EXPERT REPORT OF PROFESSOR PETER B. MOYLE, PH.D.

I have been asked to provide my expert opinion on the potential effects of suction dredging on fishes of the Klamath River and tributaries, on behalf of the plaintiffs in Karuk Tribe vs California Department of Fish and Game (Superior Court of California, Alameda County, RG0521197).

I. QUALIFICATIONS AND EXPERIENCE

I have been researching freshwater and anadromous fish in California since 1969. I was appointed Professor of Fisheries Biology at the University of California at Davis in 1972, and held the chair of the University's Department of Wildlife, Fish and Conservation Biology from 1982 to 1987. I have served as Associate Director of the Center for Integrated Watershed Science and Management since 2002. My *curriculum vitae* is attached as Exhibit A.

The principal area of my research and expertise is the ecology and conservation of freshwater and anadromous fishes, particularly in California. A significant portion of my research has focused on regulated streams and the impacts of dams, diversions, and other factors on fish populations in California, including the Central Valley. I have authored or co-authored more than 160 publications, most of which concern freshwater and anadromous fishes. Among my publications is *Inland Fishes of California* (Moyle 2002), the standard reference work on California fishes, as well as four other books and monographs on fishes. A list of my publications is attached as Exhibit B.

In 1993, I was named a Fellow of the California Academy of Sciences. I serve on the editorial boards of several peer-reviewed journals, including *Environmental Biology of Fishes*, *Biological Conservation*, and *Biological Invasions*. I am a member of the American Fisheries Society, American Society of Ichthyologists and Herpetologists, Ecological Society of America, Society for Conservation Biology, American Association for the Advancement of Science, and American Institute of Biological Sciences. I also have received an Award of Excellence from the Western Division of the American Fisheries Society (1991); recognition as a Distinguished

Fellow of the Gilbert Ichthyological Society (1993); the Outstanding Educator Award from the American Fisheries Society (1995, with J. J. Cech); and recognition as Distinguished Ecologist by Colorado State University (2001). I currently co-hold the President's Chair in Undergraduate Education at UC Davis.

In 2003, I was one of the co-authors of the National Research Council's final report on the causes of the decline and strategies for recovery of coho salmon and other fishes in the Klamath River Basin (National Research Council 2003). I also was a member of the Science Board of the CALFED Ecosystem Restoration Program and its predecessor (1998-2005), led the USFWS Delta Native Fishes Recovery Team (1993-1995), and served as a member of the USFS Sierra Nevada Ecosystem Project Team (1994-1996). I currently serve as a member of interagency Fish Screen Evaluation Committee.

I have previously served as an expert witness or consultant on salmon and other fishes in California in a number of venues. I was retained as a consultant by the City and County of San Francisco in a re-licensing proceeding before the Federal Energy Regulatory Commission (FERC), and served as an expert witness for the Putah Creek Council, in the *Putah Creek Water Cases*, Judicial Council Coordination Proceeding Number 2565 (Sacramento Superior Court). I also have testified before the State Water Resources Control Board and a congressional committee. In 2000 I was deposed as an expert witness on coho salmon in the case *Environmental Protection & Information Center. Andrea Tuttle*, Case No. 00-0713-SC (N.D. Cal). In March, 2004, I was deposed as an expert witness on the 2002 Klamath River salmon kill in the case *Pacific Coast Federation of Fisherman's Associations, Yurok Tribe, Hoopa Valley Tribe v. Bureau of Reclamation, Klamath Water Users, No.C 02-020006 SBA* (N.D.California). I am currently serving as an expert witness for the Natural Resources Defense Council on NRDC vs Rodgers (E.D. Cal. No. Civ. 88-1658 LKK) on restoring flows to the San Joaquin River.

I have also been called on to provide expertise on salmon and native fish restoration in many other venues and proceedings. For example, I recently presented expert testimony regarding Section 5937 in proceedings before the California State Water Resources Control Board involving the Santa Ynez River (*in re Santa Ynez River Public Trust Proceedings on U.S. Bureau of Reclamation Water Rights Permits, Applications 11331 and 11332*, 2003).

In relation to the suction dredging and fishes of the Klamath River, I have the following background. I have been keeping track of the status of Klamath River fishes ever since I began writing the standard reference work on California fishes, *Inland Fishes of California,* first published in 1976. In the revised edition, published in 2002, I extensively reviewed the biology and status of fishes of the Klamath Basin. I was responsible for the analyses that led to various species being listed as Species of Special Concern by the California Department of Fish and Game (Moyle et al. 1994) and with two postdoctoral scholars in my laboratory, produced the first major peer-reviewed review of the status of coho salmon in California (Brown et al.1994). As the result of my expertise, I was appointed a member of the National Research Council's committee to review the causes of fish declines in the Klamath Basin (NRC 2003). In the summer of 2002, Dr. Jeffrey Mount and I brought a team of advanced undergraduates and graduate students into the Scott River basin to conduct field investigations on the status of coho salmon in Scott River tributaries. I am aware of the impacts of suction dredging primarily through the work of Dr. Bret Harvey, who conducted his first studies under me while a graduate student in my laboratory. Subsequently, I reviewed several drafts of the best (really *only*) review paper on suction dredging impacts in California written by Dr. Harvey (Harvey and Lisle 1998). I have also observed suctions dredges at work numerous times while conducting field work.

II. PREVIOUS TESTIMONY

See qualifications section (last three paragraphs).

III. COMPENSATION

I am not being paid and have not been paid for my work as an expert witness for this legal proceeding or for other similar matters relating to the Klamath River.

IV. SCOPE OF ASSIGNMENT

I was asked by the Plaintiffs to investigate and provide expert opinion, as a fisheries biologist, on the following questions:

(1) What are the likely effects of suction dredging on anadromous fishes, especially coho salmon, in the Klamath River and its tributaries?
(2) What tributaries and thermal refugia contain fish that would be particularly at risk from suction dredging?

V. MATERIALS CONSIDERED IN FORMULATING THIS EXPERT REPORT

In formulating the opinions stated in this expert report, I have relied on information I accumulated working on salmon and other California fishes since 1969. Much of this material is summarized in my 2002 book, *Inland Fishes of California* (University of California Press, 502 pp) and in my 160+ peer-reviewed publications. More specifically, I considered each of the publications cited in this report and materials cited in my publications on the Klamath River. Particularly important was the research I conducted on the status of Klamath River fishes on behalf of the NRC. Thus the opinions that I express in this report are based on my 35 years of experience and publications and on periodicals, texts, research, and historical and other materials that other experts in my field would consider reliable.

VI. SUMMARY OF EXPERT OPINIONS

Opinion 1: *All* anadromous fishes in the Klamath basin should be considered to be in decline and ultimately threatened with extirpation as wild populations because of the long history of decline and the multiple threats to river system. Suction dredging through a combination of disturbance of resident fish, alteration of substrates, and indirect effects of heavy human use of small areas, especially thermal refugia, will further contribute to the decline of the fishes. I agree with thrust of Harvey and Lisle (1998), that it should be assumed that dredging is harming declining species unless it can be proven otherwise.

