

O. Eugene Maughan¹

Eldon E. Edmundson²

Allen E. Farris³

Department of Zoology
Washington State University
Pullman, Washington 99164

and

Richard L. Wallace

Department of Biological Sciences
University of Idaho
Moscow, Idaho 83843

A Comparison of Fish Species above and below Palouse Falls, Palouse River, Washington-Idaho

Abstract

Fish species above and below Palouse Falls did not differ greatly. Exotics above the falls are due to planting. Multiple invasions of cottid species are indicated by exclusion of recent invaders.

Introduction

Natural falls often give insight into the evolutionary history of an area in terms of fish fauna present. Formation of these physical barriers often isolate "ancient" faunal elements and protect them from elimination by more recent invaders. Where isolation is complete and disturbance is minimal, streams above falls can often be used to indicate "primitive conditions" or show relationships between two currently unconnected drainages (Bisson and Bond, 1971; Robins and Miller, 1957). Palouse Falls on the Palouse River isolates fish fauna in upstream areas from those in downstream areas. This characteristic makes the Palouse ideal as a place to look for clues to the faunal history of these mountain drainages.

Description of the Study Area

The Palouse River (Fig. 1) flows from the mountains in northcentral Idaho, through the Palouse Prairie of eastern Washington, and into the Snake River. Near the mouth, the Palouse River plunges 60 m into a large rimrock basin. The river then flows through a canyon before entering Lower Monumental Reservoir on the Snake River.

Methods

Fish were collected from 1968 through 1976 from locations on the Palouse River and tributaries with an AC-DC shocker. Fish were fixed in 10 percent formalin and stored in ethyl alcohol. The depository of the specimens is the Conner Museum, Washington State University, Pullman, Washington, or the museum at the University of Idaho.

¹Present address: Oklahoma Cooperative Fishery Research Unit, Oklahoma State University, Stillwater, Oklahoma 74074.

²Present address: Environmental Protection Agency, Boise, Idaho 83724.

³Present address: Iowa Conservation Commission, Des Moines, Iowa 50319.

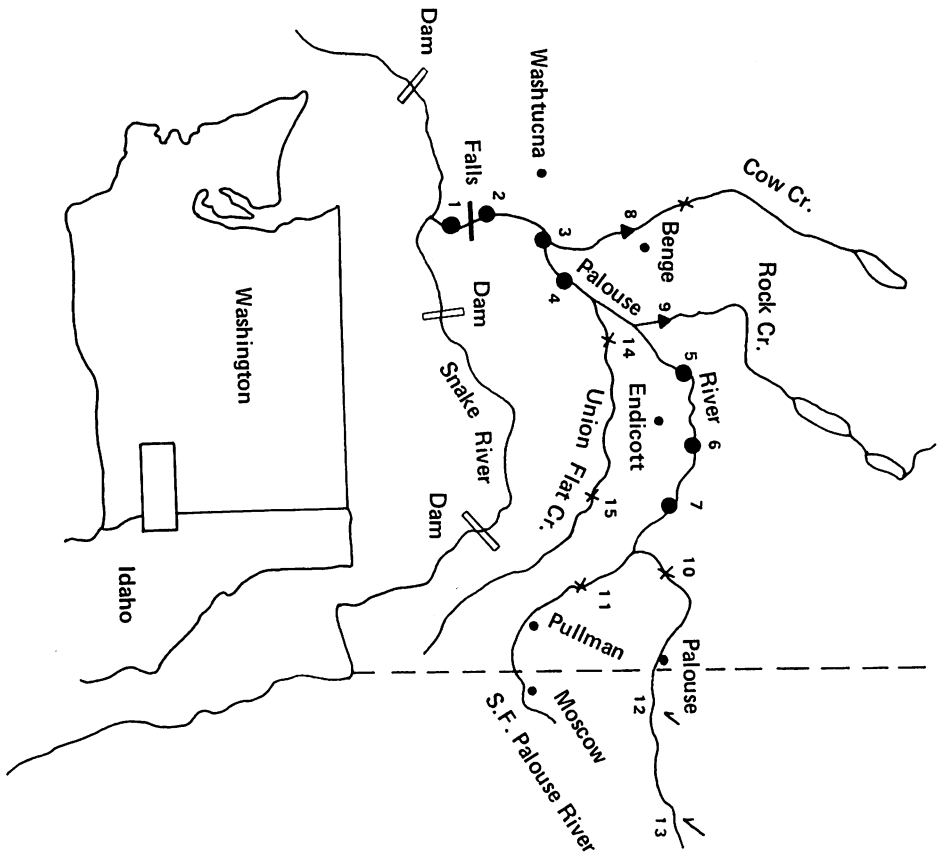


Figure 1. Station locations for collections made on the Palouse River from 1968-1976; Δ = stations collected by Maughan, Farris, and Edmundson 1969; \bullet = stations collected by Maughan, Farris, and Edmundson 1969, and by Wallace 1976; \times = stations collected by Wallace 1976 and ∇ = stations collected by Wallace 1968-1976.

