

Curriculum vitae: Adam G. Hansen

Current Positions

Aquatic Research Scientist IV (2016-present)
Lake and Reservoir Ecology
Colorado Parks and Wildlife
317 W. Prospect Rd., Fort Collins, CO 80526
Office: (970) 472-4432
Cell: (970) 699-8969
Email: adam.hansen@state.co.us

Affiliate Faculty Member (2017-present)
Dept. of Fish, Wildlife, and Conservation Biology
Colorado State University
1474 Campus Delivery, Fort Collins, CO 80523



ResearchGate: https://www.researchgate.net/profile/Adam_Hansen2

Education

Ph.D.—Aquatic and Fishery Sciences, University of Washington, Seattle, WA, 2014.
B.S. *Magna cum laude*—Fishery Biology, Colorado State University, Fort Collins, CO, 2008.

Research Interests

Aquatic ecology; Bioenergetics modeling; Fisheries hydroacoustics; Food-web dynamics; Hydrodynamic modeling; Lake and reservoir fisheries management; Population dynamics; Predator-prey interactions;

Previous Appointments

- **Research Scientist Engineer III**, Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington (Dec. 2013–Dec. 2015).
- **Graduate Fellow and Research Assistant**: Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington (June 2009–Dec. 2013).
- **Research Associate I**: Stream Fish Ecology and Fish Physiological Ecology Laboratories (Jan. 2009– May 2009), Department of Fish, Wildlife, and Conservation Biology, Colorado State University.
- **Aquatic Research Technician**: Colorado Parks and Wildlife (June 2007–Dec. 2007; June 2008–Aug. 2008).

Recent Honors and Awards

- Pauley Award, \$1,000 travel grant from Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington (2014).

- Claire L. and Evelyn S. Egtvedt Fellowship, Gerald J. Paulik Memorial Fund, Fisheries Graduate Fund, and H. Mason Keeler Fellowship granted by University of Washington, School of Aquatic and Fishery Sciences (2009–2012).

Peer-Reviewed Publications

15. **Hansen, A.G.**, J.A. Gardner, K.A. Connelly, M. Polacek, and D.A. Beauchamp. 2018. Trophic compression of lake food webs under hydrologic disturbance. *Ecosphere* 9(6):e02034.
14. Spanjer, A.R., P.W. Moran, K.A. Larsen, L.A. Wetzel, **A.G. Hansen**, and D.A. Beauchamp. 2018. Juvenile coho salmon growth and health in streams across an urbanization gradient. *Science of the Total Environment* 625:1003-1012.
13. Johnson, B.M., W.M. Pate, and **A.G. Hansen**. 2017. Energy density and dry matter content in fish: new observations and an evaluation of some empirical models. *Transactions of the American Fisheries Society* 146:1262-1278.
12. Borin, J.M., M.L. Moser, **A.G. Hansen**, C. Donoghue, D.A. Beauchamp, C. Pruitt, S.C. Corbett, J.L. Ruesink, and B. Dumbauld. 2017. Energetic requirements of the North American green sturgeon (*Acipenser medirostris*) feeding on burrowing shrimp (*Neotrypaea californiensis*) in estuaries: importance of temperature, reproductive investment, and residence time. *Environmental Biology of Fishes* 100:1561-1573.
11. **Hansen, A.G.**, J.G. Gardner, D.A. Beauchamp, R. Paradis, T.P. Quinn. 2016. Recovery of sockeye salmon in the Elwha River, Washington after dam removal: dependence of smolt production on the resumption of anadromy by landlocked kokanee. *Transactions of the American Fisheries Society* 145:1303-1317.
10. Sorel, M.H., **A.G. Hansen**, and D.A. Beauchamp. 2016. Trophic feasibility of reintroducing anadromous salmonids in three reservoirs on the North Fork Lewis River, Washington: prey supply and consumption demand of resident fishes. *Transactions of the American Fisheries Society* 145:1331-1347.
9. Sorel, M.H., **A.G. Hansen**, K.A. Connelly, A.C. Wilson, E.D. Lowery, and D.A. Beauchamp. 2016. Predation by northern pikeminnow and tiger muskellunge on juvenile salmonids in a high-head reservoir: implications for anadromous fish reintroductions. *Transactions of the American Fisheries Society* 145:521-536.
8. Hovel, R.A., D.A. Beauchamp, **A.G. Hansen**, and M.H. Sorel. 2015. Development of a bioenergetics model for the threespine stickleback *Gasterosteus aculeatus*. *Transactions of the American Fisheries Society* 144:1311-1321.
7. **Hansen, A.G.**, and D.A. Beauchamp. 2015. Latitudinal and photic effects on diel foraging and predation risk in freshwater pelagic ecosystems. *Journal of Animal Ecology* 84:532-544.
6. **Hansen, A.G.**, and D.A. Beauchamp. 2014. Effects of prey abundance, distribution, visual contrast and morphology on selection by a pelagic piscivore. *Freshwater Biology* 59:2328-2341.
5. **Hansen, A.G.** 2014. Persisting in the pelagic: environmental, behavioral, and morphological controls on predator-prey interactions. Ph.D. dissertation. School of Aquatic and Fishery Sciences, University of Washington, Seattle, Washington. 165 pages.
4. Garcia, R.L., **A.G. Hansen**, M Chan, and G.E. Sanders. 2014. Gyrodactylid Ectoparasites in a population of rainbow trout (*Oncorhynchus mykiss*). *The Journal of the American Association for Laboratory Animal Science* 53:92-97.
3. **Hansen, A.G.**, D.A. Beauchamp, and E.R. Schoen. 2013. Visual prey detection responses of

