

December 1974

A World List of Prey of *Chlaenius* (Coleoptera: Carabidae)

Andre Larochelle
College Bourget

Follow this and additional works at: <http://scholar.valpo.edu/tgle>

 Part of the [Entomology Commons](#)

Recommended Citation

Larochelle, Andre (1974) "A World List of Prey of *Chlaenius* (Coleoptera: Carabidae)," *The Great Lakes Entomologist*: Vol. 7 : No. 4 , Article 10.
Available at: <http://scholar.valpo.edu/tgle/vol7/iss4/10>

This Peer-Review Article is brought to you for free and open access by the Department of Biology at ValpoScholar. It has been accepted for inclusion in The Great Lakes Entomologist by an authorized administrator of ValpoScholar. For more information, please contact a ValpoScholar staff member at scholar@valpo.edu.

**A WORLD LIST OF PREY OF *CHLAENIUS*
(COLEOPTERA: CARABIDAE)**

André Laroche
Collège Bourget, C.P. 1000, Rigaud, Québec

Being predaceous insects, the carabid beetles are believed to play an important role in the control of insect pests (Scherney 1957 and 1959, Hughes 1959, Wright, Hughes and Worral 1960, Mitchell 1963). The current interest in biological control against noxious insects requires a complete understanding of the organisms being used. The aim of this paper was to compile a list of data on the food of the genus *Chlaenius*, from the literature and observations in the laboratory.

The beetles of this genus are world-wide in distribution; they live mostly at the borders of waters and appear to be principally nocturnal. Their mandibles are more or less asymmetric and differ both in shape and in the disposition of teeth. The left mandible is elongate and straight, while the right is short and curved (Bell 1960).

The members of the genus *Chlaenius* as destroyers of caterpillars and grubs suggest their application to biological control of pests, peculiarly in wet agricultural lands.

SPECIES ACCOUNTS

- Chlaenius* sp. *Laphygma exempta* Walker (Lepidoptera: Noctuidae)—Australia (Bell 1936).
Phaedonia areata Fabricius (Coleoptera: Chrysomelidae)—Malawi (Smee 1936, Ankersmit 1952). *Pyrausta nubilalis* Hübner (Lepidoptera: Pyraustidae)—Japan (Kuwayama 1930, Goidanich 1931). *Sesamia inferens* Walker (Lepidoptera: Noctuidae)—Japan (Yanagihara 1934). *Utetheisa pulchella* Linné (Lepidoptera: Arctiidae)—India (Fletcher 1916). An unidentified Acrididae (Orthoptera)—Mali (Popov 1959).
- Chlaenius abstersus* Bates. *Gryllotalpa africana* Palisot de Beauvois (Orthoptera: Gryllotalpidae)—Japan (Sakurai and Inouye 1953, Inouye 1956).
- Chlaenius alternatus* Horn. Fresh water shrimps, pieces of *Tenebrio molitor* Linné and *T. picipes* Hervst (Coleoptera: Tenebrionidae)—Canada, in captivity (Henri Goulet, personal communication).
- Chlaenius australis* Dejean. *Laphygma exempta* Walter (Lepidoptera: Noctuidae)—Australia (Jarvis 1921, 1924 and 1928).
- Chlaenius bioculatus* Chaudoir. *Antigastra catalaunalis* Duponchel (Lepidoptera: Pyralidae)—India (Fletcher 1919). *Diacrisia obliqua* Walker (Lepidoptera: Arctiidae)—India, in captivity (Fletcher 1919). *Polytela gloriosae* Fabricius (Lepidoptera: Noctuidae)—India, in captivity (Fletcher 1919). *Prodenia litura* Fabricius (Lepidoptera: Noctuidae)—India, in captivity (Fletcher 1919). *Utetheisa pulchella* Linné (Lepidoptera: Arctiidae)—India (Fletcher 1919).
- Chlaenius circumdatus* Brullé. *Monolepta signata* Olivier (Coleoptera: Chrysomelidae)—India (Fletcher 1919). *Pales pavidus* Meigen (Diptera: Tachinidae)—Japan (Takaoka 1950, Tanaka 1956, Habu 1961, Habu and Sadanaga 1962). *Stictaspis ceratitina* Bezzi (Diptera: Tephritidae)—India, in captivity (Fletcher 1919). An unidentified Chrysomelidae (Coleoptera)—India (Fletcher 1919).
- Chlaenius circumductus* Morawitz. *Barathra brassicae* Linné (Lepidoptera: Noctuidae)—Japan (Inouye 1953a and 1956, Sakurai and Inouye 1953, Habu and Sadanaga 1962). *Gryllotalpa africana* Palisot de Beauvois (Orthoptera: Gryllotalpidae)—Japan (Sakurai and Inouye 1953, Inouye 1956, Habu and Sadanaga 1962). *Oulema oryzae* Kuwayama (Coleoptera: Chrysomelidae)—Japan (Kuwayama and Nishijima 1946, Sakurai and Inouye 1953, Habu and Sadanaga 1962).
- Chlaenius cordicollis* Kirby. Unidentified dead or injured insects—North America (Ball 1963).

