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List of Type Specimens Deposited Since 1998 in the United States Department of Agriculture Nematode Collection, Beltsville, Maryland

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Abstract

The United States Department of Agriculture Nematode Collection (USDANC) is one of the largest and most valuable in existence and includes millions of specimens housed in over 39,800 permanent slides and 9,300 vials. This collection preserves type specimens of nematodes to serve as a reference for identifications and future taxonomic revisions. Also, the collection provides useful information on nematode hosts, occurrence, and distribution. The present list includes type specimens added to the USDANC since 1998. Since that time, the collection has expanded, with 474 type species mounted and preserved on 2,564 glass slides and 180 vials. We encourage nematologists throughout the world to deposit type specimens in the USDANC for use by future generations.

Key words

Collection, list, nematode, repository, taxonomy, type collection.

The United States Department of Agriculture Nematode Collection (USDANC) was established in 1960 by A. Morgan Golden (Golden, 1962; Handoo et al., 1998a) and currently contains more than 49,200 species entries. The type collection includes more than 7,484 slides and 9,300 vials. This revised list contains updates to the exhaustive 1998 list of type specimens deposited at the USDANC (Handoo et al. 1998a). The 1998 publication described more than 1,430 type species mounted and preserved on 5,177 metal and glass slides and in 404 vials. Since then, more than 474 type species mounted and preserved on 2,560 slides and 180 vials have been added to the type collection. This increase resulted from depositions by scientists as well as from restudying USDANC type specimens. Several other publications provide detailed information on the importance of the USDANC (Golden, 1977; Golden and Huettel, 1990; Handoo et al., 1996; Handoo et al., 1998b, 2013; Suszkiw, 2010; Kaplan, 2016).

The USDANC database is publicly available to and can be accessed at a USDA website at: https://nt.ars-grin.gov/nematodes/. The online collection database is user friendly; typing the genus and the species name will reveal a list with all relevant entries and provide information about the host, the collector, the collection date, and the date when the sample was received. The database also provides a detailed list of specimens that are deposited in the USDANC and that are available to interested scientists throughout the world. The policies for loaning slides has been described in detail by Handoo et al. (1998a,b). In addition to the nematode collection database, the USDANC website features a brief history of the USDA Nematology Laboratory as well as some basic techniques used in the laboratory. The USDANC welcomes and encourages submissions of type specimens from scientists worldwide in order to continue to enrich the collection and future research.

The type specimens listed in this publication can be used as a reference to locate type material added since 1998. Researchers are cautioned that nomenclatorial changes are not provided. The generic and specific names listed below are arranged in alphabetical order according to the nomenclature indicated at

the time when first deposited by the author (s) in the type sections of the USDANC. For each species listed in the current publication, the slide/vial number(s) as well as information about the author (s), date of publication and source are given.

Symbols and abbreviations

♂ = Male
♀ = Female
⚥ = Hermaphrodite
Allo. = Allotype
Ant. = Anterior
J = Juvenile (s)
Holo. = Holotype
Hololecto. = Hololectotype
Lecto. = Lectoptype
Neo. = Neotype
Para. = Paratype
Paras. = Paratypes
Paralecto. = Paralectotype
Pre. = Preparasitic
Post. = Posterior
PP. = Postparasitic
Topo. = Topotype
V = vial
Y = larva
YY = larvae

TYPE SPECIMENS

Abathymermis fiseri Johnson, A.A., and Kleve, M.G. 1994. Invertebrate Biology 114: 19-26. T-426p-T-431p (Para. V).

A. shocki Johnson, A.A., and Kleve, M.G. 1994. Invertebrate Biology 114: 19-26. T-432p-T-436p (Para. V).

Acrostichus floridensis Kanzaki, N., Giblin-Davis, R.M., Gonzalez, R., and Manzoor, M. 2017. Nematology 19: 515-531. T-703t (Holo. 1♂), T-6869p-T-6872p (Para. 11♂), T-6873p-T-6877p (Para. 1♀).

