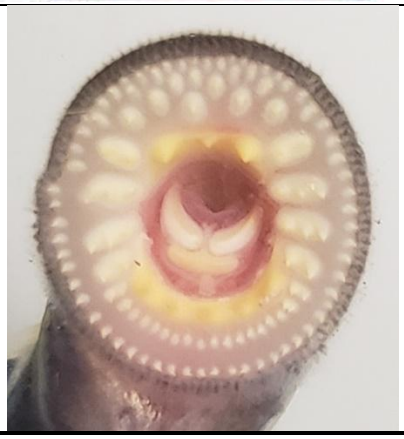
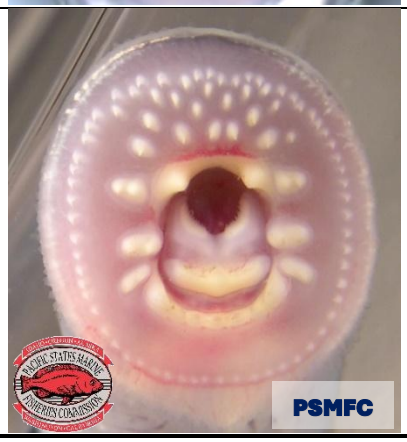
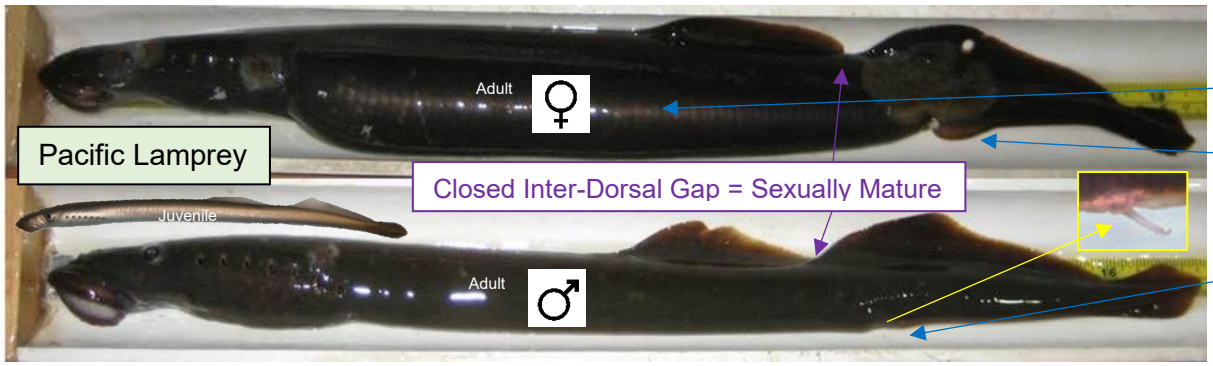
Columbia Basin Lamprey Identification Guide (Adults / Juvenile)

*last updated 8/6/2025

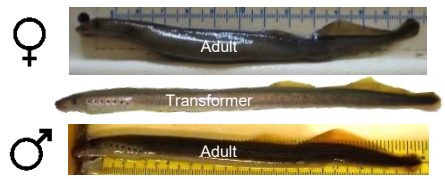
Prepared by Yakama Nation Fisheries (Primary Contact: Ralph Lampman lamr@yakamafish-nsn.gov)

Species Name	Pacific Lamprey (*Entosphenus tridentatus*)	Western River Lamprey (*Occidentis ayresii*); anadromous life history	Western & Pacific Brook Lamprey (*Occidentis ayresii & pacifica*); resident life history
Adult Length	380-840 mm (13-33 inch) (dwarf type 200-380 mm)	200-330 mm (8-13 inch)	100-200 mm (4-8 inch)
Juvenile Length	Typically 100-200 mm (4-8 inch)	Typically 100-200 mm (4-8 inch)	Typically 100-200 mm (4-8 inch)
# of Cusps/Teeth	**A**: 3 (juvenile initially 2), **B**: 4 (typically 2-3-3-2), **C**: 5-6	**A**: 2, **B**: 3 (typically 2-3-2 or 2-2-2), **C**: 7-10	**A**: 2, **B**: 3 (typically 1-2-1, 2-2-1, or 2-2-2), **C**: 7-10
Adult Dentition *see Dentition Pattern & Dentition Guide (bottom right)			
Juvenile (Trans-former) Dentition *see Dentition Pattern & Dentition Guide (bottom right)			

