and temporal distribution of reef fish spawning aggregations in the Seychelles - an interview-based survey of artisanal fishers. *Western Indian Ocean Journal of Marine Science* 3(1):63-69.
- Rudd, M.A. and M.H. Tupper. 2002. The Impact of Nassau Grouper size and abundance on scuba dive site selection and MPA economics. *Coastal Management*.
- Russell, M. 2003. Reducing the impact of fishing and tourism on fish spawning aggregations in the Great Barrier Reef marine park. *57th Gulf and Caribbean Fisheries Institute*: 680-688.

- Sadovy, Y.J., T.J. Donaldson, T.R. Graham, F. McGilvray, G.J. Muldoon, M.J. Philips, M.A. Rimmer, A. Smith and B. Yeeting. 2003. While Stocks Last: The Live Reef Food Fish Trade. Manila: Asian Development Bank: 147.
- Sadovy, Y.J. and M. Figuerola. 1992. The status of red hind fishery in Puerto Rico and St. Thomas, as determined by yield-per-recruit analysis. *Gulf Caribb Fish Inst* 42:23–38.
- Sala, E., E. Ballesteros and R.M. Starr. 2001. Rapid decline of Nassau grouper spawning aggregations in Belize: Fishery management and conservation needs. *Fisheries* 26: 23-30.
- Sale, P. F., R.K. Cowen, B.S. Danilowicz, G.P. Jones, J.P. Kritzer, K.C. Lindeman, S. Planes, N.V.C. Polunin, G.R. Russ, Y.J. Sadovy and R.S. Steneck. 2005. Critical science gaps impede use of no-take fishery reserves. *Trends in Ecology and Evolution* 20(2): 75-80.
- Sluka, R., M. Chiappone, K.M. Sullivan and R. Wright. 1997. The benefits of a marine fishery reserve for Nassau grouper *Epinephelus striatus* in the Central Bahamas. *Proc 8th Int Coral Reef Sym 2* :1961-1964.
- Sosa-Cordero, E. and J. Cárdenas-Vidal. 1996. Estudio preliminary de la pesquería de mero *Epinephelus striatus* del sur de Quintana Roo. *Proc Gulf Carib Fish Inst* 44:56–72.
- Tupper, M. and Rudd, M.A. 2002. Species-specific impacts of a small marine reserve on reef fish production and fishing productivity in the Turks and Caicos Islands. *Environmental Conservation* 29 (4): 484–492.
- Turnbull, C.T., and M. Samoilys. 1997. Effectiveness of spawning closures in managing the line fishery on the Great Barrier Reef. Report to the ReefMAC of QFMA. pp28.
- Vincent, A. and Y.J. Sadovy. 1998. Reproductive ecology in the conservation and management of fishes: Pages 209-245 *in*: T. Caro (ed.). Behavioral ecology and conservation biology, Oxford Univ. Press, New York.

## Reports and Books

### Books

- Auil-Marshalleck, S. 1993. A review of the occurrence of fish spawning aggregations in the Caribbean and the implications for fisheries management. CFRAMP-Large pelagics, reef and slope fishes assessment

- subproject specification Workshop (LPRSF Assessment SSW/WP/24), pp 48.
- Bohnsack, J.A. 1989. Protection of grouper spawning aggregations. Nat. Mar. Fish. Serv., Coastal Resource Div., Contrib No. CRD-88/89-06, 8 pp.
- Bohnsack, J.A. and S.P. Bannerot. 1986. A stationary visual census technique for quantitatively assessing community structure of coral reef fishes. NOAA Tech. Rep. NMFS 41:1-15.
- Carlos, G. and M.A. Samoily. 1993. An investigation of the occurrence of spawning aggregations of blue-spot coral trout (*Plectropomus laevis*) on the Northern Great Barrier Reef. Internal report, Northern Fisheries Centre, Dept. Primary Ind., Queensland, 10 pp.
- Claro, R., J.A. Baisre, K.C. Lindeman and J.P. Garcia-Arteaga. 2001. Cuban Fisheries: Historical trends and current status. In: Ecology of the Marine Fishes of Cuba (edited by Claro, R., Lindeman, K. C., and Parenti, L. R.). Smithsonian Institution Press, Washington and London. pp. 194-219.
- Colin, P.L. 1985. Spawning of western Atlantic surgeonfishes. Nat'l. Geo. Soc. Res. Rpts. 18:243-250.
- García-Cagide, A., R. Claro, and B. V. Koshelev. 2001. Reproductive patterns of fishes of the Cuban shelf. In Ecology of the marine fishes of Cuba (R. Claro, K. C. Lindeman and L. R. Parenti, eds.), p.73–114. Smithsonian Institution Press, Washington DC.
- Graham, T. 2002. Asia Pacific regional conservation strategy for reef fish spawning aggregations. The Nature Conservancy Marine Program, 58 pp.
- Graham, T. 2002. Pacific division implementation plan for the Asia Pacific regional conservation strategy for reef fish spawning aggregations. The Nature Conservancy Marine Program, 100 pp.
- Great Barrier Reef Marine Park Authority (GBRMPA) 1997, Interim policy for fish spawning aggregation site and tourism activity management measures, Great Barrier Reef Marine Park Authority, Australia.
- Heyman, W.D. 2001. Spawning aggregations in Belize. Workshop report "Towards a sustainable management of Nassau groupers in Belize", Belize City, 30 July 2001. The Nature Conservancy, Belize.

