

## PUBLICATIONS

- 2020 Bart, H. Jr. L. O'Brien, D. Garcia. 2020. Acknowledging the Elephant in the Room. *BioScience*, biaa043 (Letters), <https://doi.org/10.1093/biosci/biaa043>.
- 2020 Guyer, C., C. Murray, Henry L. Bart, Brian I. Crother, Ryan E. Chabarria, M. A. Bailey, and K. Dunn. 2020. Color and size reveal three new species of *Necturus* (Caudata: Proteidae) from the Gulf Coastal Plain of the United States. *J. Natural History*, <https://doi.org/10.1080/00222933.2020.1736677>
- 2020 O'Brien, L.T., **H. L. Bart Jr.** and D. Garcia. 2020. Why are there so few ethnic minorities in Ecology and Evolutionary Biology?: Challenges to inclusion and the role of sense of belonging. *Social Psychology of Education*, OPEN ACCESS: <https://doi.org/10.1007/s11218-019-09538-x>
- 2019 Grace, M. A., M. H. Doosey, J. S. S. Denton, G. J. P. Naylor, **Henry L. Bart Jr.** & John G. Maisey. *Zootaxa* 4619:109-120.
- 2019 **Bart, H.L. Jr.**, W.D. Nyingi, R.C. Schmidt, J. Gathua. A new species of cyprinoid fish (Actinopterygii: Danioninae) from the Tana River, Kenya, *Zootaxa*. 4652: 533–543 OPEN ACCESS: <http://dx.doi.org/10.11646/zootaxa.4652.3.9>
- 2019 Schmidt, R.C. M, N. Dillon, N. M. Kuhn, **H. L. Bart Jr.** and F. Pezold. Unrecognized and imperilled diversity in an endemic barb (Smiliogastrini, Enteromius) from the Fouta Djallon highlands. *Zoologica Scripta* 48:605-613 (<https://doi.org/10.1111/zsc.12362>).
- 2018 Schmidt, R.C., **H.L. Bart Jr.** W.D. Nyingi. Integrative taxonomy of the red-finned barb, *Enteromius (Agrammobarbus) apleurogramma* (Cyprininae: Smiliogastrini) from Kenya, supports recognition of *E. amboseli* as a valid species. *Zootaxa* 4482 (3): 566–578 ([doi.org/10.11646/zootaxa.4482.3.8](https://doi.org/10.11646/zootaxa.4482.3.8)).
- 2018 Denton, J. S., J. G. Maisey, M. Grace, A. Pradel, M. H. Doosey, **H. L. Bart, Jr.**, G. Naylor. Cranial morphology in *Mollisquama* sp. (Squaliformes; Dalatiidae) and patterns of cranial evolution in dalatiid sharks. *Journal of Anatomy* 233(1):15-32 (doi: 10.1111/joa.12823). **Featured Cover Article**
- 2017 Chabarria, R.E., C.M. Murray, P.E. Moler, **H. L. Bart Jr.**, B. I. Crother and C. Guyer. Historical Biogeography and Taxonomy of *Necturus beyeri* (Amphibia: Caudata). *Journal of Zoological Systematics and Evolutionary Research* (DOI: 10.1111/jzs.12203).
- 2017 Schmidt, R.C., **H. L. Bart Jr.**, F. Pezold, J. P. Friel. A biodiversity hotspot heats up: nine new species of suckermouth catfishes (Mochokidae: *Chiloglanis*) from Upper Guinean Forest streams in West Africa. *Copeia* 105, No. 2, 2017, 301–338.
- 2017 Piller, K. R. and **H. L. Bart Jr.** Rediagnosis of the Tuckasegee Darter, *Etheostoma*

*gutselli* (Hildebrand), a Blue Ridge endemic. *Copeia* 105, No. 3, 2017, 569–574.

- 2017 Schmidt, R.C., **H. L. Bart Jr.**, W. D. Nyingi. Multi-locus phylogeny reveals widespread introgression and unrecognized diversity in Kenyan barb (Cyprininae: Smiliogastrini). *Molecular Phylogenetics and Evolution* 111 (2017) 35–43.
- 2016 Schmidt, R. C., **H. Bart** and F. Pezold. High levels of endemism in suckermouth catfishes (Mochokidae: Chiloglanis) from the Upper Guinean forests of West Africa. *Molecular Phylogenetics and Evolution* 100:199-205.
