

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. = Lectotype
 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 michaelsoni 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♂ eurytomatous form), T-6493p-T-6496p (Para. 1♀ eurytomatous 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♀ eurytomatous 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-T-4692p (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 ephemero-phagis 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. 1F), 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♂, 2J).
- 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♀).
- Australodoros enigmaticus* Coomans, A., Olmos I., Casella, E., and Chaves, E. 2004. Nematology 6: 183-191. T-5154p (Para.).
- Basiria paratumida* Sakwe, P.N., and Ger-aert, E. 1994. Nematologica 40: 214-229. T-4705p (Para. 1♀, 1♂).
- Berntsensus 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. porcupinosum* 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 Kobori, 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. tryphloei* 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-T-5723 (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).
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