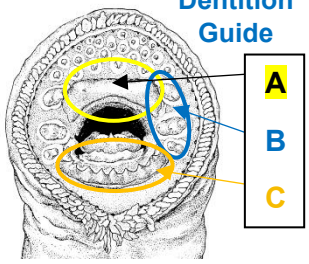


Western River Lamprey

Western / Pacific Brook Lamprey



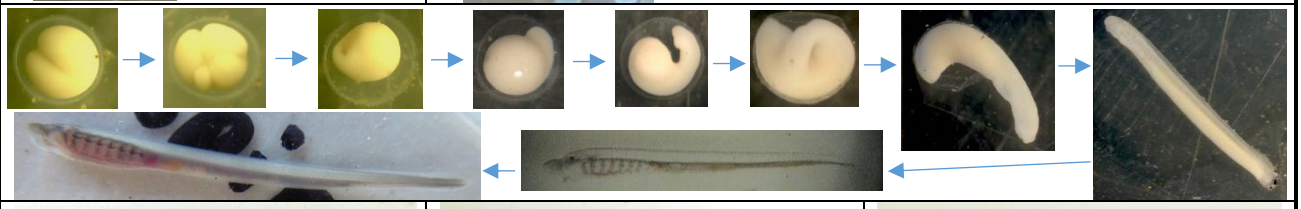
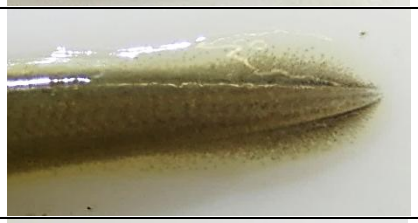
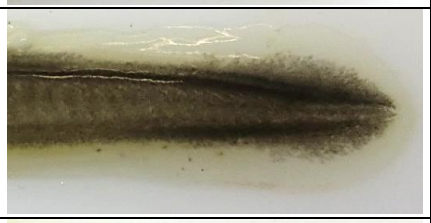
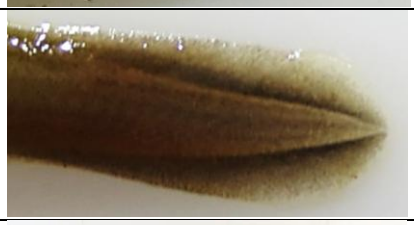
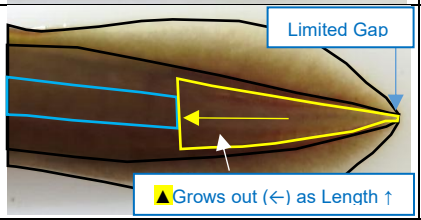
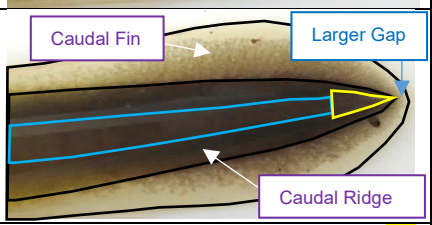
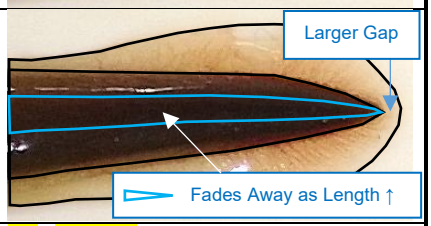
Dentition Guide



Columbia Basin Lamprey Identification Guide (Larvae)