- 2016 Ellwood, L., **H. Bart**, M. Dosey, D. Jue, G. Nelson, N. Rios, A. Mast. Mapping Life—Quality Assessment of Novice and Computer Automated vs. Expert Georeferencers. *Citizen Science: Theory and Practice* <http://doi.org/10.5334/cstp.30>.
- 2015 Schmidt, R.C., **H. L. Bart Jr.**, W. D. Nyingi. Two new species of African suckermouth catfishes, genus *Chiloglanis* (Siluriformes: Mochokidae), from Kenya with remarks on other taxa from the area. *Zootaxa* 4044 (1):45-64.
- 2015 Schmidt, R.C. and **H. L. Bart Jr.** Nomenclatural changes should not be based on equivocally supported phylogenies: Reply to Yang et al. 2015. *Molecular Phylogenetics and Evolution* 90: 193–194.
- 2015 Grace, M.A., M.H. Dosey, **H. L. Bart** and G. J. P. Naylor. First record of *Mollisquama* sp. (Chondrichthyes: Squaliformes: Dalatiidae) from the Gulf of Mexico, with a morphological comparison to the holotype description of *Mollisquama parini* Dolganov. *Zootaxa* 3948: 587–600.
- 2015 Simon, Thomas P., Charles C. Morris, Bernard R. Kuhajda, Carter R. Gilbert, **Henry L. Bart Jr.**, Nelson Rios, Paul M. Stewart, Thomas P. Simon IV, Mitt Denney. Fishes of the Choctawhatchee River System in Southeastern Alabama and Northcentral Florida. *Southeastern Fishes Council Proceedings* 01/2015; 55(1):1-54.
- 2015 Yu, Kai, Xin Dang, **Henry Bart Jr.** and Yixin Chen. Robust Model-based Learning via Spatial-EM Algorithm. *IEEE Transactions on Knowledge and Data Engineering*. Issue No. 6 pp: 1670-1682. DOI 10.1109/TKDE.2014.2373355.
- 2014 Powers, K. E., Prather, L. A., Cook, J. A., Woolley, J., Bart, H. L., Jr., Monfils, A. K., & Sierwald, P. Revolutionizing the use of natural history collections in education. *The Science Education Review*, 13(2), 24-33.
- 2014 Schmidt, Ray C., **Henry L. Bart Jr.**, Wanja D. Nyingi, Nathan N. Gichuki. Phylogeny of suckermouth catfishes (Mochokidae: Chiloglanis) from Kenya: the utility of Growth Hormone introns in species level phylogenies. *Molecular Phylogenetics and Evolution* 79:415-421.

- 2014 Doosey, Michael H. and **Henry L. Bart Jr.** Buffalofishes. Pp 258-263, *In:* M. Eberle (Ed.), *Fishes of Kansas*. University Press of Kansas, Lawrence, KS.
- 2014 Jenkins, J. A., **H. L. Bart Jr.**, J. D. Bowker, P. R. Bowser, J. R. MacMillan, J. G. Nickum, J. W. Rachlin, J. D. Rose, P. W. Sorensen, B. E. Warkentine, and G. W. Whitledge. *Guidelines for the Use of Fishes in Research*. American Fisheries Society, Bethesda, Maryland.
- 2014 Jenkins, J. A., **H. L. Bart Jr.**, J. D. Bowker, P. R. Bowser, J. R. MacMillan, J. G. Nickum, J. W. Rachlin, J. D. Rose, P. W. Sorensen, B. E. Warkentine, and G. W. Whitledge. *Guidelines for Use of Fishes in Research - Revised and Expanded, 2014. Fisheries*.
- 2013 Church, J. R. Schmidt, H. Bart Jr, X. Dang, Y. Chen. Straightening 3-D Surface Scans of Curved Natural History Specimens for Taxonomic Research. *Computer and Information Science*, 215-229.
- 2013 Tang, K.L., M. K. Agnew, M.V. Hirt, D.N. Lumbantobins, M.E. Raley, T. Sado., V-H. Teoh, L. Yang, **H.L. Bart**, P.M. Harris. S. He, M. Miya, K. Saitoh, A.M. Simons, R.M. Wood, R.L. Mayden. Limits and phylogenetic relationships of East Asian fishes in the subfamily Oxygastrinae (Teleostei: Cypriniformes: Cyprinidae). *Zootaxa* 3681 (2): 101–135.
