

# A BIBLIOGRAPHY OF CAVES IN TRINIDAD AND TOBAGO

EDITION MAY 2009

Authors : J P E C Darlington<sup>a</sup> & P A Shaw<sup>b</sup>

<sup>a</sup> University Museum of Zoology, Downing Street, Cambridge CB2 3EJ, UK

<sup>b</sup> Department of Tropical Agriculture and Geographical Sciences, University of the West Indies, St Augustine, Trinidad & Tobago. (corresponding author – contact email: [paul.shaw@sta.uwi.edu](mailto:paul.shaw@sta.uwi.edu))



## BIBLIOGRAPHY OF CAVES IN TRINIDAD AND TOBAGO

Authors : J P E C Darlington<sup>a</sup> & P A Shaw<sup>b</sup>

<sup>a</sup> University Museum of Zoology, Downing Street, Cambridge CB2 3EJ, UK

<sup>b</sup> Department of Tropical Agriculture and Geographical Sciences, University of the West Indies, St Augustine, Trinidad & Tobago.

Edn : 25<sup>th</sup> May 2009

AJELLO L., GREENHALL A.M. & MOORE J.C. 1962 Occurrence of *Histoplasma capsulatum* on the island of Trinidad, B.W.I.: II. Survey of chiropteran habitats. *Amer. Jour. Trop. Med. & Hyg.* 11 (2), 249-254. (Besides the caves at Aripo and Tamana, *capsulatum* has been found in soil from hollow trees used by bats; but was not found in attics, which may be too hot for it. Two other pathogenic fungi were also identified.)

AJELLO L., SNOW D., DOWNS W.G. & MOORE J.C. 1962 Occurrence of *Histoplasma capsulatum* on the island of Trinidad, B.W.I.: I. Survey of oil bird (*Steatornis caripensis*) habitats. *Amer. J. Trop. Med. & Hyg.* 11 (2), 245-248.

ALLEN J.A. & CHAPMAN F.M. 1893 On a collection of mammals from the island of Trinidad. *Bull. Amer. Mus. Nat. Hist.* 5, 203-207. (p 206 under *Noctilio leporinus* they note that "the cave on Monos Island - - seems now to be deserted by them".)

ALLEN R.P. 1962 *Birds of the Caribbean*. 256 pp. Thames and Hudson, London. (pp 85-88 brief account of discovery and later work on oilbirds, all from the literature. p 226 short description of the bird and its distribution.)

AQUING F. 1974 *Survey of Lopinot Caves*. 11 pp and 6 maps. National Environment and Conservation Council Research Paper No. 1/74, Government of Trinidad and Tobago Ministry of Planning. (A first-hand report on five caves in Lopinot Valley, including physical descriptions and a discussion of the prospects of developing them for tourism. It includes a topographic map showing the location of the caves, and maps and sections of each cave. These were the Martin Gomez Cave, Darceuil Cave, Colado Cave, Yaraba Cave and Devil Hole.)

BACON P.R. 1978 *Flora and fauna of the Caribbean: an introduction to the ecology of the West Indies*. 319 pp. Key Caribbean Publications, Port of Spain. (pp 247-256 "The Caves". Brief outline of the ecology of bat and oilbird caves including guano fauna. Mentions and figures the blind catfish in Trinidad.)

BACON P.R. 1978-79 Theodore Roosevelt slept on the table. *Living World (Journal of the Trinidad & Tobago Field Naturalists' Club)* 1978-1979, 10. (Comments on old references to oilbird colonies, and on Roosevelt's original 1917 account of his visit to Oropouche Cave.)

BALE P. 1982 *Wildlife through the camera*. 224 pp. BBC-London.

BELCHER C. & SMOOKER G.D. 1936 Birds of the Colony of Trinidad and Tobago. (3rd part) Ibis, 1-35. (p 19 Oilbirds nest in caves, the two most important colonies being at Oropouche and Aripo, plus half a dozen smaller ones.)

BLACKWELDER R.E. 1943 Monograph of the West Indian beetles of the family Staphylinidae. Smiths. Inst. U.S.N.M. Bull. 182, 658 pp. (Records five species from caves, all collected on 19 April 1935 by N.A. Weber in a cave in Aripo Valley at 2600 ft (or 2000 ft) altitude, presumably Aripo Main Cave : pp 153-154 *Thoracophorus dubitans* sp.nov., pp 168-169 *Neotrochusmithi* (Cameron), pp 200-201 *Osorius exalatus* sp.nov., pp 465-466 *Heterothops ocularis* sp.nov., and p 499 *Lithocharodes cavicola* sp.nov. found deep in the cave.)

BOOS H.E.A. 1975 Following the snake trail. Wildlife 17, 74-75. (Describes the capture of a large colubrid snake *Pseustes sulphureus* in Tamana Main Cave in 1966.)

BOOS H.E.A. 1978 Trip to Aripo Caves. Trinidad Naturalist 2, pp 53, 59, 60. (Popular account of a day trip through forest to the cave. Oilbird and bat colonies occurred near the entrance, with associated guano beds and fauna. Below two ledges an underground stream emerged in which a maniocou crab was seen, and there were spider webs and harvestmen on the walls. This was apparently the same trip, on 30 April 1978, referred to in Quesnel 1978b,d)

BORY de SAINT-VINCENT J.B.G.M. 1838 Sur l'existence du Guacharo (*Steatornis*), a l'ile de la Trinite. Compte rendu des seances de l'Academie des Sciences 7 (9), 474-478, 27 Aug 1838. (Birds of all ages collected from the sea cave on Huevos Island and sold in markets. Presented one adult, 3 eggs, a nest, and seeds from the cave floor to the Academy.)

BRADBURY J.W. & EMMONS L.H. 1974 Social organisation of some Trinidad bats. I. Emballonuridae. Z. Tierpsychol. 36, 137-183.

BRENNAN J.M. & JONES E.K. 1960 Chiggers of Trinidad, B.W.I. (Acarina, Trombiculidae). Acarologia 2, 493-540. (Records *Euschoengastia desmodus* Brennan & Dalmat (Trombiculidae) found on *Carollia perspicillata* in Trinidad. Quoted in Tamsitt & Fox 1966.)

BRIGHT D.E. 1981 Eye reduction in a cavernicolous population of *Coccotrypes dactyliperda* Fabricius (Coleoptera: Scolytidae). Coleopterists' Bull. 35 (1), 117-120. (First record of an apparently cavernicolous bark beetle. Beetles collected from "decaying seed humus" in Oropouche Cave by T. Clay in 1961 had a reduced number of facets in their eyes compared to beetles from non-cave habitats, but showed no other cave adaptation.)

BRINDLE A. 1971 The Dermaptera of the Caribbean. No. 131 Studies on the Fauna of Curacao and other Caribbean islands 38, 1-75. (On p 22 he records *Carcinophora percheroni* (Guerin & Percheron) as "common in various stages", collected by J.P.E.C. Darlington from Tamana Cave. *Spandexpercheron* is listed as a synonym).

BROODBAKKER N.W. 1984 The distribution and zoogeography of freshwater Ostracoda (Crustacea) in the West Indies, with emphasis on species inhabiting wells. Bijdragen tot de Dierkunde 54, 25-50. (On p 33 "a subterranean river yielded *Darwinula stevensoni* and another *Darwinula* species". Presumably collected by Hummelinck, maybe from Oropouche Cave?)

BROWN D. 1988 Cave-associated histoplasmosis : Trinidad. J. Amer. Med. Assoc. 260 (17), 2510. (Reports incident in 1943 when eight airmen entered a cave to rescue an injured man. All eight fell ill within a month, with symptoms and chest X-rays now considered typical of

histoplasmosis. The un-named cave was identified as Aripo #1 cave - pers.comm. and Freitag 1943.)