piscivorous trout and salmon: effects of light, turbidity, and prey size. *Transactions of the American Fisheries Society* 142:854-867.

2. **Hansen, A.G.**, D.A. Beauchamp, and C.M. Baldwin. 2013. Environmental constraints on piscivory: insights from linking ultrasonic telemetry to a visual foraging model for cutthroat trout. *Transactions of the American Fisheries Society* 142:300-316.
1. Lepak, J.M., K.D. Kinzli, E.R. Fetherman, W.M. Pate, **A.G. Hansen**, E.I. Gardunio, C.N. Cathcart, W.L. Stacy, Z.E. Underwood, M.M. Brandt, C.M. Myrick, and B.M Johnson. 2012. Manipulation of growth to reduce mercury concentrations in sport fish on a whole-system scale. *Canadian Journal of Fisheries and Aquatic Sciences* 69:122-135.

Published Data Packages

1. **Hansen, A.G.**, and D.A. Beauchamp. 2014. Data and R code from: Latitudinal and photic effects on diel foraging and predation risk in freshwater pelagic ecosystems. *Dryad Digital Repository*. <http://doi.org/10.5061/dryad.vt82p>.

Publications Under Review or Revision

1. Litz, M.N.C., J.A. Miller, R.D. Brodeur, E.A. Daly, L.A. Weitkamp, and **A.G. Hansen**. Energy dynamics of subyearling Chinook salmon reveal the importance of piscivory to short term growth during early marine residence. *Fisheries Oceanography*. *Under review*.

Manuscripts in Preparation

8. **Hansen, A.G.**, J.S. Thompson, L.N. Hargis, D. Brauch, and B.M. Johnson. Predatory threat of illegally introduced yellow perch in a salmonid dominated reservoir food web.
7. **Hansen, A.G.**, J.A. Gardner, K.A. Connelly, M. Polacek, and D.A. Beauchamp. Lentic food webs, water use, and conservation of cold-stenothermic species: considerations for threatened bull trout.
6. **Hansen, A.G.** Multimesh monofilament gillnet selectivity for kokanee salmon (*Oncorhynchus nerka*) and rainbow smelt (*Osmerus mordax*).
5. Miller, M.W., E. Cristan, and **A.G. Hansen**. Long-term dynamics of an unexploited northern pike population.
4. **Hansen, A.G.**, and E.I. Gardunio. Biological effectiveness of an angler incentive program for suppressing invasive smallmouth bass.
3. **Hansen, A.G.**, and D. Brauch. Long-term population dynamics of introduced lake trout in a fluctuating reservoir.
2. **Hansen, A.G.**, B.M. Johnson, J.M. Hardiman, and D. Brauch. Flow-dependent dispersal of kokanee salmon fry in a river-reservoir network.
1. Barnett, H.K., D.K. Paige, **A.G. Hansen**, and D.A. Beauchamp. Seasonal habitat selection and depth distribution of adfluvial bull trout from acoustic telemetry.