- 2012 Suttkus, R.D., **H.L. Bart, Jr.** and D. A. Etnier. A new darter of the subgenus *Oligocephalus*, genus *Etheostoma*, from southeastern Texas and southwestern Louisiana. *Tulane Studies in Zoology and Botany* 32(1): 6-30.
- 2012 Clements, M.D., **H. L. Bart, Jr.** and D. L. Hurley. A different perspective on the phylogenetic relationships of the Moxostomatini (Cypriniformes: Catostomidae) based on cytochrome-b and Growth Hormone intron sequences. *Molecular Phylogenetics and Evolution* 63:159–167.
- 2011 Doosey, M.H. and **H. L. Bart, Jr.** Morphological variation of the palatal organ and chewing pad of catostomidae (Teleostei: Cypriniformes). *J. Morphology* 272: 1092-1108.
- 2011 Tang, K. L. M.K. Agnew, W-J. Chen, M.V. Hirt, M.E. Raley, T. Sado, L.M. Schneider, L. Yang, **H. L. Bart, Jr.**, S. He, H. Liu, M, Miya, K, Saitoh, A.M. Simons, R.M. Wood, R.L. Mayden. Phylogeny of the gudgeons (Teleostei: Cyprinidae: Gobioninae). *Molecular Phylogenetics and Evolution* 61: 103–124.
- 2011 Cashner, M.F., K.R. Piller, **H.L. Bart, Jr.** Phylogenetic relationships of the North American cyprinid subgenus *Hydrophlox*. *Molecular Phylogenetics and Evolution* 59: 725–735.
- 2011 Saitoh, K., T. Sado, M.H. Doosey, **H.L. Bart, Jr.**, J.G. Inoue, M. Nishida, R.L. Mayden, and M. Miya. Evidence from mitochondrial genomics supports the lower Mesozoic of

- South Asia as the time and place of basal divergence of cypriniform fishes (Actinopterygii: Ostariophysi). *Zoological Journal of the Linnean Society* 161:633–662.
- 2011 Albert, J.S., **H.L. Bart, Jr.** and Roberto E. Reis. Species richness and cladal diversity. pp 89-104 *In: J.S. Albert and R.E. Reis (Eds.) Historical Biogeography of Neotropical Freshwaters.* University of California Press.
- 2010 Cashner, M.F. and **H. L. Bart, Jr.** Reproductive Ecology of Nest Associates: Use of RFLPs to Identify Cyprinid Eggs. *Copeia* 2010 (4): 554-557.
- 2010 **Bart, H.L. Jr.**, M.D. Clements, R. E. Blanton, K. R. Piller, D. L. Hurley. Discordant molecular and morphological evolution in buffalofishes (Actinopterygii: Catostomidae). *Molecular Phylogenetics and Evolution* 56 (2010) 808–820.
- 2010 **Bart, H.L. Jr.**, P.C. Reneau, M.H. Doosey, C.D. Bell. Evolutionary divergence of duplicate copies of the growth hormone gene in suckers (Actinopterygii: Catostomidae). *International Journal of Molecular Sciences* 11: 1090-1102.
- 2010 Doosey, M. H., **H. L. Bart, Jr.**, K. Saitoh, and M. Miya. Phylogenetic relationships of Catostomid Fishes (Actinopterygii: Cypriniformes) based on Mitochondrial ND4/ND5 Gene Sequences. *Molecular Phylogenetics and Evolution* 54 (2010) 1028–1034.
- 2010 Chen, Y., S. Huang, H. Chen, and **H. L. Bart, Jr.** Joint feature selection and classification for taxonomic problems within fish species complexes. *Pattern Analysis and Applications* 13 (2): 23–34.
- 2010 Rios, N. E., and **H. L. Bart.** "GEOLocate (Version 3.22) [computer software]." Belle Chasse, LA: Tulane University Museum of Natural History.
- 2010 Constable, H., R. Guralnick, J. Wiczorek, C. Spencer, A. T. Peterson, **H. Bart**, J. Bates, G. Cotter, J. Hanken, C. Moritz, N. Simmons, L. Trueb. VertNet: A New Model for Biodiversity Data Sharing. *PLoS Biol* 8(2): e1000309.  
