



Mott T. Greene  
*John B. Magee Distinguished Professor*

June 25, 1993

Maureen Finnerty  
Superintendent  
Olympic National Park  
600 E. Park Avenue  
Port Angeles, WA 98362-6798

Dear Superintendent Finnerty,

Enclosed please find my review [order # 1443-PX9500-93-286] of the evidence for the historical, prehistoric and Late Quaternary presence/absence of mountain goats on the Olympic Peninsula, consisting in the evaluation of the four source documents (Schultz, Schalk, Houston and Schreiner, Lyman) forwarded to me by Mark Nesvig, and the conclusions I have drawn from them, as well as an extensive examination of the sources quoted by these authors. I have also, as requested, forwarded a copy of this report to Prof Keith Benson, executive secretary of the History of Science Society.

May I urge careful attention to my remarks on the question of "negative evidence" and "proof" in historical and scientific work (pp. 17-21 of this review)? I think the issue has been misconstrued, and that there has been an attempt here to set an evidentiary criterion far more severe than the normal professional practice of biogeography, paleobiogeography - and geology and paleontology, for that matter, concerning the scientific status of the finding "absent", as opposed to the finding "present".

Sincerely yours,

Mott T. Greene

**A REVIEW OF THE EVIDENCE BEARING ON THE PRESENCE (OR ABSENCE) OF THE MOUNTAIN GOAT (*OREAMNOS AMERICANUS*) AS PART OF THE FAUNA OF THE OLYMPIC MOUNTAINS IN HISTORIC, PREHISTORIC, AND LATE QUATERNARY TIME.**

Mott T. Greene  
University of Puget Sound  
June 1993  
Order # 1443-PX9500-93-286

**SUMMARY FINDING**

A REVIEW OF THE PRE-1925 HISTORICAL RECORD OF EXPLORATION OF THE OLYMPIC PENINSULA BY EUROPEANS (SCHULTZ 1993, PREPRINT), A REVIEW OF THE ETHNOGRAPHIC AND ARCHAEOLOGICAL RECORD OF NATIVE AMERICAN RESIDENTS OF THE OLYMPIC PENINSULA AND NEAR MAINLAND (SCHALK 1993, PREPRINT), AND A COMPARATIVE BIOGEOGRAPHIC SURVEY ENCOMPASSING THE OLYMPIC PENINSULA, THE WASHINGTON CASCADES, COASTAL BRITISH COLUMBIA, VANCOUVER ISLAND, THE QUEEN CHARLOTTE ISLANDS AND THE ALEXANDER ARCHIPELAGO (HOUSTON AND SCHREINER 1993, PREPRINT), RESPECTIVELY POINT VERY STRONGLY TOWARD THE CONCLUSION THAT THE MOUNTAIN GOAT (*OREAMNOS AMERICANUS*) WAS, PRIOR TO ITS INTRODUCTION TO THE PENINSULA IN THE 1920S, ABSENT FROM THE OLYMPIC PENINSULA IN HISTORIC, PREHISTORIC AND LATE QUATERNARY TIME. THE CLAIM OF LYMAN (1988) THAT *OREAMNOS* MAY HAVE BEEN PRESENT PRIOR TO INTRODUCTION IN THE 1920S IS BASED ON A CONJECTURAL MODEL OF COLONIZATION BY DISPERSAL IN THE LATE QUATERNARY FOLLOWED BY EXTIRPATION JUST AS OR BEFORE THE HISTORICAL AND ETHNOGRAPHIC RECORD BEGINS, AND LACKS A FOUNDATION IN HISTORICAL, ETHNOGRAPHICAL OR BIOGEOGRAPHICAL EVIDENCE. LYMAN'S APPROACH TO THE AVAILABLE EVIDENCE IS BOTH UNDULY RESTRICTIVE AND AT VARIANCE WITH COMMONLY ACCEPTED CANONS OF SCIENTIFIC PROCEDURE.

