

American Shad

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Columbia River and Pacific Coast

Hamman, M. G. 1981. Utilization of the Columbia River Estuary by American shad, *Alosa sapidissima* (Wilson). Master's thesis. Oregon State University, Corvallis, Oregon.
<http://hdl.handle.net/1957/10544>

Analyzes the migrations, distribution and feeding of American Shad from February 1980 through January 1981 in the Columbia River Estuary.

Haskell, C. A. 2018. From salmon to shad: shifting sources of marine-derived nutrients in the Columbia River Basin. *Ecology of Freshwater Fish* 27(1):310–322.
<https://doi.org/10.1111/eff.12348>

Assesses the magnitude of the nutrient flux owing to the shift from salmon to shad as the most numerous fish in the Columbia River Basin.

Haskell, C. A., D. A. Beauchamp, and S. M. Bollens. 2017. Trophic interactions and consumption rates of subyearling Chinook salmon and nonnative juvenile American shad in Columbia River reservoirs. *Transactions of the American Fisheries Society* 146(2):291-298.
<https://doi.org/10.1080/00028487.2016.1264997>

Examines the diets and estimate consumption rates of subyearling Chinook salmon and juvenile American shad. Finds that American shad reduce zooplankton availability for Chinook salmon, but juvenile shad also serve as a food source for larger Chinook salmon.

Haskell, C. A., K. F. Tiffan, and D. R. Rondorf. 2006. Food habits of juvenile American shad and dynamics of zooplankton in the lower Columbia River. *Northwest Science* 80(1):47-64. <https://pubs.usgs.gov/publication/70028680>

Assesses the impact of American shad food habits on zooplankton abundance and Daphnia biomass in McNary Reservoir and John Day Reservoir.

Haskell, C. A., K. F. Tiffan, and D. W. Rondorf. 2013. The effects of juvenile American shad planktivory on zooplankton production in Columbia River food webs. *Transactions of the American Fisheries Society* 142(3):606-620. <https://doi.org/10.1080/00028487.2012.728164>

Studies the impact of American shad food habits on zooplankton abundance and community in John Day Reservoir.

Hasselman, D. J., R. A. Hinrichsen, B. A. Shields, and C. C. Ebbesmeyer. 2012. The rapid establishment, dispersal, and increased abundance of invasive American shad in the Pacific Northwest. *Fisheries* 37(3):103-114. <https://doi.org/10.1080/03632415.2012.659938>

Overview of the history of American shad introduction and discusses the mechanisms that may have contributed to the species establishment, rapid dispersal along the Pacific coast, and its increased abundance in the Columbia River.

Hasselman, D. J., R. A. Hinrichsen, B. A. Shields, and C. C. Ebbesmeyer. 2012. American shad of the Pacific coast: a harmful invasive species or benign introduction? *Fisheries* 37(3):115-122. <https://doi.org/10.1080/03632415.2012.659941>

Considers the potential ecological effects of invasive American shad on Pacific coastal ecosystems and the possible consequences for the persistence of native salmonids.

Hasselman, D. J., P. Bentzen, S. R. Narum, and T. P. Quinn. 2018. Formation of population genetic structure following the introduction and establishment of non-native American shad (*Alosa sapidissima*) along the Pacific Coast of North America. *Biological Invasions* 20(11):3123-3143. <https://doi.org/10.1007/s10530-018-1763-7>

Genotypes anadromous, freshwater resident and landlocked American shad from 14 locations along the Pacific Coast to determine population genetic structure.

Hinrichsen, R. A., D. J. Hasselman, C. C. Ebbesmeyer, and B. A. Shields. 2013. The role of impoundments, temperature, and discharge on colonization of the Columbia River Basin, USA, by nonindigenous American shad. *Transactions of the American Fisheries Society* 142(4):887-900. <https://doi.org/10.1080/00028487.2013.788553>

Examines how habitat disturbances affect the abundance and spatial distribution of American shad in the Columbia River Basin.

Independent Scientific Advisory Board. 2021. American shad in the Columbia River: past, present, future. ISAB 2021-4. https://www.nwcouncil.org/media/filer_public/88/b2/88b2dbc4-2bce-4ca2-9e69-d5d51306ea69/ISAB_2021-4_Shad_Report.pdf

Reviews the state of knowledge on American shad in the Columbia River Basin and presents new analysis on the influence of ocean conditions on shad, population dynamics of shad in the Columbia, and the influence of temperature and discharge on timing of adult shad migration.

Jepson, M. A., C. L. Williams, C. A. Peery, and M. I. Moser, 2003. Effects of the shad fishery on passage of adult Chinook salmon through the Oregon-shore fishway ladder at The Dalles Dam – 2002. Report to U.S. Army Corps of Engineers Portland and Walla Walla Districts. <https://docs.cbfwl.org/biblio40442.pdf>

Assesses the impact of a fishery for American shad at The Dalles Dam on the passage of adult Chinook salmon.