Opinion 2. Suction dredging should be banned from following areas, unless it can be proven using peer-reviewed scientific studies that the dredging has no short term or cumulative effects: All tributaries to the Klamath River, 500 m above and below cool-water refuge areas (stream mouths) on the mainstem Klamath River, Klamath River from Trinity River confluence

to Green Riffle, Canyon Creek and all other Scott River tributaries, and Salmon River including the north and south forks and all tributaries.

VII. WHAT ARE THE LIKELY EFFECTS OF SUCTION DREDGING ON ANADROMOUS FISHES, ESPECIALLY COHO SALMON, IN THE KLAMATH RIVER AND ITS TRIBUTARIES?

The general effects of suction dredging on fish are well described in Harvey (1986) and Harvey and Lisle (1998) and so will be described only briefly here. The effects vary according to a variety of factors including size of stream, fish species present, season of dredging, and frequency and intensity of dredging. The key is that suction dredging represents a chronic unnatural disturbance of natural habitats that are already likely to be stressed by other factors and can therefore have a negative impact on fishes that use the reach being dredged. Direct effects include entrainment of invertebrates and small fish in the dredges, altering of the habitat that supports the food supply of fishes, and changing channel structure in ways that make it less favorable for fish (usually by making it less stable and complex). An area of particular concern in the Klamath River and its tributaries is the creation of piles of dredge tailings that are attractive for the spawning of salmonids but that are so unstable they are likely to scour under high flows, greatly reducing survival of the embryos placed within the gravel.

A more immediate effect is the impact of chronic disturbance of the fishes, which can change their behavior and cause them to move to less favorable conditions. I am particularly concerned in this regard with dredging in or near thermal refugia of juvenile salmonids. As discussed in the NRC (2003) report and references therein, the Klamath River and some of its tributaries can reach temperatures in excess of 65-70ºF during the day in late summer. Such temperatures are very stressful or even lethal for many salmonids, so the fish seek out cooler areas, where small tributaries flow into the river or there is upwelling of ground water. Juvenile coho salmon, Chinook salmon, and steelhead will often be packed into these areas during the day. This past August, I spent a day with Dr. Michael Deas, who was documenting the nature of a thermal refuge created by the inflow of single creek into the Klamath River. When I swam through the refuge area with a mask and snorkel I was impressed with the concentrations of fish

in the area (and the lack of them in the main river) and how much even a minor disturbance of the habitat would reduce the ability of the area to support fish.

Adult salmon and steelhead can also be disturbed by the intense dredging activities. I am particularly concerned with spring-run Chinook salmon, a species with which I have worked closely in the Sacramento River drainage. Adult spring-run Chinook spend the summer in pools in rivers, especially the Salmon River (and its forks) and Wooley Creek. They have to survive the summer without feeding, using reserves of fats and oils they bring up from the ocean. Chronic disturbance of the type created by dredging and dredgers can increase stress on these fish and has the potential to reduce their over-summer survival. An often overlooked impact of dredging is that the people involved often live on or close to the stream in remote areas for weeks at a time, where they not only dredge, but swim, bathe, and fish (sometimes illegally). Such activity can cause spring-run Chinook to use up precious energy reserves if they have to move to less favorable areas or swim about avoiding people.

It is important to note that the Klamath River and its tributaries support the highest diversity of anadromous fishes of any river in California including: coho salmon, chum salmon, multiple runs of Chinook salmon, coastal cutthroat trout, multiple runs of steelhead, eulachon, green sturgeon, white sturgeon, Pacific lamprey, and river lamprey. This is the reason, of course, why the river also supported a rich and diverse fishery by the native peoples who live along the river. Today virtually all the species are in decline or threatened with declines from multiple factors (see NRC 2003). Therefore, in my professional opinion, suction dredging should only be allowed in areas where it can be demonstrated there will no immediate or cumulative impact on the anadromous fishes. It should be assumed there is harm, unless it can be proven otherwise.

One reason for my taking this conservative position, is that we simply do not know the effects of dredging on many species, especially when the intensity of dredging is increasing. For example, the larvae (ammocoetes) of Pacific and river lamprey live in soft materials along the stream edge or in slow-moving sections of stream. Dredging of areas where ammocoetes are abundant will push them into the water column where they can be readily consumed by predators, contributing further to the likely declines of the species. Even for salmonids, our information, with the exception of a few studies such as that of Harvey (1989), is largely

anecdotal or in non-peer reviewed reports (see, for example, the bibliography of DFG 1994).. Studies are also largely confined to looking at immediate effects of single dredges and they do not examine the cumulative or long-term effects of multiple dredges and activities associated with the dredges. Indeed little has changed since DFG (1994, p. 71) listed the need for additional studies on practically every important aspect of the environmental impacts of dredging. Harvey and Lisle (1998) present a strategy for acquiring much of the needed information.

VII. WHAT TRIBUTARIES AND THERMAL REFUGIA CONTAIN FISH THAT WOULD BE PARTICULARLY AT RISK FROM SUCTION DREDGING?

The NRC (2003) report emphasized two important considerations for the recovery of Klamath basin fishes that are especially relevant here: (1) cold water refuges are key to the persistence of many species, especially coho salmon and (2) the entire array of anadromous fishes (i.e., the Tribal Trust Species) need large scale and pro-active measures to assure recovery. Suction dredging is one more insult to these fishes that is likely to hurt their chances for recovery. In particular, coho salmon, spring-run Chinook salmon, and summer (spring) steelhead are particularly vulnerable to the immediate effects of dredging and have been reduced to low numbers in the Klamath Basin so need special protection.

In my professional opinion, the following waters should be Class A (no dredging permitted) waters beyond what is already classified as such:

1. All Klamath River cold-water tributaries, including the Shasta (already class A) River. This is to protect coho salmon in particular.
2. The Klamath River below Iron Gate at the mouths of all tributaries for a minimum of 500 meters (1500 ft) upstream of the mouths and 500 meters downstream of detectable coldwater influence. Most of the smaller tributaries of the Klamath River are substantially colder than the main river and the short sections along the edges that are influenced by the creeks are important summer refuges for juvenile Chinook and coho salmon, as well as steelhead. For example in 2001, USFWS (unpublished data) found juvenile salmonids using refuge areas at the mouths of the following creeks: Aikins, Beaver, Blue, Bluff, Bogus, Boise, Cade, Camp, Cappell, China, Clear, Coon, Dillon, Elk, Elliott, Fort Goff, Grider, Halverson, Hopkins, Horse, Independence,

Indian, Irving, Little Grider, McGarvey, Miners, Oak Flat, Pearch, Pecwan, Perch, Pine, Portuguese, Red Cap, Roach, Rock, Rogers, Roseland, Sandy Bar, Seiad, Slate, Stanshaw, Swillup, Thompson, Ti, Tinkman, Tully, Uksnom, Ullthorne, Ukanom, Upsanddown, and Walker. The mouths of the Scott, Shasta, and Salmon rivers should also be protected.