## Section I: The Pre-1925 Historical Record

Assessment of the record of European exploration begins appropriately with the Spanish Explorations of 1789-1792, which closely preceded and then overlapped the voyage of Vancouver (1792). The standard English language source for records of these voyages is Henry Raup Wagner (1862-1957) *Spanish Explorations in the Straits of Juan de Fuca*. Santa Ana: Fine Arts Press, 1933, which is quoted extensively by Schultz.<sup>1</sup>

These voyage descriptions include observations taken in June and July of 1790 by Manuel de Quimper along the W Coast of Vancouver Island (the portions S. of Nootka Sound), the N coast of the "Estrecho de Fuca", the S. Coast of the "Estrecho de Fuca" and the San Juan Islands. These observations contain, in faunal lists, references to "wild goats" which appear to refer to them as inhabitants of the S. Shore of the "Estrecho de Fuca", which by our reckoning would be the Olympic Peninsula. This would be a telling bit of evidence in favor of the historic presence of goats if it did not occur as part of a list citing the occurrence of "buffalo, stags, deer, wild goats, bears, leopards, foxes, hares and rabbits", in the same "luxuriant pastures". There are no buffalo, foxes, rabbits or leopards native to this area. One may speculate on

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<sup>1</sup>Susan Schultz. "A Review of the Historical Evidence Relating to Mountain Goats in the Olympic Mountains Prior to 1925." Draft Preprint. May 1993. Wagner, cited on pp 5-8 of her report as "Wagner 1933" was not in her bibliography, but the source is unambiguously identified nonetheless. Also missing from the document is a bibliographic citation for Catherine H. U(sic) cited on page 48. My copy of this preprint lacked p 49. There was also no p. 57 (though there appears to be no missing text at this latter point)

equivalences ( buffalo - elk?, leopard - bobcat? or cougar? stag -??) but the list remains suspect since unknown forms in the list outnumber the known.

The same problem recurs with the descriptions, from the 1791 observations at Discovery Bay by Juan Pantoja y Arriaga, which repeat the Quimper list verbatim and add "coyotes and wolves". Again, coyotes are not known historically or prehistorically on the Peninsula until the extirpation of the wolf population after 1930. There are also references to sheepskins(?) (as opposed to dog skins, also mentioned) in the account of the 1792 reconnaissance in the Estrecho de Fuca by Galiano and Valdes - in the course of their trade with natives of East Side of Vancouver Island.

This latter item takes us to a point made by Schultz (p.10) that Spanish explorers of 1792 used the term "Estrecho de Fuca" to refer to both the Strait of Juan de Fuca and the Georgia Strait and thus all faunal descriptions for 1792 (above) include everything N to Nootka Sound on the West side of Vancouver Island, and everything seen in the Georgia Strait as well. Schultz's argument on p. 10 that this extension of the designation of Estrecho de Fuca to include coastal waters of continental British Columbia (where goats are found along the shores of the latter) does not seem to me to be a plausible explanation of the faunal lists of Quimper for 1790, which contain the mention of "wild goats". Quimper at least is clearly travelling in what we call today the Strait of Juan de Fuca. However, Quimper's lists are rendered completely unreliable for our purposes because they contain a large number of animals no one else has ever seen or claimed were part of the Olympic fauna.

In the period between 1792 and 1890, no European explorers and traders and no European settlers on the Peninsula recorded seeing any goats. Certainly they saw that residents of the Peninsula wore garments identifiably woven at least in part from goat wool. But beginning with the testimony from Archibald Menzies, naturalist on the 1792 expedition of Lord Vancouver, of goatskins at Bella Bella on the (British Columbia) mainland, we have a continuous record of reports that these skins and wool had been obtained in trade by coastal natives from natives further inland. Jose Mozino, a Spanish naturalist working out of the explorer's headquarters Nootka Sound on Vancouver Island in 1792, states that the wool of local garments (suspected to be goat or bison by him) was obtained by trade.

The United States Exploring Expedition 1841-1843 (The Wilkes Expedition) visited the Olympic peninsula in 1841, and saw no goats and mentioned no goats but did note that trade blankets had largely supplanted local manufactures of robes woven of goat wool, dog hair and hair and feathers noted by earlier European visitors.

The physician/naturalists George Suckley and James Cooper who accompanied the Pacific Railroad Surveys of 1853-1856 described the range of mountain goats in the Cascades and Suckley saw dozens of goat skins on Whidbey Island which he noted were "obtained from the Indians about Mt. Baker" and mentioned goats being abundant in NE Washington and present in the upper Nisqually.

