Table 1: List of research recommendations from Genetics subgroup of the River Herring Technical Expert Working Group.

Research topic	Relevance to restoration	Generality	Status and time frame	Estimated funds required for research*	Relevant citations
Molecular marker development					
Single Nucleotide Polymorphism (SNP) discovery	Highly relevant; useful in a variety of contexts	Very general; broad applications (bycatch, marine ecology, life history, etc.)	Research not funded; needed immediately	$$	
Restriction site Associated DNA (RAD) markers	Relevant; valuable for examining adaptive genetic variation	General; useful in designating Distinct Population Segments (DPSs) and understanding evolutionary potential, etc.	Research not funded; long term goal	$$$	
Life History					
Rangewide population structure (Canada and US)	Highly relevant; invaluable baseline data	Very general; broad applications (bycatch, marine ecology, distribution of standing genetic variation, population structure)	Research was funded separately in Canada and the US. Unfortunately, the microsatellite data cannot be easily combined for rangewide perspective (uncoordinated effort). Needed immediately	$$$ (?)	Palkovacs et al. 2013 (USA range, both species) McBride et al. in review (Canadian range, alewife only)

Straying rates	Highly relevant; crucial for connectivity, re-colonization, setting expectations for 'natural' recovery	Very general; broad applications (identify source of migrants, understand timelines for re-colonization after dam removal, resolve range expansion/shifts)	Research not funded; needed immediately	$$	
Demography					
Effective population size (N_e)	Relevant; important information about relative population abundance	Specific; provides data about relative census population size (N_c), promotes integration with Stock Status subgroup	Research not funded; long term goal	$$	
Incidental harm					
Impacts of catch in non-targeted ocean fisheries and mixed stock fisheries conducted by some states	Highly relevant; potentially important source of mortality	Very general; important for understanding which stocks/populations are most at risk to catch	Research funded by NFWF; needed immediately	$$$	Bethoney et al. 2012 Cournane et al. 2012
Additional sources of mortality	Highly relevant; could impact recovery efforts	Very general; important to determine the extent to which specific stocks and populations are impacted by dams, hydropower, etc.	Research not funded; needed in the medium term	$$	
Marine Ecology					
Distribution, migration, mixing	Highly relevant; crucial information about spatiotemporal distributions, migratory routes, extent of	Very general; broad applications because factors that influence population dynamics for the freshwater portion of	Research not funded; needed immediately	$$$$	

	intermixing among stocks and populations	their lives cannot be easily separated from marine factors			
Restoration					
Impacts of stocking activities	Relevant; important data about effects of stock transfers etc. on population structure and genetic diversity	General; important for understanding whether stocking activities undermine restoration objectives by jeopardizing genetic variation	Research funded by NFWF; needed in the medium term	$$	Labbe 2012 (MSc thesis) McBride 2013 (MSc thesis)
Natural recolonization	Relevant; crucial information about timelines for recovery and sources of migrants	General; needed for understanding whether stocking activities are required for restoration following dam removal/fish passage modification	Research not funded; needed immediately	$$	
Hybrids					
Selection against hybrids vs. hybrid vigor	Somewhat relevant; are hybrids at a disadvantage (or advantage) in the ocean?	Specific; need to understand the extent to anadromous hybrids reproduce with purebred river herring or other hybrids	Research funded by NFWF; needed in the medium term	$$$	Hasselman et al. 2014
Archival collections (natural resource agencies, museums, etc.)	Relevant; archival collections could reveal whether the proportion of hybrids is increasing (decreasing) over time	General; hybrid proportions could be impacted by the extent of dam construction on various rivers, broader applications beyond	Research not funded; needed in the medium term	$$	

		hybrids (could reveal temporal patterns/trends in genetic diversity, etc.)			
Otolith microchemistry					
Integration of genetic and otolith data; obtain baseline data from specific rivers (TBD)	Relevant; useful in specific contexts	Specific; most applicable where genetic data provides coarse resolution	Research funded by NFWF; needed in the medium term	$$$	Turner 2014 (PhD dissertation) Payne 2014 (MSc thesis)
Miscellaneous					
Additional marking methods (e.g., oxytetracycline marking, tagging)	Relevant; potentially useful in combination with genetic methods and otolith techniques	Somewhat specific; most applicable for determining and quantifying impacts of mixed stock fisheries	Research not funded; long term goal	$$$	
Predation effects (stomach contents)	Relevant; valuable for understanding whether predation impacts recovery	Somewhat specific; most applicable where predators are already suspected to have a negative impact on recovery	Research not funded; long term goal	$$$	
Establish standardized rangewide sampling protocols and dedicated monitoring for specific populations to establish long term data series	Highly relevant; developing standardized (lethal and non-lethal) sampling protocols ensures consistency in data collection across species ranges	Very general; broad application for sampling tissues and collecting data will generate rangewide data that is directly comparable and will provide meaningful insights on rangewide patterns	Research not funded; needed immediately	$$	

* $: 1-9K; $$: 10-99K; $$$: 100-199K; $$$$: >200K