

Googling Insects as a New Trend in Cultural Entomology: An Italian Perspective

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Abstract: Cultural entomology (CE) explores the interactions between the world of insects and mankind. Since the internet plays a major role in nowadays life, it would be of great interest to investigate the insects-related internet usage and activities. However, there are very few studies about this. For this reason, inspired by the seminal work carried out by the Japanese Takada, we decided to replicate his findings. We analyzed with Google Trends and with the wavelet power spectrum analysis (WPSA) the hit-search volumes of the most common insects. We found that the five most commonly searched insects are bees, butterflies, mosquitoes, ants and spiders which are arachnids, but are commonly believed to be insects. We found a seasonality for some insects, as confirmed by the WPSA, and with peaks related to the seasonal period in which the insects are most visible, while we could not detect any regularity or trend for other insects, which are not clearly related to any particular season. In addition, we proved that, at least in some cases, hit-search volumes were influenced by the media and that the degree of seasonal regularity as measured by the WPSA was variable. Thus, we have proven the robustness of previous finding, extending their validity also in another culture and another context. Therefore, rather than being confined to a specific culture, googling insects could be a universal behavior and attitude, even though with some cross-cultural differences. Further systematic research is needed to shed light on this topic.

Keywords: Cultural entomology (CE), google trends, insect, Italy, popularity, wavelet power spectrum analysis (WPSA).

1. INTRODUCTION

Cultural entomology (CE) is a multidisciplinary science situated at the intersection of entomology and the humanities, which underpins the cultural and societal implications of the complex, multifaceted reign of the insects [1-7]. CE explores how insects are thought, perceived, elaborated, used and manipulated by humans. Insects indeed have always fascinated and attracted mankind's interest, and have been portrayed in songs [8-10], movies [11], novels and poems (the so-called “*poetic entomology*”) [12], paintings and sculptures [13], as well as have populated human dreams [14] and cuisines [15].

CE witnesses the attraction of mankind for life and its different forms of manifestation [16], a concept that the prominent biologist Edward Wilson, the founder of sociobiology [17], termed as “*biophilia*” (literally, love for life and for living systems) [18, 19]. CE, moreover, represents the effort to make different disciplines converge into an integrated approach called “*consilience*” by Wilson [20].

Since the internet has become an important part in nowadays life, it would be meaningful to study the insects-related internet usage and activities, such as the hit-search volumes, to verify whether is possible or not to extrapolate a trend. The Internet has already proven to be a valuable medium for disseminating knowledge in the field of

entomology, both for teaching and researching purposes [21]. The specialized branch of CE specifically devoted to the systematical study of the insects-related Internet activities and usage is called “*digital CE*”.

However, there are very few studies about this.

Inspired by the pioneering articles by Takada [22, 23], we decided to replicate his findings. Since insects are well represented in Japanese culture, he wanted to investigate the Internet activities of Japanese people, searching for particular kinds of insects. Among about 130 *Coleoptera*, fireflies and *Dinastines* or Japanese rhinoceros beetles (“*Kabuto-mushi*”, in Japanese language) resulted the most preferred and searched insects. Takada speculated that these insects may be endowed with particular aesthetic properties and be related to the feeling and the pride of being Japanese (“*Mono no aware*”). In another article, Takada found that Japanese people tend to ambiguously perceive lampyrids (“*Hotaru*”, in Japanese language) and that the results varied if using a writing system (*hiragana* or *katakana*) or another. In another article, Takada investigated the popularity of different scarabaeid species in Japanese society, searching in *katakana* script and using the Keyword Tool of Google AdWords. He confirmed his previous findings and this found that Japanese users were attracted by a small number of insects, in particular those exhibiting peculiar and distinctive morphological and ecological traits, associated with human survival and habitat, or highly common in Japan. *Kabuto-mushi Trypoxylus dichotomus* resulted once again the most searched insect. Takada concluded suggesting that, on the basis of this find-

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ing, Japanese rhinoceros beetles could be exploited as a flagship species for conservation campaigns.

Another scholar that investigated this topic is Yuma [24], who confirmed the interest of Japanese culture towards insects.