3. Klamath River from Trinity River confluence to Green Riffle, to reduce potential impacts on green sturgeon spawning and rearing.

4. Canyon Creek and all other Scott River tributaries. These streams contain cold water habitats essential for the rearing of juvenile coho salmon.

5. Salmon River including the north and south forks and all tributaries. This designation is to protect the entire suite of Klamath Basin anadromous fishes, especially coho salmon in the tributaries, spring-run Chinook and summer steelhead in the two forks of the Salmon River, and green sturgeon and lamprey in the mainstem salmon.

REFERENCES

Brown, L. R., P. B. Moyle, and R. M. Yoshiyama. 1994. Status of coho salmon (*Oncorhynchus kisutch*) in California. North American Journal of Fisheries Management 14: 237-261.

Department of Fish and Game, California. 1994. Final environmental impact report: adoption of regulations for suction dredge mining. DFG, Sacramento. 173 pp.

Harvey, B. C. 1986. Effects of suction gold dredging on fish and invertebrates in two California streams, North American Journal of Fisheries Management 6:401-409.

Harvey, B. C. and T. E. Lisle. 1998. Effects of suction dredging on streams: a review and an evaluation strategy. Fisheries 23(6):8-17.

Moyle, P. B. 2002. *Inland Fishes of California*. Revised and Expanded. Berkeley: University of California Press. 502 pp.

Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern of California. California Department of Fish and Game, Sacramento, California. 2nd ed. 272 pp.

National Research Council 2003. *Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery*. Committee on Endangered and Threatened Fishes in the Klamath River Basin. Board on Environmental Studies and Toxicology.. National Academy Press.

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Peter B. Moyle Date

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EXHIBIT A: CURRICULUM VITAE

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And

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EDUCATION

1964	University of Minnesota	**B.A. -**	**Zoology**
1966	Cornell University	**M.S. -**	**Conservation**
1969	University of Minnesota	**Ph.D. -**	**Zoology**

UNIVERSITY POSITIONS

1969 - 1972	Assistant Professor, Biology, California State University, Fresno, CA
1972 – present	Assistant to Full Professor, University of California, Davis, California
1982 - 1987	Chair, Department of Wildlife & Fisheries Biology, University of California, Davis, California
2002-present	Associate Director, Center for Integrated Watershed Science and Management UCD

PROFESSIONAL SOCIETIES/ORGANIZATIONS

American Fisheries Society (national & local chapters); American Society of Ichthyologists and Herpetologists; Ecological Society of America; Desert Fishes Council; Society for Conservation Biology; AAAS; AIBS

AWARDS

Award of Excellence, Western Division, American Fisheries Society (1991); Haig-Brown Award, California Trout (1993); Distinguished Fellow, Gilbert Ichthyological Society (1993); Fellow, California Academy of Sciences (1993); Bay Education Award, Bay Institute (1994); Public Service Award, UCD (1995); Outstanding Educator Award, American Fisheries Society (1995, with J. J. Cech); Streamkeeper Award, Putah Creek Council (1997); Distinguished Ecologist, Colorado State University (2001); Outstanding Mentor Award, UCD (2003); President's Chair in Undergraduate Education, UCD (2003-2005, with J. Mount).

OTHER

Editorial Boards, *Environmental Biology of Fishes*, *Biological Conservation,* and *Biological Invasions*. Expert testimony: Bay/Delta Hearings, State Water Resources Control Board; Congressional hearings, Re-authorization of Endangered Species Act, etc. Head, Delta Native Fishes Recovery Team (1993-1995); Member, Sierra Nevada Ecosystem Project Team (1994-1996); Member, Independent Science Board, CALFED Ecosystem Restoration Program; Vice President, The Natural Heritage Institute; Fisheries Consultant, City and County of San Francisco. Member, National Research Council Committee on Endangered Fishes in the Klamath Basin (2002-2003).

TEACHING

Teach basic courses in fish biology, wildlife conservation, fisheries, watershed ecology, and nature/culture. Co-authored (with J. Cech) widely used ichthyology text (5th edition, 2003) and co-edited (with C. Schreck) handbook on techniques for working with fish. Active in Graduate Group in Ecology (currently on Executive Committee). Steering Committee, Nature and Culture Program.

PUBLICATIONS

Author or co-author of over 150 peer-reviewed publications, including five books/monographs.

EXIBIT B

PEER-REVIEWED PUBLICATIONS

Peter Briggs Moyle

(Does not include ca. 100 non-peer-reviewed publications)

1. Moyle P.B. and J. A. Israel. 2005 Untested assumptions: effectiveness of screening diversions for conservation of fish populations, Fisheries 30 (5):20-28.
2. Kimmerer, W., S. R. Avent, S. M. Bollens, F. Feyrer, L. F. Grimaldo, P. B Moyle, M. Nobriga, and T. Visintainer. 2005. Variability in length-weight relationships used to estimate biomass of estuarine fish from survey data. Transactions, American Fisheries Society 134:481-495.
3. Schroeter, R. E. and P. B. Moyle. 2005. Alien fishes in California's marine environments. *In*: M. H. Horn, L.G. Allen, and D. Pondella, eds. *Ecology of California Marine Fishes*. Berkeley: UC Press.
4. Brown, L. and P. B. Moyle 2004. Native Fishes of the Sacramento-San Joaquin Drainage, California: a History of Decline" Pages xxx-xxx *in Historical Changes in Fish Assemblages of Large North American Rivers.* American Fisheries Society, Bethesda.
5. Ribeiro, F., P. K. Crain, and P. B. Moyle. 2004. Variation in condition factor and growth in young-of-year fishes in floodplain and riverine habitats of the Cosumnes River, California. Hydrobiologia 527:77-84.
6. Marchetti, M. P., T. Light, P. B. Moyle, and J. H. Viers. 2004. Fish invasions in California watersheds: testing hypotheses using landscape patterns. Ecological Applications 14:1507-1525.
7. Marchetti, M. P., P. B. Moyle, and R. Levine. 2004. Invasive species profiling: exploring the characteristics of exotic fishes across invasion stages in California. Freshwater Biology 49:646-661..
8. Moyle, P.B., R. D. Baxter, T. Sommer, T. C. Foin, and S. A. Matern. 2004. Biology and population dynamics of Sacramento Splittail (*Pogonichthys macrolepidotus)* in the San Francisco Estuary: a review. San Francisco Estuary and Watershed Science [online serial] 2(2):1-47.
9. Hogan, Z. S., P. B. Moyle, B. May, M. J. Vander Zander, and I. G. Baird. 2004. The imperiled giants of the Mekong. American Scientist 92: 228-237.
10. Marchetti, M. P. , P. B. Moyle, and R. Levine. 2004. Alien fishes in California watersheds: characteristics of successful and failed invaders. Ecological Applications 14:587-596.
11. Lewis, W. A., R. M. Adams, E.B. Cowling, E. S. Helfman, C.D.D.Howard, R. J, Huggett, N. E. Langston, J. F. Mount, P. B. Moyle, T. J. Newcomb, M. L. Pace, and J. B. Ruhl. 2004. Endangered and threatened fishes of the Klamath River Basin: Causes of decline and strategies for recovery. National Academies Press. 334 pp.
12. Crain, P.K., K. Whitener, P.B. Moyle. 2004. Use of a restored central California floodplain by larvae of native and alien fishes. Pages 125-140 in F. Feyrer, L.R. Brown, R.L. Brown, and J.J. Orsi, editors. *Early life history of fishes in the San Francisco Estuary and watershed*. American Fisheries Society Symposum 39, Bethesda, Maryland.
13. Moyle, P. B., P. K. Crain, K. Whitener, and J. F. Mount. 2003. Alien fishes in natural streams: fish distribution, assemblage structure, and conservation in the Cosumnes River, California, USA. Environmental Biology of Fishes 67:277-288.