<https://doi.org/10.1371/journal.pbio.1000309>.
- 2009 Piller, K. R. and **H. L. Bart, Jr.** Incomplete sampling, outgroups, and phylogenetic inaccuracy: A case study of the Greenside Darter complex (Percidae: Etheostoma blennioides). *Molecular Phylogenetics and Evolution* 53 (2009) 340–344.
- 2009 Mayden, R.L. W-J. Chen, **H.L. Bart, Jr.**, M.H. Doosey, A.M. Simons, K.L. Tang, R.M. Wood, M.K. Agnew, L. Yang, M.V. Hirt, M.D. Clements, K. Saitoh, T. Sado, M. Miya, M. Nishida. Reconstructing the Phylogenetic Relationships of the Earth's 1 Most Diverse Clade of Freshwater Fishes - Order Cypriniformes (Actinopterygii: Ostariophysi): A Case Study Using Multiple Nuclear Loci and the Mitochondrial Genome. *Molecular Phylogenetics and Evolution* 51:500-514.

- 2009 Chen, Y, X. Dang, H. Peng, and **H. L. Bart, Jr.** Outlier Detection with the Kernelized Spatial Depth Function. *IEEE Transactions on Pattern Analysis and Machine Intelligence* 31: 288-305.
- 2008 Mayden, R.L., K.L. Tang, R. M. Wood, W-J, Chen, M. K. Agnew, K.W. Conway, L. Yang, A.M. Simons, **H.L. Bart, Jr.**, P.M. Harris, J. LI, X. Wang, K. Saitoh, S. He, H. Liu, Y. Chen, M. Nishida, M. MIYA. Inferring the Tree of Life of the order Cypriniformes, the earth's most diverse clade of freshwater fishes: Implications of varied taxon and character sampling. *Journal of Systematics and Evolution* 46 (3): 424–438.
- 2008 Piller, K.R., **H.L. Bart, Jr.**, and D.L. Hurley. Molecular systematics and phylogeography of the greenside darter complex (Teleostomi: Percidae). *Molecular Phylogenetics and Evolution* 46 (2008) 974–985.
- 2008 Chen, H., **H.L. Bart, Jr.** and S. Huang. Integrated Feature Selection and Clustering for Taxonomic Problems within Fish Species Complexes. *Journal of Multimedia* 3:10-17.
- 2006 Fentress, J. A., S. L. Steele, **H. L. Bart, Jr.** and Ann Oliver Cheek. 2006 Reproductive Disruption in Wild Longear Sunfish (*Lepomis megalotis*) Exposed to Kraft Mill Effluent. *Environmental Health Perspectives* 114: 40-45.
- 2005 Freeman, M.J., E.R. Irwin, N.M. Burkhead, B.J. Freeman, **H.L. Bart, Jr.** Status and conservation of the Fish Fauna of the Alabama River System. American Fisheries Society Symposium 45:557–585.
- 2005 Page, L. M., **H.L. Bart, Jr.**, R. Beaman, L. Bohs, L. T. Deck, V. A. Funk, D. Lipscomb, M. A. Mares, L. A. Prather, J. Stevenson, Q. D. Wheeler, J. B. Woolley, D. W. Stevenson. 2005. LINNE: Legacy Infrastructure Network for Natural Environments. Illinois Natural History Survey, Champaign, IL.
- 2005 Greenfield, D. I. and **H.L. Bart, Jr.** Fish community dynamics over a sixteen-year collection period from a blackwater stream receiving paper mill effluents. *Hydrobiologia* 534: 81-90.
- 2005 Watanabe, K. H. H, Lin, **H.L. Bart, Jr.**, P.J. Martinat, J. C. Means, M.L. Kunas, D.A. Grimm. Bayesian estimation of kinetic rate constants in a food-web model of polycyclic aromatic hydrocarbon accumulation. *Ecological Modelling* 181: 229-246.
- 2004 **Bart, H. L., Jr.**, R. D. Suttkus, J. Lyons and N. Mercado-Silva. 2004. A preliminary analysis of the taxonomic status of *Ictiobus meridionalis* (Günther). pp 47-61 In: M.L. Lozano-Vilano and A.J. Contreras-Balderas (eds), Homenaje al Doctor Andres Resendez Medina, Universidad Autonoma de Nuevo Leon, Monterrey, Mexico. (**BOOK CHAPTER**).
