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NOTES ON SOME INSECTS ASSOCIATED TO FRANKINCENSE TREE (*BOSWELLIA SACRA* FLÜCKIGER, 1867, BURSERACEAE) IN DHOFAR (SULTANATE OF OMAN)

Abstract - We report on preliminary observations made in Dhofar (Sultanate of Oman) in order to identify insects dangerous to the frankincense tree (*Boswellia sacra* Flueckiger1867) The purpose was to identify the web of insects connected to this species and therefore, could damage the Frankincense tree, since nothing was previously published about this subject. We observed two species of long-horned beetles (Coleoptera Cerambycidae) and one of Buprestidae beetle (Coleoptera Buprestidae), whose larvae develops under the bark and in the into the trunk of living Frankincense trees. The Cerambycidae are identified as *Neoplocaederus atlanticus* (Rungs, 1952) and *Derolus martini* ssp. *hayekae* Villiers, 1968, and the Buprestidae beetle as *Sphenoptera chalcichroa* Obenberger, 1914. This last is known as a possible allochthonous species, very dangerous for the *Acacia nilotica* in Sudan.

Key words - Dhofar, frankincense, dangerous insects.

Riassunto - *Note su alcuni insetti associati all'albero dell'incenso nel Dhofar (Sultanato di Oman).* Gli autori riferiscono sugli insetti che sono stati osservati svilupparsi a spese dell'albero dell'incenso (*Boswellia sacra* Flueckiger1867) nella regione del Dhofar (Sultanato dell'Oman). Due specie di Coleotteri Cerambycidae ed una di Buprestidae sono state osservate svilupparsi con le loro larve sotto la corteccia o nel legno di alberi dell'incenso. Esse sono state identificate come *Neoplocaederus atlanticus* (Rungs, 1952) e *Derolus martini* ssp. *hayekae* Villiers, 1968 (Cerambicidae) e *Sphenoptera chalcichroa* Obenberger, 1914 (Buprestidae).

Parole chiave - Dhofar, albero dell'incenso, insetti dannosi.

INTRODUCTION

From 1999 to 2004 the Museum of Natural History of the Pisa University, held some entomological field researches in Dhofar, the most southern region of Sultanate of Oman. Initially our goal was to indagate the insects fauna and the natural environment of Khor Rori archeological site. The site is a complex of ruins of the ancient port and city of Sumharam, an important ancient spot of the frankincense's trade, dated 1st Century BC - 3rd Century AC. The place is under investigation by the Italian Archeological Mission to Oman, led by Alessandra Avanzini (cfr. Avanzini *et al*., 2001). From there we spread our interest around the region, focussing our attention to several different localities both along the coast, on the mountains and their northern slopes facing the Rub Al Kali desert (Fig. 1). Occasionally we search for insects on Frankincense trees, with poor results. Only in few occasion we had the evidence of some Insects living on the plants, eventually feeding on the timber of the dead ones.

Testing the Omanites Autorities, the Frankincense tree population is declining. Into the last years raining were decreasing, and this probably affected the trees. Also over grazing by camels and goats could have an impact on the renovation of the Frankincense trees.

The material examined is preserved in the following collections:

- Museo di Storia Naturale e del Territorio, Università di Pisa, Calci (Pisa, Italy) [MSNTC];
- Museo Civico di Storia Naturale «G. Doria», Genoa (Italy) [MCSNG];
- Vitali F. Collection, Genoa (Italy) [VCG];
- Gianasso D. Collection, Castelnuovo Don Bosco-Asti (Italy) [GC]

LIST OF SPECIES

Cerambycidae

Neoplocaederus atlanticus (Rungs, 1952) (Fig. 2)
Plocaederus atlanticus Rungs, 1952 - Bull. Soc. ent. Fr., 57: 146

Distribution: Morocco, Yemen, Saudi Arabia (Holzschuh, 1993), Oman: Dhofar (new record).

Host plants: Burseraceae: *Commiphora opobalsamum* (L.) Engl. (Holzschuh, 1993), *Boswellia sacra* Flueckiger 1867 (new record).