Actinolaimus michaelseni Steiner, G. 1916. Nematodes 377-411. T-592t (Holo. 1♀), T-5333p (Para. 1♂), T-5334p (Para. 1♂).

Agamospirura anabri Christie, J.R. 1930. Journal of Parasitology 16: 250-256. T-4854p-T-4860p (Paralecto.).

A. melanopli Christie, J.R. 1928. Journal of Parasitology 15: 127-230. T-4861p and T-4862p (Paralecto.).

Allodiplogaster josephi Kanzaki, N., Giblin-Davis, R.M., and Ragsdale, E.J. 2015. Nematology 17: 831-863. T-684t (Holo. 1♂), T-6482p-T-6484p (Para. 1♂ stenostomatous form), T-6485p-T-6488p (Para. 1♀ stenostomatous form), T-6489p-T-6492p (Para. 1♂ eurystomatous form), T-6493p-T-6496p (Para. 1♀ eurystomatous form).

A. seani Kanzaki, N., Giblin-Davis, R.M., and Ragsdale, E.J. 2015. Nematology 17: 831-863. T-685t (Holo. 1♂), T-6497p-T-6499p (Para. 1♂ stenostomatous form), T-6500p-T-6503p (Para. 1♀ stenostomatous form), T-6504p-T-6507p (Para. 1♀ eurystomatous form).

Alloionema luofuensis Huang, R.E., Li, R., and Zhao, Z. 2016. Invertebrate Systematics, 30: 387-397. T-6710p-T-6727p (Para. ♀, ♂, J).

Allomermis solenopsii Poinar, G. Jr., Porter, S.D., Tang, S., Hyman, B.C. 2007. Systematic Parasitology 68: 115-128. T-5434p (Para. 1♂), T-5435p (Para. 1♀).

A. trichotopson Nickle, W.R. 1972. Journal of Nematology 4: 113-146. T-4690p-T4692p (Lecto).

Angiostoma norvegicum Ross, J.L., Haukeland, S., Hatteland, B.A. and Ivanova, E.S. 2017. Systematic Parasitology 94: 51-63. T-663t (Holo. 1♀), T-6210p (Para. 1♂), T-6209p (Para. 1♀), T-6211p (Para. 1♀, 1♂).

Angiostrongylus cantonensis (Chen, 1935) Dougherty, 1946; Iwanowicz, D.D., Sanders, L.R., Schill, W.B., Xayavong, M.V., da Silva, A.J., Qvarnstrom, Y., and Smith, T. 2015. Journal of Wildlife Diseases 51: 749-753. T-6555p (Para.), T-6556p (Para.).

Anomalomermis ephemerophagis Poinar, G., Walder, L., and Uno, H. 2015. Systematic Parasitology 90: 231-236. T-670t (Holo. 1♂), T-6321p (Para. 1♀).

Anonchus pulcher Zullini, A., Loof, P.A.A., and Bongers, T. 2002. Nematology 4: 709-724. T-5062p (Para.).

Aphasmatylenchus liberiensis Baujard, P., Vovlas, N., Mounport, D., and Martiny, B 1998. Fundamental and Applied Nematology 21: 129-138. T-4806p (Para. 1♀).

Aphanolaimus crassatus Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-642t (Holo. 1 F), T-6016p (Para. F), T-6017p (Para. ♂, J).

A. duplex Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-643t (Holo. 1♀), T-6018p (Para. 1♂).

A. furcatus Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-644t (Holo. 1♀).

A. perlitus Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-645t (Holo. 1♀), T-6019p (Para. 1♂).

A. recedens Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-646t (Holo. 1♀).

A. sclerolaimus Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-647t (Holo. 1♀), T-6020p (Para. 1♂).

A. tritubifer Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-648t (Holo. 1♀), T-6021p (Para. 4♂, 4♀), T-6022p (Para. 1♀).