14. Feyrer, F., B. Herbold, S.A. Matern, and P.B. Moyle. 2003. Dietary shifts in a stressed fish assemblage: consequences of a bivalve invasion in the San Francisco Estuary. Environmental Biology of Fishes 67:277-288.

15. Matern, S. A., P. B. Moyle, and L. C. Pierce. 2002. Native and alien fishes in a California estuarine marsh: twenty-one years of changing assemblages. Transactions of the American Fisheries Society 131:797-816.

16. Moyle, P. B. 2002. *Inland Fishes of California. Revised and expanded*. Berkeley: University of California Press. 502 pp.

17. Chasnoff, B. and P. B. Moyle. 2001. Ethics, ecology, and economics in river management: the benefits of working together. Pages 157-176 *in* C. K, Davis and R. E. McGinn, editors. *Navigating rough waters: ethical issues in the water industry*. Denver, Colorado, American Waterworks Association.

18. Sweetnam, D. S., R. D. Baxter, and P. B. Moyle. 2001. True smelts. Pages 472-479 *in* W. S. Leet, C. M. Dewees, R. Klingbeil, and E. J. Larson, eds. *California's living marine resources: a status report*. Sacramento: California Department of Fish and Game.

19. Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2001. Historical and present distribution of chinook salmon in the Central Valley. Pages 71-176 *in* R. Brown, ed. *Contributions to the biology of Central Valley salmonids*. CDFG Fish Bulletin 179.

20. Baird, I., Z. Hogan, B. Phylaivanh, and P. B. Moyle. 2001. A communal fishery for the migratory catfish *Pangasius macronema* in the Mekong River. Asian Fisheries Science 14: 25-41.

21. Sommer, T. R., W. C. Harrell, M. Nobriga, R. Brown, P. B. Moyle, W. J. Kimmerer and L. Schemel. 2001. California's Yolo Bypass: evidence that flood control can be compatible with fish, wetlands, wildlife and agriculture. Fisheries 58(2):325-333.

22. Moyle, P. B., and L. H. Davis. 2001. A list of freshwater, anadromous, and euryhaline fishes of California. California Fish and Game 86:244-258.

23. Marchetti, M. P., T. Light, J. Feliciano, T. Armstrong, Z. Hogan, and P. B. Moyle. 2001. Homogenization of California's fish fauna through abiotic change. Pages 269-288 *in* J.L. Lockwood and M.L. McKinney, editors. *Biotic Homogenization*. Kluwer/Academic Press, New York.

24. Marchetti, M. P., and P. B. Moyle. 2001. Effects of flow regime on fish assemblages in a regulated California stream. Ecological Applications 11:530-539.

25. Marchetti, M. P., and P. B. Moyle. 2000. Spatial and temporal ecology of native and introduced fish larvae in lower Putah Creek, California. Environmental Biology of Fishes 58:75-87.

26. Moyle, P. B. 2000. Restoring aquatic ecosystems is a matter of values. California Agriculture 54(2):16-25.

27. Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 2000. Chinook salmon in California's Central Valley: an assessment. Fisheries 25(2):6-20.

28. Li, H. W., and P. B. Moyle. 1999. Management of introduced fishes. Pages 345-374 *in* C. C. Kohler and W. A. Hurbert, eds., *Inland Fisheries Management*, 2nd edition. American Fisheries Soc., Washington D.C.

29. Parker, I. M., D. Simberloff, W. M. Lonsdale, K. Goodell, M. Wonham, P. M. Kareiva, M. H. Williamson, B. von Holle, P. B. Moyle, J. E. Byers, and L. Goldwasser. 1999. Impact: toward a framework for understanding the ecological effects of invaders. Biological Invasions 1:3-19.

30. Moyle, P. B., and P. J. Randall. 1998. Evaluating the biotic integrity of watersheds in the Sierra Nevada, California. Conservation Biology 12:1318-1326.

31. Moyle, P. B., and J. J. Smith. 1998. Freshwater fishes of the Central California Coast. Pages 17-22 *in* N. Chiariello and R. F. Dasmann, eds. *Symposium on biodiversity of the Central California Coast*. Association for the Golden Gate Biosphere Reserve, San Francisco.

32. Moyle, P. B., and M. P. Marchetti. 1999. Applications of indices of biotic integrity to California streams and watersheds. Pages 367-380 *in* T. P. Simon and R. Hughes, editors. *Assesssing the sustainability and biological integrity of water resources using fish communities*. CRC Press, Boca Raton, Fl.

33. Moyle, P. B. 1999. Effects of invading species on freshwater and estuarine ecosystems. Pages 177-191 *in* Sandlund, O.T., P.J. Schei & C. Viken, eds. *Invasive species and biodiversity management*. Kluwer, Leiden.

34. Yoshiyama, R. M., F. W. Fisher, and P. B. Moyle. 1998. Historical abundance and decline of chinook salmon in the Central Valley region of California. North American Journal of Fisheries Management 18: 487-521.

35. Moyle, P. B., M. P. Marchetti, J. Baldrige, and T. L. Taylor. 1998. Fish health and diversity: justifying flows for a California stream. Fisheries (Bethesda) 23(7):6-15.

36. Healey, M., W. Kimmerer, G. M. Kondolf, R. Meade, P. B. Moyle, and R. Twiss. 1998. Strategic plan for the Ecosystem Restoration Program. CALFED Bay-Delta Program, Sacramento. 252 pp.

37. Trenham, P. C., H. B. Shaffer, and P. B. Moyle. 1998. Biochemical identification and assessment of population subdivision in morphologically similar native and invading smelt species (*Hypomesus*) in the Sacramento-San Joaquin Estuary, California. Transactions, American Fisheries Society 127: 417-424.

38. Leidy, R. A., and P. B. Moyle. 1997. Conservation status of the world's fish fauna: an overview. Pp.187-227 *In* P. A. Fiedler and P. M. Karieva, eds. *Conservation biology for the coming decade*. Chapman and Hall, N.Y.