*last updated 8/6/2025

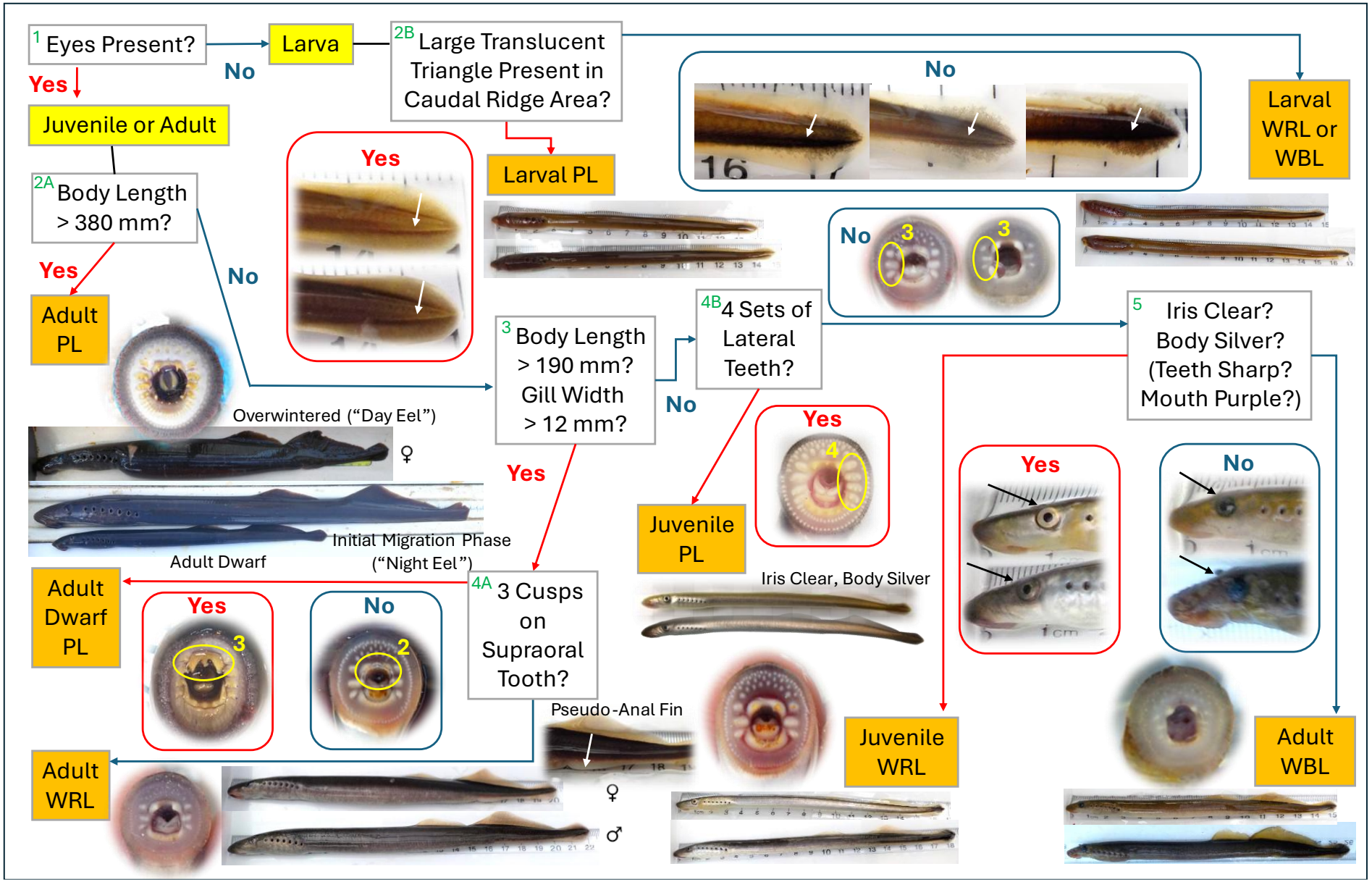
Prepared by Yakama Nation Fisheries (Primary Contact: Ralph Lampman lamr@yakamafish-nsn.gov)

Species Name	Pacific Lamprey (*Entosphenus tridentatus*)	*Occidentis* Spp. (Class B) *not synonymous with anadromous	*Occidentis* Spp. (Class A) *not synonymous with resident
Fertilized Eggs	 Creamy Yellow (~1.2 mm diam.)	 Creamy Green (~1.0 mm diam.)	
Embryo / Early Larva (All Spp.)			
Larva Tail (~50 mm)			
Larva Tail (~65 mm)			
Larva Tail (~80 mm)			
Larva Tail (~100 mm)			
Larva Tail (~130 mm)			
Guide Diagram (Trans-lucent Area High-Lighted)			
Caudal Ridge (Center)	"Wide" translucent ▲ (yellow); blue region similar to L. spp. Class A	If present, "wide" translucent ▲ (yellow) only at tip; blue region similar to L. spp. Class A	▲ (yellow) absent; narrow translucent region (blue) exists for smaller (≈<100mm) larvae
Caudal Fin	Pigmented (darkens & covers more area as they grow)	Pigmented or mottled (can be similar to *E. tridentatus*)	No pigment (mostly clear or red vein)