- Chlaenius costiger* Chaudoir. *Chilo suppressalis* Walker (Lepidoptera: Pyralidae)—Japan (Nawa 1917). *Naranga aenescens* Moore (Lepidoptera: Noctuidae)—Japan (Nawa 1917). *Pales pavidus* Meigen (Diptera: Tachinidae)—Japan (Takaoka 1950).
- Chlaenius dichrous* Wiedemann. *Carpocapsa pomonella* Linné (Lepidoptera: Tortricidae)—South Africa (Pettey 1919, Nel 1942).
- Chlaenius discopictus* Fairmaire. An unidentified Acrididae (Orthoptera)—Somalia (Great-head 1962).
- Chlaenius ducalis* Chaudoir. *Oryctes rhinoceros* Linné (Coleoptera: Scarabaeidae)—India (Rao et al. 1964).
- Chlaenius emarginatus* Say. Pieces of ham, a grape—Canada, in captivity. According to Ball (1963), the "character of the mandibles indicates that this species prey on large, soft-bodied organisms".
- Chlaenius erythropus* Germar. Unidentified cankerworms (Lepidoptera: Geometridae)—U.S.A. (Forbes 1883). Unidentified cutworms (Lepidoptera: Noctuidae)—U.S.A. (Forbes 1883). Earthworms—U.S.A. (Forbes 1883).
- Chlaenius flaviguttatus* Macleay. Unidentified caterpillars (Lepidoptera)—Guam (Darlington 1970).
- Chlaenius fulgidicollis* Duftschmid. *Aphodius* sp. (Coleoptera: Scarabaeidae) and unidentified Staphylinidae (Coleoptera)—Spain (Burmeister 1939).
- Chlaenius impunctifrons* Say. *Arzama obliqua* Walker (Lepidoptera: Noctuidae)—U.S.A., in captivity (Claassen 1919). *Lymnaecia phragmitella* Stainton (Lepidoptera: Cosmopterygidae)—U.S.A., in captivity (Claassen 1919). A dead *Chlaenius sericeus* Forster (Coleoptera: Carabidae), a dead slug, earthworms, pieces of ham and maize kernels—Canada, in captivity. Unidentified flies (Diptera)—U.S.A., in captivity (Claassen 1919). Unidentified insects and small animals—Undetermined country (Wellhouse 1926).
- Chlaenius inops* Chaudoir. *Anomala rufocuprea* Motschulsky (Coleoptera: Scarabaeidae)—Japan (Tanaka 1956). *Aphodius rectus* Motschulsky (Coleoptera: Scarabaeidae)—Japan (Tanaka 1956). *Gryllotalpa africana* Palisot de Beauvois (Orthoptera: Gryllotalpidae)—Japan (Sakurai and Inouye 1953, Inouye 1956, Tanaka 1956). Fresh meat (Tanaka 1956).
- Chlaenius lithophilus* Say. Earthworms, a dead slug, a piece of ham and a maize kernel.
- Chlaenius macropus* Chaudoir. *Oryctes rhinoceros* Linné (Coleoptera: Scarabaeidae)—India (Rao, et al. 1964).
- Chlaenius micans* Fabricius. *Barathra bassicae* Linné (Lepidoptera: Noctuidae)—Japan (Nawa 1919, Yokoyama 1929, Inouye 1956, Habu and Sadanaga 1965). *Glyphodes pyloalis* Walker (Lepidoptera: Pyralidae)—Japan (Yokoyama 1929, Inouye 1956, Habu and Sadanaga 1965). *Micractis variabilis* Bremer (Lepidoptera: Pyralidae)—Japan (Yokoyama 1929, Inouye 1956). *Parnara guttata* Bremer and Grey (Lepidoptera: Noctuidae)—Japan (Nakai 1904, Yokoyama 1929, Inouye 1956, Habu and Sadanaga 1965).
- Chlaenius naeviger* Morawitz. *Adoxophyes orana* Fisher von Röslerstamm (Lepidoptera: Tortricidae)—Japan (Nawa 1936). *Adoxophyes privatana* Walker (Lepidoptera: Tortricidae)—Japan (Kamiya 1941). *Brachmia macroscopa* Meyrick (Lepidoptera: Gelechiidae)—Japan (Ohira 1951). *Micractis variabilis* Bremer (Lepidoptera: Pyralidae)—Japan (Habu 1964). *Pales pavidus* Meigen (Diptera: Tachinidae)—Japan (Takaoka 1950). *Parnara guttata* Bremer and Grey (Lepidoptera: Hesperidae)—Japan (Habu 1964).
- Chlaenius neelgheriensis* Guérin-Meneville. *Oryctes rhinoceros* Linné (Coleoptera: Scarabaeidae)—India (Rao et al. 1964).
- Chlaenius nemoralis* Say. Unidentified insects, earthworms, fungi and plant fragments—U.S.A. (Forbes 1883).
- Chlaenius nigricans* Wiedemann. *Barathra brassicae* Linné (Lepidoptera: Noctuidae)—Japan (Nawa 1919). *Pales pavidus* Meigen (Diptera: Tachinidae)—Japan (Takaoka 1950).
- Chlaenius obesus* Laferté. An unidentified acrididae (Orthoptera)—Malawi (Smee 1935).
- Chlaenius omochlorus* Andrewes. *Oryctes rhinoceros* Linné (Coleoptera: Scarabaeidae)—India (Rao et al. 1964).