But the goat habitat today on the Peninsula is in the interior Alpine Zone, and it is the explorations of the interior which are of greatest import. Beginning with the Watkinson Expedition (1878) which reported

no goats, through the Gilman expeditions of 1889 and 1890, the Press Expedition of 1889-1890, the O'Neill Expeditions of 1885 and 1890, the Wickersham Excursions of 1889 and 1890, the Olmstead Exploration Diary of 1890, the Reid and Hopper Party of 1890, the Mountaineers Excursions of 1907, 1913, 1920 and 1926, - many of which camped in the high country and current goat range for weeks at a time --we have in all two reports of goats. The first is Samuel Gilman's (posthumous) account in *National Geographic* (1896) which lists mountain goat among the huntable game of the Peninsula, but does not specify a sighting.<sup>2</sup> The second is by C.A. Barnes, a member of the Press Expedition, who claimed in 1890 that "one goat was seen by the party" in a newspaper account, though there is no record of the sighting in his expedition diary.

Among the numerous published recollections of settlers, hunters trappers, and recreationists who travelled in the high country of the Olympics, and the published reports of dedicated natural history surveys: the U.S.G.S and Forest Service, and U.S. Fish and Wildlife Service (and the Biological Survey which preceded it), The Field Museum Expedition, the State of Washington Expedition, the Gage Expedition, all between 1888 and 1925, there is no mention of the sighting, shooting or capture of a goat.

Thus the entire historical record asserting the presence of goats on the peninsula consists of two Spanish claims of wild goats in 1790 and 1791, in faunal lists which contain many claims for species never seen on the Peninsula by anyone else; a claim in an 1896 *National Geographic* article that there are mountain goat on the Peninsula, and a claim in a

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<sup>2</sup> Samuel C. Gilman "The Olympic Country". *National Geographic* 7(1896) 133-140

newspaper article of 1890 that the Press Expedition saw "a goat" (not a "mountain goat", just "a goat" in a report which also cites in the same place the occurrence of "chickens"), a claim which has no counterpart in the extensive expedition diary of the man under whose signature this claim appeared.

Over against this stands a record of repeated and extensive exploration of the interior of the Olympic Range including current goat habitat over a period of almost 50 years (1878-1925) in which trained naturalists working for recognized natural history museums and government agencies looked to catalogue the complete mammalian fauna. The U.S. Biological Survey Expedition spent two months in the Olympic high country in 1921 looking not only for goat, but goat tracks, trails, wallows, droppings and swatches of hair. In all of these efforts in a half-century of professional study of the Olympics, no goat was ever collected or mentioned, nor any sign of goat collected or mentioned.

#### Evaluation of the Historical Record Compiled by Schultz (1993)

This document is the most complete historical survey of natural-historical explorations and historical accounts of exploration of the Olympic Peninsula produced to date. It employs the full range of documentation from archival primary sources to published official reports, national, regional, and local magazine and newspaper accounts, previous work on the history of the Peninsula, and extensive parallel documentation for the Cascades. It treats with equal seriousness scientific studies and newspaper claims, and covers the period from the first

explorer's accounts (1790) to the date of the introduction of goats in the middle 1920s.

The document addresses the suggestion made by Lyman (1988)<sup>3</sup> that mountain goats might not have been recorded by surveys because these surveys did not survey appropriate areas. Schultz's document shows that current goat habitat and suitable but uncolonized goat habitat on the Peninsula were indeed surveyed extensively and many times over by trained biologists.

The historical record in favor of the presence of mountain goats consists of two claims of "wild goats" from 1790-1791, an undocumented faunal list in a National Geographic article in 1896, and a Seattle newspaper column from 1890 which states that a member of the Press Expedition of 1889-1890 saw "a goat". Over against this is the lack of a specimen, a photograph or any recorded sighting of a mountain goat by any other biologist, hunter or traveller, trained or untrained, over a period of one hundred and thirty years. The weight of the evidence in the historical record as presented here ( and I believe this record to be accurate and complete) indicates that throughout the historical period there is not a single reliable or documented sighting of a mountain goat, or of the spoor, scat, physical remains or habitation traces of mountain goats on the Olympic Peninsula prior to introduction of same in the 1920s, in spite of repeated and extensive expeditions, hunting trips, recreational forays and scientific surveys looking for these highly visible, gregarious animals in a very restricted geographical area.