Miller, D. R. 1994. Columbia River American shad: an overview. Northwest Fisheries Science Center, Seattle. <https://docs.cbfwl.org/biblio43062.pdf>

Reviews the spread and growth of Columbia River Basin American shad and the role of dams in the rapid increase in abundance of shad in the Columbia River.

Monk, B. D. Weaver, C. Thompson, and F. Ossiander. 1989. Effects of flow and weir design on the passage behavior of American shad and salmonids in an experimental fish ladder. *North American Journal of Fisheries Management* 9(1):60-67. [https://doi.org/10.1577/1548-8675\(1989\)009<0060:EOFAWD>2.3.CO;2](https://doi.org/10.1577/1548-8675(1989)009<0060:EOFAWD>2.3.CO;2)

Assesses the use of fish ladders at John Day Dam by salmonids and American shad, finds shad oriented toward surface flows, tending to reject submerged orifices as shallow as 2 m.

Mullen, R. E. 1974. A summary of American shad (*Aloa sapidiaeima*) tagging studies on the coastal streams of Oregon, 1946-70. Fish Commission of Oregon, Coastal Rivers Investigation Information Report 74-3. <http://hdl.handle.net/1957/26363>

Reviews reports on coastal American shad tagging studies undertaken by the Oregon Fish Commission from 1946-1970.

Noyes, C. J. 2013. The migration and dam passage behavior of adult Pacific lamprey (*Entosphenus tridentatus*) and American shad (*Alosa sapidissima*) in the Columbia River, in relation to population decline. Master's thesis. University of Idaho, Boise, Idaho. <https://search.worldcat.org/title/861813753>

Assesses the uses of dam passages of Pacific lamprey and American shad in the Columbia River.

Oregon Department of Fish and Wildlife Columbia River Management. 1984-1987. Columbia River commercial shad fisheries. <https://catalog.cbfiw.org/cgi-bin/koha/opac-detail.pl?biblionumber=47713>

Annual reports on Oregon shad fisheries from 1984-1986.

Parks, N.B. 1987. The Pacific Northwest commercial fishery for American shad. Marine Fisheries Review 40(2):29-31. <https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr402/mfr4025.pdf>

Describes the introduction of American shad to Pacific coast waters in the 1800s and the commercial fisheries which developed in Oregon, Washington, and British Columbia.

Parsley, M. J., S. T. Sauter, and L. A. Wetzel. 2011. Impact of American shad in the Columbia River. Final Report to Bonneville Power Administration, Project 2007-275-00, Portland, Oregon. <https://www.cbfish.org/Document.mvc/Viewer/P121252>

Reports on studies on the diet, growth characteristics, bioenergetics, thiaminase activity, and life history of American shad in the Columbia River Basin.

Pearcy, W. G. and J. P. Fisher. 2011. Ocean distribution of the American shad (*Alosa sapidissima*) along the Pacific coast of North America. Fishery Bulletin 109(4):440-453. <https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/2011/1094/1094pearcy.pdf>

Appraises the ocean life of American shad on the Pacific coast by analyzing catches of shad, and landings by commercial and sport vessels.

Peery, C. A., T. C. Bjornn, K. R. Tolotti, and L. C. Stuehrenberg. 1999. Effects of a shad fishery on passage of adult Chinook salmon through the Oregon-shore fishway at The Dalles Dam, 1996. Idaho Cooperative Fish and Wildlife Research Unit Technical Report 98-4, Moscow, Idaho. <https://docs.cbfwl.org/biblio37697.pdf>

Assesses the impact of a fishery for American shad at The Dalles Dam on the passage of adult Chinook salmon.

Petersen, J. H., R. A. Hinrichsen, D. M. Gadomski, D. H. Feil, and D. W. Rondorf. 2003. American shad in the Columbia River. Pages 141-155 in K. E. Limburg and J. R. Waldman, editors. Biodiversity, status, and conservation of the world's shads. American Fisheries Society, Symposium 35, Bethesda, Maryland. <https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=46329>

Paper from a conference on global shad populations presenting the state of research on American shad in the Columbia River Basin.

Quinn, T. P., and D. J. Adams. 1996. Environmental changes affecting the migratory timing of American shad and sockeye salmon. *Ecology* 77(4):1151–1162. <https://doi.org/10.2307/2265584>

Studies differences in response to changing environmental conditions between sockeye salmon and American shad, assessing differences in their migration patterns and early life histories.

Quinn, T. P., J. Epifanio, P. B. Moyle, S. Gregory, D. J. Hasselman, E. Merrill, K. Rose, T. F. Turner, and T. C. Wainwright, T. C. 2024. Ecological interactions between non-native American shad and Pacific salmon: the Columbia River case study. *Reviews in Fisheries Science & Aquaculture* 32(3):435-449. <https://doi.org/10.1080/23308249.2024.2337434>

Reviews evidence for possible ecological interactions between salmon and American shad across their life histories and habitats in the Columbia River Basin.