Collecting data: Dhofar region - Al Mughsayl dint., m 30, 16°53'01N-53°46'47E, 9.IX.2002, Leg. Dellacasa M. (Hg light), 1 ex. [MSNTC]; Jabal Samhan, W of summit, m 1350, 17°07'88N-54°43'99E, 14.IX.2002, Leg. Dellacasa M., 5 exx. [MSNTC]; Rd 31 N of Queiroon, 17°19'71N-54°04'94E, m 670, 8.IV.2001, Leg. Scaramozzino P., 4 exx. [MSNTC; MCSNG, VCG]; Wadi Darbat, bottom of waterfall, 7.IX.2002, Leg. Dellacasa M. (Hg light), 4 exx. [MSNTC]; *idem*, 11.IX.2002, Leg. Dellacasa M. (Hg light), 6 exx. [MSNTC]; Ain Garziz env., 17°06'29"N-54°04'35"E, m 110, 16.III.2004, Leg. Dellacasa M. (Hg light), 1 ex.

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Fig. 1 - A 360° view of Wadi Dokha (17°19'N-54°05'E).

Fig. 2 - Specimen of *Neoplocaederus atlanticus* (Rungs, 1952) (Male, length 41 mm, Wadi Dokha XI-2000).

[MSNTC]; Al Mughsayl env., 16°53'01"N-53°46'47"E, m 30, 1.III.2004, Leg. Dellacasa M. (Hg light), 3 exx. [MSNTC]; *idem*, 6.III.2004, Leg. Dellacasa M. (Hg light), 1 ex. [MSNTC]; Khor Rori env., 17°02'N-54°26'E, m 10, 11.III.2004, Leg. Dellacasa M. (Hg light), 2 exx. [MSNTC]; Rd 47, Wadi W of Al Mughsayl, 16°52'53"N-53°43'51"E, m 50, 1.III.2004, Leg. Dellacasa M., 1 ex. [MSNTC]; Rd. to Tawi Atayr, Wadi Hinna, 17°03'13"N-54°36'32"E, m 310, 8.III.2004, Leg. Dellacasa M., 4 exx. [MSNTC]; Wadi Darbat, bottom of waterfall, 17°04'27"N-54°25'53"E, 2.III.2004, Leg. Dellacasa M. (Hg light), 4 exx. [MSNTC]; Wadi Dowkha, 17°20'32"N-54°04'16"E, 5-9.III.2004, Leg. Dellacasa M. (UV light trap), 2 exx. [MSNTC].

Bionomics: the species in Saudi Arabia was reared from *Commiphora opobalsamum* tree (Holzschuh, 1993), a plant of the same family of Frankincense. On September 2002 we collected *N. atlanticus* by means of an Hg light trap positioned at beginning of Darbat Pool a small plain just up to the big Wadi Darbat's waterfall, on the slope of Qara mountains facing the Arabic Sea. Since no Frankincense trees were seen there, it is likely that in Dhofar additional plants exist. The same attraction for the Hg light was observed in spring 2004 in Wadi Doka, a very dry area, north of the mountain's chaines in the direction of the Rub Al Kali desert, in wich nearly about 1,200 trees of Frankincense are growing (Raffaelli *et al*., 2003). The use of light traps should be a practical method for removing this pest if his number would result dangerous to Frankincense. This method, if adopted, needs additional experimentation.
In addition on a dead trunk in a wadi near Adwnab (16°56'N-53°49'E) we observed the distinctive bores made by xylophages beetles. The bores moved first under the bark (Fig. 3) and then penetrated intho the trunk (Fig. 4), where we found larvae of Cerambycidae, with a size compatible to *N. atlanticus* (Fig. 5).

Systematics remarks: Holzschuh (1993) reports that all the specimens he examined from Arabian Peninsula «agrees as well with *P. denticornis,* which is widely distributed especially in tropical Africa, as they do with *P. atlanticus*, described from Morocco. The pronotal sculpture is not very uniform in the Arabian specimens: perhaps there is a further species concealed in this material?».

Derolus martini ssp. ***hayekae*** Villiers, 1968 (Fig. 6)
Villiers, 1968 - Bull. Mus. natn. Hist. Nat. Paris (2) 39 [1967]: 847

Distribution: Yemen, Saudi Arabia, Oman: Dhofar (new record).

Host plants: Moraceae: *Ficus* spp. (Holzschuh, 1993).

