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## Approaches to Assessing Gene Flow

A.R. KAPUSCINSKI, J.J. HARO, K.M. PAULSON, R. NEIRA, A. PONNIAH, W. KAMONRAT, W. MWANJA, I.A. FLEMING, J. GALLARDO, R.H. DEVLIN AND J. TRISAK

### Introduction

Potential gene flow from transgenic individuals to wild relatives is a major pathway through which transgenic fish might affect natural populations. Introgression of transgenes into wild populations has the potential to depress adaptation, alter (and likely reduce) genetic diversity within and between wild populations and consequently reduce their probability of continued existence. Environmental risk assessment should thus assess the probability and consequences of gene flow whenever a transgenic fish line has relatives in accessible aquatic ecosystems. However, gene flow is not a prerequisite for potential environmental effects resulting from escapes of transgenic fish. Chapter 6 addresses additional processes through which escaping transgenic fish can alter natural aquatic ecosystems.

This chapter focuses on ways to assess the likelihood of gene flow *before* approved use and actual entry of transgenic fish into the environment. (Chapter 9, this volume, addresses methods of monitoring gene flow *after* approval of a specific use or environmental entry of transgenic fish.) This chapter is relevant for proposed uses of transgenic fish that could lead to accidental escape from an aquaculture operation, ornamental fish aquarium, other confined systems or live fish markets. Assessing gene flow would also be needed to evaluate proposals for purposeful release of transgenic fish into natural water bodies, which is being contemplated as a novel way to control invasive fish species (Thresher *et al.*, 1999; Kapuscinski and Paton, 2005).

In this chapter, the term 'relative' refers to any fish with which the transgenic fish can interbreed, and use of this term applies to cases in which wild relatives are either a native or non-native species that have established a feral population in the aquatic ecosystem. Wild relatives could belong to the same species as the transgenic fish, or to a closely related species. It is important to note that, although the chapter focuses on gene flow from transgenic fish, its assessment approach, and much of the supporting scientific knowledge, also applies to assessing gene flow from selectively bred farmed fish to wild relatives.