Quinn, T. P., L. A. Wetzel, D. J. Hasselman, and K. Larsen. 2024. Differences in life history patterns of American shad (*Alosa sapidissima*) populations between ancestral, Atlantic coast, and non-native Pacific coast rivers of North America. *Canadian Journal of Fisheries and Aquatic Sciences*. 81(7):862-878. <https://doi.org/10.1139/cjfas-2023-0286>

Compares life history patterns of American shad, from five rivers along the U.S. Pacific coast (introduced range) with contemporary data from the Atlantic coast source populations.

Rottiers, D. V., L. A. Redell, H. E. Booke, and S. Amaral. 1992. Differences in stocks of American shad from the Columbia and Delaware Rivers. *Transactions of the American Fisheries Society* 121(1):132-136. [https://doi.org/10.1577/1548-8659\(1992\)121<0132:NDISOA>2.3.CO;2](https://doi.org/10.1577/1548-8659(1992)121<0132:NDISOA>2.3.CO;2)

Compares results from rearing two stocks of American shad, one from the Columbia River on the Pacific coast, and one from the Delaware River on the Atlantic Coast.

Slatick, E. 1975. Laboratory evaluation of a Denil-type steep pass fishway with various entrance and exit conditions for passage of adult salmonids and American shad. *Marine Fisheries Review* 37(9):17-26. <https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr379/mfr3783.pdf>

Feasibility study for using a Denil-type fishway as part of a system to trap marked salmonids and American shad at Little Goose Dam on the Snake River.

Slatick, E., and L. R. Basham. 1985. The effect of Denil fishway length on passage of some nonsalmonid fishes. *Marine Fisheries Review* 47(1):83-85. <https://spo.nmfs.noaa.gov/sites/default/files/pdf-content/MFR/mfr471/mfr47113.pdf>

Documents the successful use of Denil-type fish passages by various migratory species at Bonneville and McNary dams on the Columbia River and Little Goose Dam on the Snake River.

Stainbrook, C. E. 1982. Selected life history aspects of American shad (*Alosa sapidissima*) and predation on young-of-the-year shad in Lake Umatilla of the Columbia River. Master's thesis. Oregon State University, Corvallis, Oregon. <http://hdl.handle.net/1957/41994>

Compares and examines life history characteristics of American shad collected in Lake Umatilla during 1980 and 1981 with other American shad populations.

Talbot, G. B. 1953. Passage of shad at the Bonneville fishways. U.S. Fish and Wildlife Service, Special Scientific Report: Fisheries 94, Washington. <https://spo.nmfs.noaa.gov/sites/default/files/legacy-pdfs/SSRF94.pdf>

Reports on American shad passing through Bonneville Dam to provide information on the use of fishways to inform restoration efforts and fishway design on the Atlantic coast.

Weaver, C. R. 1965. Observations on the swimming ability of adult American shad (*Alosa sapidissima*). Transactions of the American Fisheries Society 94(4):382-385. [https://doi.org/10.1577/1548-8659\(1965\)94\[382:OOTSAO\]2.0.CO;2](https://doi.org/10.1577/1548-8659(1965)94[382:OOTSAO]2.0.CO;2)

Describes the swimming abilities of American shad based on observations of shad using fish passages along the Columbia River.

Wendler, H. O. 1967. The American shad of the Columbia River with a recommendation for management of the fishery. Washington State Department of Fisheries, Olympia, Washington. <https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=41309>

1967 report on status of American shad in the Columbia River and the state of the fishery.

Life History

Bentzen, P., G. C. Brown, and W. C. Leggett. 1989. Mitochondrial DNA polymorphism, population structure, and life history variation in American shad (*Alosa sapidissima*). Canadian Journal of Fisheries and Aquatic Sciences 46(8):1446-1454. <https://doi.org/10.1139/f89-184>

Assesses genetic differentiation and population structure in American shad sampled from 14 rivers spanning the native range of the species (Florida to Quebec).

Carscadden, J. E., and W. C. Leggett. 1975. Life history variations in populations of American shad, *Alosa sapidissima* (Wilson), spawning in tributaries of the St John River, New Brunswick. Journal of Fish Biology 7(5):595-609. <https://doi.org/10.1111/j.1095-8649.1975.tb04633.x>

Compares American shad captured at four locations in the St. John River Area, New Brunswick, Canada, to assess the impacts of fisheries and environment on development.

Chittenden, M. E. 1969. Life history and ecology of the American shad, *Alosa sapidissima*, in the Delaware River. Doctoral dissertation. Rutgers University, New Brunswick, New Jersey. <https://search.worldcat.org/title/5761850>

Dissertation on the life history of American shad in the Delaware River population on the Atlantic coast.

Conover, D. O. 1990. The relation between capacity for growth and length of growing season: evidence for and implications of countergradient variation. Transactions of the American Fisheries Society 119(3):416-430. [https://doi.org/10.1577/1548-8659\(1990\)119<0416:TRBCFG>2.3.CO;2](https://doi.org/10.1577/1548-8659(1990)119<0416:TRBCFG>2.3.CO;2)

Assesses the theory that capacity for growth within a species may vary inversely with the length of the growing season across a latitudinal gradient using American Shad along their native range of the Atlantic coast of North America.