- Chlaenius pallipes* Gebler. *Aulacophora femoralis* Motschulsky (Coleoptera: Chrysomelidae)—Japan (Tanabe and Mishima 1930, Inouye 1952 and 1956, Habu and Sadanaga 1962). *Barathra bassicae* Linné (Lepidoptera: Noctuidae)—Japan (Matsumura 1897). *Chilo suppressalis* Walker (Lepidoptera: Pyralidae)—Japan (Nawa 1917). *Cinara todocola* Inouye (Hemiptera: Aphididae)—Japan (Inouye 1944). *Dermestes* sp. (Coleoptera: Dermestidae)—Japan (Tanaka 1956). *Gryllotalpa africana* Palisot de Beauvois (Orthoptera: Gryllotalpidae)—Japan (Sakurai and Inouye 1953). *Naranga aenescens* Moore (Lepidoptera: Noctuidae)—Japan (Nawa 1917). *Paederus fuscipes* Curtis (Coleoptera: Staphylinidae)—Japan (Kurosa 1958). *Pales pavidia* Meigen (Diptera: Tachinidae)—Japan (Takaoka 1950). *Scotinophara lurida* Burmeister (Hemiptera: Pentatomidae)—Japan (Katsumata 1930). Fresh meat (Tanaka 1956).
- Chlaenius pericallus* Redtenbacher. *Paederus fuscipes* Curtis (Coleoptera: Staphylinidae)—Japan (Tanaka 1956, Kurosa 1958). Fresh meat (Tanaka 1956).
- Chlaenius pictus* Chaudoir. *Bombyx mori* Chaudoir (Lepidoptera: Bombycidae)—Japan (Nishikawa 1919). *Glyphodes pyloalis* Walker (Lepidoptera: Pyralidae)—Japan (Nishikawa 1919). *Pyrausta nubilalis* Hubner (Lepidoptera: Pyralidae)—Japan (Koo 1940).
- Chlaenius platyderus* Chaudoir. *Palaeacrita vernata* Peck (Lepidoptera: Geometridae)—U.S.A. (Porter and Alden 1924). Unidentified caterpillars (Lepidoptera), larvae of Coleoptera, fungi and fragments of vegetal tissue—U.S.A. (Forbes 1883).
- Chlaenius posticalis* Motschulsky. *Adoxophyes orana* Fischer von Röslerstamm (Lepidoptera: Tortricidae)—Japan (Habu *et al.* 1963, Inouye 1956). *Barathra brassicae* Linné (Lepidoptera: Noctuidae)—Japan (Inouye 1953a). *Phrixolepia sericea* Butler (Lepidoptera: Heterogeneidae)—Japan (Inouye 1956, Habu *et al.* 1963). *Sesamia inferens* Walker (Lepidoptera: Noctuidae)—Japan (Miyatake 1952).
- Chlaenius prasinus* Dejean. Unidentified insects—U.S.A. (Bell 1960).