Columbia Basin Lamprey Dichotomous Identification Guide

Prepared by Yakama Nation Fisheries ***last updated 8/17/2024**

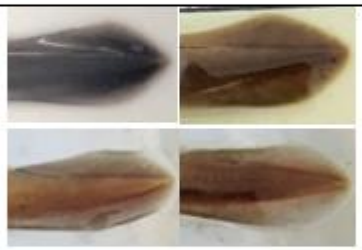
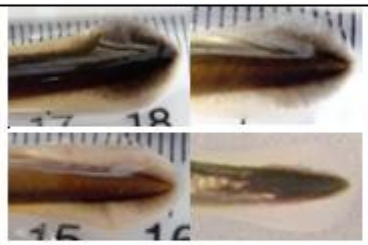
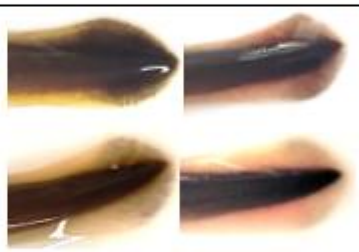
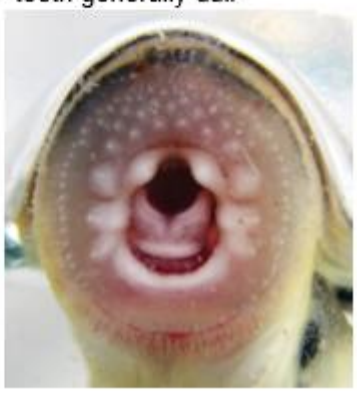
Dichotomous key to guide morphological ID of the three focal lampreys (Pacific Lamprey [PL], Western River Lamprey [WRL], and W. Brook Lamprey [WBL]) in NE Pacific tributaries. The guide uses different traits including total body length, dentition and tail pigmentation patterns to ID the focal lamprey taxa and categorize by life stage (adult, juvenile, and larva). “Overwintered (‘Day Eel’)”, “Initial Migration Phase (‘Night Eel’)”, and “Adult Dwarf” are all terms that have been applied to describe a range of variation observed among PL adults (Clemens et al. 2019). Body sizes are proportional except for adult PL.

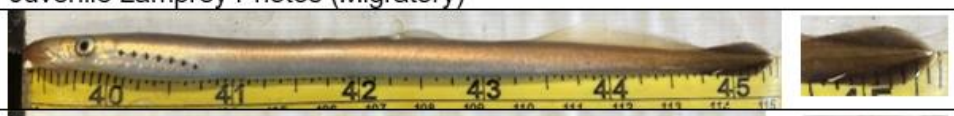
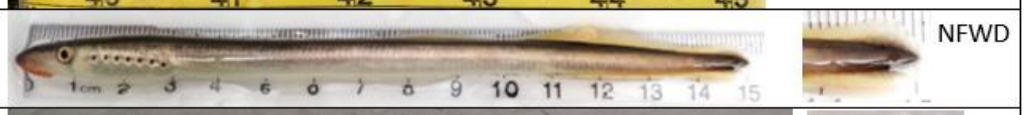


Columbia Basin Lamprey Smolt Identification Guide

Prepared by Yakama Nation Fisheries ***last updated 5/22/2025**

Special thanks to Greg Kovalchuk (Pacific States Marine Fisheries Commission; PSMFC) and Nisga'a Fisheries and Wildlife Department (NFWD) for additional photos

Species Name	**Pacific Lamprey** (*Entosphenus tridentatus*)	**W. River Lamprey** (*Occidentis ayresii*); anadromous ecotype	**W. & Pacific Brook Lamprey** (*O. richardsoni & pacifica*); resident ecotype
Early Stage (Summer/ Fall)		No photos available: At this stage they are not distinguishable from W. Brook Lamprey	
Middle Stage (Fall / Winter)		 NFWD	
Late Stage (Winter / Summer)	 PSMFC		
Caudal Ridge & Fin Pigment (From Dark to Light)		 NFWD	
Dentition Pattern (Only Middle / Late Stages)	A=2 (early) or 3 (late), B=4, C=5-6 *teeth generally sharp  PSMFC	A=2, B=3, C=7-10 *teeth generally sharp  PSMFC	A=2, B=3, C=7-10 *teeth generally dull 

