A genomic island linked to ecotype divergence in Atlantic cod - DTU Orbit (17/12/2018)

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The genomic architecture underlying ecological divergence and ecological speciation with gene flow is still largely unknown for most organisms. One central question is whether divergence is genome-wide or localized in 'genomic mosaics' during early stages when gene flow is still pronounced. Empirical work has so far been limited, and the relative impacts of gene flow and natural selection on genomic patterns have not been fully explored. Here, we use ecotypes of Atlantic cod to investigate genomic patterns of diversity and population differentiation in a natural system characterized by high gene flow and large effective population sizes, properties which theoretically could restrict divergence in local genomic regions. We identify a genomic region of strong population differentiation, extending over approximately 20 cM, between pairs of migratory and stationary ecotypes examined at two different localities. Furthermore, the region is characterized by markedly reduced levels of genetic diversity in migratory ecotype samples. The results highlight the genomic region, or 'genomic island', as potentially associated with ecological divergence and suggest the involvement of a selective sweep. Finally, we also confirm earlier findings of localized genomic differentiation in three other linkage groups associated with divergence among eastern Atlantic populations. Thus, although the underlying mechanisms are still unknown, the results suggest that 'genomic mosaics' of differentiation may even be found under high levels of gene flow and that marine fishes may provide insightful model systems for studying and identifying initial targets of selection during ecological divergence.
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 5.56 SJR 3.508 SNIP 1.834
Web of Science (2011): Impact factor 5.522
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.564 SNIP 1.919
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 3.489 SNIP 2.022
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 3.363 SNIP 2.075
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 3.508 SNIP 2.102
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 2.978 SNIP 1.908
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 2.98 SNIP 2.089
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.799 SNIP 2.092
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.582 SNIP 1.716
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 2.259 SNIP 1.445
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 2.165 SNIP 1.571
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 1.821 SNIP 1.67
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 2.483 SNIP 1.783
Original language: English
Electronic versions:
Hemmer_Hansen_et_al_Submitted.pdf
DOI:
10.1111/mec.12284
URLs:
Source: dtu
Source-ID: n:oai:DTIC-ART:blackwell/385771315::28202
Research output: Research - peer-review › Journal article – Annual report year: 2013