



Helbing Laboratory eDNA Technical Bulletin

All eDNA tools are validated through a rigorous multi-step evaluation protocol that includes tests of DNA target specificity and amplification sensitivity¹⁻³.

General eDNA Assay Information

Target Species: Longnose (nooksack) dace (*Rhinichthys cataractae*) eDNA qPCR Tool: eRHCA4 Gene Target: MT-ND4
Species Code: te-RHCA eDNA qPCR Format: TaqMan Published in:

eDNA Assay Sensitivity Test Summary using gBlocks™ Synthetic DNA

LOD 0.2 95% CI 0.2-0.4 Copies/Rxn LOQ 0.9 95% CI 0.6-1.6 Copies/Rxn LOB 0 hits/8
LOQ_{continuous} 4 Copies/Rxn

Binomial-Poisson model for 8 technical replicates determined using eLowQuant R code⁴. When the LOQ < LOD, use the LOD for the LOQ. Enzyme: QIAcuity

eDNA Assay Specificity Test Information

Each qPCR reaction in the specificity assay contained 10 picograms of voucher target gDNA (n=25 technical replicates)

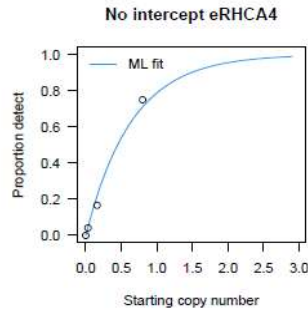
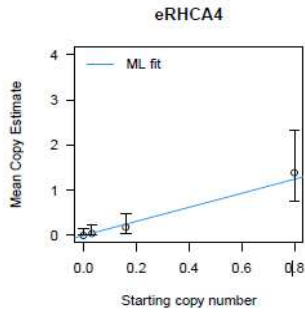
Species	Common Name (<i>Species</i>)	Detection	# Voucher		Sample Sources/Locations
			Specimens		
ma-CALUfa	Domestic dog (<i>Canis lupus familiaris</i>)	No	1		British Columbia
ma-FECA	Domestic cat (<i>Felis catus</i>)	No	1		British Columbia
ma-HOSA	Human (<i>Homo sapiens</i>)	No	1		Netherlands
te-COCO	Slimy sculpin (<i>Cottus cognatus</i>)	No	1		British Columbia
te-ESNI	Chain pickerel (<i>Esox niger</i>)	No	1		British Columbia
te-ONCLle	Westslope cutthroat trout (<i>Oncorhynchus clarkii lewisi</i>)	No	1		Alberta
te-ONGO	Pink salmon (<i>Oncorhynchus gorbuscha</i>)	No	1		British Columbia
te-ONKE	Chum salmon (<i>Oncorhynchus keta</i>)	No	1		British Columbia
te-ONKI	Coho salmon (<i>Oncorhynchus kisutch</i>)	No	2		British Columbia
te-ONMY	Rainbow (steelhead) trout (<i>Oncorhynchus mykiss</i>)	No	1		British Columbia
te-ONNE	Sockeye salmon (<i>Oncorhynchus nerka</i>)	No	1		British Columbia
te-ONTS	Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	No	1		British Columbia
te-SANA	Lake trout (<i>Salvelinus namaycush</i>)	No	1		Alberta
te-PLGR	Flathead chub (<i>Platygobio gracilis</i>)	No	1		Ontario
te-PTOR	Northern pikeminnow (<i>Ptychocheilus oregonensis</i>)	No	1		British Columbia
te-MYCA	Peamouth chub (<i>Mylocheilus caurinus</i>)	No	1		Ontario
te-RHCA	Longnose (nooksack) dace (<i>Rhinichthys cataractae</i>)	Yes	5		British Columbia

References

- Hobbs, J, Adams, IT, Round, JM, Goldberg, CS, Allison, MJ, Bergman, LC, Mirabzadeh, A, Allen, H, Helbing, CC (2020) Revising the range of Rocky Mountain tailed frog, *Ascaphus montanus*, in British Columbia, Canada, using environmental DNA methods. *Environmental DNA*, 2: 350-361. <https://doi.org/10.1002/edn3.82>
- Hobbs, J, Round, JM, Allison, MJ, Helbing, CC (2019) Expansion of the known distribution of the coastal tailed frog, *Ascaphus truei*, in British Columbia, Canada, using robust eDNA detection methods. *PLOS ONE* 14(3): e0213849. <https://doi.org/10.1371/journal.pone.0213849>
- Langlois, VS, Allison, MJ, Bergman, LC, To, TA, and Helbing, CC (2020) The need for robust qPCR-based eDNA detection assays in environmental monitoring and risk assessments. *Environmental DNA*, 3: 519-527. doi: 10.1002/edn3.164
- Lesperance, M, Allison, MJ, Bergman, LC, Hocking, MD, and Helbing, CC (2021) A statistical model for calibration and computation of detection and quantification limits for low copy number environmental DNA samples. *Environmental DNA*, 3: 970-981. doi: 10.1002/edn3.220

eDNA Assay Sensitivity Test Details using gBlocks™ synthetic DNA

To calculate tables for different numbers of replicates, raw csv data files can be accessed here:
<https://onlineacademiccommunity.uvic.ca/helbinglab/edna/>

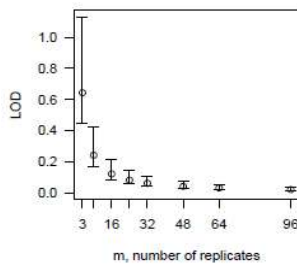


From 8 Technical Replicates

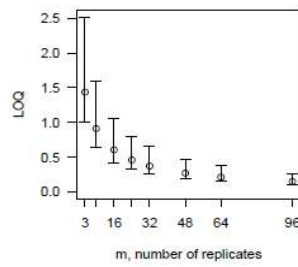
# Detects	# Copies	SE
0	0	0
1	0.869	0.095
2	0.169	0.126
3	0.285	0.181
4	0.401	0.226
5	0.556	0.29
6	0.78	0.391
7	1.172	0.599

Determined using eLowQuant R code⁴.

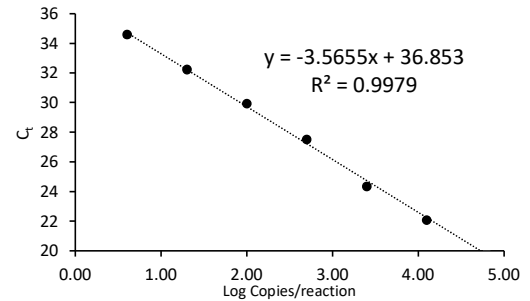
Limits detect – no intercept eRHCA4



Limits quant – no intercept eRHCA4



Applied to reactions with 100% positive hits



Efficiency 91%

Binomial-Poisson model: No intercept
 Determined using eLowQuant R code⁴.
 Based on a 2 µL DNA input in a total 15 µL reaction

Field Sample Validation

Sample Type	Known		Detected	Location
	Presence	# Samples		

Abbreviations

95% CI	95% Confidence interval	LOQ	Limit of quantification
eDNA	Environmental DNA	MT-ND4	Mitochondrial NADH-ubiquinone oxidoreductase chain 4 gene
gDNA	Total genomic DNA extracted from voucher specimen	NTC	qPCR no template control
LOB	Limit of blank	qPCR	Quantitative real-time polymerase chain reaction
LOD	Limit of detection	SE	Standard error