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<sup>3</sup> R. Lee Lyman "Significance for Wildlife Management of the Late Quaternary Biogeography of Mountain Goats (*Oreamnos americanus*) in the Pacific Northwest, U S A." *Arctic and Alpine Research* 20(1988) 13-23, p 14

## Section II: Ethnographic and Archaeological Record

This record has recently been reviewed by Randall Schalk<sup>4</sup> who consulted published and unpublished ethnographic and archaeological sources, directly contacted 35 anthropologists who have worked on Olympic, Cascade and British Columbia coastal archaeology and ethnology, and reviewed the archaeofaunal data for the 24 sites on the Peninsula that have yielded mammalian faunal remains.

The review begins with a band-by-band survey of ethnographic research on peoples of the Peninsula, moving in a clockwise direction from the Quinault, to the Quileute, Makah, Klallam, Chemakum, Twana, and finally the Chehalis ( Satsop, Wynoochee and Humptulips). This record is uneven but it is the full record, that is, it is all the ethnological data we have, and therefore the only source of data.

The record is unanimous. Informants going back to the beginning of the 19th century agree that mountain goats were not present on the Peninsula, and this includes those groups that did hunt land game in the interior, such as the Quinault. Almost all the groups, however, made use of goat wool for weaving and used goat-horn spoons, but all agreed that these items were obtained in trade from mainland groups in the Washington Cascades and coastal British Columbia, and there is evidence

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<sup>4</sup> Randall F. Schalk "A Review of the Ethnographic and Archaeological Evidence Relating to Mountain Goats in the Olympic Mountains." 1993 preprint. Infotec Research, Seattle.

that the coastal groups were conveyancers and traders of goat products obtained still further inland from other groups.

Of special interest is the matter of wool dogs. Several of the Olympic bands kept a breed of dog --separate from their hunting dogs -- which was shorn for its hair, to be used in weaving garments in combination with goat wool and other materials. Schalk's examination of the keeping of wool dogs points to a distribution of this practice completely disjunct with bands having direct access to wild goat populations which they could hunt. That is, those bands that had goats available kept no wool dogs, those who kept wool dogs report no direct access to goats. This seems a suggestive item of indirect evidence for the absence of goats on the Peninsula back into the 18th century, where the earliest explorer's accounts (see Schultz above) document wool dogs along the Straits of Juan de Fuca.

The archaeofaunal record is not extensive, and much of it restricted to lowland coastal sites far from goat habitat. Since goats were hunted for wool more than meat, it is unlikely that whole carcasses would be transported from upland hunting grounds to coastal middens for disposal. Nevertheless, as in the case of the ethnographic data, it is the record that exists, and it is the full record, that is, it is all the archaeofaunal data concerning mammals we have from the Peninsula.

The record is again unanimous. None of these sites have reported goat bones, though they do report all other mammals known from the Peninsula, and also include some extinct and extirpate species (Mammut and Caribou) from the site near Sequim. There is a single account by

Reagan (1917)<sup>5</sup> of mountain goat bones in a 20 acre midden near La Push which he investigated between 1905 and 1909, but Reagan's own footnote to this claim reads "The latter [mountain goat bones] are found usually only in the ladle form of the horns" -- goat horn spoons being a well documented trade item along the coast. Schalk notes that the same species list by Reagan claims to identify five species of salmon from the bones alone -- a procedure extremely difficult even today, and almost impossible without scales and otoliths.<sup>6</sup> Schalk's inference is that the faunal list compiled by Reagan was part midden archaeology and part ethnographic observation.

Schalk is fully aware that his survey and conclusions concern the nineteenth century, and that the late Quaternary (or Holocene) presence or absence of goats cannot be determined from this evidence. But from the standpoint of this reviewer, Schalk's survey goes even farther than the historical work of Schultz to suggest that there were no goats on the Peninsula prior to 20th century introduction. Here the comparative material with mainland sites is most impressive. Those mainland sites show goat bones in middens, and the ethnographic material contains ample record of goat hunting.

One final bit of evidence corrects the erroneous assertion of Lyman 1988<sup>7</sup> that all the ethnographic evidence concerning goats from the Peninsula is negative: i.e. consists of not mentioning goats. Schalk reports to the contrary an account collected from the Twana of the east slopes of

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<sup>5</sup> Albert B. Reagan "Archaeological Notes on Western Washington and British Columbia" *Proceedings of the California Academy of Sciences* 7(1917):1-31. p. 16 cited after Schalk p. 22

<sup>6</sup> Schalk op.cit. p. 23

<sup>7</sup> See above note 3

the Olympics in ethnographic work between 1935 and 1955, a retelling of a Satsop story explaining that "Transformer" put no goats in the Olympic Mountains, but did give them to the Skagit people.<sup>8</sup> The Twana were quite definite about obtaining their goat wool by trade as goats did not occur locally.

