

NBR GRASSHOPPER SPECIES METADATA:

A. COLOR –

- 1) Gray = year of study
- 2) Blue = HILL site (UTM 706453 EAST 5249980 NORTH)
- 3) Rose = TRIANGLE site (UTM 713570 EAST 5248100 NORTH)
- 4) Green = TRISKY site (UTM 711317 EAST 5242500 NORTH)
- 5) Light Blue = TOWER 2 – GRASSY site (UTM 708205 EAST 5244024 NORTH)
- 6) Orange = Misc. sites [HILL 2 (UTM 706407 EAST 5249831 NORTH), PAULINE (UTM 705717 EAST 5247255 NORTH), NORTH BOUNDARY (UTM 710177 EAST 5250023 NORTH), TOWER 2 – ROCKY site (UTM 708212 EAST 5243906 NORTH), WESTSIDE (UTM 708763 EAST 5244773 NORTH), TOWER 1 (UTM 709036 EAST 5247149 NORTH)]

B. YEAR –

- 1) Study = began in 1981 and has continued every year.
- 2) Annual data = average of values across the bimonthly samples within a year: EARLY JUNE (6/1 – 6/15), LATE JUNE (6/16 – 6/30), EARLY JULY (7/1 – 7/15), LATE JULY (7/16 – 7/31), EARLY AUGUST (8/1 – 8/15), LATE AUGUST (8/16 – 8/31), EARLY SEPTEMBER (9/1 – 9/15), LATE SEPTEMBER (9/16 – 9/30).

C. WITHIN EACH SITE –

- 1) Average density. Grasshopper density averaged over biweekly samples within a year when density is non-zero (see NBR GRASSHOPPER DENSITY METADATA).
- 2) Subfamily. Subfamily of grasshopper species.
- 3) Species. Grasshopper species by subfamily and listed from smallest to largest adult body mass (left to right) within each subfamily (Belovsky et al. 1990).
- 4) Values. Proportion of grasshopper individuals by species over all bimonthly samples within a year, where the individuals are collected in two ways:
 - a) Prior to 1986 and for all HILL samples, the individuals captured in the 100 m² areas encircled with nylon insect screen (1.52 m high) at select times of the year (peak adult density), which were used to estimate density (see NBR GRASSHOPPER DENSITY METADATA), were stored in 70% ETOH. Grasshoppers were caught by two individuals using butterfly nets and those escaping by flying over the enclosing net were counted and identified in flight.
 - b) Starting in 1986, a sweep sample of 50 individuals was collected bimonthly from late-May to Mid-October and preserved in 70% ETOH.Species identifications were made using the following keys: Brooks 1958; Brusven 1972; Handford 1946; Hebard 1928, 1934; Helfer 1963; Otte 1981, 1984; Pfadt 2002; Scoggin & Brusven 1972; Scott 2010.

REFERENCES.

Belovsky, G.E., J.B. Slade, & B.A. Stockhoff. 1990. Susceptibility to predation for different grasshoppers: and experimental study. *Ecology* 71: 624-634.

- Brooks, Arthur R. 1958. Acridoidea of Southern Alberta, Saskatchewan, and Manitoba (Orthoptera). Canadian Entomologist, Supplement 9, Vol. 90: 1-92.
- Brusven, M. A. 1972. Differentiation and Ecology of Common Catantopinae and Cyrtacanthacridinae Nymphs (Orthoptera: Acrididae) of Idaho and Adjacent Areas. Melanderia 9: 1-31.
- Handford, R.H. 1946. The identification of nymphs of the genus Melanoplus of Manitoba and adjacent areas. Scientific Agriculture 26: 147-180.
- Hebard, Morgan. 1928. The Orthoptera of Montana. Proceedings of the Academy of Natural Sciences of Philadelphia, Vol. 80: 211-306.
- Hebard, Morgan. 1934. The Dermaptera and Orthoptera of Illinois. Illinois Natural History Survey Bulletin, Vol. 20, Article 3: 125-279.
- Helfer, Jacques R. 1963. How to Know the Grasshoppers, Cockroaches and Their Allies. Wm. C. Brown Company, Dubuque, Iowa.
- Otte, D. 1981. The North American Grasshoppers. Vol. I. Acrididae: Gomphocerinae and Acridinae. Harvard University Press, Cambridge, MA.
- Otte, D. 1984. The North American Grasshoppers. Vol. II. Acrididae: Oedipodinae. Harvard University Press, Cambridge, MA.
- Pfadt, Robert E. 2002. Field Guide to Common Western Grasshoppers. Third Edition. USDA APHIS Wyoming Agricultural Experiment Station Bulletin 912.
- Pfadt, Robert E. Grasshopper Species Fact Sheets. Wyoming Agricultural Experiment Station Bulletin 912. Species Fact Sheets.
http://www.sidney.ars.usda.gov/grasshopper/ID_Tools/F_Sheets/index.htm
- Scoggan, Allen C., and M. A. Brusven. 1972. Differentiation and Ecology of Common Immature Gomphocerinae and Oedipodinae (Orthoptera: Acrididae) of Idaho and Adjacent Areas. Melanderia 8: 1-76.
- Scott, Ralph D. 2010. Montana Grasshoppers, Katydid & Crickets: A Pictorial Field Guide to the Orthoptera. MagpieMtGraphics, Billings, MT.