BROWN L. 1947 Birds and I. 200 pp. Michael Joseph, London. (Part III Ch 5 pp 125-139 "The Caves". Describes Aripo and Oropouche Caves, and mentions that there are four other caves with oilbird nests.)

CARACCILO H. 1894 Bats. Journal of the Trinidad Field Naturalists' Club 2, 164-170. (The fish-eating bat *Noctilio leporinus* is rather common in Trinidad, and lives under the roofs of houses but principally in caves. Great numbers live in the caves at Gasparillo, and were observed fishing in the sea close to shore off Gasparee Island.)

CARRICKER M.A. 1931 The cave birds of Trinidad. Auk 48 (2), 186-194. (Mentions an oilbird colony on Monos, describes Shagramal Cave (=Aripo #1) "and three smaller ones on an adjacent ridge", and Oropouche Cave.)

CARTER C.H., GENOWAYS H.H., LOREGNARD R.S. & BAKER R.J. 1981 Observations on bats from Trinidad, with a checklist of species occurring on the island. The Museum, Texas Tech University, Occasional Papers no.72, 27 pp. (Some cave localities listed.)

CHAMBERLIN R.V. 1918 The Chilopoda and Diplopoda of the West Indies. Bull. Mus. comp. Zool. 62, 151-262. (pp 168-169 brief description of a scutigera centipede *Pselliophora cavicola* collected by C.B. Williams and F.W. Urich in the "Guacharo cave", Trinidad "on the wall of the cave, far in". According to Williams 1922 this was the Oropouche cave.)

CHAPMAN F.M. 1894 On the birds of the island of Trinidad. Bull. Amer. Mus. nat. Hist. 6, 1-86. (p 60 Huevos cave.)

CHAUHARJASINGH A.S. 1982 Lopinot in history. 93 pp. Columbus Publishers Ltd. Port of Spain for Trinidad and Tobago National Cultural Council. (Ch 26 pp 83-89 "A region of caves". Popular account of the five caves in Lopinot valley, giving some traditional history, and derivations of their names, and also some hearsay information about animals living in them.)

CHOPARD L. 1954 Contribution a l'etude des orthopteroides cavernicoles. Notes biospeologiques 9, 27-36. (pp 35-36 description of *Aclodes cavicola* (Phalangopsidae) collected in Aripo #1 Cave by D.K.McE. Kevan on 15 March 1942.)

CLUTCHEY D. & COLTHURST K. 1966 Trinidad and Tobago Geography Teachers' Association Field Trip to Aripo Caves. Sunday, March 12, 1966. Mimeographed, 9 pp. (Notes on origin of caves, and geology and vegetation of the Northern range. pp 7-8 "Animal life" mentions blind catfish, blind white frogs, bats and streblid flies, guano fauna and ticks as being present in the cave. This section is hearsay and not reliable.)

COMEAU, P.L. 1991a. Field trip to "Soho" Cave on the 25<sup>th</sup> November 1990. Bull. T&T FNC, 2<sup>nd</sup> Quarter 1991, 2-4. An account of the discovery of a new cave in the Aripo Valley.

COMEAU, P.L. 1991b. Rediescovering one of Carricker's Caves. Bull. T&T FNC, 4<sup>th</sup> Quarter 1991, 2-3. The rediscovery of a cave first described by Carricker in the Aripo Valley.

COMEAU, P.L., POTTER, L.R. & ROBERTS, P.K. 2006. The Trinidad and Tobago Field Naturalists' Club Trail Guide 2<sup>nd</sup> Edn. (Contains directions to Soho and Carricker Caves pp154-159 and Cumaca Cave pp 160-163)

COOKE J. 1981 The perpetual darkness of Tamana Cave. In Thompson G. (Ed) "Focus on Nature", 66-71. (A very readable account of the caves and of the problems of filming there, with excellent photographs, but has many inaccuracies - eg states that streblid larvae live in guano on cave floor (cf Jobling 1949); that *Leimadophis* is only known from Tamana Caves; etc.)

DARLINGTON J. 1969 Animals in Trinidad caves. Journal of the Trinidad Field Naturalists' Club 1969, 2. (Superseded by Darlington 1970)

DARLINGTON J. 1969 Animals in Trinidad caves. Biological Journal (University of the West Indies) 3, 26-28. (Different text to the above. Superseded by Darlington 1970).

DARLINGTON J.P.E.C. 1970 Studies on the ecology of the Tamana Caves with special reference to cave-dwelling cockroaches. Ph.D. thesis, University of the West Indies, Trinidad. 224 pp. (Detailed study of the invertebrate macrofauna of the caves. Population and biomass of a guano-eating cockroach *Eublaberus posticus* were measured in a chamber in the Deep Part of the cave. Laboratory estimates of respiration, growth rate, defaecation, assimilation and moulting were used to calculate an energy budget.)

DARLINGTON, J.P.E.C. 1993 Recent work on the caves of Trinidad & Tobago. *Acta Carsilologica* 22: 77-87. A review of cave exploration and ecosystem studies from the 1930s onwards, with the dimensions of the largest cave systems given. Contains a map showing links between the Tamana Main Cave and Dry Cave.

DARLINGTON, J.P.E.C 1995A. Ecology and fauna of the Tamana Caves, Trinidad, West Indies. Summary and update of 1970 study, including description, hydrology and faunal status. 3 maps. *Studies in Speleology* vol X: 37-50.

DARLINGTON, J.P.E.C 1995B. Caves in the Heights of Aripo, Trinidad, West Indies: A review of current knowledge, including history of exploration, description and faunal status. 3 maps. *Studies in Speleology* vol X: 51-63

DARLINGTON, J.P.E.C 1995C. A review of current knowledge about Oropuche or Cumaca Cave, including history of exploration, description, hydrology and faunal status. Maps from survey of 1970, 1976 and 1979. Trinidad, West Indies. *Studies in Speleology* vol X: 65-74

DARLINGTON J.P.E.C. & HILL S.B. 1966 Preliminary report on Tamana Caves, Central Range, Trinidad. 30pp. Mimeographed report, Zoology Department, University of the West Indies, Trinidad. (Superseded by Darlington 1970 and Hill 1969).

DAVIS D.R. 1972 *Tetrapalpus trinidadensis*, a new genus and species of cave moth from Trinidad. (Lepidoptera, Tineidae). *Proc. ent. Soc. Washington* 74, 49-59. (Detailed descriptions of adults and larvae, illustrated with photographs and line drawings. The specimens were reared from larvae collected in the Upper Part of Tamana Main Cave by J.P.E.C. Darlington in 1968. Some ecological information is given, quoted from Darlington & Hill 1966 and Darlington pers. comm. The species is probably a troglophile, although the unusually long antennae might be an adaptation to cave life.)

DAY, M.J. & CHENOWETH, M.S. 2003 A geomorphic assessment of karstlands in Trinidad. *Caribbean Geography* 13: 156-169. A review of the distribution and form of karst landforms in Trinidad, in which caves are mentioned in passing. Useful bibliography of geological background.

DAY, M.J. & CHENOWETH, M.S. 2005 The karstlands of Trinidad and Tobago, their land use and conservation. *Geographical Journal* 170: 256-266. Reviews not just karst landforms, but also their current usage and conservation status.

DAY, M.J. & KOENIG, S. 2002. Cave monitoring priorities in Central America and the Caribbean. *Acta Carsologica* 31: 123-134. Suggests priority steps to be taken to maintain cave quality in the region. Several suggestions pertinent to Trinidad and Tobago.