Collecting data: Dhofar region - Wadi Darbat, bottom of waterfall, 17°04'27"N-54°25'53"E, 3.III.2004, Leg. Dellacasa M. (Hg light), 1 ex. [MSNTC]; Darbat Pool, 14.III.2004, Leg. Dellacasa M. (Hg light), 2 exx. [MSNTC, VCG]; Wadi Dowkha, 17°20'32"N-54°04'16"E, 5-9.III.2004, Leg. Dellacasa M. (UV light

Fig. 3 - A dead trunk of Frankincense with several bores made by the long-horned beetle *Neoplocaederus atlanticus* with larvae still living inside (Wadi Adwnab16°56'N-53°49'E, IX 2002).

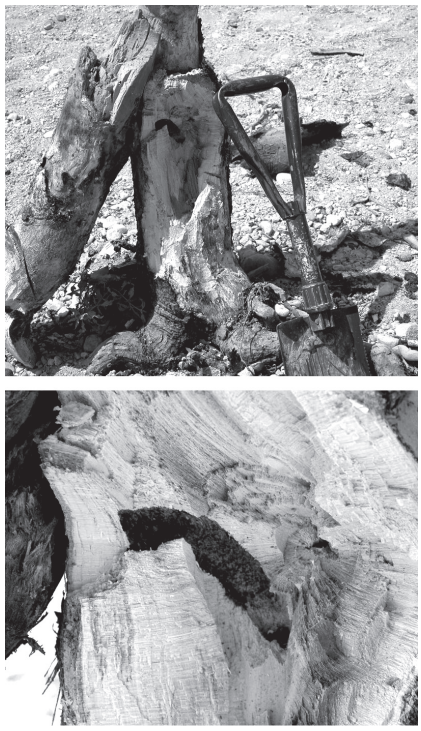

Fig. 4 - The end of the bore of Figure 3 where the living larva of the beetle *Neoplocaederus atlanticus* was found.

Fig. 5 - The mature larva of *Neoplocaederus atlanticus* in bottom and top view.

Fig. 6 - Male of *Derolus martini* ssp. *hayekae* Villiers, 1968 found in spring 2001 near Wadi Dokha.

trap), 1 ex. [MSNTC]; Queiroon dint., 2250 ft, 6.V.2001, Leg. Scaramozzino P., 2 exx. [MSNTC]; Rd 31 N of Queiroon, 17°19'71N-54°04'94E, m 670, 8.IV.2001, Leg. Scaramozzino P., 1 exx. [VCG].

Bionomics: only two new adults of this species were collected under the bark of a dead Frankincense plants near Wadi Doka.

Buprestidae

Sphenoptera chalcichroa Obenberger, 1914 (Fig. 7)
Obenberger, 1914: 132

Distribution: Northern Africa, Sudan; Iran, Saudi Arabia, Oman: Dhofar (new record).

Host plants: Leguminosae: *Acacia nilotica* (L.) Willd. (El Atta, 1988)

Collecting data: Dhofar region - Dhofar region: Rd 47 W of Mughsayl, 16°52'64N-53°44'01E, m 260, 9.IX.2002, Leg. Strumia F., 1 ex. (on twig of Frankincense) [MSNTC]; Arift, Rd 47, m 700/1000, 16°48'N-53°33'E, 1.XI.1999, Leg. Strumia F., 1 ex. [MSNTC]; Uyun, m 850, 6.IX.2000, Leg. Scaramozzino P. (on Frankincense tree), 1 ex. [GC]; Wadi Darbat, Taqah, m 50, 7.IX.2000, Leg. Gianasso D. (on *Acacia* spp. canopy), 1 ex. [GC]; Qeiroon, m 200, 8.IX.2000, Leg. Gianasso D. (dead on the ground), 1 ex. [GC].

Bionomics: El Atta (1988) reported *Sphenoptera chalcichroa arenosa* Obenberger, 1914 as the most serious pest of *Acacia nilotica* in Sudan, a valuable timber producing species. We not checked for the presence in Oman of *Sphenoptera chalcichroa* on the *Acacia nilotica* trees but this beetle can be considered as a potentially dangerous pest for Frankincense. According to El Atta *S. chalcichroa* spread out in Sudan from the North, being, possibly, an allochthonous species. *S. chalcichroa* is large insect all-metallic bronze red in color and easy to observe. (Fig. 7) Since it was not reported by our and previous surveys (1999) of Dhofar (Mandaville 1980, Gallagher *et al*., 1980) and Yemen (Monod, 1979), we can suppose that *S. chalcichroa* his a recent arrival in Dhofar. In such a case the treat for the Frankincense his serious and could become very important in future.
We found the presence of the distinctive and large bores on Frankincense tree communities we surveyed on the hills around Mughsayl (16°53'N-53°46'E) and around Uyun (17°14'N-53°57'E), as well as one specimens near the exit holes on a twig of the plant, the buprestid was feeding on the sap leaking from the holes.