#### Evaluation of the Ethnographic and Archaeological Evidence gathered by Schalk (1993)

This is a complete, scientifically accurate, carefully worded and conservative study of all the available material on Olympic archaeology and ethnography. It is a model of thoroughness. It shows convincingly that in the whole record there is but a single archaeological claim of goat bones, that by Reagan (1917), who footnoted his own claim to remark that he was speaking of horn spoons, not disarticulated skeletal remains. In the whole ethnographic record there is no account of hunting mountain goat or seeing mountain goat by any of the Peninsula peoples and bands, though there are very many attestations of obtaining mountain goat wool by trade. There is the persuasive disjunct distribution of wool dogs and goats, with wool dogs common on the Peninsula. There is a single tale (Twana-Satsop) attempting to account for the *absence* of goats on the Peninsula as a divine act. This evidence points very strongly toward the conclusion that native peoples subsisting on the Peninsula had no access to goats, except through trade for goat wool with mainland peoples.

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<sup>8</sup> William W Elmendorf "Skokomish and Other Coast Salish Tales 3 pts. *Washington State University Research Studies* 29(1961):1-37 p. 23. Cited in Schalk op. cit. p. 15

### Section III. Biogeography of the Olympic Peninsula - Summary and Evaluation

The report reviewed here is that of Houston and Schriener, and consists of a draft chapter of a forthcoming monograph on the mountain goats of Olympic National Park.<sup>9</sup>

The Olympics have a large collection (35) of endemic animal and plant species, but lack a large number of mammalian species found in the nearby Cascades, and lack a considerable part of the Cascade avifauna. The same lack occurs in subalpine and alpine vascular plants and coniferous trees. Several plants within the Olympic National Park show disjunct range with plants otherwise absent locally but present in Idaho and British Columbia - some as many as 1000 miles away. All three classes of evidence - the presence of endemic species, the lack of some common to ubiquitous nearby mainland mammalian and avian fauna and coniferous flora, and the presence of floral elements shared only with far distant plant communities -- suggest the conclusion that the Olympics are a biogeographic island.

The author's review of the geomorphological history of the region during the last glacial maximum shows the Olympic Peninsula quite isolated -- with an extended but ice-covered continental shelf to the

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<sup>9</sup> Douglas B. Houston and Edward G. Schriener. "Biogeography of the Olympic Peninsula. Preprint. 1993. Draft of Chap IV of *Mountain Goats in Olympic National Park* (forthcoming).

West, the Cordilleran Ice Sheet to the N, E and SE, and the great braided outflow channels and rivers to the S, SW and W, draining westward toward Grays Harbor. In the post-maximum melt-off the Puget trough was a series of lakes draining S and W, and this was succeeded in post-glacial time by the current marine embayment. This material is drawn from the standard modern treatment of the subject, Wait and Thorsen (1983)<sup>10</sup>

The authors also look at (moving northward) Vancouver Island, the Queen Charlotte Islands, and the Alexander Archipelago in Alaska. Prior to the emergence of the modern coastline, with the sea level rise of about eight thousand years ago, these were part of the mainland of North America and are, from a biogeographical standpoint, landbridge islands, because of their former land connections. All of these are impoverished in mammalian fauna compared to the neighboring mainland, and all lack native mountain goat populations (though goats have been successfully introduced into the Alexander Archipelago as they have been to the Olympic Peninsula). Authors are aware that the impoverished terrestrial mammalian faunas on landbridge and habitat islands -- typically nonequilibrium, relict faunas -- may result either from extinction or from failed colonization. But here we have group of species absent from a geographic series of habitat and landbridge islands, where this same group of species is present in adjacent mainland. At the same time, the missing species have very different demographies, diversities and ecological requirements -- such that they would not be assumed to be

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<sup>10</sup> R B. Waitt and R.M. Thorsen "The Cordilleran Ice Sheet in Washington, Idaho, and Montana" in S.C Porter (ed) *Late Quaternary Environments in the United States*. Vol. I. The Late Pleistocene London: Longman[s], 1983 pp 53-70

similarly disposed to extinction. Under these constraints we may well suppose the failure to find these species (in particular the Alpine species of Pika and mountain goat) in *all four locales* -- Vancouver Island, Olympic Peninsula, Alexander and Queen Charlotte Archipelagoes to be the result of a failure of these organisms to colonize these habitat islands, rather than their simultaneous unrelated extinction. This seems especially likely to be the correct interpretation given their distribution along a mainland coastal strip with near mountains offering both abundant habitat and established Pika and mountain goat populations .