Species/Stages	Juvenile Lamprey Photos (Migratory)
Pacific Lamprey Juvenile (151 mm)	
Pacific Lamprey Juvenile (149 mm)	
W. River Lamprey Juvenile (149 mm)	 NFWD
W. River Lamprey Juvenile (155 mm)	

Columbia Basin Lamprey "Simple" Identification Guide

*last updated 5/22/2025

~for those that like to keep it simple~

Prepared by Yakama Nation Fisheries (Tyler Beals and Ralph Lampman)

Lamprey – juvenile (100-200 mm; large eyes)

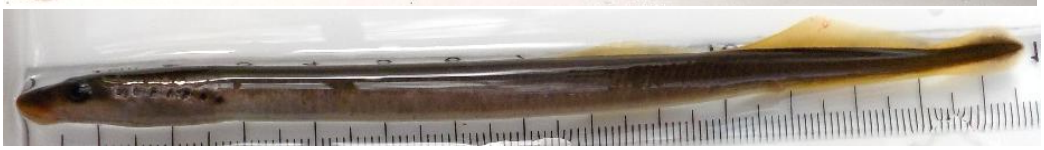
Large bright eyes (large in relation to the size of their head). Silvery body color. [For species ID, see other guides]

Lamprey – larva (< 200 mm; no eyes)

No eyes (a protruding bulge may be present by eye region). Brown body color. [For species ID, see other guides]

Lamprey – adult *Occidentis* [formerly *Lampetra*] (100-330 mm; small eye)

Small dark eyes. Generally light brown or greenish body color.

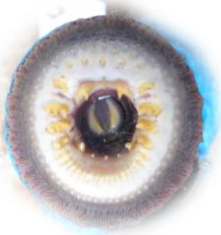


[Mouth]

Lamprey – adult Pacific (generally > 330 mm)

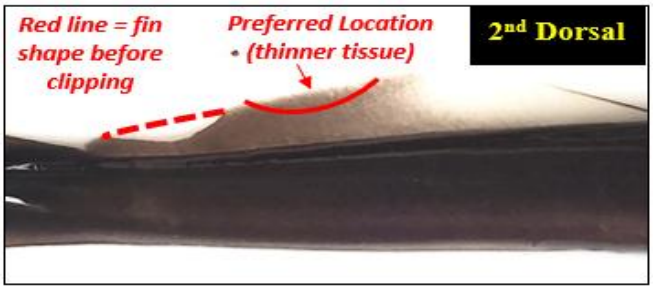
Large body and dark eyes. Generally dark or light brown body color.

[Mouth]

