Expedition finds Nemo can travel great distances to connect populations

September 17 2014

As babies, clownfish sometimes travel hundreds of kilometres across the open ocean. Credit: Tane Sinclair-Taylor

Clownfish spend their entire lives nestling in the protective tentacles of host anemones, but new research shows that as babies they sometimes travel hundreds of kilometres across the open ocean. Although the process of long-distance dispersal by reef fish has been predicted, this is the first time that the high level exchange of offspring between distant

populations has been observed.

Dr Steve Simpson, Senior Lecturer in Marine Biology and Global Change at the University of Exeter, and colleagues from the Australian Research Council Centre of Excellence for Coral Reef Studies (ARC COE CRS), Sultan Qaboos University (Oman) and the Centre National de la Recherche Scientifique (France) have published their findings on the dispersal of Omani clownfish larvae in the journal *PLOS ONE*.

The study found that six percent of the fish sampled had migrated over 400 km from one population to the other, which, contrary to the film Finding Nemo, is a process that only occurs during the ocean-going larval stage.

"This is an epic journey for these tiny week-old fish. When they arrive at the reef, they are less than a centimetre long, and only a few days old, so to travel hundreds of kilometres they must be riding ocean currents to assist their migration," said Dr Simpson.

Dr Simpson led a team of undergraduate and postgraduate students from the University of Edinburgh to collect the clownfish samples from throughout southern Oman.

"The southern coast of Oman is relatively isolated from the rest of the Arabian Peninsula so you find a lot of species there that you wouldn't find anywhere else in the world," said Dr Simpson. "There are only two coral reef systems along this coast, and they are separated by 400 km of surf beaches. In order to persist as a single species, we know Omani clownfish fish must occasionally migrate between these two populations."

Nemo can travel great distances to connect populations. Credit: Tane Sinclair-Taylor

The team used DNA fingerprinting to identify local, long-distant migrant, and hybrid individuals from populations throughout the entire Omani clownfish (Amphiprion omanensis) species range. Around 400 fish were harmlessly caught during 92 dives, and a small fin clip taken for DNA analysis before releasing fish back to their colonies.

"Just like accents that allow us to tell an Englishman from an American, fish populations develop their own genetic signatures," said co-author Hugo Harrison from the ARC COE CRS. "By looking at the signature of each fish we can tell whether it originated there or not. It's like finding an Englishman in New York, they stand out."

The DNA evidence identified that the majority of migrant fish had travelled from north to south and so, to test whether this was due to

prevailing currents, the team developed an oceanographic model for the region.

"We found that the pattern of migration corresponded to the dominant ocean currents in the region that are driven by the winter monsoon," said co-author Michel Claereboudt from Sultan Qaboos University.

As well as migrants, second generation hybrids were also identified in both populations, showing that after dispersal migrants had joined and reproduced with local populations.

"This study is the furthest anyone has tracked the dispersal of coral reef fish, and it demonstrates that distant populations in the marine environment can be well connected," said Simpson. "Our ability to predict how far fish larvae disperse helps us to manage coral reef ecosystems. Understanding connectivity means we can protect populations that are most sensitive, harvest from populations that have a regular and consistent turn-over, and design coherent networks of marine protected areas".

The Omani coastline is an arid desert and the expedition took months of preparations for the harsh conditions. The 24 students and researchers were trained by Simpson and his dive instructors in SCUBA diving, emergency first aid and off-road driving. The team camped in areas that were isolated and dived at sites that had never been dived before.

"This was a turning point in my career," said co-author Hugo Harrison. "At that stage I'd never seen a coral reef or experienced how diverse these ecosystems can be. Many of us on this expedition went on to pursue careers in marine science, and my work now is focused on improving the management of these fragile ecosystems."

The project was highly commended by the Duke of Edinburgh, who

invited the team to Buckingham Palace to hear more about the expedition.

More information: Long-distance dispersal via ocean currents connects Omani clownfish populations throughout entire species range by Steve Simpson, Hugo Harrison, Michel Claereboudt and Serge Planes is published in *PLOS ONE*.

Provided by University of Exeter

Citation: Expedition finds Nemo can travel great distances to connect populations (2014, September 17) retrieved 5 April 2024 from https://phys.org/news/2014-09-nemo-great-distances-populations.html

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