Other Published Contributions, News, Articles, and Interviews

- Interviewed by Geoff Mueller, Senior Editor, The Drake Magazine, for a story in the summer 2018 issue on tiger trout and tiger muskie research, management, and angling opportunities. May 15th, 2018.
- Research pertaining to biological effectiveness of incentive-based fishing tournaments for

controlling invasive smallmouth bass highlighted in a story written by Dan England titled *Bucket Biology* in *Colorado Outdoors Magazine*, May/June 2018, Vol. 67, No. 3.

- Sorel, M.H., D.A. Beauchamp, and **A.G. Hansen**. 2015. Reintroducing native salmon above formally impassable dams on the Lewis River. Washington State Lake Protection Agency. WATERLINE, June 2015 issue.

Technical Reports

12. **Hansen, A.G.** Coldwater lake and reservoir research projects. 2018. Annual summary report. Colorado Parks and Wildlife, Aquatic Research Section, Fort Collins, CO. 85 pages.
11. **Hansen, A.G.**, M. Polacek, K.A. Connelly, J.R. Gardner, and D.A. Beauchamp. 2017. Food web interactions in Kachess and Keechelus Reservoirs, Washington: implications for threatened adfluvial bull trout and management of water storage. **Final Report** to Washington Department of Ecology. 67 pages.
10. Clark, C.P., S. Ball, S. Burgess, **A.G. Hansen**, and D.A. Beauchamp. 2017. Growth, distribution, and abundance of pelagic fishes in Lake Washington: March and October 2016. **Final report** to Seattle Public Utilities. Washington Cooperative Fish and Wildlife Research Unit. Report # WACFWRU-17-01. 39 pages.
9. **Hansen, A.G.**, J.R. Gardner, and D.A. Beauchamp. 2015. Growth, distribution, and abundance of pelagic fishes in Lake Washington: March and October 2015. **Final report** to Seattle Public Utilities. Washington Cooperative Fish and Wildlife Research Unit. Report # WACFWRU-16-01. 30 pages.
8. **Hansen, A.G.**, K.A. Connelly, and D.A. Beauchamp. 2015. Growth, distribution, and abundance of pelagic fishes in Lake Washington: March and October 2014. **Final report** to Seattle Public Utilities. Washington Cooperative Fish and Wildlife Research Unit. Report # WACFWRU-15-01. 29 pages.
7. **Hansen, A.G.**, and D.A. Beauchamp. 2015. Evaluation of factors affecting bull trout and kokanee production in Kachess and Keechelus Reservoirs, Yakima River Basin, Washington. **Final Report** to Washington Department of Ecology. 43 pages.
6. Beauchamp, D.A., A. McCoy, and **A.G. Hansen**. 2014. Quantifying pelagic food web interactions in Lake Tahoe: a road map for re-introduction of Lahontan cutthroat trout. **Final report** (2012-2013) to the U.S. Fish and Wildlife Service.
5. Beauchamp, D.A., A. McCoy, and **A.G. Hansen**. 2014. Baseline data collection in preparation for a localized mysid reduction experiment in Lake Tahoe. **Final report** (2012-2013) to the U.S. Fish and Wildlife Service.
4. **Hansen, A.G.**, D.A. Beauchamp, and E. Lowery. 2014. Growth, distribution, and abundance of pelagic fishes in Lake Washington: March and October 2013. **Final report** to Seattle Public Utilities. Washington Cooperative Fish and Wildlife Research Unit. Report # WACFWRU-14-01.
3. **Hansen, A.G.**, D.A. Beauchamp, and E. Lowery. 2013. Growth, distribution, and abundance of pelagic fishes in Lake Washington: March-April and October 2012. **Final report** to Seattle Public Utilities. Washington Cooperative Fish and Wildlife Research Unit. Report # WACFWRU-13-01.
2. Johnson, B.M., J. Butteris, C.M. Clapp, S.D. Cossey, C.C. Deguelle, M.J. Dodrill, R.E. Dritz, D.A. Falconi, R.T. Fortier, T.L. Goodin, **A.G. Hansen**, and **15** others. 2009. Effects of an anticipated illegal introduction of walleye into Blue Mesa Reservoir, Colorado. **Final report** to Colorado Parks and Wildlife. Colorado State University, Fort Collins, CO.