39. Moyle, P. B., and R. M. Yoshiyama. 1997. The role of adaptive management in restoring chinook salmon to the Tuolumne River. Pages 557-562 *in* S. Y. Wang and T. Carstens, eds. *Environmental and coastal hydraulics: protecting the aquatic habitat*. NewYork: ASCE.

40. Brown, L. R., and P. B. Moyle. 1997. Invading species in the Eel River, California: successes, failures, and relationships with resident species. Environmental Biology of Fishes 49: 271-291.

41. Moyle, P. B., R. Pine, L. R. Brown, C. H. Hanson, B. Herbold, K. M. Lentz, L. Meng, J. J. Smith, D. A. Sweetnam, and L. Winternitz. 1996. Recovery plan for the Sacramento-San Joaquin Delta native fishes. US Fish and Wildlife Service, Portland, Oregon. 193 pp.

42. Bennett, W.A., and P. B. Moyle. 1996. Where have all the fishes gone: interactive factors producing fish declines in the Sacramento-San Joaquin estuary. Pages 519-542 *in* J. T. Hollibaugh, ed. *San Francisco Bay: the Ecosystem*. San Francisco: AAAS, Pacific Division.

43. Moyle, P. B., and T. Light. 1996. Biological invasions of fresh water: empirical rules and assembly theory. Biological Conservation 78:149-162.

44. Moyle, P. B., P. J. Randall, and R. M. Yoshiyama. 1996. Potential aquatic diversity management areas of the Sierra Nevada. Pages 409-478 *in* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. III, assessments, commissioned reports, and

background information. Davis: University of California, Centers for Water and Wildland Resources.

45. Yoshiyama, R. M., E. R. Gerstung, F. W. Fisher, and P. B. Moyle. 1996. Historical and present distribution of chinook salmon in the Central Valley drainage of California Pages 309-362 *in* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. III, assessments, commissioned reports, and background information. Davis: University of California, Centers for Water and Wildland Resources.

46. Moyle, P. B., R. Kattlemann, R. Zomer, and P. J. Randall. 1996. Management of riparian areas in the Sierra Pages 1-37 *in* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. III, assessments, commissioned reports, and background information. Davis: University of California, Centers for Water and Wildland Resources

47. Moyle, P. B. 1996. Potential aquatic diversity management areas. Pages 1493-1503. *In* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. II, assessments, commissioned reports, and background information. Davis: University of California, Centers for Water and Wildland Resources.

48. Moyle, P. B., and P. J. Randall. 1996. Biotic integrity of watersheds. Pages 975-985 *In* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. II, assessments, commissioned reports, and background information. Davis: University of California, Centers for Water and Wildland Resources.

49. Moyle, P. B., R. M. Yoshiyama, and R. A. Knapp. 1996. Status of fish and fisheries. Pages 953-973 *In* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. II, assessments, commissioned reports, and background information. Davis: University of California, Centers for Water and Wildland Resources.

50. Moyle, P. B. 1996. Status of aquatic habitat types. Pages 945-952. *In* Sierra Nevada Ecosystem Project: Final report to Congress , Vol. II, assessments, commissioned reports, and background information. Davis: University of California, Centers for Water and Wildland Resources.

51. Moyle, P. B., and T. Light. 1996. Fish invasions in California: do abiotic factors determine success? Ecology 77:1666-1670.

52. Courtenay, W. R., Jr. and P. B. Moyle. 1996. Biodiversity, fishes, and the introduction paradigm. Pages 239-252 in R. C. Szaro and D. W. Johnston, eds. Biodiversity in managed landscapes. Oxford University Press: N.Y.

53. Moyle, P. B. and J. J. Cech, Jr. 1996. Fishes: an Introduction to Ichthyology. 3rd Edition. Prentice-Hall: Upper Saddle River, N. J. 590 pp. (4th edition, 2000).

54. Meng, L., and P. B. Moyle. 1995. Status of splittail in the Sacramento-San Joaquin estuary. Transactions of American Fisheries Society 124:538-549.

55. Stanley, S. E., P. B. Moyle, and H. B. Shaffer. 1995. Allozyme analysis of delta smelt, *Hypomesus transpacificus* and longfin smelt, *Spirinchus thalichthys*, in the Sacramento-San Joaquin estuary, California. Copeia 1995:390-396.

56. Marchetti, M. P., and P. B. Moyle. 1995. Conflicting values complicate stream protection. California Agriculture 49(6):73-78.

57. Moyle, P. B. 1995. The decline of anadromous fishes in California. Conservation Biology 8: 869-870

58. Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern of California. California Department of Fish and Game, Sacramento, California. 2nd ed. 272 pp.

59. Brown, L. R., S. A. Matern, and P. B. Moyle. 1995. Comparative ecology of prickly sculpin, *Cottus asper*, and coastrange sculpin, *C. aleuticus*, in the Eel River, California. Environmental Biology of Fishes 42:329-343.

60. Moyle, P. B. 1995. Conservation of native freshwater fishes in the Mediterranean type climate of California, USA: a review. Biological Conservation 72: 271-280.

61. Meng, L., P. B. Moyle , and B. Herbold. 1994. Changes in abundance and distribution of native and introduced fishes of Suisun Marsh. Transactions of the American Fisheries Society 123:498-507.

62. Brown, L. R., P. B. Moyle, and R. M. Yoshiyama. 1994. Status of coho salmon (*Oncorhynchus kisutch*) in California. North American Journal of Fisheries Management 14: 237-261.

63. Moyle, P. B. 1994. Biodiversity, biomonitoring, and the structure of stream fish communities. Pages 171-186 In S. Loeb and A. Spacie (Editors), Biological Monitoring of Freshwater Ecosystems. Lewis Publishing, Inc., Boca Raton, Florida.

64. Moyle, P. B., and R. M. Yoshiyama. 1994. Protection of aquatic biodiversity in California: A five-tiered approach. Fisheries 19:6-18.

65. Brown, L. R., and P. B. Moyle. 1993. Distribution, ecology, and status of the fishes of the San Joaquin River drainage, California. California Fish and Game 79:96-113

66. Li, H. W., and P. B. Moyle. 1993. Management of introduced fishes. Pp. 282-307. In C. Kohler and W. Hubert (Editors), Inland Fisheries Management in North America. American Fisheries Society, Bethesda, Maryland.

67. Baltz, D. M., and P. B. Moyle. 1993. Invasion resistance to introduced species by a native assemblage of California stream fishes. Ecological Applications 3:246-255.

68. Moyle, P. B. 1993. Fish: An Enthusiast's Guide. University of California Press, Berkeley, California. 272 pp.

69. Moyle, P. B., and R. M. Yoshiyama. 1992. Fishes, aquatic diversity management areas and endangered species: A plan to protect California's native aquatic biota. California Policy Seminar, Berkeley. 222 pp.