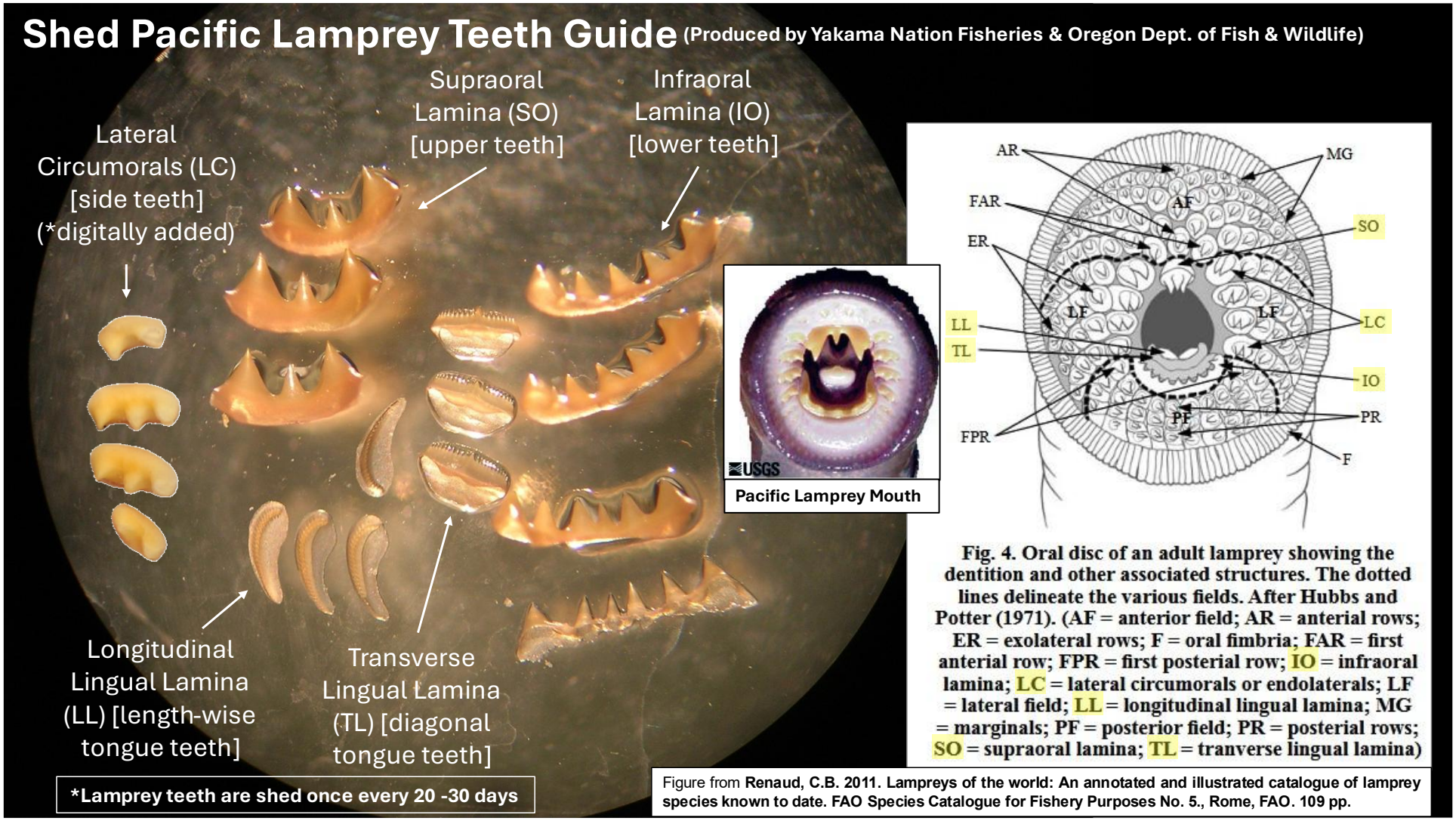


Fin Clipping Guide (For Genetic Analysis)

When fin clipping, include on genetic sheet or coin envelop: 1) Collection Date, 2) Collection GPS / Location, 3) Total Length, 4) Life stage (Eyed Juvenile, Larva, or Adult), 5) Species ("unknown" if unsure – photo of body/tail/mouth is helpful). Use a small (3-4") pair of scissors (recommended clip size = 2-6 mm^2, e.g. 1 x 2 mm, 2 x 3 mm). For shipment & other questions, contact Greg Silver (CRITFC): gsilver@critfc.org.



Shed Pacific Lamprey Teeth Guide (Produced by Yakama Nation Fisheries & Oregon Dept. of Fish & Wildlife)



Pacific Lamprey Mouth

Fig. 4. Oral disc of an adult lamprey showing the dentition and other associated structures. The dotted lines delineate the various fields. After Hubbs and Potter (1971). (AF = anterior field; AR = anterial rows; ER = exolateral rows; F = oral fimbria; FAR = first anterial row; FPR = first posterial row; IO = infraoral lamina; LC = lateral circumorals or endolaterals; LF = lateral field; LL = longitudinal lingual lamina; MG = marginals; PF = posterior field; PR = posterial rows; SO = supraoral lamina; TL = tranverse lingual lamina)

Figure from **Renaud, C.B. 2011. Lampreys of the world: An annotated and illustrated catalogue of lamprey species known to date. FAO Species Catalogue for Fishery Purposes No. 5., Rome, FAO. 109 pp.**

***Lamprey teeth are shed once every 20 -30 days**

Description for Columbia Basin Lamprey Identification Guide (Adults)

Entosphenus and *Occidentis* [formerly *Lampetra*; see Carim et al. 2024] species are diverse in some regions of the Pacific Northwest (in particular, Klamath River Basin) with many unique endemic species of lamprey. This guide does not provide enough detail to distinguish all those species, but it was drafted with the intention to help those that work primarily with Pacific Lamprey (*Entosphenus tridentatus*), Western River Lamprey (*Occidentis ayresii*), W. Brook Lamprey (resident ecotype of W. River Lamprey) and/or Pacific Brook Lamprey (*O. pacifica*) within the Columbia River Basin or other basins with primarily those target species present. The dentition guide on the lower right highlights three areas: supraoral lamina (A), lateral circumorals or endolaterals (B), and infraoral lamina (C) and the number of teeth within. The (2-3-2) represents the number of cusps within each tooth (from top to bottom).