Crecco, V., T. Savoy, and L. Gunn. 1983. Daily mortality rates of larval and juvenile American shad (*Alosa sapidissima*) in the Connecticut River with changes in year-class strength. *Canadian Journal of Fisheries and Aquatic Sciences*. 40(10):1719-1728. <https://doi.org/10.1139/f83-199>

Analyzes age-specific growth and survival rates for larval and juvenile American shad from the Connecticut River from 1979 to 1982.

Crecco, V., and T. Savoy. 1985. Effects of biotic and abiotic factors on growth and relative survival of young American shad, *Alosa sapidissima*, in the Connecticut River. *Canadian Journal of Fisheries and Aquatic Sciences*. 42(10):1640-1648. <https://doi.org/10.1139/f85-205>

Assesses the impact of temporal oscillations in zooplankton abundance, river flows, and temperatures in the Connecticut River affect the survival and growth rates of larval and juvenile American shad.

Gilligan-Lunda, E. K., D. S. Stich, K. E. Mills, M. M. Bailey, and J. D. Zydlewski. 2021. Climate change may cause shifts in growth and instantaneous natural mortality of American shad throughout their native range. *Transactions of the American Fisheries Society* 150(3):407-421. <https://doi.org/10.1002/tafs.10299>

Develops a model to estimate coastwide, regional, and system-specific von Bertalanffy growth function parameters and natural mortality for American shad using data collected from 1982 to 2017.

Glebe, B. D., and W. C. Leggett. 1981. Latitudinal differences in energy allocation and use during the freshwater migrations of American shad (*Alosa sapidissima*) and their life history consequences. *Canadian Journal of Fisheries and Aquatic Sciences*. 38(7):806-820. <https://doi.org/10.1139/f81-109>

Studies the relationships between tissue dynamics and bioenergetics of the anadromous American shad homing to the St. Johns (Florida), York (Virginia), and Connecticut Rivers and the life history characteristics of these populations.

Hoffman, J. C., and J. E. Olney. 2005. Cohort-specific growth and mortality of juvenile American shad in the Pamunkey River, Virginia. *Transactions of the American Fisheries Society* 134(1):1-18. <https://doi.org/10.1577/FT03-219.1>

Assesses the variation in instantaneous rates of growth and mortality between intraannual cohorts of juvenile American shad in the Pamunkey River, Virginia.

Hyle, A. R., R. S. McBride, and J. E. Olney. 2014. Determinate versus indeterminate fecundity in American shad, an anadromous clupeid. *Transactions of the American Fisheries Society* 143(3): 618-633. <https://doi.org/10.1080/00028487.2013.862178>

Investigates oocyte recruitment, atresia, and spawning intervals using gonad histology of female American shad from the Mattaponi River, Virginia.

Leggett, W. C., and J. E. Carscadden. 1978. Latitudinal variation in reproductive characteristics of American shad (*Alosa sapidissima*): Evidence for population specific life history strategies in fish. *Journal of the Fisheries Research Board of Canada*. 35(11):1469-1478. <https://doi.org/10.1139/f78-230>

Studies the reproductive characteristics of five populations of American shad on the Atlantic coast.

Limburg, K. E. 1996. Growth and migration of 0-year American shad (*Alosa sapidissima*) in the Hudson River estuary: otolith microstructural analysis. *Canadian Journal of Fisheries and Aquatic Sciences* 53(1):220-238. <https://doi.org/10.1139/f95-160>

Utilizes otolith microanalysis to elucidate patterns of growth and seaward migration of American shad.

Limburg, K. E., K. A. Hattala, and A. Kahnle. 2003. American shad in its native range. Pages 125-140 in K. E. Limburg and J. R. Waldman, editors. *Biodiversity, status, and conservation of the world's shads*. American Fisheries Society, Symposium 35, Bethesda, Maryland. <https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=46329>

Reviews the state of American shad in their native range, the Atlantic coast of North America.

Lipsky, C. A., R. Saunders, and J. R. Stevens. 2016. Evidence of successful spawning and other life-history aspects of *alosa sapidissima* (American shad) in the Penobscot River and estuary. *Northeastern Naturalist* 23(3):367-377. <https://doi.org/10.1656/045.023.0305>

Surveys the Penobscot River, Maine, estuary and finds there are premetamorphic American Shad upstream of a salinity barrier, and therefore a successful spawning population of shad in the Penobscot River.

Maki, K. L., J. M. Hoenig, and J. E. Olney. 2001. Estimating proportion mature at age when immature fish are unavailable for study, with application to American shad in the York River, Virginia. *North American Journal of Fisheries Management* 21(4):703-716. [https://doi.org/10.1577/1548-8675\(2001\)021<0703:EPMAAW>2.0.CO;2](https://doi.org/10.1577/1548-8675(2001)021<0703:EPMAAW>2.0.CO;2)

Presents a model to estimate the maturation schedule for American shad in the York River, Virginia, based on the analysis of spawning marks on the scales of fish sampled from the mature population.