70. Brown, L. R., and P. B. Moyle . 1992. Native fishes of the San Joaquin drainage: Status of a remnant fauna and its habitats. Pp. 89-98. In D. L. Williams, S. Byrne, and T. A. Rado (Editors), Endangered and Sensitive Species of the San Joaquin Valley, California. California Energy Commission, Sacramento, California.

71. Moyle, P. B. 1992. True smelts. Pp. 75-78. In W. S. Leet, C. M. Dewees, and C. W. Havern (Editors), California Living Marine Resources and Their Utilization. UC Sea Grant Extension Publication UCSGEP-92-12.

72. Courtenay, W. R., and P. B. Moyle. 1992. Crimes against biodiversity: The lasting legacy of fish introductions. Transactions of the 57th North American Wildlife and Natural Resource Conference. Pp. 365-372.

73. Mathias, M. E., and P. B. Moyle. 1992. Wetland and aquatic habitats. Agricultural Ecosystems and Environments 42:165-176.

74. Strange, E. M., P. B. Moyle, and T. C. Foin. 1992. Interactions between stochastic and deterministic processes in stream fish community assembly. Environmental Biology of Fishes 36:1-15.

75. Brown, L. R., P. B. Moyle, W. A. Bennett, B. D. Quelvog. 1992. Implications of morphological variation among populations of California roach *Lavinia symmetricus* (Cyprinidae) for conservation policy. Biological Conservation 62:1-10.

76. Kershner, J. L., W. M. Snider, D. M. Turner, and P. B. Moyle. 1992. Distribution and sequencing of mesohabitats: Are there differences at the reach scale? Rivers 3:179-190.

77. Herbold, B., A. D. Jassby, and P. B. Moyle. 1992. Status and trends report on aquatic resources in the San Francisco Estuary. San Francisco Estuary Project. 257 pp.

78. Moyle, P. B., B. Herbold, D. E. Stevens, and L. W. Miller. 1992. Life history and status of Delta smelt in the Sacramento-San Joaquin Estuary, California. Transactions of the American Fisheries Society 121:67-77.

79. Moyle, P. B., and R. A. Leidy. 1992. Loss of biodiversity in aquatic ecosystems: Evidence from fish faunas. Pp. 128-169. In P. L. Fiedler and S. A. Jain (Editors), Conservation Biology: The Theory and Practice of Nature Conservation, Preservation, and Management. Chapman and Hall, New York. .

80. Campbell, E. A., and P. B. Moyle. 1991. Historical and recent population sizes of spring-run chinook salmon in California. Pp. 155-216. In T. Hassler (Editor), Proceedings, Northeast Pacific Chinook and Coho Salmon Workshop. Arcata, California. American Fisheries Society.

81. Moyle, P. B., and J. Ellison. 1991. A conservation-oriented classification system for California's inland waters. California Fish and Game 77:161-180.

82. Moyle, P. B., T. Kennedy, D. Kuda, L. Martin, and G. Grant. 1991. Fishes of Bly Tunnel, Lassen County, California. Great Basin Naturalist 51:267-270.

83. Moyle, P. B., and G. M. Sato. 1991. On the design of preserves to protect native fishes. Pp. 155-169. In W. L. Minckley and J. E. Deacon (Editors), Battle Against Extinction: Native Fish Management in the American West. University of Arizona Press.

84. Brown, L. R., and P. B. Moyle. 1991. Changes in habitat and microhabitat partitioning within an assemblage of stream fishes in response to predation by Sacramento squawfish (*Ptychocheilus grandis*). Canadian Journal of Fisheries and Aquatic Sciences 43:849-856.

85. Baltz, D. M., B. Vondracek, L. R. Brown, and P. B. Moyle. 1991. Seasonal changes in microhabitat selection by rainbow trout in a small stream. Transactions of the American Fisheries Society 120:166-176.

86. Moyle, P. B., and M. A. Moyle. 1991. Introduction to fish imagery in art. Environmental Biology of Fishes 31:5-23.

87. Moyle, P. B., and J. E. Williams. 1990. Biodiversity loss in the temperate zone: decline of the native fish fauna of California. Conservation Biology 4(3):275-284.

88. Schreck, C. B., and P. B. Moyle (Editors). 1990. Methods for Fish Biology. American Fisheries Society, Bethesda, Maryland. 684 pp.

89. Moyle, P. B., J. E. Williams, and E. D. Wikramanayake. 1989. Fish species of special concern of California. California Department of Fish and Game, Sacramento, California. 222 pp.

90. Herbold, B., and P. B. Moyle. 1989. Ecology of the Sacramento-San Joaquin Delta: A community profile. U.S. Fish and Wildlife Service Biological Report 85(7.22) September. 106 pp.

91. Wikramanayake, E. D., and P. B. Moyle. 1989. Ecological structure of tropical fish assemblages in wet-zone streams of Sri Lanka. Journal of Zoology, London, England 218:503-526.

92. Miller, D. L., P. M. Leonard, R. M. Hughes, J. R. Karr, P. B. Moyle, L. H. Schrader, B. A. Thompson, R. A. Daniels, K. D. Fausch, G. A. Fitzhugh, J. R. Gammon, D. B.

Halliwell, P. L. Angermeier, and D. J. Orth. 1988. Regional applications of an index of biotic integrity for use in water resource management. Fisheries (Bethesda) 13 (5):12-20.

93. Power, M. E., R. J. Stout, C. E. Cushing, P. P. Harper, F. R. Hauer, W. J. Mathews, P. B. Moyle, B. Statzner, and I. De Bagen. 1988. Biotic and abiotic controls in river and stream communities. Journal of the North American Benthological Society 7:456-479.

94. Vondracek, B., D. M. Baltz, L. R. Brown, and P. B. Moyle. 1988. Spatial, seasonal, and diel distribution of fishes in a California reservoir dominated by native fishes. Fisheries Research 7:31-53.

95. Moyle, P. B. 1987. Review of C. H. Hocutt and E. O. Wiley, The Zoogeography of North American Freshwater Fishes. Aquaculture 62:171-172.

96. Baltz, D. M., B. Vondracek, L. R. Brown, and P. B. Moyle. 1987. Influence of temperature on microhabitat choice by fishes in a California stream. Transactions of the American Fisheries Society 116:12-20.

97. Moyle, P. B., and B. Herbold. 1987. Life-history patterns and community structure in stream fishes of western North America: Comparisons with eastern North America and Europe. Pp. 25-32. In W. J. Matthews and D. C. Heins (Editors), Community and Evolutionary Ecology of North American Stream Fishes. University of Oklahoma Press, Norman, Oklahoma.

98. Herbold, B., and P. B. Moyle. 1986. Introduced species and vacant niches. American Naturalist 128:751-760.

99. Moyle, P. B., H. W. Li, and B. A. Barton. 1986. The Frankenstein effect: impact of introduced fishes on native fishes in North America. Pp. 415-426. In R. H. Stroud (Editor), Fish Culture in Fisheries Management. American Fisheries Society, Bethesda, Maryland.

100. Jett, S., and P. B. Moyle. 1986. The exotic origins of fishes depicted on prehistoric Mimbres pottery from New Mexico. American Antiquity 51:688-720.

