The following supplement accompanies the article

A traits-based approach for prioritizing species for monitoring and surrogacy selection

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Supplement 1

Description of traits used in our case studies

Our approach was centered on using traits that would lend insight into the overall risk of a fish being entrained and injured or killed during turbine passage for all 802 freshwater fish species in the USA. The risk for each species was characterized from the addition of standardized metrics from four different categories: entrainment vulnerability (Table S1), entrainment injury/ mortality vulnerability (Table S2), population vulnerability (Table S3), and turbine exposure. We characterized entrainment vulnerability using presence or absence of fish behavioral traits including whether or not a fish was pelagic, migratory, or was found in slow, moderate or fast current. Next, we characterized entrainment injury vulnerability using physical traits of a fish species that likely bears on entrainment injury including maximum total length, scale type—different scales offer different levels of protection for fishes, and swim bladder type. We assessed the population vulnerability by calculating an index of a fish species going extinct in the wild. We based this score on factors such as whether a species has undergone range reductions or has been overexploited as well as population status designations by the US Endangered Species Act (i.e., non-status, threatened, endangered), NatureServe (i.e., secure, critically imperiled), and the International Union for the Conservation of Nature (i.e., least concern, vulnerable, critically endangered). Turbine exposure of a species provided the relative risk of a fish species to hydropower turbine entrainment based on the number of in-dam hydropower turbines in a fish species' range.

Table S1. Variables used for clustering fish species based on vulnerability to turbine entrainment. Lower risk score means a species has a lower risk of turbine injury/ mortality.

Variable	Value	Description	Rationale
Pelagic	0	Not pelagic	Pelagic fishes are more vulnerable to entrainment because turbine intakes are generally neither at the surface or at the bottom
	1	Pelagic	
Habitat	1	River	Riverine fishes are least vulnerable to entrainment because they are infrequently found in reservoirs upstream of dams where they could be entrained
	2	Lake	Lake fishes are somewhat vulnerable to entrainment because they may be found in reservoirs upstream of dams where they could be entrained
	3	River and lake	Lake and river fishes are somewhat vulnerable to entrainment because they can be found in reservoirs where they are vulnerable to entrainment.
Body Length	Continuous	Maximum TL	Longer fish have faster burst swim speeds and are less vulnerable to entrainment
Migratory*	0	Not migratory	
	1	Migratory	
Slow Current	0	Not slow current dwelling	Fish that dwell in slow or no current, such as fish found in lakes, are more susceptible to entrainment because turbine intake structures are in reservoirs where there is slow or no current.
	1	Slow current dwelling	
Moderate Current	0	Not moderate current dwelling	
	1	Moderate current dwelling	
Fast Current	0	Not fast current dwelling	
	1	Fast current dwelling	

*Not from Fish Traits Database

Table S2. Variables used for clustering fish species based on vulnerability to turbine injury. Lower risk score means a species has a lower risk of turbine injury/ mortality.

Variable	Value	Description	Rationale
Maximum TL	continuous		Probability of blade strike increases with length
Scales*	1	Scaleless	Scaleless fish do not receive protection conferred by scales
	2	Cycloid	Cycloid scales are small and easily removed
	3	Ctenoid	Ctenoid scales are larger than cycloid scales and less easily removed than cycloid scales
	4	Ganoid	Ganoid scales are large, hard and difficult to remove
	5	Scutes	Scutes are hard, bony plates that are very difficult to remove and provide maximum protection of any fish integument
Swim bladder*	1	Physoclistous	Physoclistous fishes are slow to regulate swim bladder gases because they do so through diffusion into capillaries leaving them vulnerable to rapid pressure decrease injury
	2	Physostomous	Physostomous fishes can more quickly regulate swim bladder gases because they have an opening from their swim bladder to their esophagus that allows them to quickly burp air leaving them less vulnerable to rapid pressure decrease injury

*Not from Fish Traits Database

Table S3. Variables used for clustering fish species by species population and conservation status. Lower value means a species has a lower population impact from turbines.

Variable	Value	Description
Habitat/Range Reduction	0	Minimal range reduction
	1	Significant range reduction
Overexploitation	0	Minimal overexploitation
	1	Widespread overexploitation
Anthropogenic Threats	0	Minimal anthropogenic threats
	1	Widespread anthropogenic threats
Restricted Range	0	Widely occurring species
	1	Highly endemic species
Natureserve Conservation Status	1	Secure
	2	Secure/apparently secure
	3	Apparently secure
	4	Apparently secure/ vulnerable
	5	Vulnerable
	6	Vulnerable/ imperiled
	7	Imperiled
	8	Imperiled/ critically imperiled
	9	Critically imperiled
US ESA Status	1	Non-status species
	2	Species of concern
	3	Threatened
	4	Endangered
IUCN Conservation Status	1	Least concern
	2	Near threatened/ data deficient
	3	Vulnerable
	4	Endangered
	5	Critically endangered
Periodic life history strategy	1	Periodic strategy
	0	Not periodic strategy
Equilibrium life history strategy	1	Equilibrium strategy
	0	Not equilibrium strategy
Opportunistic life history strategy	1	Opportunistic strategy
	0	Not opportunistic strategy

*Data from NatureServe. All other data from Fish Traits Database.