CE can indeed have many implications, both scientific and societal. It reflects the growing importance of the so-called “*citizen science*” [25] (also termed as “*crowd science*” [26], “*crowd-sourced science*” [27], “*civic science*” [28], “*networked science*” [29], “*small artisan science*” [30] or “*shared science*” [31]) in which the barrier between scholars and lay people becomes blurred and citizen empowerment enables amateur or nonprofessional scientists to carry out scientific research, in whole or at least in part, being actively engaged in scientific activities (data collections, use of technologies, etc.). Crowd-sourcing, crowd-funding and public education play a major role. It is noteworthy that citizen science developed from ornithology and biological sciences [32,33].

2. EXPERIMENTAL SECTION

We used Google Trends searching for some of the most common insects. Google Trends, an online tracking system of Internet hit-search volumes that recently merged with its sister project Google Insights for Search (Google Inc.), was searched for the years 2004 to 2013 (as data before 2004 were not available) [34].

Google Trends has been extensively used for predicting infectious epidemics and outbreaks [35], studying patients attitudes towards their diseases or their compliance to treatment [36], in neurology [37-40], in psychiatry [40,41], in oncology [42,43], as well as in nephrology and urology [45-47], ophthalmology [48,49], gynecology [50], otolaryngology [51], cardiovascular [52,53] and bariatric surgery [52]. However, Google Trends has been used not only in the medical field within the framework of P6 medicine (a model of patient-centered medicine, in which the patient actively seeks for health-related information on the Internet) [54,55],

but also for biological [56], economic and financial [57,58] disciplines.

Flux volumes of each hit-search data were inspected looking for regularity and analyzed also using the wavelet power spectrum analysis (WPSA), a mathematical technique that enables to establish a cyclic trend, by decomposing a time series into time *versus* frequency space. WPSA was performed with the application developed by Torrence and Pompo [59,60]. WPSA is usually used in geophysics, meteorology and biophysics, and has been recently applied also to time series derived from Google Trends [37] and to real epidemiological data [61].

3. RESULTS AND DISCUSSION

With Google Trends we analyzed the hit-search volumes of the most common insects, we inspected the curves for regularity and we assessed quantitatively the trend with the WPSA. Generally speaking, the search for “*insects*” exhibits a regular pattern over the time (Fig. 1).

The five most searched insects are: bees, mosquitoes, butterflies, ants and spiders which are arachnids, but are commonly believed to be insects (Fig. 2).

For some insects, we managed to find a cyclic regularity (Fig. 3), with peaks clearly related with the season in which these insects are most visible. WPSA confirmed this regularity (Fig. 4).

We could not detect any regular trend instead for other insects, like gnat, or moth, which are not prominently correlated with a specific season.

We succeeded in replicating the Takada's findings. Moreover, we provide two novel evidences. The first is that the degree of seasonal regularity varies among the searched words, being higher for “*mosquito*” (Fig. 3a). The second evidence is that interests in searching and looking for insects may be fostered by the new media. As can be noticed in Fig. (3d), hit-search volume for “*sago palm weevil*”