The biogeographical evidence, set in a context of geological rather than human history, argues very strongly that mountain goats failed to colonize any of the landbridge or habitat islands from Alaska to the Olympics, as did a range of other mammalian species common on the adjacent mainland. It is extremely important in making biogeographical assessments to have a such a comparative context in which to work. The authors have done an excellent job in collecting the data on plant endemism, vascular plant distribution and diversity of terrestrial mammals in making their cautious but instructive comparison to the islands and archipelagoes further North.

The references provided for the glacial history of the Olympic Peninsula, especially the size and extent of rivers on the outwash plains at the S end of the Olympic Peninsula (their figure 2a-4) very much strengthen the case for the Puget lowland as a barrier rather than a "dispersal route" as in the conjectural argument of Lyman (1988).<sup>11</sup> In

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<sup>11</sup> See above note 3.

sum, it seems unlikely that mountain goats colonized any of these landbridge and habitat islands in the late Quaternary - being forestalled first by ice, then by chains of lakes and outflow channels, then by marine embayments.

#### IV Lyman 1988<sup>12</sup> on Quaternary Biogeography of the Mountain Goat in the Pacific Northwest

Here is a digest of Lyman's argument.

Though no historical search for mountain goats ever discovered any goats on the Peninsula, the goats **might** have been there and the observers either did not see them or did not look in the right places. (Lyman 1988, p. 14).

Thought there is no ethnographic data to support the presence of mountain goats, **maybe** ethnographic data is a poor indicator of presence or absence. (Lyman 1988, p. 14)

Archaeofaunal studies have not discovered any mountain goat remains but **maybe** too few sites have been studied, or **maybe** bones were found but not recognized, or **maybe** the fauna found **may** not be representative of Holocene faunas and **may** be a poor indicator of

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<sup>12</sup> Ibidem

presence or absence of mammalian, especially Alpine taxa. (Lyman 1988, p. 14).

Absence of paleontological remains of *Oreamnos* in the Olympic Mountains cannot be used as evidence to argue that native mountain goats were not at one time extant in the area, because Alpine species are seldom preserved. (Lyman 1988, p. 15)

The argument that mountain goats are not native to the Olympic Peninsula is based on negative evidence. (Lyman 1988, p. 15)

It is **possible to conjecture** that *Oreamnos* species, occupying the N. Cascades and Rocky Mountain habitats in Idaho and Montana prior to 18,000 B.P., occupied southern Idaho Mountains between 17,500 and 13,500 and dispersed to N.E. Oregon (Wallowa). Mountain goats living in the S. Cascades became overcrowded, dispersed across the Columbia River when it was frozen over, and eventually occupied all the Cascade Volcanoes as far S. as Shasta. Some of the S. Cascade goats dispersed at this time westward across the Puget lowland, which had suitable but not optimal habitat, and moved N into the Olympics. (Lyman 1988, p. 18-19).

Some of the other mammals which are absent from the Olympics **could have** dispersed there also at the same time. (Lyman 1988, p. 20)

If anyone found remains of these animals in the places and in the time horizons suggested, this **would** be evidence in favor of this model. (Ibid).

After 10,000 years ago the conjectural dispersed goat populations **may** have become isolated on the Wallowa, Mazama, Jefferson, Three Sisters, Shasta, Hood and the Olympics, and then these seven biogeographic islands **may** have all been randomly extinguished in the Holocene by some combination of the Mazama eruption (local population only), overkill by human populations, climate fluctuations. (Lyman 1988, p. 20)

It is therefore not difficult to suggest that the **hypothetical** prehistoric mountain goat population of the Olympics had either vanished by the early 20th century or was so small it could not be found. (Lyman 1988, p. 21).

#### Evaluation of the Argument

I have highlighted the many conditional qualifiers used by Lyman to make two points:

The first is that his argument is entirely conjectural, offering no evidence on behalf of hypothesis he supports and refuting none of the evidence offered in favor of the hypothesis he opposes.