- Chlaenius pusillus* Say. *Diatraea saccharalis* Fabricius (Lepidoptera: Pyralidae)—U.S.A. (Negm and Hensley 1969). *Staphylinus cinnamopterus* Gravel (Coleoptera: Staphylinidae)—U.S.A. (Webster 1881).
- Chlaenius quadrinotatus* Dejean. An unidentified Acrididae (Orthoptera)—Mali (Popov 1959).
- Chlaenius sericeus* Forster. *Popillia japonica* Newman (Coleoptera: Scarabaeidae)—U.S.A. (Smith and Hadley 1926). A dead slug, earthworms, a piece of ham and a grapefruit—Canada, in captivity. Unidentified dead or dying insects—U.S.A. (Bell 1960).
- Chlaenius sericimicans* Chaudoir. Unidentified living small insects and fresh meat—Japan (Tanaka 1956).
- Chlaenius sexmaculatus* Dejean. *Locusta migratoria migratorioides* Reiche and Fairmaire (Orthoptera: Locustidae)—Mali (Popov 1959).
- Chlaenius stellatus* Dejean. An unidentified Acrididae (Orthoptera)—Senegal (Risbec 1946) and Mali (Popov 1959).
- Chlaenius tomentosus* Say. *Melolontha* sp. (Coleoptera: Scarabaeidae)—U.S.A. (Davis 1919). *Laciniptolia spiculosa* Grote (Lepidoptera: Noctuidae)—U.S.A. (Arnaud 1970). *Pediasia caliginosella* Clemens (Lepidoptera: Crambidae)—U.S.A. (Runner 1914). Viscera of *Phyllophaga* sp. (Coleoptera: Scarabaeidae)—U.S.A. (Forbes 1894). Two dead *Anisodactylus verticalis* LeConte (Coleoptera: Carabidae)—Canada, in captivity. Unidentified insects, earthworms, fungi and vegetal tissue—U.S.A. (Forbes 1883).
- Chlaenius tricolor* Say. A dead *Chlaenius sericeus* Forster (Coleoptera: Carabidae), a dead slug, an earthworm, a piece of ham—Canada, in captivity.
- Chlaenius tristis* Schaller. Unidentified insect larvae—Germany (Rapp 1933).
- Chlaenius trachys fumatus* Andrewes. *Oryctes rhinoceros* Linné (Coleoptera: Scharabaeidae)—India (Rao *et al.* 1964).
- Chlaenius transversalis* Dejean. An unidentified Acrididae (Orthoptera)—Senegal (Risbec 1946) and Ethiopia (Popov and Greathead 1958).
- Chlaenius varicornis* Morawitz. *Gryllotalpa africana* Palisot de Beauvois (Orthoptera: Gryllotalpidae)—Japan (Inouye 1953b and 1956, Habu and Sadanaga 1962).