Elateridae

In October 2001, West of Mughsayl (16°51'N-53°42'E), we found under the bark of tall frankincense a large (length 41 mm) Elateridae larva not identifiable at species level (Fig. 8), that can be either a pest or a predator

Fig. 7 - Female of *Sphenoptera calcichroa* Obenberger, 1914 found on Frankincense tree near Al Mughsayl in September 2002.

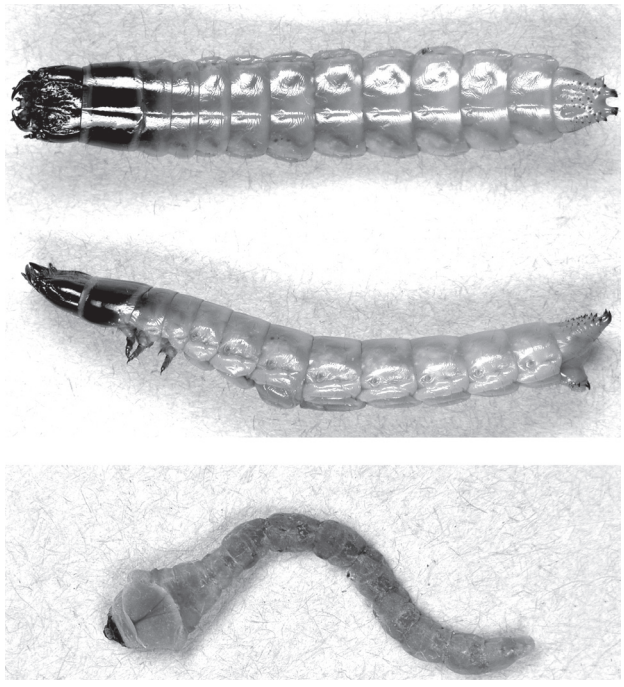

Fig. 8 - Top and lateral view of the Elateridae (top) and of the Buprestidae (bottom) larvae found in a Frankincense tree near Al Mughsayl in 2001.

Fig. 9 - Twig of a dead Frankincense showing the attac of beetles, possibly of family Scolitidae.

of other insects and thus beneficial for the Frankincense tree.

Scolitidae

In September 2001 in the Wadi North of Mughsayl, we found on several dead branches also the evidence of the smalls bore typical of the beetles of family Scolytidae, a possible dangerous pest (Fig. 9). Unfortunately in September 2001 the adults were not present and the taxonomic identification was impossible.

Pollinators

The Frankincense tree blossoms mostly in spring and, together with the shrub *Ziziphus leucodermis* Schwarz 1939, is the most attractive for a number of insects of many species, mainly Hymenoptera and Diptera, that beneficially act as pollinators. On April 2001 in Wadi Ashawq on several flowering trees we could observe active pollinators belonging to the Hymenoptera families Sphecidae, Eumenidae, Vespidae, Scoliidae, Tiphiidae, Sapygidae, Chrysididae, Pompilidae, and the super family Apoidea. We observe also some large Diptera of family Bombilidae. In addition the Butterflies of the genus *Colotis* (Lepidoptera, Pieridae) were common ad active on the Frankincense flowers.

CONCLUSIONS

Our present results are preliminary since the field observations were limited in time. Nevertheless the Frankincense trees appeared in good health with limited threat by the insect pests. The most dangerous of these appear to be one Buprestidae species (*Sphenoptera chalcichroa* Obenberger) and two Cerambycidae (*Neoplocaederus atlanticus* Rungs) and *Derolus martini* ssp. *hayekae* Villiers). In addition we found evidence of attacks by Coleoptera Scolitidae. Further observations on the field are needed to investigate and verify the presence of additional pests. If *Sphenoptera chalcichroa* is a recent arrival in Dhofar a blooming of this pest will are to be expected in the next few years.

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