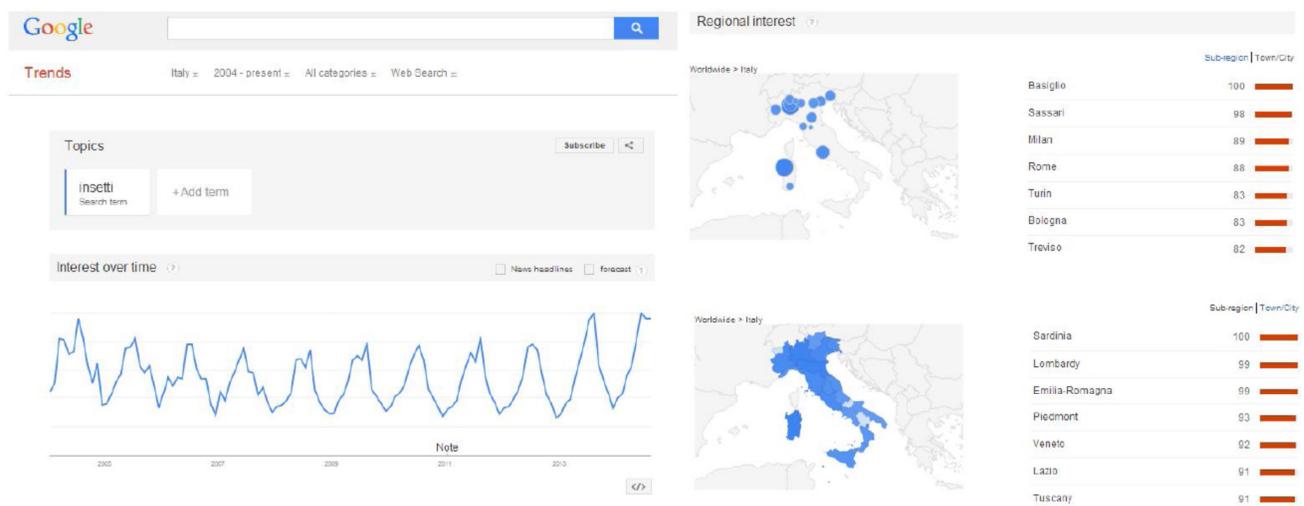


Fig. (1). Hit-search volumes of the word “*insects*”, exhibiting a regular cyclic trend over the time and for which it is possible to detect a regular searching pattern in Italy.

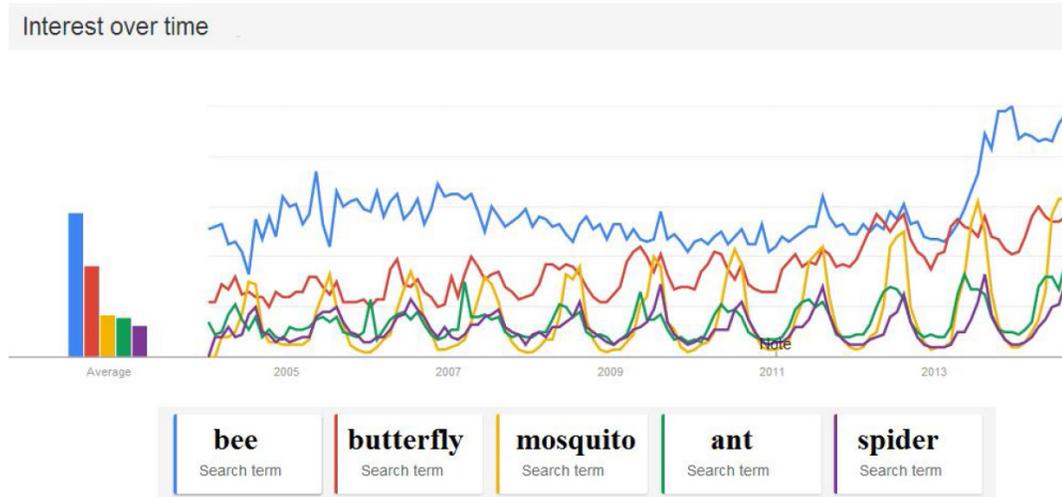


Fig. (2). Hit-search volumes of the five most searched insects in Italy.

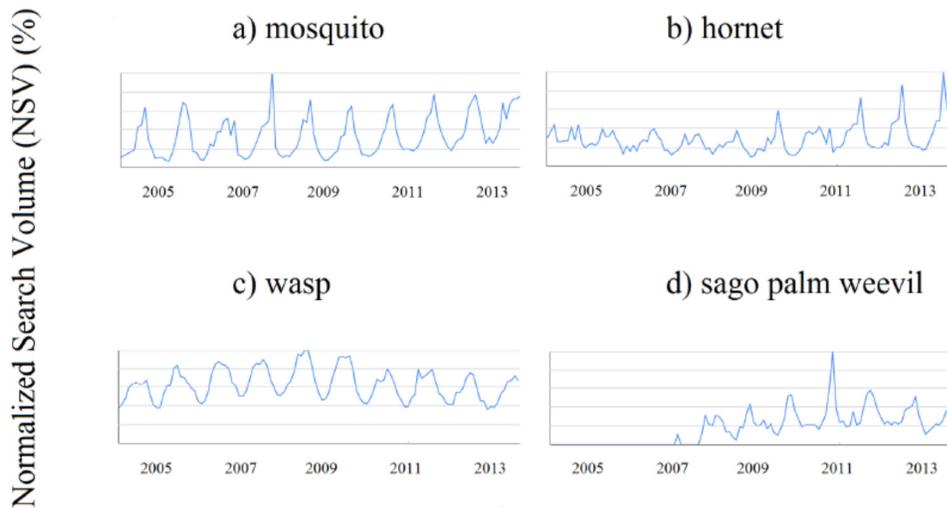


Fig. (3). Hit-search volumes of some common insects for which it is possible to detect a regular pattern and cyclic seasonal trend.