ACKNOWLEDGMENTS

I would like to thank Dr. E. C. Becker, Mr. H. Goulet and Dr. K. Tanaka for communicating data on the food of *Chlaenius* and on the up-to-date scientific names of animals cited in this paper.

LITERATURE CITED

- Ankersmit, G. W. 1952. Life history and control of the soya bean leaf beetle, *Phaedonia inclusa* Stål (Coleoptera: Chrysomelidae). Pemb. Balai Besar Penj. Pert., 129:1-34.
- Arnaud, P. H., Jr. 1970. *Chlaenius tomentosus zunianus* (Coleoptera: Carabidae) preying on an adult *Lacinipolia spiculosa* (Lepidoptera: Noctuidae). Pan-Pac. Entomol., 46(1):69-70.
- Ball, G. E. 1963. Carabidae, pp. 55-181. In R. H. Arnett, Jr., The beetles of the United States. Catholic Univ. Amer. Press, Washington.
- Bell, A. F. 1936. Report of the Division of Entomology and Pathology. Rept. Bur. Sug. Expt. Sta. Qd., Brisbane, 36:19-23.
- Bell, R. T. 1960. A revision of the genus *Chlaenius* Bonelli (Coleoptera: Carabidae) in North America. Misc. Pap. Entomol. Soc. Amer., 1(3):98-166.
- Burmeister, F. 1939. Biologie, Ökologie und Verbreitung der Europäischen Käfer. Hans Goecke Verlag, Krefeld, 1:1-307.
- Claassen, P. W. 1919. Life history and biological notes on *Chlaenius impunctifrons* Say (Coleoptera: Carabidae). Ann. Entomol. Soc. Amer., 12:95-99.
- Darlington, P. J. Jr. 1970. Insects of Micronesia. Coleoptera: Carabidae, including Cicindelinae. Bull. Bernice P. Bishop Mus., 15(1):1-49.
- Davis, J. J. 1919. Contribution to a knowledge of the natural enemies of *Phyllophaga*. Bull. State Illinois Nat. Hist. Surv., 13(5):53-133.
- Fletcher, T. B. 1916. Agricultural Entomology. Reprint from Amer. Rept. Bd. Scientific Advice for India, 1914-1915. Calcutta. Economic Zoology, p. 1-15.
- . 1919. Second Hundred notes on Indian insects. Bull. Agric. Des. Inst. Pus., 89:1-102.
- Forbes, S. A. 1883. The food relations of the Carabidae and Coccinellidae. Bull. Ill. State Lab. Nat. Hist., 6:33-64.
- . 1894. The white grubs. Eighteenth Rept. State Entomol. Illinois p. 109-144.
- Goidanich, A. 1931. Gli insetti predatori e parassiti della *Pyrausta nubilalis* Hübn. Boll. Lab. Entomol. Bologna, 4:77-218.
- Greathead, D. J. 1962. A review of the insect enemies of Acridoidae (Orthoptera). Trans. Roy. Entomol. Soc., 114:437-517.
- Habu, A. A. 1961. Family Carabidae. Nature and Life in Southeast Asia. Bull. Nat. Inst. Agric. Sci., Tokyo, Ser. C, 12:285-287.
- . 1964. Carabidae, p. 12-22. In K. Yasumatsu and C. Watanabe. A tentative catalogue of insect natural enemies of injurious insects in Japan. Part I. (In Japanese). Entomol. Lab., Fac. Agric., Kyushu Univ.
- and K. Sadanaga. 1962. Illustrations for identification of larvae of the Carabidae found in cultivated fields and paddy-fields. Part I. (In Japanese). Bull. Nat. Inst. Agric. Sci., Tokyo, ser. C, 13:207-248.
- and ———. 1965. Illustrations for identification of larvae of the Carabidae found in cultivated fields and paddy-fields. Part III. (In Japanese). Bull. Nat. Inst. Agric. Sci., Tokyo, ser. C, 19:81-216.
- Habu, A. et al. 1963. Additional notes on predators of the Tea Nettle Grub, *Phrixolepia sericæ* Butler. (In Japanese). Kontyû, 31(4):305-308.
- Hugues, R. D. 1959. The natural mortality of *Eriosechia brassicae* (Bouché) during the egg stage of the first generation. J. Anim. Ecol., 28(4):343-357.
- Inouye, H. 1952. Biology of *Chlaenius pallipes* Gebler in Hokkaido. (In Japanese). Shin Konchû, 5(1):41.
- . 1953a. Carabid beetles as predators of *Mamestra brassicae* L. (In Japanese). Shin Konchû, 6(1):52-53.