2004. Piller, K.R., **H.L. Bart, Jr.** and J. A. Tipton. Decline of the frecklebelly madtom, *Noturus munitus* (Teleostomi: Ictaluridae) in the Pearl River Basin. *Transactions of the*

- American Fisheries Society* 133: 1004-1013.
- 2004 Tipton, J.A., **H.L. Bart, Jr.** and K.R. Piller. Geomorphic disturbance and darter (Percidae) distribution in the Pearl River drainage. *Hydrobiologia* 527: 49–61.
- 2004 Clements, M.D., **H.L. Bart, Jr.** and D.L. Hurley. Isolation and characterization of two distinct growth hormone cDNAs from the tetraploid small buffalofish (*Ictiobus bubalus*). *General and Comparative Endocrinology* 136: 411-418.
- 2004 Nickum, J.G., **H. L. Bart, Jr.**, P.R. Bowser, I. E. Greer, C. Hubbs, J. A. Jenkins, J. R. MacMillan, J. W. Rachlin, J. D. Rose, P. W. Sorensen, J. R. Tomasso. 2004. *Guidelines for the use of fishes in research*. American Fisheries Society, Bethesda, MD.
- 2004 **Bart, H.L., Jr.** Rush Darter [species account] *In*: R. Mirarchi (Ed.) Non-game vertebrates of Alabama in need of protection. Auburn University Press.
- 2003 Piller, K.R. **H.L. Bart, Jr.** and J.A. Tipton. 2003. Spawning of the black buffalo, *Ictiobus niger* (Cypriniformes: Catostomidae). *Ichthyological Explorations of Freshwaters* 14:145-150.
- 2002 Suttkus, R.D. and **H.L. Bart, Jr.** A preliminary analysis of the river carpsucker, *Carpiodes carpio*, in the southern portion of its range. Pp 209-221 *In*: L. Lozano (ed.) Libro jubilar en honor al Dr. Salvador Contreras Balderas, Universidad Autonoma de Nuevo Leon, Monterrey Mexico.
- 2002 Machado, M.D., D.C. Heins, and **H.L. Bart, Jr.** Microgeographic variaion in ovum size of the blacktail shiner, *Cyprinella venusta* Girard, in relation to streamflow. *Ecology of Freshwater Fish*. 11:11-19.
- 2001 Watanabe, K and **H. L. Bart, Jr.** Comments on "Model of biota-sediment accumulation factor for polycyclic aromatic hydrocarbons". *Environmental Toxicology and Chemistry* 20(9):1867-1869.
- 2001 Piller, K.R., **H.L. Bart, Jr.** and C.A. Walser. Morphological variation of the redfin darter, *Etheostoma whipplei*, with comments on the status of the subspecific populations. *Copeia* 2001(3):802-807.
- 2000 Walser, C. A., B. Falterman, and **H.L. Bart, Jr.** Impact of introduction of the rough shiner (*Notropis baileyi*) on the native fish community of the Chattahoochee River system. *American Midland Naturalist* 144:393-405.
- 2000 **Bart, H.L., Jr.** Fish diversity in a heavily industrialized reach of the lower Mississippi River, pp 203-218 *In*: C. Colten (ed.) Centuries of Change: transformation of the lower Mississippi River and its environs. University of Pittsburgh Press. (**BOOK CHAPTER**)

- 2000 Warren, M. L. Jr., B. M. Burr, S. J. Walsh, **H. L. Bart, Jr.**, R. C. Cashner, D. A. Etnier, B.J. Freeman, B. R. Kuhajda, R. L. Mayden, H. W. Robison, S. T. Ross, and W. C. Starnes. Diversity, distribution, and conservation status of the native freshwater fishes of the southern United States. *Fisheries* 25(10): 7-31.
- 1999 Wasler, C.A. and **H.L. Bart, Jr.** The effect of agriculture on in-stream habitat and fish community structure in Piedmont watersheds of the Chattahoochee River system. *Ecology of Freshwater Fish* 8: 237-246.
- 1999 **Bart, H.L., Jr.** and M.S. Taylor. A new darter of the subgenus *Fuscatelum* of *Etheostoma* from the upper Black Warrior River system, Alabama. *Tulane Studies in Zoology and Botany* 31:23-52.