Maki, K. L., J. M. Hoenig, and J. E. Olney. 2002. Interpreting maturation data for American shad in the presence of fishing mortality: A look at historical data from the York River, Virginia. *North American Journal of Fisheries Management* 22(4):1209-1217. [https://doi.org/10.1577/1548-8675\(2002\)022<1209:IMDFAS>2.0.CO;2](https://doi.org/10.1577/1548-8675(2002)022<1209:IMDFAS>2.0.CO;2)

Study of maturation by American shad in the York River, Virginia to enable better monitoring, forecasting, and establishment of restoration targets.

McBride, R. S., R. Ferreri, E. K. Towle, J. M. Boucher, and G. Basilone. 2016. Yolked oocyte dynamics support agreement between determinate- and indeterminate-method estimates of annual fecundity for a northeastern United States population of American shad. *PLoS ONE* 11(10):e0164203. <https://doi.org/10.1371/journal.pone.0164203>

Assesses geographic variation and the pattern of oocyte development to better assess fecundity of American shad in the Connecticut River.

Nack, C. C., D. P. Swaney, and K. E. Limburg. 2019. Historical and projected changes in spawning phenologies of American shad and striped bass in the Hudson River Estuary. *Marine and Coastal Fisheries* 11(3):271-284. <https://doi.org/10.1002/mcf2.10076>

Presents a model to estimate the onset, cessation, and duration of the spawning season through the 21st century, in the Hudson River estuary corresponding to projected water temperatures.

O'Donnell, M. J., and B. H. Letcher. 2008. Size and age distributions of juvenile Connecticut River American shad above Hadley Falls: influence on outmigration representation and timing. *River Research and Applications* 24(7):929-940. <https://doi.org/10.1002/rra.1111>

Studies age- and size-based habitat use and movement patterns of young-of-year American shad in the Connecticut River through seining of three sites from spring through fall.

Olney, J. E., S. C. Denny, and J. M. Hoenig. 2001. Criteria for determining maturity stage in female American shad, *Alosa sapidissima*, and a proposed reproductive cycle. *Bulletin Francais de la Peche et de la Pisciculture* 362-63:881-901. <https://doi.org/10.1051/kmae:2001025>

Describes macro-and microscopic criteria to judge maturation stages of female American shad collected in the York River, Virginia.

Olney, J. E., and R. S. McBride. 2003. Intraspecific variation in batch fecundity of American shad: revisiting the paradigm of reciprocal latitudinal trends in reproductive traits. Pages 185-192 *in* K. E. Limburg and J. R. Waldman, editors. *Biodiversity, status, and conservation of the world's shads*. American Fisheries Society, Symposium 35, Bethesda, Maryland. <https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=46329>

Studies variations in fecundity of American shad and the importance of geographical variation along latitudinal trends in reproductive traits.

Poulet, C., G. Lassalle, A. Jordaan, K. E. L. C. C. Nack, J. A. Nye, A. O'Malley, B. O'Malley-Barber, D. S. Stich, J. R. Waldman, J. Zydlewski, and P. Lambert. 2023. Effect of straying, reproductive strategies, and ocean distribution on the structure of American shad populations. *Ecosphere* 14(12):e4712. <https://doi.org/10.1002/ecs2.4712>

Uses a mechanistic species distribution model called GR3D (Global Repositioning Dynamics for Diadromous Fish Distribution) to examine the integrated dynamics of American shad across their native range, the Atlantic Coast of North America.

Riley, K. L., S. M. Binion, and A. S. Overton. 2012. Estimating the food requirements and prey size spectra of larval American shad. *Marine and Coastal Fisheries* 4(1):228-238. <https://doi.org/10.1080/19425120.2012.675979>

Evaluates the effect of prey density on the growth and survival of American shad and to determine whether larvae can survive and grow in a riverine environment with a limited forage base.

Savoy, T. F., V. A. Crecco, and B. C. Marcy, Jr. 2004. American shad early life history and recruitment in the Connecticut River: a 40-year summary. Pages 407-417 *in* P. M. Jacobson, D. A. Dixon, W. C. Leggett, B. C. Marcy, Jr., and R. R. Massengill, editors *The Connecticut River ecological study (1965-1973) revisited: Ecology of the Lower Connecticut River 1973-2003*. American Fisheries Society, Bethesda, Maryland. <https://search.worldcat.org/title/58449270>

Chapter on the life history of American shad in the Connecticut River, builds on an initial 1965-1973 report with an additional 30 years of research.

Shardo, J. D. 1995. Comparative embryology of teleostean fishes. I. Development and staging of the American shad, *Alosa sapidissima* (Wilson, 1811). *Journal of Morphology* 225(2):125-167. <https://doi.org/10.1002/jmor.1052250202>

Presents embryological staging systems of American shad and compares their development with other clupeoids.