- . 1953b. Biology of *Chlaenius variicornis* Morawitz in Hokkaido. (In Japanese). Shin Konchû, 6(4):44.
- . 1956. Notes on the life history of Callistinae from Hokkaido (Coleoptera: Harpalidae). (In Japanese). Ins. World, 5:69-77.
- Inouye, M. 1944. Control experiment of *Cinara todocola* Inouye. (In Japanese). Rept. Hokkaido Forest Expt. Sta., 53:1-36.
- Jarvis, E. 1921. A new moth pest of sugar-cane and maize: leaf-eating grass worm (*Laphygma exempta* Walk.). Queensland Agric. J., 16(4):276-280.
- . 1924. The economic value of certain Queensland parasitic insects. Queensland Agric. J., 22(2):113-116.
- . 1928. Biological control of caterpillars attacking sugar-cane. Queensland Agric. J., 30(6):510-511.
- Kamiya, K. 1941. The natural enemies of *Adoxophyes privatana* Walk. (In Japanese). Kontyû, 14:224-226.
- Katsumata, K. 1930. Results of the studies on *Scotinophara (Podops) lurida* Burm. (In Japanese). Ishikawa, Ishikawa-Ken Agric. Exp. Sta. 240 p.
- Koo, M. 1940. Studies on *Pyrausta nubilalis* Hübner attacking the cotton plant. (In Japanese). Kofu, Yamanshi Agric. Exp. Sta. 82 p.
- Kurosa, K. 1958. Studies on the life history of *Paederus fuscipes* Curtis (Staphylinidae) (Studies on poisonous beetles, part III). (In Japanese). Jap. J. Sanitary Zool., 9:245-273.
- Kuwayama, S. 1930. Studies on the corn borer, *Pyrausta nubilalis* Hübner, in Japan. (In Japanese). Rept. Hokkaido Agric. Exp. Sta., 25:1-140.
- and Y. Nishijima. 1946. Notes on the predatory insects of the rice leaf-beetle, *Lema oryzae* Kuwayama. (In Japanese). Matsumushi, 1:67-69.
- Matsumura, S. 1897. Manual of insect control. (In Japanese). Japan Department of Agriculture, Tokyo. 320 p.
- Mitchell, I. 1963. Ecology of two carabid beetles, *Bembidion lampros* (Herbst) and *Trechus quadristriatus* (Schrank). J. Anim. Ecol., 32(5):289-299.
- Miyatake, M. 1952. Ecological studies on the purplish stem borer, *Sesamia inferens* Walker, in Japan (Lepidoptera: Noctuidae). Sci. Rept. Matsuyama Agric. Coll., 8:1-37.
- Nakai, T. 1904. Biology of *Chlaenius micans* Fabricius. (In Japanese). Ins. World, 8:17-18.
- Nawa, U. 1917. On insect specimens exhibited in the common-insect exhibition. (In Japanese). Ins. World, 21:151-152.
- . 1919. Carabid beetles predaceous on the cabbage army worm. (In Japanese). Ins. World, 24:233-239.
- . 1936. Memoranda on insects, 70. (In Japanese). Ins. World, 40:366-367.
- Negm, A. A. and S. D. Hensley. 1969. Evaluation of certain biological control agents of the sugarcane borer in Louisiana. J. Econ. Entom., 62(5):1008-1013.
- Nel, R. I. 1942. Biological control of the codling moth in South Africa. J. Entomol. Soc. Africa, 5:118-137.
- Nishikawa, I. 1919. Studies on insect enemies of the silkworm, continued. (In Japanese). Sangyo Shimpô, Tokyo, 27(312):244-251.
- Ohira, H. 1951. Notes on the sweet-potato leaf folder and its natural enemies. Preliminary report. (In Japanese). Oyô-Kontyû, 7:63-64.
- Peter, B. A. and C. H. Alden. 1924. The cankerworms. Bull. U.S. Dept. Agric., 1238:1-37.
- Pettey, F. W. 1919. Insect enemies of the codling moth in South Africa and their relation to its control. S. Afr. J. Sci., Johannesburg, 16(3):239-257.
- Popov, G. B. 1959. Ecological studies on oviposition by *Locusta migratoria migratorioides* (R. and F.) in its outbreak area in French Sudan. Locusta, 6:5-63.
- and D. J. Greathead. 1958. Oviposition behaviour and egg mortality of the desert locust (*Schistocera gregaria* Förskal) on the coast of Eritrea. Anti-Locust Bull., 30:1-33.
- Porter, B. A. and C. H. Alden. 1924. The cankerworms. U.S. Dept. Agric., Bull., 1238:1-37.