The second is that Lyman is careful enough of his own scientific reputation to make sure that his phraseology conveys the fact that this article is only a plausible hypothetical conjecture.

I think, therefore, that it is both unnecessary and scientifically inappropriate to be drawn into a logical argument about the ability or

inability to "prove" a hypothesis by "negative evidence", an issue which seems to have assumed some (undeserved) stature in the debate over policy concerning goats in the Olympic National Park, since it was raised by Lyman.

This is because, in the first instance, scientific demonstration is *never* a matter of proof beyond all doubt, but of only of probability -- which is why the convention of specifying confidence intervals for all quantitative data is universal in science. There is no "proof" in science at all. There is only inductive inference from observational and experimental evidence, subject to some specifiable margin of error and confidence over the data at hand.

The sole issue in this and any other scientific debate is the evidence at hand. If the evidence at hand all points in one direction, then conjectural arguments that the evidence might not be good evidence, or that there might not be enough of it, or that confuting evidence might someday be discovered have absolutely no scientific standing *unless* a convincing argument can be made that the existing evidence is bad - by some criterion or standard used to adjudge the value of all such evidence, and agreed upon by the community of scientists who work with such evidence.

Sometimes it is necessary to remove ourselves to some embarrassingly simple issues of scientific procedure, to things that normally "go without saying" in order to remind ourselves of this point.

We must now ask: how is it that we draw maps *at all* of the historical biogeography of extant or extinct animals? The answer is quite direct.

1. we look for them and signs of their habitation.
2. we ask residents of the suspected range if they have ever seen them.
3. we consult historical records to see if any people now dead left records of seeing them.
4. we dig holes in the ground in likely spots and look for their remains.

Where we see them, or find reliable evidence of their having been seen now or in the past, or where we find their remains, we mark the species "Present".

Where we do not see them, or find any reliable evidence of their having been seen, or where we find no remains, we mark the species "Not Present".

Biogeographic maps are thus always made up of both "positive" and "negative" evidence -- the "negative evidence" being the places on the biogeographic map where a species is marked "Not Present".

In other words, no "negative" evidence means also no map and no biogeography at all. Negative evidence is not only acceptable, it is indispensable. Thus the evidence for the historical absence of *Oreamnos* from the Peninsula passes the test of being acceptable evidence in the profession of biogeographic mapping. It is just as good evidence as the

evidence of historical presence, it is used by all biogeographers, and there is nothing suspect about it, illicit about it, or shameful about it . It is not to be confused with the "lack" of evidence necessary to reach a conclusion, it is a rather a scientific sufficiency of evidence to render a judgement of "Not present" for a given species in a given locale.

There is no question in my mind that the historical, ethnographic and biogeographic data make a much stronger than usual case for the historical absence of mountain goats in the Olympic Mountains, as adjudged by criteria of adequacy normatively applied in biogeography for any animal in an area where habitat is at all suitable for the animal to be even considered as a possible part of the resident fauna.

In closing I should like to point to the founding document of modern scientific procedure - Isaac Newton's *Philosophiae Naturalis Principia Mathematica (1687)*. In Part III of that book, Newton proposed a series of "rules of reasoning in philosophy" ["natural philosophy was the 17th century word for what we call "natural science" ] which have guided scientists ever since he wrote them down.

The last of these reads as follows: Rule IV: ..."we are to look upon propositions inferred by general induction from phenomena as accurately or very nearly true, *notwithstanding any contrary hypotheses that may be imagined* [emphasis mine] till such time as other phenomena occur, by which they may be made either more accurate, or liable to exceptions."

"This rule we must follow, that the argument of induction may not be evaded by hypothesis".

This precisely fits our case. The argument by general induction from phenomena has been made (no native goat population or sign or remnant of one) and Lyman has attempted to evade the argument from induction by a hypothesis ( there might have been a native goat population even though there is no evidence). The whole history of modern science is unanimous in not according arguments of the latter class scientific standing - "until such time as other phenomena occur" - that is, until they produce evidence. Since Lyman produces no evidence of any sort -- but merely imagines how things might be different, his argument has no scientific standing whatever.

## Review of Susan Schultz

1. "Wagner 1933" - cited on pp. 5-8 not in biblio. Assume this is Henry Raup Wagner (1862-1957) Spanish Explorations in the Straits of Juan de Fuca. Santa Ana: Fine Arts Press, 1933.?