101. Moyle, P. B. 1986. Fish introductions into North America: Patterns and ecological impact. Pp. 27-43. In H. A. Mooney and J. A. Drake (Editors), Ecology of Biological Invasions of North America and Hawaii. Springer-Verlag, New York.

102. Moyle, P. B., R. A. Daniels, B. Herbold, and D. M. Baltz. 1986. Patterns in distribution and abundance of a non-coevolved assemblage of estuarine fishes in California. Fishery Bulletin 84:105-117.

103. Moyle, P. B., and D. M. Baltz. 1985. Microhabitat use by an assemblage of California stream fishes: Developing criteria for instream flow determinations. Transactions American Fisheries Society 114:695-704.

104. Grossman, G. D., M. C. Freeman, P. B. Moyle, and J. O. Whitaker. 1985. Stochasticity and assemblage organization in an Indiana stream fish assemblage. American Naturalist 126:275-285.

105. Moyle, P. B., and B. Vondracek. 1985. Persistence and structure of the fish assemblage in a small California stream. Ecology 66:1-13.

106. Daniels, R. A., and P. B. Moyle. 1984. Geographic variation and a taxonomic reappraisal of the marbled sculpin, *Cottus klamathensis*. Copeia 1984:949-959.

107. Moyle, P. B., and F. R. Senanayake. 1984. Resource partitioning among the fishes of rainforest streams in Sri Lanka. Journal of Zoology, London, England 202:195-223.

108. Baltz, D. M., and P. B. Moyle. 1984. Segregation by species and size classes of rainbow trout, *Salmo gairdneri*, and Sacramento sucker, *Catostomus occidentalis*, in three California streams. Environmental Biology of Fishes 10:101-110.

109. Moyle, P. B. 1983. Use of intermittent streams by California fishes. Pp. 61-65. In S. Jain and P. Moyle (Editors), Proceedings of Second Symposium on Vernal Pools and Intermittent Streams. Institute of Ecology Publication 28, University of California, Davis, California.

110. Cech, J. J., Jr., and P. B. Moyle. 1983. Alternative fish species as predators for rice field mosquitos in California. Bulletin of the Society of Vector Ecologists 8:107-110.

111. Moyle, P. B., B. Herbold, and R. A. Daniels. 1983. Resource partitioning in a non-coevolved assemblage of estuarine fishes. Pp. 178-184. In G. M. Caillet and C. A. Simenstad (Editors), Proceedings of the Third Pacific Workshop on Fish Food Habit Studies. Washington Sea Grant.

112. Moyle, P. B., and D. M. Baltz. 1983. Fish populations of Eleanor Reservoir, Yosemite National Park. Pp. 183-186. In C. Van Riper, L. D. Whittig, and M. L. Murphey (Editors), Proceedings of the First Biennial Conference on Research in California's National Parks.

113. Daniels, R. A., and P. B. Moyle. 1983. Life history of splittail (Cyprinidae: *Pogonichthys macrolepidotus*) in the Sacramento-San Joaquin Estuary. Fishery Bulletin 81:647-654.

114. Moyle, P. B., B. Vondracek, and G. D. Grossman. 1983. Responses of fish populations in the North Fork of the Feather River, California, to treatments with fish toxicants. North American Journal of Fisheries Management 3:48-60.

115. Baltz, D. M., and P. B. Moyle. 1982. The influence of riparian vegetation on stream fish communities of California. Pp. 183-187. In P. Warner and H. Hendrix (Editors), California Riparian Systems. University of California Press, Berkeley, California.

116. Baltz, D. M., P. B. Moyle , and N. J. Knight. 1982. Competitive interactions between benthic stream fishes, riffle sculpin, *Cottus gulosus*, and speckled dace, *Rhinichthys osculus*. Canadian Journal of Fisheries and Aquatic Sciences 39:1502-1511.

117. Grossman, G. D., P. B. Moyle , and J. O. Whitaker, Jr. 1982. Stochasticity in structural and functional characteristics of an Indiana stream fish assemblage: A test of community theory. American Naturalist 120:423-454.

118. Baltz, D. M., and P. B. Moyle. 1982. Life history characteristics of tule perch (*Hysterocarpus traski*) populations in contrasting environments. Environmental Biology of Fishes 7:229-242.

119. Moyle, P. B., and J. J. Cech, Jr. 1982. Fishes: An Introduction to Ichthyology, (2nd Edition, 1988). Prentice-Hall, Englewood Cliffs, New Jersey. 593 pp.

120. Moyle, P. B., J. J. Smith, R. A. Daniels, and D. M. Baltz. 1982. A Review. Pp. 255-256. In P. B. Moyle (Editor), Distribution and Ecology of Stream Fishes of the Sacramento-San Joaquin Drainage System, California. Publications in Zoology 115, University of California Press, Berkeley, California.

121. Taylor, T. L., P. B. Moyle, and D. G. Price. 1982. Fishes of the Clear Lake Basin. Pp. 171-223. In P. B. Moyle (Editor), Distribution and Ecology of Stream Fishes of the Sacramento-San Joaquin Drainage System, California. Publications in Zoology 115, University of California Press, Berkeley, California.

122. Moyle, P. B., and R. A. Daniels. 1982. Fishes of the Pit River System, McCloud River System, and Surprise Valley Region. Pp. 1-82. In P. B. Moyle (Editor), Distribution and Ecology of Stream Fishes of the Sacramento-San Joaquin Drainage System, California. Publications in Zoology 115, University of California Press, Berkeley, California.

123. Senanayake, F. R., and P. B. Moyle. 1982. Conservation of freshwater fishes of Sri Lanka. Biological Conservation 22:181-195.

124. Baltz, D. M., and P. B. Moyle. 1981. Morphometric analysis of tule perch (*Hysterocarpus traski*) populations in three isolated drainages. Copeia 1981:305-311.

125. Li, H. W., and P. B. Moyle. 1981. Ecological analysis of species introductions into aquatic systems. Transactions of the American Fisheries Society 110:772-782.

126. Brown, L. R., and P. B. Moyle. 1981. The impact of squawfish on salmonid populations: A review. North American Journal of Fisheries Management 1:104-111.

127. Moyle, P. B., and M. Massingill. 1981. Hybridization between hitch, *Lavinia exilicauda*, and Sacramento blackfish, *Orthodon microlepidotus*, in San Luis Reservoir, California. California Fish and Game 67:196-198.

128. Moyle, P. B. 1980. Sixteen species accounts of California endemic fishes. Pp. 123, 164, 199, 200, 209, 345, 346, 347, 384, 385, 391, 582, 777, 803, 815, 819. In Atlas of North American Freshwater Fishes, D. S. Lee, et al. (Editors). North Carolina Museum of Natural History, Raleigh, North Carolina.

129. Geary, R. E., and P. B. Moyle. 1980. Aspects of the ecology of the hitch, *Lavinia exilicauda* (Cyprinidae), a persistent native cyprinid in Clear Lake, California. The Southwestern Naturalist 25:385-390.