Tuckey, T. D., and J. E. Olney. 2010. Maturity schedules of female American shad vary at small spatial scales in Chesapeake Bay. *North American Journal of Fisheries Management* 30(4):1020-1031. <https://doi.org/10.1577/M09-178.1>

Presents age-at-maturity schedules for the Rappahannock River and York River in Virginia.

Walburg, C. H. 1957. Observations on the food and growth of juvenile American had, *Alosa sapidissima*. *Transactions of the American Fisheries Society* 86(1):302–306. [https://doi.org/10.1577/1548-8659\(1956\)86\[302:OOTFAG\]2.0.CO;2](https://doi.org/10.1577/1548-8659(1956)86[302:OOTFAG]2.0.CO;2)

Compares the food habits of juvenile American shad across six widely separated rivers. In general, young shad appeared to utilize those food organisms which were most available in their habitat at a particular time.

Weiss-Glanz, L. S., J. G. Stanley, and J. R. Moring. 1986. Species profiles: Life histories and environmental requirements of coastal fishes and invertebrates (North Atlantic): American shad. U.S. Fish and Wildlife Service Biological Report 82(11.59). https://www.arlis.org/docs/vol1/AK_Heritage/FWS/BIOLRPT/82/BIOLRPT-82-11.59.pdf

Report on the life history of and environmental requirements of American shad in their native range.

Dam Passage

Aunins, A. W., B. L. Brown, M. Balazik, and G. C. Garman. 2013. Migratory movements of American shad in the James River fall zone, Virginia. *North American Journal of Fisheries Management*, 33(3): 569-575. <https://doi.org/10.1080/02755947.2013.768564>

Assesses the passage of tagged adult American Shad through the fall zone and Bosher's Dam fishway on the James River, Virginia.

Bailey, M. M., J. J. Isely, and W. C. Bridges, Jr. 2004. Movement and population size of American shad near a low-head lock and dam. *Transactions of the American Fisheries Society* 133(2):300-308. <https://doi.org/10.1577/03-025>

Investigates the population size and the proportion of the population of American shad that passed through the New Savannah Bluff Lock and Dam, a low-head lock and dam on the Savannah River in South Carolina and Georgia.

Barry, T., and B. Kynard. 1986. Attraction of adult American shad to fish lifts at Holyoke Dam, Connecticut River. *North American Journal of Fisheries Management* 6(2): 233-241. [https://doi.org/10.1577/1548-8659\(1986\)6<233:AOAAST>2.0.CO;2](https://doi.org/10.1577/1548-8659(1986)6<233:AOAAST>2.0.CO;2)

Reports on the movements of 18 radio-tagged American shad in 1980 and 1981 as they attempted to locate the upstream fish collection facilities of two fish lifts at Holyoke Dam on the Connecticut River in Massachusetts.

Bell, C. E., and B. Kynard. 1985. Mortality of adult American shad passing through a 17-megawatt Kaplan turbine at a low-head hydroelectric dam. *North American Journal of Fisheries Management*, 5(1):33-38. [https://doi.org/10.1577/1548-8659\(1985\)5<33:MOAASP>2.0.CO;2](https://doi.org/10.1577/1548-8659(1985)5<33:MOAASP>2.0.CO;2)

Investigates the mortality of pre-spawning American shad over a 5-hour period after passage through the 17-megawatt Kaplan turbine at Holyoke Dam, Connecticut River, Massachusetts.

Castro-Santos, T., and A. Haro. 2015. Survival and behavioral effects of exposure to a hydrokinetic turbine on juvenile Atlantic salmon and adult American shad. *Estuaries and Coasts* 38(Suppl 1):203-214. <https://doi.org/10.1007/s12237-013-9680-6>

Describes experiments designed to measure the effect of exposure to a full-scale, vertical axis hydrokinetic turbine on downstream migrating juvenile Atlantic salmon and upstream migrating adult American shad.

Caumartin, J., R. Verdon, D. Desrochers, A. Guindon, F. Lafleur, and F. Guay. 2020. Response of out-migrating adult American shad guided by spill and ultrasound as they approach Rivière-des-Prairies Hydroelectric Generating Station (Québec, Canada). *North American Journal of Fisheries Management* 40(3):773-788. <https://doi.org/10.1002/nafm.10445>

Tests methods to repel out-migrating adult American Shad from the turbine intakes of the Rivière-des-Prairies Generating Station powerhouse and guide them toward the adjacent spillway.

Collins, G. B. 1951. A fishway that shad ascend. U.S. Fish and Wildlife Service, Special Scientific Report: Fisheries 65, Washington. <https://spo.nmfs.noaa.gov/sites/default/files/legacy-pdfs/SSRF65.pdf>

Reports on fishways where American shad are known to have successfully used, namely Bonneville Dam on the Columbia River and Merrimack Dam in Massachusetts.