2. Spanish descriptions sound very unreliable: buffalo, hares and rabbits(?) stags and deer(?), leopards(?), coyotes and wolves(?) all described as part of fauna on both sides of the straits. There are references to sheepskins(?) as opposed to dog skins which are also mentioned in the account of the 1792 reconnaissance in the Straits of Juan de Fuca by Galiano and Valdes - in trade with natives of East Side of Vancouver Island.

3. Point well taken (p.10) that Spanish explorers of 1792 used the term "Estrecho de Fuca" to refer to both the Strait of Juan de Fuca and the Georgia Strait, thus all faunal descriptions for 1792 (above) include everything N to Nootka Sound.

4. Testimony from Archibald Menzies, naturalist on the 1792 expedition of Lord Vancouver, of goatskins at Bella Bella on the mainland, but that these had been obtained in trade by coastal natives from natives further inland. Jose Mozino, a Spanish naturalist working out of Nootka on Vancouver Island in 1792, states that the wool of local garments (suspected to be goat or bison wool by him) was obtained by trade.

5. Wilkes expedition in 1841 saw no goats and mentions no goats - trade blankets have largely supplanted local manufactures.

Railroad Surveys of 1853-1856 saw goat skins on Whidbey Island "obtained from the Indians about Mt. Baker" and mentioned goats being abundant in NE Washington and present in upper Nisqually.

6. The most convincing claim is that of Samuel Gilman in National Geographic of 1896 which states that mountain goats are part of the fauna of this "hunter's paradise".

In 1890 C.A. Barnes claimed that the Press Party 1889-190 saw one goat in the interior of the peninsula, in a list of wild species encountered (rendering Schultz's attempts to explain it away as a feral animal unconvincing).

Goat Monograph Chapter 4 Draft

p. 2 Must mean distinct *endemic* forms. We certainly recognize more than "35 distinct forms of plants and animals" on the Olympic Peninsula.

pp4-5 Olympics lack a large number of mammalian species found in Cascades, and a considerable part of the Cascade avifauna.

6 same true of subalpine and alpine vascular plants and conifers

p7 several plants show disjunct ranges with plants in Idaho and BC -

all this heightens sense of Olympics as a biogeographic island

The Alexander Archipelago and Queen Charlottes, Landbridge islands in last glaciation, also lack records of oreamnos species

impoverished terrestrial mammal faunas of landbridge and habitat islands --nonequilibrium, relict faunas may result either from extinction or from failed colonization (trans they were there or they were never there)

but where a group of species is absent from a geographically clustered series of habitat and landbridge islands, present in adjacent mainland, and at the same time having different demography, diversity and ecological requirements -- such that they would not be assumed to be similarly predisposed to extinction, then we may suppose the failure to find the Alpine species (Pika and mountain goat) in all four locales -- Vancouver Island, Olympic Peninsula, Alexander and Queen Charlotte Archipelagoes suggests failure to colonize rather than extinction given their distribution along a coastal strip parallel to mountains offering abundant habitat and goat population soon the near mainland.

I must say that the references provided for the glacial history of the Olympic Peninsula, especially the size and extent of rivers on the outwash plains at the S end of the Olympic Peninsula., very much strengthen the case for the Puget Lowland as a barrier, rather than a dispersal route as in the highly conjectural argument of Lyman (1988)

## Schalk - Ethnographic and Archaeological Evidence

examines published and unpublished reports for Olympics, Cascades and Coastal B.C.

Determines that there are no archaeologically documented goat bones on the peninsula, though an undocumented claim by Reardon 1917 that there were goat bones in a Makah midden. No informants ever hunted goat, though they hunted the interior of the peninsula.

There is documentation of trade with coastal tribes for goat wool, and there is a disjunct distribution of goat-hunting regions and wool-dog regions, with the peninsula being the latter.

Author fully aware that can't prove a negative nor establish holocene provenance of and extent of goats from 19th century, but can determine that by 19th century no goats existed on peninsula

I am satisfied that this is a complete and impartial review of the evidence which corrects an error in Lyman 1988 - that all ethnographic inferences are negative. Elmendorf 1960 collected a Twana story about why there were no goats on the peninsula, so the non-existence of goats there does have a basis in Twana myth and legend. (see p. 15)