A. trivialis Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86.

T-649t (Holo. 1♀), T-6023p (Para. 2♀), T-6024p (Para. 1♂).

A. unisexus Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-650t (Holo. 1♀), T-6025p (Para. 2♀), T-6026p (Para. 2♀), T-6027p (Para. 1♀).

A. westafricanus Siddiqi, M.R. 2009. International Journal of Nematology 19: 63-86. T-651t (Holo. 1♀), T-6028p (Para. 2♂), T-6029p-T-6031p (Para. ♀♂), T-6032p (Para. ♀).

Aphelenchoides hypotris Shah, A.A., Siddiqi, M.R., and Handoo, Z.A. 2015. International Journal of Nematology 25: 17-25. T-6320p (Para. 3♀, 3♂, 2 J).

A. microstylus Kaisa, T.R. 2000. Journal of Nematology 32: 396-402. T-535t (Holo. 1♀), T-536t (Allo. 1♂), T-4787p, T-4788p (Para.).

A. xylocopae Kanzaki, N. 2006. Nematology 8: 555-562. T-599t (Holo. 1♂), T-600t (Allo. 1♀), T-5398p-T-5406p, T-5407p-T-5415p (Para.).

Aporcelaimellus alpujarrensis Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6582p (Para. 1♀), T-6583p (Para. 1♂).

A. baeticus Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6585p (Para. 1♀), T-6586p (Para. 1♀).

A. californicus Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6588p (Para. 1♀).

A. communis Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6576p (Para. ♂, J), T-6577p (Para. 1♀), T-6578p (Para. 1♀).

A. deserticola Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6579p (Para. 2 ♀).

A. hyalinus Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6584p (Para. 2 ♀).

A. rotundus Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6587p (Para. 1♀).

A. salicinus Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6589p (Para. 1♀).

A. tenuis Álvarez-Ortega, S., Abolafia, J., Liébanas, G., and Peña-Santiago, R. 2012. Zootaxa 3551: 1-24. T-6580p (Para. 1♂), T-6581p (Para. 1♀).

Aporcelinus reyesi Vinciguerra, M.T., Orselli, L., and Clausi, M. 2014. Nematology 16: 303-322. T-6548p (Para. 2♀).

Australodorus enigmaticus Coomans, A., Olmos I., Casella, E., and Chaves, E. 2004. Nematology 6: 183-191. T-5154p (Para.).

Basiria paratumida Sakwe, P.N., and Geraert, E. 1994. Nematologica 40: 214-229. T-4705p (Para. 1♀, 1♂).

Berntsenus brachycephalus Kaisa, T.R. 2003. Journal of Nematology 35: 218-222. T-562t (Holo. ♂, Paralecto. 3♂), T-5101p (Paralecto. 5♂, 3♀), T-5102p (Paralecto. 8♀).

Bitylenchus hispaniensis Handoo, Z.A., Palomares-Rius, J.E., Cantalapiedra-Navarrete, C., Liébanas, G., Subbotin, S.A., and Castillo, P. 2014. Zoological Journal of the Linnean Society 172: 231-264. T-416t (Holo. 1♀), T-6233p-T-6248p (Para. ♀). T-6615p (Para. 8♀, 2♂), T-6616p (Para. 6♀, 4♂), T-6617p (Para. 7♀, 3♂), T-6618p (Para. 5♀, 4♂, 1Y), T-6619p (Para. 4♀, 4♂), T-6620p-T-6627p (Para.).

Blandicephalanema inserratum Wouts, W.M. 2006. Fauna of New Zealand 55: 232pp. T-5436p, T-5437p (Para.).

B. porcuspinosum Siddiqi, M.R. 2010. International Journal of Nematology 20: 43-62. T-6033p (Para. 1♀).

Bursaphelenchus abietinus Braasch, H., and Schmutzenhofer, H. 2000. Russian Journal of Nematology 8: 1-6. T-4940p (Para. 4 ♀), T-4941p (Para. 5♂), T-5390p (Para.).