- Rao, V. P. *et al.* 1964. Report of work carried out during 1963. Commonw. Inst. Biol. Contr., Trinidad. 82 p.
- Rapp, O. 1933. Die Käfer Thüringens unter besonderer Berücksichtigung der faunistisch-ökologischen. Geographie. Band I. Selbstverlag des Verfassers, Erfurt. 766 p.
- Risbec, J. 1946. Action de prédateurs et de parasites sur *Schistocera gregaria* au Sénégal. Bull. Off. Anti-acrid., Alger, 2:1-16.
- Runner, G. A. 1914. The so-called tobacco-wireworm in Virginia. Bull. U.S. Dept. Agric., Washington, 78:1-30.
- Sakurai, K. and H. Inouye. 1953. Some beetles as natural enemies of the mole cricket. (In Japanese). Ann. Rept. Assoc. Plant Prot. N. Japan, 4:145-146.
- Scherney, F. 1957. Der biologische Wirkungseffekt von Carabidae der Gattung *Carabus* auf Kartoffelkäferlarven. Verhand des IV Int. Pflanzenschutz Kongr. Hamburg, 1:1035-1038.
- . 1959. Unsere Laufkäfer, ihre Biologie und wirtschaftliche Bedeutung. Die Neue Brehm-Bücherei, Wittemberg Lutherstadt. 79 p.
- Smee, C. 1935. Report of the entomologist. Locusts. Rept. Dept. Agric. Nyasaland 1934, p. 16-18.
- . 1936. Report of the entomologist. Rept. Dept. Agric. 17 Nyasaland 1935, p. 23-25.
- Smith, L. B. and C. H. Hadley. 1926. The japanese beetle. Circ. U.S. Dept. Agric. 363:1-66.
- Takaoka, I. 1950. Notes on the predatory enemies of *Pales pavidus* Meigen. (In Japanese). Oyô-Kontyû, 6:77.
- Tanabe, C. and R. Mishima. 1930. On the biology and control method of *Aulacophora femoralis* Motschulsky. (In Japanese). J. Plant. Prot., 17(6):18-23.
- Tanaka, K. 1956. Biology of some species of *Chlaenius* (Coleoptera: Carabidae). (In Japanese). Kontyû, 24(2):87-96.
- Webster, F. M. 1881. Notes on the food of predaceous beetles. Bull. Illinois State Lab. Nat. Hist., 1(3):162-166.
- Wellhouse, W. H. 1926. How insects live. Macmillan Co., New York. 435 p.
- Wright, D. W., R. D. Hughes, and J. Worrall. 1960. The effect of certain predators on the number of cabbage root fly *Erioischia brassicae* (Bouché) and on the subsequent damage caused by the pest. Ann. Appl. Biol., 48(9):756-763.
- Yanagihara, M. 1934. Results of studies on *Sesamia inferens* Walker, a serious pest of sugar-cane in Taichu Prefecture, Formosa (In Japanese). J. Formosan Sugar Plant. Assoc., 12(1-3):1-53.
- Yokoyama, K. 1929. Latest Manual of silk industry insects in Japan. (In Japanese). Japan Department of Agriculture, Tokyo. 228 p.