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Lecture Series Environment & Biodiversity

Oceanographic and Geomagnetic Drivers of Japanese Eel Spawning Migration in the North Pacific

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NLW-Faculty, Room 421, 2nd floor

Research focus:

Marine migrations of eels (Anguillidae)





Abstract

Silver-phase Japanese eels (*Anguilla japonica*) migrate from continental growth habitats to tropical spawning grounds along the West Mariana Ridge, yet their migratory behaviour and orientation cues remain unclear. To elucidate these processes, we deployed pop-up satellite archival tags on 27 silver eels released in Japan's coastal and offshore waters of the western North Pacific. Depth and temperature time series were used to examine vertical behaviour, and daily positions were reconstructed with a particle filter integrating in-situ temperature records with ocean reanalysis data.

Eels exhibited diel vertical migration, occupying shallower depths at night and descending during the day, with swimming depth correlated to solar and lunar altitude and ambient temperature. Mean swimming depth deepened from cold coastal to warm subtropical waters, suggesting that photic and thermal cues jointly regulate vertical movement to balance predation risk and physiological demands during migration.

Horizontally, coastal eels moved eastward along the Kuroshio, while offshore individuals swam south toward the spawning area. Active swimming bearings aligned with geomagnetic intensity gradients, and simulations showed that virtual migrants maintaining this orientation converged on the spawning site.

These results reveal integrated vertical and horizontal behavioural strategies coupling environmental sensing, thermal adaptation, and geomagnetic navigation during the Japanese eel's spawning migration.