B. anamurius Akbulut, S., Braasch, H., Baysal, I., Brandstetter, M., and Burgermeister, W. 2007. Nematology 9: 859-867. T-5948p (Para. 4♀, 4♂).

B. anatolius Giblin-Davis, R.M., Hazir, S., Center, B.J., Ye, W., Keskin, N., Thorp, R.W., and Thomas, W.K. 2005. Journal of Nematology 37: 336. T-5369p, T-5370p (Para.).

B. burgermeisteri Braasch, H., Gu, J., and Brandstetter, M. 2007. Journal of Nematode Morphology and Systematics 10: 39-48. T-5949p (Para. 3♂, 3♀).

B. clavicauda Kanzaki, N., Maehara, N., and Masuya, H. 2007. Nematology 9: 757-769. T-612t (Holo. 1♀), T-5493p-T-5506p (Para. 1♀), T-5507p-T-5521p (Para. 1♂).

B. conicaudatus Kanzaki, N., Tsuda, K., and Futai, K. 2000. Nematology 2: 165-168. T-4833p-T-4852p (Para.).

B. eproctatus Sriwati, R., Kanzaki, N., Phan, L.K., and Futai, K. 2008. Nematology 10: 1-7. T-5673p (Para. 3♂), T-5674p (Para. 1♀).

B. fagi Tomalak, M., and Filipiak, A. 2014. Nematology 16: 591-606. T-5986p, T-5987p (Para.).

B. firmae Kanzaki, N., Maehara, N., Aikawa, T., and Matsunoto, K. 2012. Nematology 14: 395-404. T-679t (Holo. 1♀), T-6424p-T-6428p (Para. 1♀), T-6429p-T-6433p (Para. 1♂).

B. hellenicus Skarmoutsos, G., Braasch, H., and Michalopoulou, H. 1998. Nematologica 44: 623-629. T-4812p (Para. 3♀, 3♂).

B. hofmanni Braasch, H. 1998. Nematologica 44: 615-621. T-4813p (Para. 3♀, 3♂).

B. kesiyae Kanzaki, N., Aikawa, T., Maehara, N., and Thu, P.Q. 2016. Nematology 18: 133-146. T-692t (Holo. 1♂), T-6656p-T-6664p (Para. 1♂), T-6665p-T-6674p (Para. 1♀).

B. kiyoharai Kanzaki, N., Maehara, N., Aikawa, T., Masuya, H., and Giblin-Davis, R.M. 2011. Nematology 13: 787-804. T-675t (Holo. 1♂), T-6388p-T-6391p (Para. ♂), T-6392p- T-6396p (Para. ♀).

B. masseyi Tomalak, M., Worrall, J., Filipiak, A. 2013. Nematology 15: 907-921. T-5984p (Para. F), T-5985p (Para. ♂).

B. niphades Tanaka, S.E., Tanaka, R., Akiba, M., Aikawa, T., Maehara, N., Takeuchi, Y., and Kanzaki, N. 2014. Nematology 16: 259-281. T-682t (Holo. 1♂), T-6464p-T-6467p (Para. 1♂), T-6468p-T-6472p (Para. 1♀).

B. okinawaensis Kanzaki, N., Maehara, N., Aikawa, T., and Togashi, K. 2008. Zoological Science 25: 861-873. T-629t (Holo. 1♀), T-5764p-T-5772p (Para. 1♀), T-5773p (Para. 1♂), T-5774p (Para. 1♂).

B. osumiana Kanzaki, N., Akiba, M., Kanetani, S., Tetsuka, K., and Ikegame, H. 2014. Nematology 16: 903-916. T-674t (Holo. 1♂), T-6379p-T-6382p (Para. ♂), T-6383p-T-6387p (Para. ♀).