- 1999 Johnston, C.E., N.A. Farnau, **H. L. Bart, Jr.** and A.K. Howard. Laboratory observations of spawning behavior in two species of snubnose darters, *Etheostoma colorosum* and *E. tallapoosae*. Proceedings of the Southeastern Fishes Council 38:
- 1998 **Bart, H.L. Jr.**, P.J. Martinat, A. Abdelghani, and S. L. Taylor. Influence of taxonomy, ecology, and seasonality in river stage on fish contamination risks in floodplain swamps of the lower Mississippi River. *Ecotoxicology* 7:325-334.
- 1997 **Bart, H.L. Jr.**, M.A. Bailey, R.E. Ashton, Jr., and P.E. Moler. Taxonomic and nomenclatural status of the upper Black Warrior River Waterdog. *Journal of Herpetology* 31(2):192-201.
- 1996 Sever, D.M. and **H.L. Bart, Jr.** The cytology of spermathecae of *Necturus beyeri* (Amphibia: Proteidae) in relation to its breeding season. *Copeia* 1996:927-936.
- 1995 **Bart, H.L., Jr.** and M.S. Taylor. The Auburn University Museum Fish Collection Proceedings Southeastern Fishes Council 31:9-13.
- 1994 Suttkus, R.D., B.A. Thompson, and **H.L. Bart, Jr.** Review of the subgenus *Cottogaster* of genus *Percina*, with descriptions of two new forms from the southeastern United States. Occasional Papers Tulane University Museum of Natural History, No. 4, 44p.
- 1994 **Bart, H.L., Jr.**, M.S. Taylor, J.T. Harbaugh, J.W. Evans, S.L. Schleiger and W. Clark. New records of Gulf Slope drainage fishes in the Ocmulgee River system, Georgia. Proc. Southeastern Fishes Council 30:4-10.
- 1994 Suttkus, R.D. R.M. Bailey and **H.L. Bart, Jr.** Three new species of *Etheostoma*, subgenus *Ulocentra* from the Gulf Coastal Plain of Southeastern United States. *Tul. Stud. Zool. & Bot.* 29(2):97-126.
- 1993 **Bart, H. L., Jr.** and M.S. Taylor. Type specimens of fishes in the Tulane

- University Museum of Natural History. Tulane Stud. Zool. & Bot. 29(1):29-72.
- 1992 **Bart, H. L., Jr.** and L.M. Page. The influence of size and phylogeny on life history variation in North American percids, pp 553-572 In: R.L. Mayden (ed.) Systematics, historical ecology and North American freshwater fishes. Stanford University Press (**BOOK CHAPTER**).
- 1992 **Bart, H.L., Jr.** Spawning behavior of *Etheostoma davidsoni* Hay. Copeia 1992 (2):537-539.
- 1991 **Bart, H.L., Jr.** and L.M. Page. Morphology and adaptive significance of fin knobs of egg-clustering darters. Copeia 1991:80-85.
- 1989 Page L.M. and **H.L. Bart, Jr.** Egg mimics in darters. Copeia 1989:(514-518).
- 1989 **Bart, H.L., Jr.** Fish-habitat association in an Ozark stream. Environmental Biology of Fishes 24:173-186.
- 1986 **Bart, H.L., Jr.** and R.C. Cashner. Geographic variation in Gulf Slope populations of the bluntnose darter, *Etheostoma chlorosomum* (Hay). Tulane Studies in Zoology & Botany 25(2):151-170.
- 1985 **Bart, H.L., Jr.** and R.W. Holzenthal. Feeding ecology of *Necturus beyeri* in Louisiana. Journal of Herpetology 19(3):402-410.
- 1984 Grady, J.M. and **H.L. Bart, Jr.** Life history of *Etheostoma caeruleum* (Pisces:percidae) in Bayou Sara, MS., pp 71-81 In: D.G. Lindquist and L.M. Page (eds.), Environmental biology of darters, Dr. W. Junk Publishers, The Hage, Netherlands (**BOOK CHAPTER**).
- 1980 **Bart, H.L., Jr.** and R.C. Cashner. New records for the northern studfish, *Fundulus catenatus*, in lower Mississippi and Gulf Coastal drainages. Proc. Southeastern Fishes Council 3(2):1-4.