Dubois, R. B., and S. P. Gloss. 1993. Mortality of juvenile American shad and striped bass passed through Ossberger crossflow turbines at a small-scale hydroelectric site. *North American Journal of Fisheries Management* 13(1):178-185. [https://doi.org/10.1577/1548-8675\(1993\)013<0178:MOJASA>2.3.CO;2](https://doi.org/10.1577/1548-8675(1993)013<0178:MOJASA>2.3.CO;2)

Compares mortality of juvenile American shad and striped bass passing through Ossberger crossflow turbines at a small-scale hydroelectric site.

Hard, A., and B. Kynard. 1997. Video evaluation of passage efficiency of American shad and sea lamprey in a modified Ice Harbor fishway. *North American Journal of Fisheries Management* 17(4):981-987. [https://doi.org/10.1577/1548-8675\(1997\)017<0981:VEOPEO>2.3.CO;2](https://doi.org/10.1577/1548-8675(1997)017<0981:VEOPEO>2.3.CO;2)

Compares the use of a Ice Harbor fishway by sea lamprey and American shad via video monitoring, upstream movement of American shad during the day was higher than at night at both lower and middle fishway observation sites.

Haro, A., and T. Castro-Santos. 2012. Passage of American shad: Paradigms and realities. *Marine and Coastal Fisheries* 4(1):252-261. <https://doi.org/10.1080/19425120.2012.675975>

Assesses the state of design and use of fish passages for American shad around the continent, includes discussion on fish passages in the Columbia River watershed.

Haro, A., T. Castro-Santos, J. Noreika, and M. Odeh. 2004. Swimming performance of upstream migrant fishes in open-channel flow: A new approach to predicting passage through velocity barriers. *Canadian Journal of Fisheries and Aquatic Sciences*. 61(9):1590-1601. <https://doi.org/10.1139/f04-093>

Provides a detailed analysis of sprint swimming ability of six migratory fish species, including American shad, in a large, open-channel flume.

Haro, A., M. Odeh, T. Castro-Santos, and J. Noreika. 1999. Effect of slope and headpond on passage of American shad and blueback herring through simple Denil and deepened Alaska steep pass fishways. *North American Journal of Fisheries Management*, 19(1):51-58. [https://doi.org/10.1577/1548-8675\(1999\)019<0051:EOSAHO>2.0.CO;2](https://doi.org/10.1577/1548-8675(1999)019<0051:EOSAHO>2.0.CO;2)

Investigates passage and transit time of adult upstream-migrant American shad in standard Denil and Alaska steep pass fishways with variable slope and head pond under semi controlled conditions.

Haro, A., M. Odeh, J. Noreika, and T. Castro-Santos. 1998. Effect of water acceleration on downstream migratory behavior and passage of Atlantic salmon smolts and juvenile American shad at surface bypasses. *Transactions of the American Fisheries Society* 127(1):118-127. [https://doi.org/10.1577/1548-8659\(1998\)127<0118:EOWAOD>2.0.CO;2](https://doi.org/10.1577/1548-8659(1998)127<0118:EOWAOD>2.0.CO;2)

Compares behavior and passage rate of smolts of Atlantic salmon and juvenile American shad between a standard and a modified surface bypass weir that employs uniform flow velocity increase.

Heisey, P.G., D. Mathur, J. L. Fulmer, and E. Kotkas. 2008. Turbine passage survival of late running adult American shad and its potential effect on population restoration. Pages 141-152 in S. V. Amaral, D. Mathur, and E. P. Taft, editors. *Advances in fisheries bioengineering*. American Fisheries Society, Symposium 61, Bethesda, Maryland. <https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=31894>

Assesses mortality rates of migrating American shad passing through turbines in hydroelectric sites.

Kahnle, A., and K. Hattala. 2012. Relative sensitivity of New England American shad to fishing, discard mortality, and dam passage failure or mortality. *Marine and Coastal Fisheries* 4(1):294-301. <https://doi.org/10.1080/19425120.2012.675981>

Analyzes the impacts of discards of immature fish in various fisheries, directed fishing on pre-spawning adults, and the passage failure or mortality of mature fish at migratory barriers on American shad.

Kynard, B., and C. Buerkett. 1997. Passage and behavior of adult American shad in an experimental lower bypass system. *North American Journal of Fisheries Management* 17(3):734-742. [https://doi.org/10.1577/1548-8675\(1997\)017<0734:PABOAA>2.3.CO;2](https://doi.org/10.1577/1548-8675(1997)017<0734:PABOAA>2.3.CO;2)

Tests 436 adult American shad in an experimental louver bypass system, to determine guidance and passage efficiency and to study fish response to stimuli from physical structures, light intensity, and water velocity.

Kynard, B. and J. O'Leary. 1993. Evaluation of a bypass system for spent American shad at Holyoke Dam, Massachusetts. *North American Journal of Fisheries Management*, 13(4):782-789. [https://doi.org/10.1577/1548-8675\(1993\)013<0782:EOABSF>2.3.CO;2](https://doi.org/10.1577/1548-8675(1993)013<0782:EOABSF>2.3.CO;2)

Assesses the implementation of a fish passage system at Holyoke Dam, Massachusetts, and the effectiveness of the fishway for migrating American shad.