Results and Discussion

Species found above and below the falls did not differ greatly (Table 1). All species taken below the falls except *Cottus beldingi* were also taken at some station above the falls. Excluding exotics, only *Catostomus platyrhynchus*, *Cottus rhotheus*, and *Richardsonius balteatus* were taken exclusively in the upstream sections. Only one specimen of *C. platyrhynchus* was taken.

The species composition of the downstream section was composed of eight native species and three exotics, whereas the upstream collections contained eleven native species and nine exotics. Only exotic species were taken from Cow Creek (Station 8).

TABLE 1. Species list by station above and below Palouse Falls.

Species	Station number and collection year																							
	1 1969	1 1976	2 1969	2 1976	3 1969	3 1976	4 1969	4 1976	5 1969	5 1976	6 1969	6 1976	7 1969	7 1976	8 1969	8 1976	9 1969	10 1976	11 1976	12 1970	13 1968-69	14 1976	15 1976	
<i>Salmo gairdneri</i>																								
<i>Salvelinus fontinalis</i>																						x		
<i>Esox americanus</i>																						x		
<i>Cyprinus carpio</i>	x	x			x	x					x				x	x							x	
<i>Acrocheilus alutaceus</i>		x	x	x	x	x	x	x	x	x			x	x			x				x			
<i>Ptychocheilus oregonensis</i>	x	x	x		x	x	x	x	x	x														
<i>Rhinichthys cataractae</i>	x	x		x				x													x			
<i>Rhinichthys osculus</i>	x	x		x			x	x	x	x			x	x							x			
<i>Richardsonius balteatus</i>														x										x
<i>Catostomus macrocheilus</i>	x	x			x		x	x		x											x		x	x
<i>Catostomus columbianus</i>	x	x		x			x				x	x									x		x	x
<i>Catostomus platyrhynchus</i>						x															x		x	x
<i>Ictalurus nebulosus</i>																								
<i>Cottus rhotheus</i>																					x			
<i>Cottus beldingi</i>	x	x																				x		
<i>Cottus bairdi</i>		x	x	x			x	x																
<i>Micropterus dolomieu</i>	x	x																						
<i>Micropterus salmoides</i>		x																						
<i>Lepomis microlophus</i>									x															

Exotics are probably the results of escapes from lakes such as Cow Lake that have been stocked in the past. *R. balteatus* and *C. rhotheus* were taken only above the falls. However, their apparent disrupted distribution is probably the result of sampling error since they are known from other nearby locations below the falls in the Clearwater and Snake Rivers (Maughan, 1976).

The major differences in species composition above and below the falls appeared to be the absence of *C. beldingi* above the falls. *C. beldingi* is the most abundant cottid in the lower Clearwater River and tributaries near the mouth of the Clearwater (Maughan, 1976) and presumably also the lower Snake River. Over much of the Clearwater, *C. rhotheus*, *C. beldingi*, and *C. bairdi* occur sympatrically (Maughan, 1976). Therefore, the absence of *C. beldingi* above the falls probably does not involve competitive exclusion or habitat change.

There is evidence that differences below the species level occur upstream and downstream of the falls. *C. columbianus* above the falls has been designated as a separate subspecies from populations below the falls (Smith, 1966), as has *R. balteatus* above and below the falls (Schultz, 1936). The form of *C. rhotheus* above Palouse Falls does not appear to be the typical *C. rhotheus* described by Smith (1882) and may represent a separate form (Bond, pers. comm.). The form of *C. bairdi* found in the Palouse drainage is not the form described as *C. hubbsi* (Bailey and Dimick, 1949) but is similar to that described as *C. punctulatus*. *C. bairdi* of the *hubbsi* form is the only *bairdi* form found in the Clearwater drainage to the south (Maughan, 1972).