DAY, M.J. & KUENY, J.A. 1998 An assessment of protected karst landscapes in the Caribbean. *Caribbean Geography* 9: 87-100. Review of legislation protecting regional karst landscapes.

DEORAJ P. 1987 The reproductive biology of the neotropical bats *Carollia perspicillata* *Anoura geoffroyi* *Natalus tumidirostris*. M.Phil. thesis, University of the West Indies, Trinidad. 169 pp. (Bats were collected in Tamana Main Cave and Dry Cave. On pp 40-46 he gives a brief description of the caves, with maps of roosting sites. Mating and roosting habits, and breeding season, vary between the species.)

DIGBY E.C. (editor) 1935 Trinidad and Tobago. Yuelles' Printerie, Port of Spain. 2nd edition 1936-37. (pp 180-184 Huevos and Gasparee Caves.)

DITMARS R.L. & BRIDGES W. 1935 Snake-hunter's holiday. Tropical adventures in search of bats and the bushmaster. D. Appleton-Century Co.Inc., New York and London. (Ch 5 pp 78-103 "In the Jumbie Cave". Chatty description of a visit to Caura Cave with Urich, Wehekind and Greenhall. Ch 9 pp 154-.. "Rara Avis". Oilbirds, visit to Arima Gorge?. Ch - pp 176-183 "Collecting with forceps". Visit to Gasparee Cave.)

EDWARDS F.W. 1918 Two new diptera from Trinidad. *Ann. Mag. nat. Hist.* (series 9) 1, 424-425. (Very brief descriptions of *Trichobius caecus* (Streblidae) and *Erioptera troglodyta* (Tipulidae) collected by C.B. Williams and F.W. Urich in the "Guacharo Cave", Trinidad. According to Williams 1922 this was the Oropuche Cave.)

ESCHELMAN, R. & GRADY, F. 1990 The caves of Crown Point, Tobago. *National Speleological Society Bulletin* 52 : 16-20. Report (with 4 maps) of the 1979 and 1981 expeditions to map the caves of the Crown Point system, with an estimation of their archaeological and paleontological significance.

ESHELMAN R., MORGAN G. & GRADY F. 1983 First record of fossil vertebrates (Quaternary) from the island of Tobago, West Indies. (Abstract). *NSS Bulletin* 45 (2), insert. April 1945. (Bones from four caves in the Crown Point area of Tobago fall into three groups of different ages, which give some indication of recent climatic changes.)

FAIRCHILD G.B., KOHLS G.M. & TIPTON V.J. 1966 The ticks of Panama (Acarina: Ixodoidea) pp 167-219 in *Ectoparasites of Panama*, Eds. WENZEL R.L. & TIPTON V.J. *Field Mus. Nat. Hist.*, Chicago. (Records *Ornithodoros* (Schulze) (Argasidae) found on *Noctilio leporinus* in Trinidad. Quoted in Tansitt & Fix 1966.)

FRENCH R.P. 1973 A guide to the birds of Trinidad and Tobago. 470 pp. Livingstone Publ. Co. Pennsylvania. (On pp 220-222 he gives identification characters of the oilbird *Steatornis caripensis*, and quotes Snow 1961, 1962b on nesting habits and locations.)

FRENCH R. & BACON P. 1982 Nature trails of Trinidad. S.M. Publications, Cascade, Trinidad. Ed. Quesnel, V. (Directions and sketch maps to locate Aripo Cave pp 15-17; Oropouche Cave pp 38-40; and Tamana Caves pp 79-81.)

FREITAG R.W. 1943 Saga of 75 heroes. PROP (Magazine of the Trinidad Air Depot) July 1943 No. 2, 3-5.

GAUTIER J.-V. 1974 Etude comparee de la distribution spatiale et temporelle des adultes de *Blaberus atropos colosseus* (Dictyopteres) dans cinq grottes de l'ile de Trinidad. Rev. Comp. Animal. 9, 237-258. ()

GOODWIN G.G. 1959 Bats of the subgenus *Natalus*. American Museum Novitates 1977, 1-22. (Designates the type of the subgenus of *Natalus tumidirostris haymani* from Tamana Cave, collected by A.M. Greenhall. It is also recorded from "Guacharo Cave".)

GOODWIN G.G. & GREENHALL A.M. 1961 A review of the bats of Trinidad and Tobago. Bull. Amer. Mus. nat. Hist. 122, 191-301 + plates 7-46.

GRADY F. 1982 The caves of Tobago: A preliminary account. The Potomac Caver 25 (8), 114-117, Aug. 1982. (Describes four small caves near the airport at Crown Point: Robinson Crusoe Cave, Remnant Cave (with sketch map), Effigy Cave, and Amblypygid Cave (with sketch map and sections))

GREENHALL A.M. 1968 Bats, rabies and control problems. Oryx 9 (4), 263-266.

GREENHALL A.M. 1970 Problems and ecological implications in the control of Vampire bats. Proc. Latin Amer. Conf. on Cons. of Renewable Nat. Res., San Carlos de Bariloche, Argentina, 27 March - 2nd April 1968. 7 pp. (p 3 Vampire control in Trinidad. Paralytic rabies outbreak in 1925-35 killed thousands of cattle and 89 people. A bat control program was instituted by the Government. Methods used by US Forces in WW II, including destruction of bat roosts by dynamite, poison gas and flame-throwers, were not effective and killed many useful bats. Methods now recommended are specific to vampires and include regular collecting from known roosting sites in caves.)

GRIFFIN D.R. 1953 Acoustic orientation in the oil bird, *Steatornis*. Proc. Nat. Acad. Sci. 39, 884-893.

GRIFFIN D.R. 1958 Listening in the dark. 413 pp. Yale University Press, New Haven.

GRIFFIN D.R. 1963 The fishing bats of Trinidad. Animal Kingdom 66, 152-158. (Quotes Kingsley's 1871 account of fishing bats on Monos Island. Describes experiments on how bats locate food on or under the surface of water.)

GUNTHER A.E. 1940 There are thrills in cave exploration. The Aripo Caves. (Published anonymously as "by a Special Correspondent"). Trinidad Guardian, 26 May 1940, 17. (Spirited account of surveying the cave, and good description of Aripo Cave #1, with comments on caves #2 and #3.)

HAAS F. 1962 Caribbean land molluscs: Subulinidae and Oleacinidae. No. 58, Fauna of Curacao 13, 49-60 plus plates. (Records of *Subulina octona* (Bruguiere) and *Leptinaria Leptinaria lamellata* (Potiez & Michaud) in chimney of cave, Gasparo Grande; *lamellata* var. *concentrica* (Reeve) in Aripo Cave; *octogyrum plicatellum* (Guppy) in cave entrance, Gasparo Grande; *Diaopias beckianum* (Pfeiffer) in chimney of Tamana bat cave; and *Lamellaxis Allopeas gracilis* (Hutton) in Aripo Cave; all collected in 1955.)

HALLIDAY W.R. 1978 Caving in Trinidad. NSS News 36 (7), 150-151, July 1978. (Report of an exploratory visit on which the only cave visited was at the Asa Wright Centre.)

HALLIDAY W.R. 1980 Caving in Trinidad, 1977. Cascade Caver 19, 109-111, Sept.-Oct. 1980. (Reprint of Halliday 1978).

HALLIDAY W.R. 1982 Trinidad's Blue Basin, its cave and its philately. Speleo Stamp Collector 9, 13. Dec. 1982. (Three old Trinidad stamps - the 72 c of 1935 and the 60 c of 1938 and 1951 - show Blue Basin waterfall with a cave mouth beside it. The cave proved to be about 3 m long and almost man height, eroded in travertine.)