B. paracorneolus Braasch, H. 2000. Annales Zoologici 50: 177-182. T-4942p (Para. 3♀), T-4943p (Para. 4♂), T-5391p (Para.).

B. parvispicularis Kanzaki, N., and Futai, K. 2005. Nematology 7: 751-759. T-594t (Holo. 1♂), T-595t (Allo. 1♀), T-5349p-T-5366p (Para.).

B. piceae Tomalak, M., and Pomorski, J.J. 2015. Nematology 17: 1165-1183. T-6572p (Para. 10♂), T-6573p (Para. 4♀).

B. rainulfi Braasch, H., and Burgermeister, W. 2002. Nematology 4: 971-978. T-5393p (Para.).

B. rufipennis Kanzaki, N., Giblin-Davis, R.M., Cardoza, Y.J., Ye, W., Raffa, K.F., and Center, B.J. 2008. Nematology 10: 925-955. T-628t (Holo. 1♀), T-5757p-T-5759p (Para. 1♀), T-5760p-T-5763p (Para. 1♂).

B. sakishimanus Kanzaki, N., Okabe, K., and Koboori, Y. 2015. Nematology 17: 531-542. T-672t (Holo. 1♂), T-6341p-T-6359p (Para. ♂).

B. sinensis Marinari Palmisano, A., Ambrogioni, L., Tomiczek, C., and Brandstetter, M. 2004. Nematologia Mediterranea 32: 57-65. T-5218p-T-5221p (Para.).

B. singaporensis Gu, J., Zhang, J., Braasch, H., and Burgermeister, W. 2005. Zootaxa 988: 1-12. T-5394p (Para.).

B. sychophilus Kanzaki, N., Tanaka, R., Giblin-Davis, R.M., and Davies, K. 2014. PLoS One 9: e99241. doi10.1371 journal. pone.0099241. T-673t (Holo. 1♂), T-6360p- T-6368p (Para. ♂), T-6369p-T-6378p (Para. ♀).

B. tadamiensis Kanzaki, N., Taki, H., Masuya, H., and Okabe, K. 2012. Nematology 14: 223-233. T-676t (Holo. 1♂), T-6397p-T-6401p (Para. ♂), T-6402p-T-6405p (Para. ♀).

B. talonus Kaisa, T.R. 2003. Zootaxa 269: 1-7. T-565t (Hololecto. 1♂, Paralecto. 2♂, 2♀), T-5115p (Paralecto. 2♀♂), T-5116p (Paralecto. 2♂).

B. thailandae Braasch, H., and Braasch-Bidasak, R. 2002. Nematology 4: 853-863. T-5395p, T-5396p (Para.).

B. tokyoensis Kanzaki, N., Aikawa, T., and Giblin-Davis, R.M. 2009. Nematology 11: 171-180. T-630t (Holo. 1♂), T-5775p (Para. 1♂), T-5776p (Para. 1♂), T-5777p-T-5780p (Para. 1♀).

B. trypophloei Tomalak, M., Filipiak, A. 2011. Nematology 13: 619-636. T-6014p (Para.), T-6015p (Para.).

B. vallesianus Braasch, H., Schonfeld, U., Polomski, J., and Burgermeister, W. 2004. Nematologia Mediterranea 32: 71-79. T-5397p (Para.).

Caenorhabditis sinica Huang, R.E., Ren, X., Qiu, Y., and Zhao, Z. 2014. PLoS ONE 9: e110957. T-6269p-T-6274p (Para. ♀), T-6275p-T-6280p (Para. ♂).

Californidorus cylindricaudatus Robbins, R.T. 1985. Revue de Nématologie 8: 215-227. T-6592p (Para. 4YY), T-6593p (Para. 8Y), T-6594p (Para. 4YY), T-6595p (Para. 6Y), T-6596p (Para. 1♀).