1. **Hansen, A.G.**, and K.T. Bentley. 2008. Inventory of fishes inhabiting Spottlewood, Graves, and Sand Creeks on Meadow Springs Ranch and Soapstone Prairie Natural Area, Larimer County, CO. **Final report** to the City of Fort Collins (Natural Resources Department), and Colorado Parks and Wildlife. Colorado State University, Fort Collins, CO.

Professional Presentations

34. M. Miller, E. Cristan, K. Paik, A. Smith, J. Wyer, K. Hall, C.A. Myrick, and **A. G. Hansen**. What is limiting the growth of northern pike *Esox lucius* in College Lake? A bioenergetics approach. **Poster submission** for Colorado-Wyoming Chapter of the American Fisheries Society Annual Meeting, Laramie, Wyoming. February 2018.
33. Brauch, D, and **A.G. Hansen**. Riding a salmon “high”: factors contributing to a rebound of Colorado’s premier kokanee salmon fishery. Colorado-Wyoming Chapter of the American Fisheries Society Annual Meeting, Laramie, Wyoming. February 2018.
32. **Hansen, A.G.**, E. I. Gardunio, and T. Eyre. Biological effectiveness of incentive-based harvest tournaments for controlling nonnative piscivores in fluctuating coldwater reservoirs. Upper Colorado River Basin Endangered Fish Recovery Program Annual Researcher’s Meeting. Vernal, Utah. January 2018.
31. **Hansen, A.G.** How will altered or more demanding water use regimes affect reservoir food webs and fisheries? North American Lake Management Society Conference, Westminster, Colorado. November 2017.
30. **Hansen, A.G.** CPW sponsored harvest tournaments: collaborating with anglers to reconcile native fish conservation and warm water sport fishing in western Colorado. Invited speaker at the Colorado State University student subunit of the American Fisheries Society. Fort Collins, Colorado. October 2017.
29. **Hansen, A.G.**, J.A. Gardner, K.A. Connelly, and M. Polacek, and D.A. Beauchamp. A bioenergetic-based food web evaluation of factors affecting bull trout and kokanee production in Kachess and Keechelus Reservoirs. Yakima Basin Science and Management Conference. June 2017.
28. Litz, M.N.C, J.A. Miller, R.D. Brodeur, E.A. Daly, L.A. Weitkamp, and **A.G. Hansen**. Energy dynamics and growth of juvenile Chinook salmon reveal the importance of piscivory during early marine residence. 3rd PCIES/ICES Early Career Scientist Conference. Busan, Korea. May 2017.
27. **Hansen, A.G.** Environmental and behavioral controls on predator-prey interactions in large lakes. Invited speaker at the Colorado State University student subunit of the American Fisheries Society. Fort Collins, Colorado. October 2016.
26. **Hansen, A.G.**, J.A. Gardner, K.A. Connelly, M. Polacek, and Beauchamp, D.A. Baseline food web interactions in Lake Kachess: seasonal predation by northern pikeminnow and burbot on prey important for bull trout. Yakima Basin Science and Management Conference. June 2016.
25. **Hansen, A.G.**, and D.A. Beauchamp. Reservoirs, irrigation demand, drought, and threatened adfluvial bull trout in the Yakima River Basin, Washington. *Salvelinus confluentus* Curiosity Society annual meeting. September 2015.
24. **Hansen, A.G.**, and D.A. Beauchamp. Reservoirs, irrigation demand, drought, and threatened adfluvial bull trout in the Yakima River Basin, Washington. American Fisheries Society National Meeting. August 2015.
23. **Hansen, A.G.**, D.A. Beauchamp, and M. Polacek. Food web structure of Kachess and