- Heyman, W., D. Neal, M. Paz, J. Hepp and B. Wade. 2002. Reef fish spawning aggregation monitoring protocol: Belize. The Nature Conservancy, 29 pp.
- Johannes, R. E. 1981. Words of the lagoon: fishing and marine lore in the Palau District of Micronesia. University of California Press, Berkeley, California.
- Johannes, R.E. and N. Kile. 2001. Grouper spawning aggregations that are a potential target of the live reef fish food trade in Ysabel and Wagina, Solomon Islands. Discussions paper No. 4 compiled as part of the "Sustainable Management of the Live Reef Fish Trade-Based Fishery in the Solomon Islands" Project, funded by ACIAR, Project No. ANRE1/1998/094.
- Johannes, R.E. and L. Squire. 1988. Spawning aggregations of coral trout and Maori wrasse on the Great Barrier Reef Marine Park. Report to the Great Barrier Reef Marine Park Authority, 13 pp.
- Johannes, R.E., L. Squire, T. Graham, Y. Sadovy and H. Renguul. 1999. Spawning aggregations of groupers (Serranidae) in Palau. The Nat. Conserv. Mar. Res. Ser. Publ. No. 1, 144 pp.
- Luckhurst, B.E. 2002. Recommendations for a Caribbean regional conservation strategy for reef fish spawning aggregations. Prepared for The Nature Conservancy, 27 pp.
- Pet, J. and A.H. Muljadi. 2001. Spawning and aggregations of groupers (Serranidae) and Napoleon wrasse (Labridae) in the Komodo National Park. The Nature Conservancy, 26 pp.
- Pet, J.S., H. Muljadi and K.L. Rhodes. 2001. TNC Pohnpei training workshop: grouper spawning aggregation site (SPAGS) conservation and monitoring. The Nature Conservancy, 40 pp.
- Pet, J. L. Squire, C. Subagyo and A. Mullyadi. 1999. Grouper and Napoleon wrasse spawning aggregation sites Komodo National Park. Monitoring Report 1998-1999. The Nature Conservancy, 43 pp.
- Ray, G.C., McCormick-Ray, C.A. Layman and B.R. Silliman. 2000. Investigations of Nassau grouper breeding aggregations at High Cay, Andros: Implications for a conservation strategy. Report to Dept. of Fisheries, Commonwealth of the Bahamas, 30 pp.

- Russell, M. 2001. Spawning aggregations of reef fishes on the Great Barrier Reef: Implications for management. Report of the Great Barrier Reef Marine Park Authority, 37 pp.
- Sadovy, Y.J., T.J. Donaldson, T.R. Graham, F. McGilvray, G.J. Muldoon, M.J. Philips, M.A. Rimmer, A. Smith and B. Yeeting. 2003. While Stocks Last: The Live Reef Food Fish Trade. Manila: Asian Development Bank: 147.
- Sale, P.F. 2002. Coral Reef Fishes: Dynamics and diversity in a complex ecosystem. Academic Press, San Diego, 549 pp.
- Samoilys M & Donnelly R. 2001. Effects of fishing spawning aggregations of tropical marine fishes: implications for management of the Live Reef Food Fish Trade in Solomon Islands. Discussion Paper No.6. Report to Australian Centre for International Agricultural Research. ACIAR, Canberra, 19 pp.
- Sweatman, H. 1996. Impact of Tourist Pontoons on Fish Assemblages on the Great Barrier Reef, Technical Report No. 5, CRC Reef Research Centre, Townsville.
- Yeeting, B.M., P. Labrosse and T.J. Adams. 2001. The Live Reef Food Fish of Bua Province, Fiji Islands. Reef Resources Assessment and Management Tech. Pap. No. 1, Secretariat of the Pacific Community, Noumea. 30 pp.
- Yeeting, B.M., Labrosse, P. and Adams, T.J.H. 2001. The live reef food fish of Bua Province, Fiji Islands. Reef Resource Assessment and Management Technical Paper No. 1. Secretariat of the Pacific Community, Noumea, New Caledonia.