Ceramonema altogolfi Holovachov, O., Tandingan, De Ley, I., Mundo-Ocampo, M., Baldwin, J.G., Rocha-Olivares, A., and De Ley, P. 2008. Nematology 10: 347-373. T-5718p. (Para. 1♀), T-5719p (Para. 1♀), T-5720-T5723 (Para. 1♂).

C. inguinispina Holovachov, O., Tandingan De Ley I., Mundo-Ocampo, M., Baldwin, J.G., Rocha-Olivares, A., and De Ley, P. 2008. Nematology 10: 347-373. T-5724p (Para. 1♂), T-5725p (Para. 1♂).

Cervidellus psammophilus Orselli, L., and Vinciguerra, M. T. 2002 Nematologia Mediterranea 30: 211-220. T-5114p (Para. 1♀, 1♂).

Chronogaster costaricae Zullini, A., Loof, P.A.A., and Bongers, T. 2002. Nematology 4: 709-724. T-5064p (Para.).

Coomansinema istvani Vinciguerra, M.T., Orselli, L., and Clausi, M. 2014. Nematology 16: 303-322. T-6547p (Para. 2♀, 2♂).

Criconema aucklandicum Loof, P.A.A., Wouts, W.M., and Yeates, G.W. 1997. New Zealand Journal of Zoology 24: 123-151. T-4797p (Para. 2♀).

C. cristulatum Loof, P.A.A., Wouts, W.M., and Yeates, G.W. 1997. New Zealand Journal of Zoology 24: 123-151. T-4798p (Para. 2♀).

C. (Nothocriconemella) crosbyi Wouts, W.M. 2000. Russian Journal of Nematology 8: 7-31. T-5989p (Para. 5♀).

C. (Nothocriconemella) dugdalei Wouts, W.M. 2000. Russian Journal of Nematology 8: 7-31. T-5990p (Para. 2♀), T-5991p (Para. 5♀).

C. (Nothocriconemella) farrelli Wouts, W.M. 2000. Russian Journal of Nematology 8: 7-31. T-5992p (Para. 5♀).

C. lineatum Loof, P.A.A., Wouts, W.M., and Yeates, G.W. 1997. New Zealand Journal of Zoology 24: 123-151. T-4799p (Para. 5♀).

C. (Nothocriconemella) macilentum Wouts, W.M. 2000. Russian Journal of Nematology 8: 7-31. T-5993p (Para. 5♀).

C. mackenziei Wouts, W.M. 2006. Fauna of New Zealand 55: 232pp. T-5438p (Para. 2♀).

C. nelsonense Wouts, W.M. 2006. Fauna of New Zealand 55: 232pp. T-5439p, T-5440p (Para.).

C. (Nothocriconemella) ramsayi Wouts, W.M. 2000. Russian Journal of Nematology 8: 7-31. T-5994p (Para. 6♀).

C. xhaphozi Van Den Berg, E., Schroeder, S., and Tiedt, L. 2007. Journal of Nematode Morphology and Systematics 10: 63-74. T-5730p (Para. 4♀), T-5731p (Para. 4♀).

C. zulu Van Den Berg, E., Schroeder, S., and Tiedt, L. 2007. Journal of Nematode Morphology and Systematics 10: 63-74. T-5732p (Para. 4♀), T-5733p (Para. 4♀).

Cryphodera sinensis Zhuo, K., Wang, H.H., Ye, W., Peng, D.L., and Liao, J.L. 2014. Journal of Helminthology 88: 468-480. T-665t (Holo. 1♀), T-6218p (Para. 1♂), T-6219p (Para. 1♂), T-6220p (Para. 3J2), T-6221p (Para. 3J2).

Cylindrocorpus anoplophorae Kanzaki, N., and Futai, K. 2004. Japanese Journal of Nematology 34: 11-19. T-573t (Holo. 1♂), T-574t (Allo. 1♀), T-5155p-T-5172p (Para.).

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