- Keechelus Reservoirs: identifying and quantifying important interactions for bull trout. Yakima Basin Science and Management Conference. June 2015.
22. **Hansen, A.G.**, and D.A. Beauchamp. Reservoirs, irrigation demand, drought, and threatened adfluvial bull trout in the Yakima River Basin, Washington. Annual Washington Cooperative Fisheries and Wildlife Research Unit meeting. April 2015.
 21. Sorel, M.H., D.A. Beauchamp, and **A.G. Hansen**. Evaluating predation risk for reintroduced anadromous salmonids in Merwin Reservoir on the Lewis River, Washington. Annual Washington Cooperative Fisheries and Wildlife Research Unit meeting. April 2015.
 20. **Hansen, A.G.**, and D.A. Beauchamp. Evaluation of factors limiting bull trout and kokanee production in Kachess and Keechelus Reservoirs, Yakima River Basin, Washington. Presentation to Yakima River Basin Integrated Water Management Plan working group. March 2015.
 19. **Hansen, A.G.**, and D.A. Beauchamp. Reservoirs, irrigation demand, drought, and threatened adfluvial bull trout in the Yakima River Basin, Washington. Eco-Lunch Seminar, Post-Doc Symposium, School of Aquatic and Fishery Sciences, University of Washington. Feb. 2015.
 18. **Hansen, A.G.**, and D.A. Beauchamp. Environmental and behavioral controls on pelagic predator-prey interactions: implications for the growth and survival of sockeye salmon in Lake Washington. WDFW Brown Bag Lunch Seminar Series, Olympia, WA. Dec. 2014.
 17. **Hansen, A.G.**, and D.A. Beauchamp. Effects of prey abundance, distribution, visual contrast, and morphology on selection by a pelagic piscivore. Eco-Lunch Seminar, School of Aquatic and Fishery Sciences, University of Washington. Nov. 2014.
 16. Beauchamp, D.A., **A.G. Hansen**, and E.R. Schoen. How the visual foraging environment affects pelagic food webs. Invited seminar at the University of Vermont. Oct. 2014.
 15. **Hansen, A.G.**, and D.A. Beauchamp. Effects of prey abundance, distribution, visual contrast, and morphology on apparent selection by cutthroat trout in Lake Washington. Annual Washington Cooperative Fisheries and Wildlife Research Unit meeting. April 2014 (**awarded the “Pauley Award,” a \$1,000 travel grant, for best talk**).
 14. **Hansen, A.G.** Persisting in the pelagic: environmental and behavioral controls on predator-prey interactions. Ph.D. defense seminar. School of Aquatic and Fishery Sciences, University of Washington. December 2013.
 13. Schoen, E.R., D.A. Beauchamp, and **A.G. Hansen**. How do turbidity and fine-scale prey density affect the foraging and capture success of Chinook salmon? Alaska Chapter of the American Fisheries Society Annual Meeting. October 2012.
 12. Rogers, K.B., **A.G. Hansen**, C. Kennedy, and B. Rosenlund. Using horizontal acoustic beaming to evaluate cutthroat trout population size in backcountry lakes. Western Division of the American Fisheries Society Annual Meeting. March 2012.
 11. **Hansen, A.G.**, and D.A. Beauchamp. Effects of a temperature-oxygen squeeze on piscivory: insights from linking a visual foraging model with ultrasonic telemetry of cutthroat trout. Graduate Student Symposium, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA. November 2011.
 10. **Hansen, A.G.**, D.A. Beauchamp, and C.M. Baldwin. Foraging of piscivorous cutthroat trout tracked with ultrasonic telemetry in relation to seasonal shifts in reservoir stratification. American Fisheries Society National Meeting. Invited symposium: *Cognitive, Sensory, and Behavioral Frontiers Exploring Fish Movement and Habitat Use*. Seattle, WA. September 2011.
 9. Beauchamp, D.A., **A.G. Hansen**, and E.R. Schoen. Developing visual foraging models as a