## Reports

- Anonymous. 2004. Moratorium order halts Gulf grouper catch. Worldfish Report 330:FS/4.
- Belize Fisheries Department. 2005. Report on the spawning aggregations of multi-species at Cave Glory, Nicholas Caye, Rocky Point and Sandbore Belize.
- Daw T. 2004. Reef fish aggregations in Sabah, East Malaysia. Western Pacific Fisher Survey Series, Volume 5 (confidential appendix). Society for the Conservation of Reef Fish Aggregations. 63 pp.
- Domeier, M. L., P. L. Colin, T. J. Donaldson, W. D. Heyman, J. S. Pet, M. Russell, Y. Sadovy, M. A. Samoilys, A. Smith, B. M. Yeeting, and S.

- Smith. 2002. Transforming coral reef conservation: reef fish spawning aggregations component. Spawning Aggregation Working Group Report, The Nature Conservancy, Hawaii, April 22, 2002, 85 pp.  
(<http://www.scrfa.org/doc/FSAS.pdf>).
- Donnelly R. 2001. Socio-Economic Environment and the effect of the Live Reef Food Fish Trade in Marovo Lagoon, Roviana Lagoon and Ontong Java, Solomon Islands. Discussion Paper No.5. Report to Australian Centre for International Agricultural Research. ACIAR, Canberra, 91 pp.
- Donnelly RJ, Davis DC, Lam M. 2000. Socio-economic and biological aspects of the live reef food fish trade and its development in Solomon Islands. Discussion Paper No.1. Report to Australian Centre for International Agricultural Research. ACIAR, Canberra, 51 pp.
- Fishery Management and Spawning Aggregations work by NOAA (USA)  
<http://www.nmfs.noaa.gov/habitat/ead/spawnaggs.htm>
- Government of Belize. 2003. Statutory Instrument No. 161 of 2003. Fisheries (Spawning Aggregation Site Reserves) Order, 2003. Belize: Government of Belize.
- Hamilton R.J. and Kama W. 2004. Spawning aggregations of coral reef fish in Roviana Lagoon, Western Province, Solomon Islands – A local knowledge field survey report. Report prepared for The Nature Conservancy, Pacific Island Countries Coastal Marine Program. 54 pp.
- Hamilton R.J., P. Lahui, J. Warku, J. Aitsi, A. Sapul and S. Seeto. 2005. Local knowledge of reef fish spawning aggregations in Kimbe Bay, Papua New Guinea. Report prepared for The Nature Conservancy, Pacific Island Countries Coastal Marine Program. (Draft). 41p.
- Hamilton R.J., M. Matawai and T. Potuku. 2004. Spawning aggregations of coral reef fish in New Ireland and Manus Provinces, Papua New Guinea: Local knowledge field survey report (unrestricted access version). Report prepared for the Pacific Island Countries Coastal Marine Program, TNC Pacific Island Countries Report No. 4/04 (Unrestricted). The Nature Conservancy. 99 + iv p.
- Heyman, W. 2001. A report generated for the workshop “Towards a sustainable management of Nassau groupers in Belize”. The Nature Conservancy.
- Lau, P.P.F. and L.W.H. Li. 2000. Identification guide to fishes in the live seafood trade of Asia-Pacific region. World Wildlife Fund for nature, Hong Kong, 137 pp.