The exclusion of *C. beldingi* and *C. bairdi* of the *hubbsi* form from above the falls would seem to indicate that the Palouse River and its tributaries were subjected to multiple invasions of cottid species and forms from centers of endemism; *C. beldingi* and *C. bairdi* of the *hubbsi* form are more recent invaders than *C. bairdi* ssp. and *C. rhotheus* ssp. Existing populations and distribution resulted from competition, elimination, or integration of these invaders with prior resident species and forms.

Literature Cited

- Bailey, R. M., and M. F. Dimick. 1949. *Cottus hubbsi*, a new cottid fish from the Columbia River in Washington and Idaho. Occasional Papers, Museum of Zoology, Univ. Mich. 513:1-18.
- Bisson, P. A., and C. E. Bond. 1971. Origin and distribution of the fishes of the Harney Basin, Oregon. *Copeia* 1971(2):268-281.
- Bond, C. E. 1969. Personal communication.
- Maughan, O. E. 1972. Distribution and Geographic Variation of Sculpins in the Clearwater Basin. Washington State University, Pullman. Ph.D. thesis. 213 pp.
- . 1976. A survey of the fishes of the Clearwater River. *Northw. Sci.* 50(2):76-86.
- Robins, C. R., and R. R. Miller. 1957. Classification, variation, and distribution of the sculpins, genus *Cottus*, inhabiting Pacific slope waters in California and southern Oregon, with a key to the species. *Calif. Fish Game* 43 (3):213-233.
- Schultz, L. P. 1936. Keys to the fishes of Washington, Oregon and closely adjoining regions. *Univ. Wash. Pub. in Biol.* 2(4):103-228.
- Smith, G. R. 1966. Distribution and evolution of the North American catostomid fishes of the subgenus *Pantosteus*, genus *Catostomus*. *Misc. Pub. Univ. Mich.* 129:1-133.
- Smith, R. 1882. Description of a new species of *Uranidea* (*Uranidea rotbea*) from Spokane River, Washington Territory. *Proc. U.S. Nat. Mus.* 1882:347-348.

Received August 11, 1978

Accepted for publication October 12, 1978

A. R. Kruckeberg

Department of Botany
University of Washington
Seattle, Washington 98195

Golden Chinquapin (*Chrysolepis chrysophylla*) in Washington State: A Species at the Northern Limit of Its Range

Abstract

Golden chinquapin (*Chrysolepis chrysophylla*), an evergreen tree (Fagaceae), reaches its northern limit in Washington as small outlier populations. Some Hood Canal colonies were defoliated by an ascomycetous fungus in 1976 and may not survive. A small colony also occurs at the eastern edge of the Big Lava Beds, just north of the Columbia River. Small population reduced vitality of some individuals, and human activity may adversely affect the fate of the tree in Washington.

Introduction

The occurrence of a species at the limits of its natural range has a particular fascination for the evolutionary biologist. Peripheral populations are likely to have different resources and environmental tolerances than those of populations in the heart of a species' range. When such an outlier is a spectacular evergreen tree, the interest in its status is enhanced. The distribution of the golden chinquapin (*Chrysolepis chrysophylla* (Dougl.) Hjelmqvist) is one such case.

Only two small colonies of golden chinquapin are known to occur in Washington: one in Skamania County near the Columbia River and the other 320 km to the west in Mason County above Hood Canal. Just south of the Columbia River in northern Oregon, it takes on a more continuous distribution in the Mount Hood area and extends westward through western Oregon to its southern limit in cismontane northern California.

It is the purpose of this paper to report on the status of the outlier population of golden chinquapin in Washington. As a result of the efforts of members of the Washington Native Plant Society and others, a current account of the tree in its few isolated sites is given.

There are only two species of *Chrysolepis*, both native to western North America. The other species, *C. sempervirens* (Kell.) Hjelmqvist, is a shrub of the mountains of California and southern Oregon. Until 1948, the western North American chinquapin had been retained in *Castanopsis*, a genus now reserved for old world, mainly tropical species. It was on the basis of features of the bur fruit and the inflorescence that Hjelmqvist (1948) established the genus *Chrysolepis* to embrace our two chinquapin species.

Chrysolepis chrysophylla is an evergreen member of the Fagaceae (Oak Family) with an arborescent shrub habit, or a tree to 45 m in height (Figs. 1, 2). It reaches its northern growth form as a tree in low elevation, cismontane valleys of northwestern California and southwestern Oregon. At higher elevations or in more xeric habitats, specimens are shrubs, not more than 5-10 m tall. It can occur in a variety of woody plant communities, mostly with conifers like Douglas-fir and coast redwood. Nowhere is it common, and rarely does it occur in pure stands.