HERKLOTS G.A.C. 1961 The birds of Trinidad and Tobago. 287 pp. Collins. (pp 131-132 Guacharo or Oilbird or Diablotin. He notes that they nest in natural caves or clefts in the rock but does not specify the sites.)

HERRERA-BUNSEE H-D. 1989 Scenic Trinidad and Tobago. Published by Cariflex. Pages not numbered. (Brief hearsay descriptions of Caye l'Eglise Cave in Salibea Valley, Balamero Cave near Oropouche, Oropouche Cave, Tamana Caves, Crusoe's Cave in Tobago, Gasparee Cave, Dunstan Cave and Aripo Cave.)

HERRERA H-D 2006 Eco-locations of Trinidad and Tobago (Updated version of above. Contains further hearsay descriptions of several caves, including Lopinot. Descriptions insufficient to be of any practical use)

HILL S.B. 1969 The ecology of bat guano in Tamana Cave, Trinidad, West Indies. Ph.D. thesis, University of the West Indies, Trinidad. 310 pp. (Detailed study of physical and chemical properties, microflora and microfauna of bat guano in a limestone cave. Population densities and decomposition rates in guano are high compared to soil, but fewer species are present. Frugivorous bat guano is initially decomposed via bacteria and nematodes; below the surface fungus-eating mites dominate at densities up to 268 mites per ml. Insectivorous bat guano is eaten by a cockroach *Eublaberus distanti*; remaining chitin is decomposed by a fungus *Penicillium janthinellum* which is eaten by a mite *Rostrozetes foveolatus*)

HILL S.B. 1981 Ecology of bat guano in Tamana Cave, Trinidad, W.I. Proc. Eighth International Congress of Speleology I, 243-246. (Summary of the results detailed in Hill 1969, with diagrams of food chains in guano of insectivorous and frugivorous bats, and non-deposition (=laterally displaced) guano.)

HOFFMAN R.L. 1975 Chelodesmid Studies VII. A synopsis of the tribe Lepturodesmini (Polydesmida). Studies on the Neotropical Fauna 10, 183-200. (Description on pp 193-194, and figures 12 & 13 on p 191, of *Lepturodesmus joannae* from Tamana Main Cave, named for J.P.E.C. Darlington who collected it in 1965.)



HOLLISTER G.E. 1926 The guacharo or oil bird of the Arima Gorge. Bull. N.Y. Zool. Soc. 29, 139-145.

HOOPER J.H.D. 1958 Bat erosion as a factor in cave formation. Nature, Lond. 182, 1464. (Bell-holes occur in caves where bats have never roosted, cf King-Webster and Kenny 1958. May be solution features?)

HOLLISTER G.E. 1926 The guacharo or oil bird of the Arima Gorge. Zool. Soc. Bull. 29 (5), 139-161, New York Zool. Soc. (Description of visit to Arima Gorge, entering from upstream. Half-fledged bird taken back to New York Zoo, lived for four weeks.)

HORNADAY W.T. Unpubl. Quoted in Kingsley J.S. 1885.

HORNADAY W.T. 1925 A wild-animal roundup. Stories and pictures from the passing show. Charles Scribner's Sons, New York & London. 372 pp. (pp 138-145 "Hunting the cave-bird in Trinidad". Riveting account of a visit to the Huevos sea cave, during which 18 adults, 3 young, 3 nests and 20 eggs of oilbirds were collected.)

HORNADAY 1885 In: Kingsley, J.S. Ed. 1885 vol. IV p 386 (Oilbirds)

HUMMELINCK P.W. see WAGENAAR HUMMELINCK P. 1981 Land and freshwater localities. No. 192, Studies on the Fauna of Curacao and other Caribbean islands, 1-133.

JACKSON C.H.N. 1927 On some new collembola from Trinidad. Nat. Hist. 19 (9), 485-497.

JACOBS C. 1964 Guacharo Cave: Chamber of horrors in picturesque countryside. Sunday Guardian, 29 March 1964, 11. (Brief description of Oropouche Cave written after two scuba divers drowned there, including sketch section of cave. Recounts local tales of earlier disappearances.)

JACOBS C. & CARR S. 1964 Crumbling cave halts bid to reach 2nd diver's body. Nightmare death pool at Cumaca. Trinidad Guardian, 24 March 1964, 1-2. (Police and team of TRINMAR divers recovered one body 250 feet from the dive point after 14 hours, second body seen trapped under rocks.)

JAMES C.J.W. 1977 Studies on reproduction in the female Neo-tropical bat *Phyllostomus hastatus hastatus* (Pallas) with observations on its general biology and ecology in Trinidad W.I. Ph.D. thesis, University of the West Indies, Trinidad. 282 pp. (Part I pp 5-102 "General biology, ecology and reproductive biology". Collections and observations were made at Tamana and Guanapo caves and in old buildings, observations only at Lopinot and Caura caves. Map gives location of main roosts in Tamana Cave. *Phyllostomus* cluster in domes in the roof, with conical guano piles below containing soft fruity material. A list is given of the species of fruit identified from seeds in the guano, which also contained insect remains. The bat clusters consist either (i) mostly of males and a few immature females, or (ii) of a harem of adult females and juveniles with a few males. Gestation lasts five months, and most births occur in March-April in Tamana.)

JENNINGS G.M. 1989 A look at Diptera in Tamana Caves from light trap samples. Project Report, Zoology Department, University of the West Indies, Trinidad. 43 pp. (Superseded by Jennings & Darlington 1990.)

JENNINGS G.M. & DARLINGTON J.P.E.C. 1990 Flies in Tamana Cave. *BioSpectrum* ? (Compares the species composition of light trap samples taken 20 years apart. Changes in numbers caught in successive hours of trapping.)

JOBLING B. 1949 Host-parasite relationship between the American Streblidae and the bats, with a new key to the American genera and a record of the Streblidae from Trinidad, British West Indies (Diptera). *Parasitology* 39, 315-329. (Streblids are blood-sucking ectoparasites of bats, found only on species that roost in caves. The female fly retains an egg within her body and nourishes the larva until it is ready to pupate. On pp 322 and 326-328 "Record of Streblidae from Trinidad" he lists 14 species of streblids in 9 genera, collected from 11 species of bats in three families. Full details of host and collection site are given.)

JOHNSON C. 1969 A new genus of Ptiliidae (Coleoptera) from Tamana Cave, Trinidad. *Entomologist* 102, 145-148. (Describes adult males and females of *Micridina hilli*, named for S.B. Hill who collected the material. This is a very small beetle only half a mm long found in bat guano in the Upper Part of Tamana Main Cave. It shows no adaptation to cave life. Larvae are mentioned but not described.)

JUNGE G.C.A. & MEES G.F. 1958 The avifauna of Trinidad and Tobago. *Zoologische Verhandlingen (Leiden)* 37, 1-172. (pp 49-50 very brief description, no biological information. Springhill colony (Asa Wright Centre) contained about ten birds, having previously been abandoned for some years.)

KAWAKATSU M. & MITCHELL R.W. 1984 Redescription of *Dugesia arimana* Hyman, 1957, based upon material from Trinidad, St. Vincent and Venezuela (*Turbellaria*, *Triclada*, *Paludicola*). *Bull. Fuji Women's College* 22, 63-77. (Detailed descriptions of the anatomy, including diagrams of the genitalia, of specimens of *Dugesia arimana* from four sites. One of the sites was Tamana Main Cave, where the samples were collected from small underground pools by J.A.L. Cooke in 1972. Ecological information and a map are quoted from Kenny 1978-79 and pers. comm.)