- Pet, J. and Muljadi, A. 2001 Pohnpei training workshop grouper spawning aggregation site (SPAGS) conservation and monitoring. The Nature Conservancy Coastal and Marine Program, Indonesia, 40 pp.
- Robinson, J., M. Isidore, M. A. Marguerite, M C. Ohman, and R. J. Payet. 2004. Spatial and temporal distribution of reef fish spawning aggregations in the Seychelles - an interview-based survey of artisanal fishers. *Western Indian Ocean Journal of Marine Science* 3(1):63-69.
- Sadovy Y. 2004. A report on the current status and history of exploited reef fish aggregations in Fiji. *Western Pacific Fisher Survey Series: Society for the Conservation of Reef Fish Aggregations*, volume 4.
- Sadovy Y. and M. Liu M. 2004. Report on the current status and exploitation history of reef fish spawning aggregations in eastern Indonesia. *Western Pacific Fisher Survey Series: Society for the Conservation of Reef Fish Aggregations*, volume 6.
- Sedberry, G.R., C.L. Cooksey, S.E. Crowe, J. Hyland, P.C. Jutte, C.M. Ralph, and L.R. Sautter. 2004. Characterization of deep reef habitat off the Southeastern U.S., with particular emphasis on discovery, exploration and description of reef fish spawning sites. Final Project Report, NOAA Ocean Exploration Project NA16RP2697.
- Sosa-Cordero, E., A. Medina-Quej, R. Herrera and W. Aguilar-Dávila. 2002. Agregaciones reproductivas de peces en el Sistema Arrecifal Mesoamericano: Consultoría Nacional, Mexico. *Sistema Arrecifal Mesoamericano*.

The Grouper Moon Project

<http://www.reef.org/data/groupermoon.html>

### **Newsletters, Articles, Magazine Articles, Internal Documents, Theses, other Grey Literature, Film**

- Anonymous. 2004. Moratorium order halts Gulf grouper catch. *Worldfish Report* 330:FS/4
- Burnett-Herkes, J., 1975. Contribution to the biology of the red hind, *Epinephelus guttatus*, a commercially important serranid fish from the tropical western Atlantic. PhD thesis, University of Miami, Coral Gables, pp 154.

- Carter, H.J. 1988. Grouper mating ritual on a Caribbean reef. *Underwater Nat.* 17(1): 8-11.
- Carter, H.J. 1988. Moonlight mating of the multitudes. *Anim. Kingdom* 92: 62-69.
- Carter, H.J. 1989. Grouper sex in Belize. *Nat. Hist. Oct.* 1989:60-69.
- Colin, P. L., Y.J. Sadovy and M.L. Domeier. 2003. Manual for the study and conservation of reef fish spawning aggregations. Society for the Conservation of Reef Fish Aggregations. Special Publication No. 1 (Version 1.0), pp. 1-98+iii.
- Cornish, A. S. and Y. Sadovy. 2004. Diminishing Returns. Spawning Aggregations are at Risk in the Indo-Pacific. April/May 2004 Issue: 28.
- Fa'asili, U. & Kelekolo, L. 1999. The use of village by-laws in marine conservation and fisheries management. SPC Traditional marine resource management and knowledge bulletin 11: 2-7.
- Fine, J. C. 1990. Groupers in love. *Sea Frontiers* Jan.-Feb.:42-45.
- Fine, J. C. 1992. Greedy for Groupers. *Wildlife Conser.* Nov./Dec.:68-71.
- Foale, S. 1998. The role of customary marine tenure and local knowledge in fishery management at West Nggela, Solomon Islands. Ph.D. dissertation, University of Melbourne. 269 pp.
- Gisawa, L. and P. Lokani. 2001. Trail community fishing and management of live reef food fisheries in Papua New Guinea. SPC Live reef Fish Information bulletin, No. 8.
- Goeden, G.B. 1977. The life and loves of the coral trout, *Australian Fisheries*, 36(8): 16–18.
- Hamilton R.J. 1999. Tidal movements and lunar aggregating behaviours of Carangidae in Roviana Lagoon, Western Province, Solomon Islands. MSc thesis, University of Otago, Dunedin, New Zealand, 142 pp.
- Hamilton, R. J. 2005. Indigenous ecological knowledge (IEK) of the aggregating and nocturnal spawning behaviour of the longfin emperor, *Lethrinus erythropterus*. Secretariat for the Pacific Community Traditional Marine Resource Management and Knowledge Information Bulletin No. 18, August 2005: 9-17.