130. Grossman, G. D., R. Coffin, and P. B. Moyle. 1980. Feeding ecology of the bay goby (Pisces: Gobiidae): Effects on behavioral, ontogenetic, and temporal variation on diet. Journal of Experimental Marine Biology and Ecology 44:47-59.

131. Moyle, P. B., R. E. Andrews, R. M. Jenkins, R. L. Noble, S. B. Saila, and W. O. Wick. 1979. Research needs in fisheries. Transactions of the 44th North American Wildlife and Natural Resources Conference: 176-187.

132. Moyle, P. B., and H. W. Li. 1979. Community ecology and predator-prey relationships in warmwater streams. Pp. 171-180. In H. W. Clepper (Editor), Predator-Prey Systems in Fisheries Management. Sport Fishing Institute, Washington D.C.

133. Sturgess, J. A., and P. B. Moyle. 1978. Biology of rainbow trout (*Salmo gairdneri*), brown trout (*S. trutta*), and interior Dolly Varden (*Salvelinus confluentus*) in the McCloud River, California, in relation to management. Cal-Neva Wildlife 1978:239-250.

134. Broadway, J. E., and P. B. Moyle. 1978. Aspects of the ecology of the prickly sculpin, *Cottus asper* Richardson, a persistent native species in Clear Lake, Lake County, California. Environmental Biology of Fishes 3:337-343.

135. Daniels, R. A., and P. B. Moyle. 1978. Biology, distribution, and status of the rough sculpin, *Cottus asperrimus*, in the Pit River drainage, northeastern California. Copeia 1978:673-679.

136. Moyle, P. B., and N. J. Holzhauser. 1978. Effects of the introduction of Mississippi silverside (*Menidia audens*) and Florida largemouth bass (*Micropterus salmoides floridanus*) on the feeding habits of young-of-year largemouth bass in Clear Lake, California. Transactions of the American Fisheries Society 107:575-582.

137. Tippetts, W. E., and P. B. Moyle. 1978. Epibenthic feeding by rainbow trout (*Salmo gairdneri*) in the McCloud River, California. Journal of Animal Ecology 47:549-559.

138. Moyle, P. B. 1977. In defense of sculpins. Fisheries 2(1):20-23.

139. Alley, D. W., D. H. Dettman, H. W. Li, and P. B. Moyle. 1977. Habitats of native fishes in the Sacramento River basin. Pp. 87-94. In A. Sands (Editor), Riparian forests of California, their ecology and conservation. Institute of Ecology Publication #15, University of California.

140. Li, H. W., and P. B. Moyle. 1976. Feeding ecology of the Pit sculpin, *Cottus pitensis*, in Ash Creek, California. Bulletin of Southern California Academy of Sciences 75:111-118. (Carl Hubbs Honorary Issue.)

141. Li, H. W., P. B. Moyle, and R. L. Garrett. 1976. Effects of the introduction of the Mississippi silverside (*Menidia audens*) on the growth of black crappie (*Pomoxis nigromaculatus*) and white crappie (*P. annularis*) in Clear Lake, California. Transactions of the American Fisheries Society 105:404-408.

142. Moyle, P. B. 1976. Some effects of channelization on the fishes and invertebrates of Rush Creek, Modoc County, California. California Fish and Game 62:179-186.

143. Moyle, P. B. 1976. Inland Fishes of California. University of California Press, Berkeley, California. 405 pp.

144. Moyle, P. B. 1976. Fish introductions in California: history and impact on native fishes. Biological Conservation 9:101-118.

145. Prine, J. E., G. E. Lawley, and P. B. Moyle. 1975. A multidisciplinary approach to vector ecology at Clear Lake, California. Bulletin of the Society of Vector Ecologists 2:21-31.

146. Adams, J. R., and P. B. Moyle. 1975. Some effects of impoundments on populations of stream fish. Pp. 31-40. In P. B. Moyle and D. L. Koch (Editors), Symposium on Trout/Nongame Fish Relationships in Streams. University of Nevada Center for Water Resources Miscellaneous Publication 17:31-40.

147. Moyle, P. B. 1975. California trout streams: The way they were, probably. Pp. 9-19. In P. B. Moyle and D. L. Koch (Editors), Symposium on Trout/Nongame Fish Relationships in Streams. University of Nevada Center for Water Resources Miscellaneous Publication 17:9-19.

148. Moyle, P. B., and A. Marciochi. 1975. Biology of the Modoc sucker, *Catostomus microps*, in northeastern California. Copeia 1975:556-560.

149. Moyle, P. B. 1974. Status of the Modoc sucker (*Catostomus microps*, Pisces: Catostomidae). Cal-Neva Wildlife 1974:35-38.

150. Moyle, P. B., F. Fisher, and H. W. Li. 1974. Mississippi silversides and logperch in the Sacramento-San Joaquin River system. California Fish and Game 60:144-149.

151. Moyle, P. B., and R. Nichols. 1974. Decline of the native fish fauna of the Sierra Nevada foothills, central California. The American Midland Naturalist 92(1):72-83.

152. Moyle, P. B., S. B. Mathews, and N. Bonderson. 1974. Feeding habits of the Sacramento perch, *Archoplites interruptus*. Transactions of the American Fisheries Society 103:399-402.

153. Moyle, P. B. 1973. Recent changes in the fish fauna of the San Joaquin River system. Cal-Neva Wildlife 1973:60-63.

154. Moyle, P. B. 1973. Ecological segregation among three species of minnows (Cyprinidae) in a Minnesota lake. Transactions of the American Fisheries Society 102:794-805.

155. Moyle, P. B., and R. Nichols. 1973. Ecology of some native and introduced fishes of the Sierra Nevada foothills in central California. Copeia 1973(3):478-490.

156. Moyle, P. B. 1973. Effects of introduced bullfrogs, *Rana catesbeiana*, on the native frogs of the San Joaquin Valley, California. Copeia 1973(1):18-22.

157. Kottcamp, G., and P. B. Moyle. 1972. Use of disposable beverage cans by fish in the San Joaquin Valley. Transactions of the American Fisheries Society 101:566.

158. Moyle, P. B. 1970. Occurrence of king (chinook) salmon in the Kings River, Fresno County. California Fish and Game 56:314-315.

159. Moyle, P. B., and J. Bacon. 1969. Distribution and abundance of molluscs in a freshwater environment. Journal of the Minnesota Academy of Science 35:82-85.

160. Moyle, P. B. 1969. Comparative behavior of young brook trout of domestic and wild origin. The Progressive Fish-Culturist 31:51-56.

161. Moyle, P. B. 1966. Feeding behavior of the glaucous-winged gull on an Alaskan salmon stream. Wilson Bulletin 78:175-190.

162. Moyle, P. B. 1964. Populations of peritrichs on the pond snail, *Physa gyrina* Say. Journal of the Minnesota Academy of Science 31:125-130.