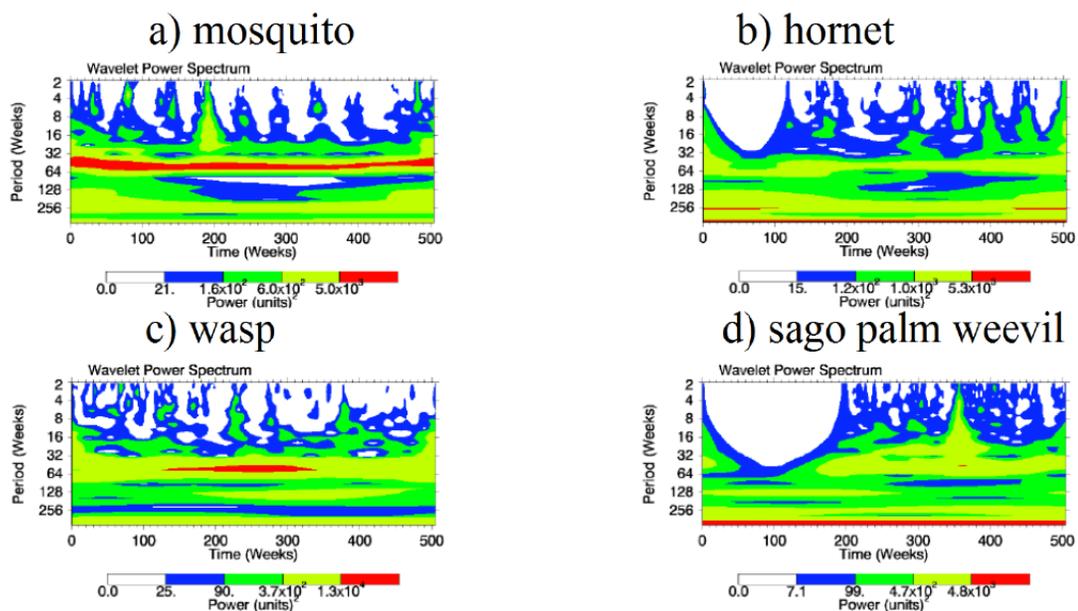


Fig. (4). WPSA of the same insects searched in Figure 3, showing the degree of regularity in the seasonal cyclic pattern.

("punteruolo rosso delle palme", in Italian) before 2007 was negligible but increased afterward thanks to the increasing attention and the warnings of the television and the Internet of potential dangerous impact of these insects on agriculture.

CONCLUSION

Despite its limitations, this article shows that Google Trends can be exploited as a useful tool to investigate the hit-search volumes of insects. Google Trends, thus, could be extremely useful for CE, showing the pattern and the trends of search.

WPSA can complement the manual inspection of the Google Trends-generated curves, assessing in a quantitative rigorous way the regularity.

Inspired by the seminal work carried out by the Japanese Takada, we decided to replicate his findings. We analyzed with Google Trends and with WPSA the hit-search volumes of the most common insects. We identified the five most commonly searched insects: they exhibit particular aesthetic properties (such as the butterflies) or are eusocial insects (such as the bees and the ants) or can represent threat and danger for individuals (such as spiders and mosquitoes). We found a seasonality for some of them, as confirmed by the WPSA, and with peaks related to the seasonal period in which the insects are most visible, while we could not detect any regularity or trend for other insects, which are not clearly related to any particular season. In addition, we proved that at least in some cases hit-search volumes were influenced by the media and that the degree of seasonal regularity as measured by the WPSA was variable. Thus, we have proven the robustness of previous finding, extending their validity also in another culture and another context. Therefore, rather than being confined to a specific culture, googling insects could be a universal behavior and attitude, even though with some cross-cultural differences. Further systematic research is needed to shed light on this topic.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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