- Hamilton, R.J. Unpublished manuscript. Artisanal spearfishermen's indigenous ecological knowledge and exploitation of a recently discovered spawning aggregation of the coral trout *Plectropomus areolatus* (Serranidae) on the Munda Bar reefs, Solomon Islands.
- Hamilton, R.J. In press. The role of indigenous knowledge in depleting a limited resource – A case study of the Bumphead Parrotfish (*Bolbometopon muricatum*) artisanal fishery in Roviana Lagoon, Western Province, Solomon Islands. Putting Fishers Knowledge to Work Conference Proceedings, UBC Fisheries Centre.
- Hamilton, R. J., M. Matawai, T. Potuku, W. Kama, P. Lahui, J. Warku and A. Smith. 2005. Applying local knowledge and science to the management of grouper aggregation sites in Melanesia. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:7-19.
- Hamilton, R. and R. Walter, 1999. Indigenous ecological knowledge and its role in fisheries research design. A case study from Roviana Lagoon, Western Province, Solomon Islands. SPC Traditional marine resource management and knowledge bulletin 11: 13-25.
- Johannes, R.E. 1997. Grouper spawning aggregations need protection. SPC Infor. Bull.: Live Reef Fish No. 3: 13-14.
- Johannes, R.E. and E. Hviding. 2000. Traditional knowledge possessed by the fishers of Marovo Lagoon, Solomon Islands, concerning fish aggregating behaviour. SPC Trad. Mar. Resource Management Knowledge Bull. 12: 22-29.
- Johannes, B. and N. Kile. 2001. Protecting grouper spawning aggregations, a potential target of the live reef fish trade in Ysabel and Wagina Islands, Solomon Islands. SPC Live Reef Fish Infor. Bull. 8: 5-9.
- Johannes, R.E. and M. Lam. 1999. The live reef food fish trade in the Solomon Islands. SPC Live Reef Fish Inf. Bull. 5: 8-15.
- Mapstone, B.D., C.R. Davies, S.J. Slade, A. Jones, K.J. Kane and A.J. Williams. 2001. Effects of live fish trading and targeting spawning aggregations on fleet dynamics, catch characteristics, and resource exploitation by the Queensland commercial demersal reef line fishery. Report to Fisheries Research and Development Corporation. Project No. 96/138, 72. [[www.reef.crc.org.au/publications/scientific/](http://www.reef.crc.org.au/publications/scientific/) - scroll down to Mapstone et al. under Technical Reports for downloadable file].
- MPANews: The Science and Policy of Protecting Spawning Aggregations- Interview with Yvonne Sadovy -

<http://depts.washington.edu/mpanews/issues.html#Jun 2004> (see below for extracts).

MPA News Vol. 8 (2). 2006. Protecting the spawning and nursery habitats of fish: the use of marine protected areas to safeguard the critical life history stages for marine life <http://depts.Washington.edu/mpanews/>

*Parexocoetus brachypterus* (flying fish) plus video  
[http://cars.er.usgs.gov/coastaleco/Northeastern\\_Gulf\\_of\\_Mexico/northeastern\\_gulf\\_of\\_mexico.html](http://cars.er.usgs.gov/coastaleco/Northeastern_Gulf_of_Mexico/northeastern_gulf_of_mexico.html)

Passfield, K. 1996. Notes on grouper spawning aggregations in Tongareva, Cook Islands. SPC Traditional Mar. Res. Management and Knowledge Info. Bull. No. 7: 20.

Pickert, P., T. Kelly, R.S, Nemeth, E. Kadison E. 2006. Seas of change: spawning aggregations of the Virgin Islands. In: Pickert P, Kelly T (eds) DVD by Friday's films, San Francisco.

Sadovy, Y.J. 1993. The Nassau grouper, endangered or just unlucky? Reef Encounter 13:10-12.

Sadovy, Y.J. 2005. Troubled times for trysting trio: three aggregating groupers in the live reef food-fish trade. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:3-6.

Sadovy, Y.J., P. Colin and M. Domeier. 2005. Monitoring and managing spawning aggregations: methods and challenges. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:25-29.

Samoilys M.A. 2002. Spawning aggregation closures for the live reef fish fishery in Solomon Islands. SPC Live Reef Fish Information Bulletin, No.10.

*Stereolepis gigas* (giant sea bass):  
[http://www.pier.org/CA\\_coastal\\_giant\\_sea\\_bass.shtml](http://www.pier.org/CA_coastal_giant_sea_bass.shtml)

Yeeting, B.M. 1999. Live reef fish developments in Fiji. SPC Fish. Newsl. No. 88. January-March,1999. Secretariat of the Pacific Community, Noumea, pp. 25-36.

## **Live Reef Fish Trade**

Sadovy, Y.J., T.J. Donaldson, T.R. Graham, F. McGilvray, G.J. Muldoon, M.J. Philips, M.A. Rimmer, A. Smith and B. Yeeting. 2003. While Stocks Last: The Live Reef Food Fish Trade. Manila: Asian Development Bank: 147.

