

# COMPARISON BETWEEN STATIONARY ANTENNA GRID AND PORTABLE ANTENNA PIT SYSTEMS FOR STUDYING FISH HABITAT USE<sup>1</sup>

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*In this paper, we compare information on fish habitat use obtained from two passive integrated transponder (PIT) systems: a stationary antenna grid and a portable antenna. In 2007, 53 juvenile salmonids were PIT-tagged and released in Ruisseau Xavier (Quebec). Fish positions were monitored with both antenna systems from July to November. The number of individuals detected and the number of detections differed between the two systems, and they were dependent on the time interval used for the comparisons. While the antenna grid provided a temporally continuous monitoring, the portable antenna provided a spatially continuous coverage. Observed differences in the spatial patterns recorded with the two systems were dependent on fish spatial behaviour. Calculated movement distances of fish were also different between the two antenna systems. The results highlight the importance of considering the spatio-temporal resolution of the PIT systems that are used to monitor fish behaviour in natural rivers.*

*Dans cet article, nous comparons l'information sur l'usage de l'habitat aquatique obtenu de deux systèmes à transpondeur intégré passif (TIP) : un réseau d'antennes stationnaires et une antenne portable. En 2007, 53 salmonidés juvéniles ont été étiquetés par le TIP et relâchés dans le ruisseau Xavier (Québec). On a surveillé les positions des poissons avec les deux systèmes d'antennes de juillet à novembre. Le nombre d'individus détectés et le nombre de détections ont différencié entre les deux systèmes et ils étaient dépendants de l'intervalle de temps utilisé pour les comparaisons. Alors que le réseau d'antennes a fourni une surveillance temporelle continue, l'antenne portable a fourni une couverture spatiale continue. Les différences observées dans les modèles spatiaux enregistrés par les deux systèmes dépendaient du comportement spatial des poissons. Les distances calculées de déplacement des poissons ont aussi été différentes entre les deux systèmes d'antennes. Les résultats soulignent l'importance de tenir compte de la résolution spatio-temporelle des systèmes de TIP qui sont utilisés pour surveiller le comportement des poissons dans les rivières naturelles.*



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## Introduction

The understanding of the link between habitat structure and fish populations has been impeded in the past by a lack of appropriate methods for tracking the movements of small individual fish in their natural environment. Passive integrated transponder (PIT) technology has partly resolved this problem in recent times by offering a versatile alternative to traditional telemetry methods (radio or acoustic). Indeed, PIT tags are small and inexpensive, last indefinitely and allow the identification of individual fish. They consist of an electronic microchip encapsulated in biocompatible glass and programmed with an alphanumeric code that is emitted when the tag is activated by an external antenna. The spatio-temporal resolution achieved when tracking PIT-tagged fish in natural settings depends mostly on the type of antenna system used. In natural rivers, stationary PIT systems typically

allow the monitoring of fish passage at a single location [Armstrong *et al.* 1996; Castro-Santos *et al.* 1996; Greenberg and Giller 2000], while a larger spatial extent is covered in wadable streams with portable PIT antennas [Morhardt *et al.* 2000; Roussel *et al.* 2000; Zydlewski *et al.* 2001; Cucherousset *et al.* 2005; Linnansaari *et al.* 2007]. The main disadvantage of portable systems is that they must be operated manually by a person wading the stream, which is time-consuming, restricts the frequency of surveys, and thus limits the temporal resolution of this type of antenna. Recent developments in PIT systems have combined the advantages of both stationary and portable systems by adapting stationary, single and multiple, antenna systems to natural environments for continuous monitoring of fish with higher spatial and temporal resolution [Armstrong *et al.* 1996; Greenberg and Giller 2000;

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