Mathur, D., P. G. Heisey, and D. A. Robinson. 1994. Notes: Turbine-passage mortality of juvenile American shad at a low-head hydroelectric dam. *Transactions of the American Fisheries Society* 123(1):108-111. [https://doi.org/10.1577/1548-8675\(1994\)123<0108:NTPMOJ>2.3.CO;2](https://doi.org/10.1577/1548-8675(1994)123<0108:NTPMOJ>2.3.CO;2).

Analyzes turbine-related mortality of American shad at the Hadley Falls Hydroelectric Station on the Connecticut River, Holyoke, Massachusetts.

Monk, B., D. Weaver, C. Thompson, and F. Ossiander. 1989. Effects of flow and weir design on the passage behavior of American shad and salmonids in an experimental fish ladder. *North American Journal of Fisheries Management* 9(1):60-67. [https://doi.org/10.1577/1548-8675\(1989\)009<0060:EOFAWD>2.3.CO;2](https://doi.org/10.1577/1548-8675(1989)009<0060:EOFAWD>2.3.CO;2)

Assesses the use of fish ladders at John Day Dam by salmonids and American shad, finds shad oriented toward surface flows, tending to reject submerged orifices as shallow as 2 m. The amount of time spent in the ladder by American shad depended on the head between pools.

Moser, M. L., A. M. Darazsdi, and J. R. Hall. 2000. Improving passage efficiency of adult American shad at low-elevation dams with navigation locks. *North American Journal of Fisheries Management* 20(2):376-385. [https://doi.org/10.1577/1548-8675\(2000\)020<0376:IPEOAA>2.3.CO;2](https://doi.org/10.1577/1548-8675(2000)020<0376:IPEOAA>2.3.CO;2)
Uses sonic tracking to assess the passage efficiency of adult American shad in 1996–1998 through the navigation locks at Lock and Dam 1 on the Cape Fear River, North Carolina.

Mulligan, K. B., A. Haro, B. Towler, B. Sojkowski, and J. Noreika. 2019. Fishway entrance gate experiments with adult American shad. *Water Resources Research* 55(12):10839-10855. <https://doi.org/10.1029/2018WR024400>

Multi-year study examining how changes to an upstream fishway entrance impacted the passage rate of adult American shad.

Raabe, J. K., J. E. Hightower, T. A. Ellis, and J. J. Facendola. 2019. Evaluation of fish passage at a nature-like rock ramp fishway on a large coastal river. *Transactions of the American Fisheries Society*. 148(4):798-816. <https://doi.org/10.1002/tafs.10173>

Evaluates upstream fish passage effectiveness and time until passage through three locks and dams on the Cape Fear River, North Carolina.

Reading, H. H. 1982. Passage of juvenile chinook salmon, *Oncorhynchus tshawytscha*, and American shad, *Alosa sapidissima*, through various trashrack bar spacings. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary Technical Report 5. <https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=35844>

Compares the passage of juvenile Chinook salmon and American shad in the San Francisco San Joaquin Estuary.

Smith, J. A., and J. E. Hightower. 2012. Effect of low-head lock-and-dam structures on migration and spawning of American shad and striped bass in the Cape Fear River, North Carolina. *Transactions of the American Fisheries Society* 141(2):402-413. <https://doi.org/10.1080/00028487.2012.667043>

Uses egg sampling and sonic telemetry to examine the effects of lock and dam structures on migration and spawning activity of American shad and striped bass in the Cape Fear River, North Carolina.

Sprinkle, K. 2005. Interdam movements and passage attraction of American shad in the lower Merrimack River main stem. *North American Journal of Fisheries Management*, 25(4):1456-1466. <https://doi.org/10.1577/M04-049.1>

Aims to determine the number of tagged American shad that pass Essex Dam and reach the Boott Station tailrace and monitor American shad movements between Essex and Pawtucket dams, Massachusetts.

Stich, D. S., T. F. Sheehan, and J. D. Zydlewski. 2019. A dam passage performance standard model for American shad. *Canadian Journal of Fisheries and Aquatic Sciences* 76(5):762-779. <https://doi.org/10.1139/cjfas-2018-0008>

Describes the development of a stochastic life-history-based simulation model for American shad to estimate effects of dam passage and migratory delay on abundance, spatial distribution of spawning adults, and demographic structuring in space and time.

Weaver, D. M., M. Brown, and J. D. Zydlewski. 2019. Observations of American shad *Alosa sapidissima* approaching and using a vertical slot fishway at the head-of-tide Brunswick Dam on the Androscoggin River, Maine. *North American Journal of Fisheries Management* 39(5): 989-998. <https://doi.org/10.1002/nafm.10330>

Analyzes American shad behavior while approaching and using a vertical slot fishway at the head-of-tide Brunswick Dam on the Androscoggin River in Maine.