Sadovy, Y.J. and A.C.J. Vincent. 2002. The trades in live reef fishes for food and aquaria: issues and impacts. *In*: Sale PF, editor. Coral reef fishes. Dynamics and diversity in a complex ecosystem. Academic Press, San Diego, pp. 391-420.

Samoilys, M.A. 2002. Spawning aggregation closures for the live reef fish fishery in Solomon Islands. SPC Live Reef Fish Information Bulletin, No.10.

2002 - Two responses to the 2001 article on spawning aggregations on the Great Barrier Reef: The live reef fish trade on Australia's Great Barrier Reef: changes to historical fishing practices by Bruce Mapstone and coworkers et al. Secretariat of the Pacific Community (SPC) Live Reef fish Bulletins 9 and 10 [SPC bulletins can be found at: <http://www.spc.int/coastfish/News/LRF/lrf.htm>.]

## Traditional Knowledge

Hamilton, R. J. 2005. Indigenous ecological knowledge (IEK) of the aggregating and nocturnal spawning behaviour of the longfin emperor, *Lethrinus erythropterus*. Secretariat for the Pacific Community Traditional Marine Resource Management and Knowledge Information Bulletin No. 18, August 2005: 9-17.

Hamilton, R. J., M. Matawai, T. Potuku, W. Kama, P. Lahui, J. Warku and A. Smith. 2005. Applying local knowledge and science to the management of grouper aggregation sites in Melanesia. Secretariat for the Pacific Community Live Reef Fish Bulletin 14:7-19.

Johannes, R.E. 1988. Spawning aggregations of the grouper *Plectropomus areolatus* (Ruppell) in the Solomon Islands. *In*: Proceedings of the 6th International Coral Reef Symposium, Townsville. 2: 751-755.

Johannes, R. E., Freeman, M.R. Milton and R. Hamilton. 2000. Ignore fishers' knowledge and miss the boat. *Fish and Fisheries* 1: 257-271.

Johannes, R.E. and E. Hviding. 2001. Traditional knowledge possessed by the fishers of Marovo Lagoon, Solomon Islands, concerning fish aggregating behaviour. *Traditional Marine Resource Management and Knowledge Bulletin* 12: 22-29.

- Johannes, R. E., K. Ruddle and E. Hviding. 1993. The value today of traditional management and knowledge of coastal marine resources in Oceania. Workshop: People, Society, and Pacific Islands Fisheries Development and Management (Noumea, New Caledonia) 1-7.
- Robinson, J., M. Isidore, M. A. Marguerite, M C. Ohman, and R. J. Payet. 2004. Spatial and temporal distribution of reef fish spawning aggregations in the Seychelles - an interview-based survey of artisanal fishers. *Western Indian Ocean Journal of Marine Science* 3(1):63-69.
- Ruddle, K. 1996. Traditional management of reef fishing. *In: Reef Fisheries*, eds. N.V.C. Polunin & C. M. Roberts, London: Chapman & Hall, pp. 315–35.
- Stevenson, M.G. 1996. Indigenous knowledge in environmental assessment. *Arctic* 49(3): 278-291.

### **Economic Analyses**

- Rudd, M.A. 2001. The Effects of Seafood Import Tariffs on Market Demand for Nassau Grouper in the Turks and Caicos Islands. Mansholt Graduate School, Wageningen University.
- Rudd, M. A. 2002. A comment on fishing effort allocation in the Turks and Caicos Islands. Department of Fisheries and Oceans, Maritimes Region.
- Rudd, M.A. and M.H. Tupper. 2002. The Impact of Nassau Grouper size and abundance on scuba dive site selection and MPA economics. *Coastal Management*.
- Ruitenbeek, H. J. 2001. an economic analysis of the spawning aggregation function in Komodo National Park. Indonesia. Secretariat of the Pacific Community Live Reef Fish Bulletin. 9:13-16.
- Russell, M. 2003. Reducing the impact of fishing and tourism on fish spawning aggregations in the Great Barrier Reef marine park. 57th Gulf and Caribbean Fisheries Institute: 680-688.
- Tupper, M. and Rudd, M.A. 2002. Species-specific impacts of a small marine reserve on reef fish production and fishing productivity in the Turks and Caicos Islands. *Environmental Conservation* 29 (4): 484–492.