- framework for predicting pelagic predation risk, foraging success and distribution. American Fisheries Society National Meeting. Invited symposium: *Cognitive, Sensory, and Behavioral Frontiers Exploring Fish Movement and Habitat Use*. Seattle, WA. September 2011.
8. **Hansen, A.G.**, D.A. Beauchamp, and C.M. Baldwin. Foraging of piscivorous cutthroat trout tracked with ultrasonic telemetry in relation to seasonal shifts in reservoir stratification. Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society joint Annual Meeting. Special session for the Washington Cooperative Fish and Wildlife Research Unit (School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA). Gig Harbor, WA. March 2011.
 7. Stacy, W., J. Lepak, K. Kinzli, E. Fetherman, W. Pate, A.G. Hansen, E. Gardunio, C. Cathcart, and Z. Underwood. Manipulation of sport fish growth to reduce mercury bioaccumulation on a whole-lake scale. Western Division American Fisheries Society Student Colloquium. Moscow, ID. December 2010.
 6. **Hansen, A.G.**, and D.A. Beauchamp. Light mediated reaction distance of Chinook salmon to fish prey. Graduate Student Symposium, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA. November 2010.
 5. Rogers, K.B, **A.G. Hansen**, C. Kennedy, and B. Rosenlund. Using hydroacoustics to evaluate cutthroat trout population size in remote backcountry lakes. High Mountain Lakes Symposium, Shepherdstown, West Virginia [via webcast]. October 28, 2010.
 4. Lepak, J.M., W.M. Pate, C.N. Cathcart, E.R. Fetherman, K.D. Kinzli, M.M. Brandt, W.L. Stacy, Z.E. Underwood, E.I. Gardunio, and **A.G. Hansen**. Manipulation of sport fish growth to reduce mercury bioaccumulation on a whole-lake scale. CO-WY American Fisheries Society Annual Meeting. Laramie, WY. April 2010.
 3. **Hansen, A.G.**, and D.A. Beauchamp. Visual foraging models: measuring the effects of light, turbidity, and prey density on piscivory by coastal cutthroat trout. Graduate Student Symposium, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA. November 2009.
 2. Rogers, K.B, **A.G. Hansen**, C. Kennedy, and B. Rosenlund. Using hydroacoustics to evaluate cutthroat trout population size in remote backcountry lakes. HTI Hydroacoustic Idea Exchange. Bear Lake, Utah. June 2009.
 1. **Hansen, A.G.** Past and present population characteristics of a diverse sport fish community in a small Colorado impoundment. Western Division American Fisheries Society Student Colloquium. Bozeman, MT. October 2007.

Teaching Experience

- Co-instructor: FW 496, *Independent Study in Fishery Biology*, Colorado State University (Spring 2017, Fall 2017, Spring 2018). Undergraduate course focused on field application and interpretation of fisheries science principles.
- Co-taught sampling field trip to College Lake for FW 204 students, *Introduction to Fishery Biology*, Colorado State University (Fall 2017).
- Guest lecture: *Implementing Bioenergetics Models in R*. University of Washington, FISH 530, Spring **2013** and **2015**: *Application of Bioenergetics Models to Aquatic Food Webs*. Taught by David A. Beauchamp.
- Undergraduate teaching assistant: FW 301, *Ichthyology Laboratory*, Colorado State University (Fall 2006, Spring 2007, Spring 2008).

Professional Service and Activities

- Co-editor (2016-present): “**The Angler**”, newsletter for the Colorado-Wyoming Chapter of the American Fisheries Society (3 issues per year).
- Past Treasurer, Vice President, and President (2007-2008) for Colorado State University student subunit of the American Fisheries Society.
- Anonymous reviewer for: *Ecological Applications* (1 ms); *Ecology of Freshwater Fish* (4 ms); *Environmental Biology of Fishes* (1 ms); *Fisheries Oceanography* (1 ms); *Journal of Fish Biology* (3 ms); *Limnology and Oceanography* (2 ms); *Northwest Science* (2 ms); *The Journal of the American Association for Laboratory Animal Science* (2 ms); *Transactions of the American Fisheries Society* (2 ms);

Project Collaborations and Funding

- Colorado Species Conservation Trust Fund: **\$182,000**. Triploid walleye: a new frontier for managing cool water predators in the west. Collaboration with Dr. Brett Johnson, Department of Fish, Wildlife, and Conservation Biology, Colorado State University (active).
- Washington State Department of Ecology: **\$78,334**. Effects of pumping dead storage on food web interactions and adfluvial bull trout in Kachess and Keechelus Reservoirs, Yakima River Basin, Washington (complete).