KENNY J.S. 1977 Theodore Roosevelt's visit to Oropouche Cave. *Living World* 1977, 45. (Reprints a photograph taken in 1911 (?) of Roosevelt and two other men at the mouth of the cave. According to Williams (1922) this photograph, which was also printed in Roosevelt (1917), was taken by F.W. Urich)

KENNY J.S. 1978-79 Floor plan, environment, and fauna of Tamana Caves. *Living World (Journal of the Trinidad & Tobago Field Naturalists' Club)* 1978-79, 5-9. (Brief description of Tamana Main Cave with two maps. This is followed by a more detailed account of the atmosphere inside the cave, including diurnal and vertical temperature profiles, humidity and air movements. Ventilation in the Deep Part is by convection driven by metabolic heat produced by the bats. There is marked temperature stratification by day but this breaks down as a result of turbulent mixing during the evening exodus of bats from the cave. A very brief account of the cave fauna is given.)

KENNY J.S. 2008 *The Biological Diversity of Trinidad and Tobago*. Prospect Press, Port of Spain, Trinidad. (Chapter 17, pp 145-168 gives a description of the fauna of Tamana, Aripo #1, Cumaca and Gasparee Caves)

KEVAN D.K.McE. 1951 Records of Trinidad earwigs (Dermaptera). *Ann. Mag. nat. Hist.* (ser. 12) 4, 249-257. (On pp 251-252 he records two species collected from Aripo Cave by D.J. Billes in 1941-42: *Spandex percheron* (Guerin-Meneville & Percheron, 1835) "among bat and *Steatornis guano*", and *Euborellia caraibea* Hebard, 1922.)

KING-WEBSTER W.A. & KENNY J.S. 1958 Bat erosion as a factor in cave formation. *Nature*, Lond. 181, 1813. Reprinted in *Cave Science* 4, 272. (They describe bell-shaped holes in the roofs of caves (citing Tamana Caves) 3 to 6 feet high and 1.5 to 2.5 feet in diameter at the mouth, in which clusters of bats roost by day. They suggest that the scratching of the bats claws in soft granular rock caused the erosion of these holes.)

KINGSLEY C. 1889 At last , A Christmas in the West Indies. MacMillan & Co., London and New York 334 pp, illus. First published 1871. (Chapter IV. " Monos". Describes unsuccessful attempts to reach oilbird colonies in the sea caves on Huevos Island (pp 105-107) and on the landward side of the Boca de Monos (pp 110-111). Mentions other colonies known in limestone caves in the northern mountains. Fish-eating bats seen flying towards "a cave nearby" on Monos at dusk (p 107). Proceeds to quote a full translation of Humboldt's account of oilbirds in the Cave of Caripe in Venezuela (pp 111-114).)

KINGSLEY J.S. (editor) 1885 The Standard Natural History. Boston: S.E. Cassino & Co. (Vol.4 "Birds" pp 385-387 "Oilbird". Brief description, including figure of skull. Quotes unpublished account by Hornaday of visit to Huevos sea cave - a shorter and more formal account of the visit described in Hornaday 1925.)

KOHL G.M., SONENSHINE D.E. & CLIFFORD C.M. 1965 The systematics of the subfamily Ornithodorinae (Acarina: Argasidae) II Identification of the larvae of the Western Hemisphere and descriptions of three new species, *Ann. Entomol. Soc. Amer.* 58, 331-364. (Records *Ornithodoros viguerasi* Cooley & Kohls (Argasidae) on several species of Phyllostomatidae bats in Trinidad. Quoted in Tamsitt & Fox 1966.)

KOMISARCIK K. (editor) 1979 Caves of Trinidad issue. Bloomington, Indiana Grotto Newsletter 14 (2), 18-39, Feb. 1979. Reprinted in *Speleo Digest* 1979, 196-203. (Descriptions of Oropouche Cumaca Cave (pp 27-29 with a map on p 28), Caura Cave (pp 29-31 with a map on p 30), Tamana Dry Cave (pp 31-33 with a map on p 32), and Tamana Main Cave (pp 33-34). Gives a list with notes of other caves, 21 in total (pp 34-38) and discusses potential for finding new caves in Trinidad (p 39).)

KOMISARCIK K. 1979 Jungle, slime, goo, oilbirds and roaches - - The Bloomington Trinidad Expedition. *NSS News* 37 (4), 75-76, April 1979. (Brief report of a 16-day visit to assess prospects of finding new caves in Trinidad).

KUENY, J.A. & DAY, M.J. 1998. An assessment of protected karst landscapes in the Caribbean. *Caribbean Geography* 9: 87-100

LAMBIE I. 1980 Birds of eternal darkness. *Trinidad Naturalist* 3 (7), 6. (Based on Snow 1961, 1962b.)

LANE J. & AITKEN T.H.G. 1956 Chaoborinae from Trinidad, B.W.I. (Diptera, Culicidae). *Ann. ent. Soc. Amer.* 49, 530-543. (On p 530-531 they record *Corethrella downsi* Lane 1943 from "Aripo Caves, elev. 2500 ft", collected by G.W. Downs on 20 March 1955. "The immature stages may lie quiescent below the water surface for long periods if disturbed.

Specimens from Aripo Caves lay at the surface with the abdominal segments curved down; the pupae were sluggish".)

LATHAM J. 1823 A general history of birds. Published privately at Winchester. (Vol. 7 p 366-368 Information from J.V.Thompson, dating from 1803-1809. Diablotin or "dumpy duck" was a local delicacy. Sea caves on islands in the Bocas were entered in April/May, the boats were filled with young birds, and any adults that could be knocked down. Sold for 1 shilling to 18 pence each in the market. Latham suggested (correctly) that this might be the guacharo of Cumana, Venezuela.)

LEOTAUD (L,OTAUD) A. 1866 Oiseaux de l'île de Trinidad (Antilles). Chronicle Publ. Office. (pp 65-69 No. 31. Describes the Diablotin, *Steatornis caripensis* Humboldt, noting that they live in caves by the sea or in the interior. Mentions regurgitated seeds, the characteristic smell, nest construction, behaviour, and the methods used to catch them.)

LEWIS W.C. 1974 Histoplasmosis in caves. NSS News 32 (2), 22-26. (The fungus occurs in guano but also in bats, where it causes ulceration of the intestine and infects the faeces directly. p 24 Known to occur in Aripo Caves #1 and #3, Oropouche Cave and Tamana Main Cave. No sources quoted.)

LINDBLAD J. 1969 Journey to red birds. Collins, 165 pp. (Ch 4 pp 46-58 Birds in eternal darkness. Oilbird colonies at Asa Wright and Oropouche Cave filmed using floodlights. Mentions an un-named bat cave, probably Guanapo Cave. Ch 5 pp 59-70 Seeing in the dark. Sniperscope used to watch oilbirds behaviour in Asa Wright colony, and infrared-sensitive film used to photograph them. Crabs seen attacking nestlings. Ch 6 pp 71-82 Snakes and bats. On pp 71-75 he briefly describes two of the four Aripo Caves. Photographs of birds and of caves.)

McATEE W.L. 1922 Notes on the food of the Guacharo (*Steatornis caripensis*). The Auk 39, 108-109. (Identifies seeds in material collected from the oilbird cave on Huevos Island by Chapman in 1893).

McCRACKEN G.F. & BRADBURY J.W. 1977 Paternity and genetic heterogeneity in the polygynous bat, *Phyllostomus hastatus*. Science 198, 303-306. (A brief account of studies carried out on bats roosting in Guanapo Cave, Caura Cave and Lopinot-Darceuil Cave in 1976. Genotypes were determined using blood samples.)