The secondary sexual characteristics highlighted and displayed in the guide typically only show up immediately prior to the spawning season (a few months to a few days prior to spawning, depending on the trait), and sexing of adults prior to this period is challenging (the best technique is via ventral gonad region texture – i.e. a “feel” test [females are generally softer]).

Description for Columbia Basin Lamprey Identification Guide (Larvae)

The larvae guide focuses primarily on distinguishing Pacific Lamprey from *Occidentis* species. However, the morphological difference between *O. ayresii* and *O. pacifica* is limited (primary difference is myomere counts, which includes some overlap). Also, no obvious genetic difference between *O. ayresii* ecotypes (anadromous vs. resident) has been identified at a local scale, substantiating that these two species are part of one large species complex with two life histories, similar to steelhead and rainbow trout (Carim et al. 2024; Silver et al. 2025).

As a result, it is difficult to accurately distinguish the various species of *Occidentis* larvae using a guide based solely on morphology, but via genetic analyses conducted by Columbia River Intertribal Fish Commission, we have identified two genetically distinct lineages of *Occidentis* species (Class A and B), which are also distinguished by tail morphology (i.e. morphotypes) (Silver et al. 2025). All larvae shown here in photos were genetically analyzed and confirmed. Class A has a clear caudal fin and no “wide” arrow-shaped translucent area in the caudal ridge (usually pigmented or only has narrow translucent area). Class B has a speckled and/or mottled caudal fin (similar to Pacific Lamprey) and usually no or only a small “wide” arrow-shaped translucent area in the caudal ridge. Pacific Lamprey has a pigmented and/or speckled caudal fin and a “wide” arrow-shaped (spade-shaped) translucent area (red highlighted region; not completely transparent but lighter in color - this arrow gradually gets larger and extends further anterior as larvae grow). All three groups of lamprey may have a “narrow” translucent area (green highlighted region) especially when they are smaller (<100 mm), which needs to be distinguished from the “wide” translucent area by the caudal ridge. The guide helps display these differences among the three groups of lamprey and by size (*however, it is still important to consider individual variation in the size differences).

Although there is some color and size based differences at the egg stage, there is very little difference among the three groups of lamprey until they reach 45-60 mm. Experienced biologist can ID Pacific Lamprey features as early as 40-50 mm (but identifying *Occidentis* at 40-50 mm is not recommended as it may simply be a Pacific Lamprey that has not manifested its species specific features quite yet). Biologists with intermediate experience can identify lamprey down to 50-70 mm sizes. We recommend beginners (with limited experience) to start identification with larger larvae (>70 mm). These tail differences can also be used for transformer and to some extent adult life stages (in addition to other features such as size and dentition). This guide would not have been possible without the help of **Tyler Beals** and **Dave’y Lumley**, who has collected countless field samples for identification in Yakama Nation treaty territories.

Other Sources:

Carim K.J., Auringer G., Docker M.F., Renaud C.B., Clemens B.J., Blanchard M.R., Parker, C., Young, M.K. 2024. Species diversity in the new lamprey genus *Occidentis*, formerly classified as western North American ‘*Lampetra*’. PLoS ONE 19(12): e0313911. https://doi.org/10.1371/journal.pone.0313911.

Goodman, D.H., A.P. Kinziger, S.B. Reid, and M.F. Docker. 2009. Morphological diagnosis of Entosphenus and Lampetra ammocoetes (Petromyzontidae) in Washington, Oregon, and California. In L.R. Brown, S.D. Chase, M.G. Mesa, R.J. Beamish and P.B. Moyle (editors), Biology, Management, and Conservation of Lampreys in North America, American Fisheries Society, Bethesda, MD. Pp. 223–232.

Renaud, C.B. 2011. Lampreys of the world: An annotated and illustrated catalogue of lamprey species known to date. FAO Species Catalogue for Fishery Purposes No. 5., Rome, FAO. 109 pp.

Silver, G. S., R. T. Lampman, N. Percival, N. Timoshevskaya, J. J. Smith, K. T. Bentley, J. Wade, S. R. Narum, and J. E. Hess. "Genetic Identification of Lamprey Genera and Anadromous Ecotypes in Watersheds of the Northeastern Pacific Ocean." *Evolutionary Applications* 18, no. 5 (2025): e70108.