Expulsion of symbiotic luminous bacteria from pony fish, *Leiognathus nuchalis*

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Expulsion of the symbiotic bacteria, *Photobacterium leiognathi*, from pony fish, *Leiognathus nuchalis*, was investigated. Seawater in the aquarium in which replicates of adult fish were kept under cycles of 12 L : 12 D, began to emit detectable luminescence after the onset of light period, with its intensity increasing up to $3 \times 10^8$ photons/min/ml. The luminescence from seawater, then decreased to a level below detection limit (< $3 \times 10^2$ photons/min/ml) towards the dark period. Defecation of luminescent pellets (with light intensities ranging from $5 \times 10^8$ to $2 \times 10^{10}$ photons/min/pellet), from which symbiotically competent *P. leiognathi* cells were isolated, coincided with the light period. Similar diurnal patterns of seawater luminescence were found also for juvenile fish that had been infected by the symbiotic luminous bacteria. Changes in the number of viable luminous bacterial cells in seawater corresponded to those in the light intensity from seawater. Up to 85% of the bacterial population in the juvenile light organ was estimated to be released daily. These findings suggest that expulsion of symbiotic bacteria from the light organ of pony fish is controlled by diurnal rhythm of host physiology, and that, at least in adult fish, a significant portion of the symbiotic bacteria is defecated as luminous pellets. Daily expulsion of the symbiotic bacteria via defecation should help maintain *P. leiognathi* population in marine environments, thereby increasing the chances of lateral infection to the next generations of the host.