McCRACKEN G.F. & BRADBURY J.W. 1981 Social organisation and kinship in the polygynous bat *Phyllostomus hastatus*. Behav. Ecol. Sociobiol. 8, 11-34. (Detailed account of work carried out on bats roosting in Guanapo, Caura, Lopinot-Colado and -Darceuil Caves.)

MEES G.F. 1974 The Auchenipteridae and Pimelodidae of Suriname (Pisces, Nematognathi). Zoologische Verhandlungen (Leiden) 132, 1-256 + plates 1-15. (pp 160-165 Norman's *Caecorhamdia urichi* is revised to *Rhamdia quelen urichi* (Norman). Norman's original specimens were eyeless and white. Mees caught a fish that was eyeless but normally pigmented. Other intermediates (reported by J.Price) indicate that this is not a separate species, but its regular occurrence in the cave indicates it is not a freak, but evolved in the underground waters upstream.)

MENDEZ R.A. 1984 A certain death. Natural History 93 (10), 118-119. (Fallen bat attacked by cockroaches. Probably in Guanapo cave.)

MEYRICK 1935 *Ptilopsaltis*, n.g. *Exotic Microlepidoptera* 4, 577. (Brief description of a new genus and species of tinaeid moth, *Ptilopsaltis synchorista*, collected in Trinidad by D. Vesey Fitzgerald.)

MEYRICK 1936 *Ptilopsaltis synchorista* Meyr. *Exotic Microlepidoptera* 5, 54. (Addendum to the above : "Larva feeding on seeds disgorged by the Guacharo bird on floor of limestone cave (Dr. Vesey Fitzgerald).")

MILLAR R.H. 1962 Some Ascidians from the Caribbean. No. 59, *Studies on the Fauna of Curacao and other West Indian islands*, 61-77. (Sponge *Ecteinascidia tortugensis* collected by P.W. Hummelinck in Gasparee Cave).

MURPHY W.L. 1986 A birder's guide to Trinidad and Tobago. Peregrine Enterprises Inc., Maryland, USA. (Mentions oilbird colonies at Asa Wright, Aripo, and Oropouche.)

NATIONAL AUDUBON SOCIETY 1970 onwards *American Birds*. Report of Christmas bird count. (Number of oilbirds present in the colony in Arima Gorge.)

NORMAN J.R. 1926 A new blind catfish from Trinidad, with a list of blind cave-fish. *Ann. Mag. nat. Hist.* 18 (9), 324-331. (pp 325-326 Description of *Caecorhamdia urichi* collected by F.W. Urich from a pool in the interior of the "Guacharo Cave" (= Oropouche Cave). Figured on p 326, with a figure of the very similar epigeal fish *Rhamdia queleni* Quoy & Gaimard on p 327.)

OBER F.A. 1908 A guide to the West Indies and Bermudas. T. Fisher Unwin, London. (p 485 The Cave of the Guacharos on Huevos can be entered only when the sea is smooth. It is full of oilbirds that can be eaten or used for oil. There are "other caves in the vicinity occupied by both vampire and piscatorial bats, which are numerous at night above the surface of the sea.")

OMAH-MAHARAJ I.R. 1987 Studies on the epidemiology of American trypanosomiasis in Trinidad. Ph.D. thesis, University of the West Indies, Trinidad. (Of 49 blood-sucking bugs *Panstrongylus geniculatus* (6 males, 2 females, 41 nymphs) collected in caves, 28 (57%) were infected with *Trypanosoma*, the causative organism of Chagas disease. The bugs were collected from Tamana Dry Cave and Caura, Paramin and Perseverance Caves.)

ORDWAY E. 1953 The big Aripo Cave of Trinidad, The British West Indies. *The Column* 1 (3), 2, March 1953. (Oilbirds near the entrance, and also hundreds of bats *Glossophaga soricina*. Below three drops were chambers in which *Anoura geoffroyi* roost in clusters in small "potholes" in the ceiling. The walls were "covered with spiders, scutigera, crane flies" etc.)

OXFORD SCIENTIFIC FILMS 1981 Focus on nature. London, Faber and Faber. 184 pp. (see Cooke 1981, Thompson (Ed.) 1981.)

PALMER J.D. & GOODENOUGH J.E. 1978 Mysterious monthly rhythms. *Natural History* 87 (10), 64-69. (Flatworms from Tamana Cave)

PAWSON K. c1948 Explorations in the caves and potholes of Trinidad, W.I. 1945-1946 (with brief notes on the Barbados caves). Unpublished article, 58 pp and 3 maps. (Thorough descriptions of locations and layout of caves.)

PAWSON K. 1974 Caving in Trinidad and Barbados. *Canadian Caver* 6 (1), 21-26, June 1974. (Two excerpts from the above manuscript. pp 21-25 Description of Aripo Cave #1, and how to negotiate obstacles in it.)

PEARSE A. (editor) 1956 Mitto Sampson on calypso legends of the Nineteenth Century. *Caribbean Quarterly* 4, 250-262. (pp 252-253 refers to Begorrat Cave, up a steep hillside to the West of Diego Martin, reputedly used for entertainment by the estate owner Begorrat in the 1790s. See also de Verteuil 1987.)

PETERKIN D.D. 1988 The parasites of *Natalus tumidirostris haymani*. Project report, Zoology Department, University of the West Indies, Trinidad. 51 pp. (In bats from Tamana Caves, four endoparasite species were found: three helminths in the intestine, and one in the gall bladder. They mostly occurred as mixed infestations in the host. No blood parasites were found.)

PLUMMER D.C. 1911 What happened in the "Bottomless Pit". The story of a strange treasure-hunt. *The Wide World Magazine* 28 (164), 136-140. Nov. 1911. (Dramatic tale of man and his wife who fell into a vertical shaft near Arima, landed in a heap of moss, crawled through underground passages and eventually emerged on the coast near Blanchisseuse.)

POWELL C. 1983 Oilbirds: endangered species? *Trinidad Naturalist* 4 (11), 17. (Colony at Asa Wright contained only 14 birds compared to 36 two years earlier.)

PRINCIS K. & KEVAN D.K.McE. 1955 Cockroaches (Blattariae) from Trinidad, B.W.I., with a few records from other parts of the Caribbean. *Opusc. Ent.* 20, 149-169.

QUESNEL V.C. 1976 Report on the trip to the Oropouche Cave on 7th March 1976. *Bulletin of the Trinidad & Tobago Field Naturalists' Club (= Bull. T&T FNC)* 2nd quarter 1976. (Includes a floor plan and section produced by the party, who measured the length of the cave to be 734 feet. They also counted about 250 oilbird nests.)

QUESNEL V.C. 1978a Field trip to the Oropouche Cave - 19th March 1978. *Bull. T&T FNC* 3rd quarter 1978. (Some members went into the cave, others searched unsuccessfully for a sink hole 2 Km West of the cave.)

QUESNEL V.C. 1978b Field trip to the Aripo Cave on 30th April 1978. *Bull. T&T FNC* 3rd quarter 1978. (The party made measurements and took compass bearings in the part of the cave below the first drop. They counted about 100 occupied oilbird nests.)

QUESNEL V.C. 1978c The search for the Oropouche sink on 21st May 1978. *Bull. T&T FNC* 3rd quarter 1978. (Another unsuccessful attempt to find the sink hole upstream of the cave.)

QUESNEL V. 1978d Field Naturalists' Club activities. *Trinidad Naturalist* 2, 49. (Brief accounts of the visit to Oropouche Cave on 19 March and to Aripo Cave on 30 April. See also Quesnel 1978a,b.)

QUESNEL V.C. 1980 Field trip to Tamana Cave on 26th Oct. 1980. *Bull. T&T FNC* 1st quarter 1981. (.)

QUESNEL V.C. 1985 Field trip to the Cumaca Cave on 28 April 1985. *Bull. T&T FNC* 3rd quarter 1985. (.)

REDDOCK R. 1974 Survey of private nature parks existing and potential. National Environment and Conservation Council Research Paper no. 2/74, Ministry of Planning and Development, Government of Trinidad and Tobago. (4.1.7. Oropouch Caves / Brothers' Estate pp 25-28. Estate of 200 acres at 100-500 feet above sea level, with an overseer and a few workers. Track 2-3 miles from the road, in bad condition. About 300 people a year visit the cave.))

RIDGEWAY R. 1884 On a collection of birds made by Messrs. J.E. Benedict and W. Wye, of the U.S. Fish Commission Steamer "Albatros". Proc. U.S. Nat. Mus. 7, 172-180. (Lists two specimens of oilbirds from "Mona" island.)

ROOSEVELT T. 1917 A naturalists' tropical laboratory. Scribner's Magazine 61, 46-64. (pp 61-64 concerns oilbirds. On pp 63-64 he gives a brief description of the Oropouche Cave mentioning oilbirds and their nests, and guano with "fungi" (sprouting seeds?). He saw many bats and a large toad. "Insects swarmed, including crickets, earwigs and moths". Further in the roof was lower and only bats occurred.)

ROSS E.S. 1965 Birds that "see" in the dark with their ears. National Geographic 127 (2), 282-290. Feb. 1965. (Popular description of a visit to an oilbird cave in Peru, illustrated with photographs from an un-named "much smaller" cave in Trinidad).

SANDERSON I.T. 1940 Caribbean treasure. 292 pp. Hamish Hamilton, London. (Ch II pp 35-56 Limestone moloch. Describes a cave opening onto a ledge on a rock wall with a side chamber containing stalactites and pools, and a steep descending passage ending at a clay floor with charcoal, large worms and many dead crabs. Bats *Artibeus planirostris* roosting in clusters in "inverted potholes" in the roof near the entrance, and a few vampire bats *Desmodus rotundus* in cracks. Caught a small lizard *Proctoporus shrevei* described as having luminous spots that flash when it is disturbed. Ch III pp 57-77 Cave of the Diablotin. Aripo Cave had large numbers of bats *Glossophagasoricina* roosting in cleft in floor near entrance. A small opossum *Marmosa chapmani* was killed there. Oilbird colony in twilight zone, with guano beds up to 17 feet thick. Deeper in the cave a bat *Chilonycteris rubiginosa* was caught. Claimed to have seen a fish in a pool, but the topographic description does not fit this cave. p 105 A sea cave on Centipede Island contained many fish-eating bats *Noctilio leporinus*. 0

SCUDDER E., DARLINGTON J.P.E.C. & HILL S.B. 1967 A new species of Lygaeidae (Hemiptera) from the Tamana Caves, Trinidad. Ann. Spel. 22 (2), 465-469. (Full description of male and female adults of *Cligenes subcavicola*, and brief description of nymphs and eggs. *Cligenes* occurs in the Upper Part of Tamana Main Cave, on and in bat guano. Densities vary, with locally up to 100,000 per sq.m. It is either a seed-eater, or a predator of the guano fauna. Another bug *Phasmatocoris spectrum* Breddin (Reduviidae) occurs on walls in the same part of the cave.)

SHAW, T.R. 1993. The history of cave studies in Trinidad, Jamaica, the Bahamas and some other Caribbean islands. Acta Carsologica 22: 11-76. Pages 15-35 provide a history of cave exploration in Trinidad & Tobago from the early 19<sup>th</sup> century onwards, taking in the phases of oilbird exploitation, mass tourism, geological mapping, rabies control and scientific exploration. Contains a good bibliography and references to major cave systems.

SHOWKER K. & ELLIS G. 1989 The outdoor traveller's guide Caribbean. Stewart, Tabori & Chang, New York. - pp. (Brief comments on Gasparee Cave p 426, Aripo Cave p 436, accessibility etc. p 451.)

SNOW D.W. 1958 Trinidad's oilbirds are yielding new facts. *Animal Kingdom* 61, 117-121. (Superseded by Snow 1961, 1962b)

SNOW D.W. 1961 The natural history of the oilbird, *Steatornis caripensis*, in Trinidad, West Indies. Part 1. General behaviour and breeding habits. *Zoologica* 46, 27-47 + plates I-II. (Detailed study of the oilbird colony in Spring Hill gorge over three and a half years. Anatomy, navigation, olfaction; behaviour in relation to nest-building, incubation of eggs, and feeding of young; development of nestlings.)

SNOW D.W. 1962a Notes on the biology of some Trinidad swifts. *Zoologica* 47, 129-139. (The chestnut-collared swift *Cypseloides rutilus* nests on cliffs or in gorges. One nest was found in a sea cave, and adult birds were seen entering and leaving La Vache sea cave (which contains a colony of oilbirds) and a sea cave on the N coast of Huevos Island, in the breeding season.)

SNOW D.W. 1962b The natural history of the oilbird, *Steatornis caripensis*, in Trinidad, West Indies. Part 2. Population, breeding ecology and food. *Zoologica* 47, 199-221. (Estimates the numbers of birds in eight breeding colonies, found in the Oropouche Cave, four caves at Aripo, Spring Hill gorge, La Vache and Huevos sea caves. Five small colonies have recently become extinct, in sea caves at Chachacare, l'Ance Pawa, Saut d'Eau and Maracas Bay, and at Acono gorge. Gives details of nesting and moulting cycles, and breeding success. Analysed freshly regurgitated seeds to determine food intake at different seasons.)

SNOW D.W. 1975 Oilbirds. Cave-living birds of South America. *Stud. Speleol.* 2 (7-8), 257-264.

SUTER H.H. 1954 The general and economic geology of Trinidad, B.W.I. HMSO, 134 pp. (p 81 Aripo Caves are indicators of underground streams in limestone areas, but so far none have been tapped for water supply.)

SZYMCZAKOWSKI P.W. 1975 Formes cavernicoles d'*Adelopsis brunneus* Jeann. du Venezuela et de l'île de Trinidad (Coleoptera: Catopidae). *Bol. Soc. Venezolana Espel.* 6 (11), 13-24. (Type was from Colombia. Five subspecies described, one from Cueva del Guacharo, Caripe; three from other Venezuelan caves; and *brevicollis* from Trinidad - "Oropouche, Oil Bird Cave, dryish bat guano in last chamber, under cave sides" collected by T. Clay on 9 Jan 1961. Briefly described on p 21, illustrated on p 20.)

TAMSITT J.R. & FOX I. 1970 Records of bat ectoparasites from the Caribbean Region (Siphonaptera, Acarina, Diptera). *Canad. J. Zool.* 48, 1093-1097. (All information about Trinidad is quoted from published sources.)

THOMAS, O. 1893. A preliminary list of the mammals of Trinidad. *J. Trinidad Field. Nat. Club* 1(7): 158-168. Description of bats specimens from Point Gourde and Monos.

THOMPSON G. (editor) 1981 *Focus on Nature*. Oxford Scientific films. 184 pp. Faber & Faber, London. (See Cooke 1981.)

URICH F.W. 1895 A visit to the guacharo cave of Oropouche. *Journal of the Trinidad Field Naturalists' Club* 1895, 231-234. (Oilbirds found near the cave mouth and numerous bats *Chilonycteris rubiginosa* further in.)



URICH F.W. 1956 Notes on some Trinidad bats, with additional observations by Ludolf WEHEKIND. *Journal of the Trinidad Field Naturalists' Club* 1956, 18-21. (Gives specific cave localities for a few species.)

VENMANS L.A.W.C. 1963 Caribbean land molluscs: Streptaxidae. No.61, *Studies on the Fauna of Curacao and other Caribbean Islands* 14, 41-76. (Record of *Streptaxis Streptatomglaber* Pfeiffer in wet plant debris in dark cave entrance, Gasparo Grande island, collected by P.W. Hummelinck in 1955.)

VERTEUIL A. de 1987 A history of Diego Martin 1784-1884. Paria Publishing Co. Ltd. (Three un-numbered pages between pp 40 and 41, with photographs and a sketch map. Begoratt's cave was a natural limestone cave underneath the estate house, used as cellars and for entertainment. Entrances have since become blocked by earth.)

VERTEUIL E. de & URICH F.W. 1936 The study and control of paralytic rabies transmitted by bats in Trinidad, British West Indies. *Trans. Roy. Soc. Trop. Med. Hyg.* 29 (4), 317-347. (A thorough and detailed account with maps of roosting sites including caves. The vampire bat *Desmodus* transmits the rabies virus to livestock and humans while feeding on their blood, but two fruit-eating bat species were also found to be infected.)

VERTEUIL, L.A.A. de 1858. Trinidad – its geography, natural resources, administration, present condition and prospects. Ward and Lock, London. Mention of Huevos Cave and guacharo, p. 293.  
WAGENAAR HUMMELINCK P. 1981 Land and fresh-water localities. No. 192, *Studies on the Fauna of Curacao and other Caribbean islands*. 133 pp + 49 plates. (pp 54-57 list of collecting sites includes Tamana bat-cave entrance and chimney, Aripo cave oilbird roosts, and Gasparo Grande island cave chimney.)

WALL G.P. & SAWKINS J.G. 1860 Report on the Geology of Trinidad. *Mem. Geol. Survey*, London, HMSO. (pp 27-29 Cave in limestone at Diego Martin (drawing on p 28) is occupied by vast numbers of bats. Oropuche cave mouth, 30 ft high by 14 feet wide for the first 100 ft, has a stream flowing out. Occupied by oilbirds, which are also found in smaller limestone caves at Aripo and Arima, and one at Acono in slate.)

WEHEKIND L. see URICH F.W. 1956

WENZEL R.L. & TIPTON V.J. 1966 Ectoparasites of Panama. *Field Museum of Natural History*, Chicago.

WENZEL R.L., TIPTON V.J. & KIEWLICA A. 1966 The streblid batflies of Panama (Diptera: Calypterae: Streblidae) pp 405-675 in *Ectoparasites of Panama* Eds. WENZEL R.L. & TIPTON V.J. *Field Mus. of Nat. Hist.*, Chicago. (Record *Trichobius costalimai* Guimaraes found on *Phyllostomus discolor joblingi*, *Paradyschiria* Speiser found on *Noctilio leporinus* in Trinidad. Quoted in Tamsitt and Fox 1970.)

WHEELER W.M. 1922 The ants of Trinidad. *Amer. Mus. Novitates* 45, 1-16. (pp 9-11 describes and figures of *Spelaemyrmex urichi* gen. & sp. nov. from 11 specimens collected by F.W. Urich in "the Guacharo cave". He considered the ants to be cavernicoles. See also Wilson 1962)

WILLIAMS C.B. 1922 Notes on the food and habits of some Trinidad birds. *Trinidad and Tobago Agric. Bull.* 20, 123-185. (General comments on oilbirds, 167-171. He visited

Oropouche Cave on 23 April 1916 with Ulrich and Freeman, and also quotes Hornaday's visit to Huevos sea cave, and describes the cave on the First Boca. One bird shot in the latter cave had mites, Megninia, on its feathers. He visited the Arima Gorge colony with Ulrich in 1918, but found the Acono Gorge empty. Species described from material they collected in Oropouche Cave were two flies (Edwards, 1918), a centipede (Chamberlin, 1918) and a woodlouse Onychidae which he does not name.)

WILLIAMS T.C.& J.M. 1967 Radio tracking of homing bats. Science 155, No. 3768, 1435-1436.

WILLIAMS T.C.& J.M. 1970 Radio tracking of homing and feeding flights of a Neotropical bat, *Phyllostomus hastatus*. Anim. Behav. 18, 302-309.

WILLIAMS T.C., J.M. & GRIFFIN D.R. 1966 The homing ability of the echolocating bat *Phyllostomus hastatus* with evidence for visual orientation. Anim. Behav. 14, 468-473.

WILSON E.O. 1962 The Trinidad cave ant, *Erebomyrma (Spelaeomyrma) urichi* (Wheeler), with a comment on cavernicolous ants in general. Psyche 69, 62-72. (Rediscovered the ant in Oropouche Cave. First nest found in guano 30 m in from the cave mouth, where three other ants also occurred : *Mesoponera constricta* Mayr, *Odontomachus haematoda* (Linne.) and *Solenopsis Diplophoptrum tenuis* Mayr. Second nest 200-300 m in, at end of oilbird nesting zone, where it was the only ant present. No ants found in upstream chamber. First nest removed to lab. to observe behaviour. Ants often forage in caves in the tropics, but are opportunists not cavernicoles.)

WIRTH W.W. & BLANTON F.S. 1971 New Neotropical sandflies of the *Culicoides debilipalpis* group (Diptera: Ceratopogonidae). Proc. ent. Soc. Washington 73, 34-43. (Describes and illustrates *Culicoides darlingtonae* (named for J.P.E.C. Darlington who collected the material) on pp 39-41. Adults were abundant in light trap samples from both Upper and Deep Parts of Tamana Main Cave, but larval stages were not found, and attempts to rear adults from bat guano were not successful.)

WOLCOTT, G.N. 1938. Fredrick William Ulrich 1870-1937. J. Econ. Ent 31 (2) : 326. Brief obituary of the caving pioneer.

WORTH C.B. 1967 A naturalist in Trinidad. 292 pp. J.B. Lipincott Co., Philadelphia and New York. (On pp 128-131 he describes the Asa Wright colony of oil birds, and another in "Aripo Cave" (evidently the Oropouche Cave) which he says was reached by ducking under a low roof. Inaccurate.)

WRIGHT M. 1979a Some inhabitants of Trinidad caves. Bloomington Indiana Grotto Newsletter 14, 21-26, Feb.8 1979. (Well-researched account of oilbirds, bats and cave fauna embedded in a popular description of Oropouche Cave and Tamana Main Cave. Illustrated with sketches of animals.)

WRIGHT M. 1979b Underworld creatures of Trinidad. NSS News 37, 76-78, April 1979. (Reprint of Wright 1979a.)

Anon. 1940 There are thrills in cave exploration. The Aripo Caves. Trinidad Guardian, 26 May 1940, 17. "By a special correspondent" - identified as A.E. GUNTHER and listed above.

Anon. 1976 Crusoe's Cave, neglected site of our romantic past. The Tobago News (Scarborough) 1 (16), 4.

Anon. 1964 Trinidad Guardian, 23 March 1964 p 1. 2 explorers feared dead. (Report of the disappearance of Adam Richards and Victor Abraham in the pool in the Guacharo Cave, Oropouche the previous day.)

Anon. 1964 Daily Mirror (Trinidad) 24 March 1964, 12-13. (Report of the death by drowning in Oropouche Cave syphon of Victor Abraham and Adam Richards on Sunday 22 March 1964. A professional diver recovered the body of Abraham and saw the body of Richards pinned under fallen rock debris.)

—  
Anon. 1966 Homing ability strong in some Trinidad bats. i  
Science Newsletter 89, 331. May 1966.