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# Organochlorine Insecticide Residues in Red-legged Partridge

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## INTRODUCTION

Of the wildfowl existing in Portugal one of the most abundant species is the red-legged partridge (Alectoris rufa hispanica, Seona). As this specie is being investigated by the"Game Service" it was decided to complement the studies on populations (PINHEIRO 1970 a) and feeding habits (PINHEIRO 1970 b) with the determination of organochlorine residues in order to assess the importance of this factor on the preservation and expansion of the species. Other studies on pesticide residue levels in partridge have been conducted and will be published shortly.

## SAMPLING AND ANALYTICAL METHODS

Between November 1971 and January 1972 eighty six partridges were shot in 19 districts in 9 provinces of Portugal (Table I). Fig. I shows the map of Portugal and the areas in which the samples were collected.

All the partridges were weighed and their sex determined. The chest muscle of each bird was analysed for insecticide residues using the method of FAUBER MAUNDER (1964) which includes sohxlet extraction with hexane, partition with dimethylformamide and alumina column. Alkaline hydrolysis of the extracts was performed to confirm the residues detected and to enable the estimation of PCBs if present. This method proved to be reliable in the analysis of the OECD Exchange Sample as has been reported by Holden (1970).

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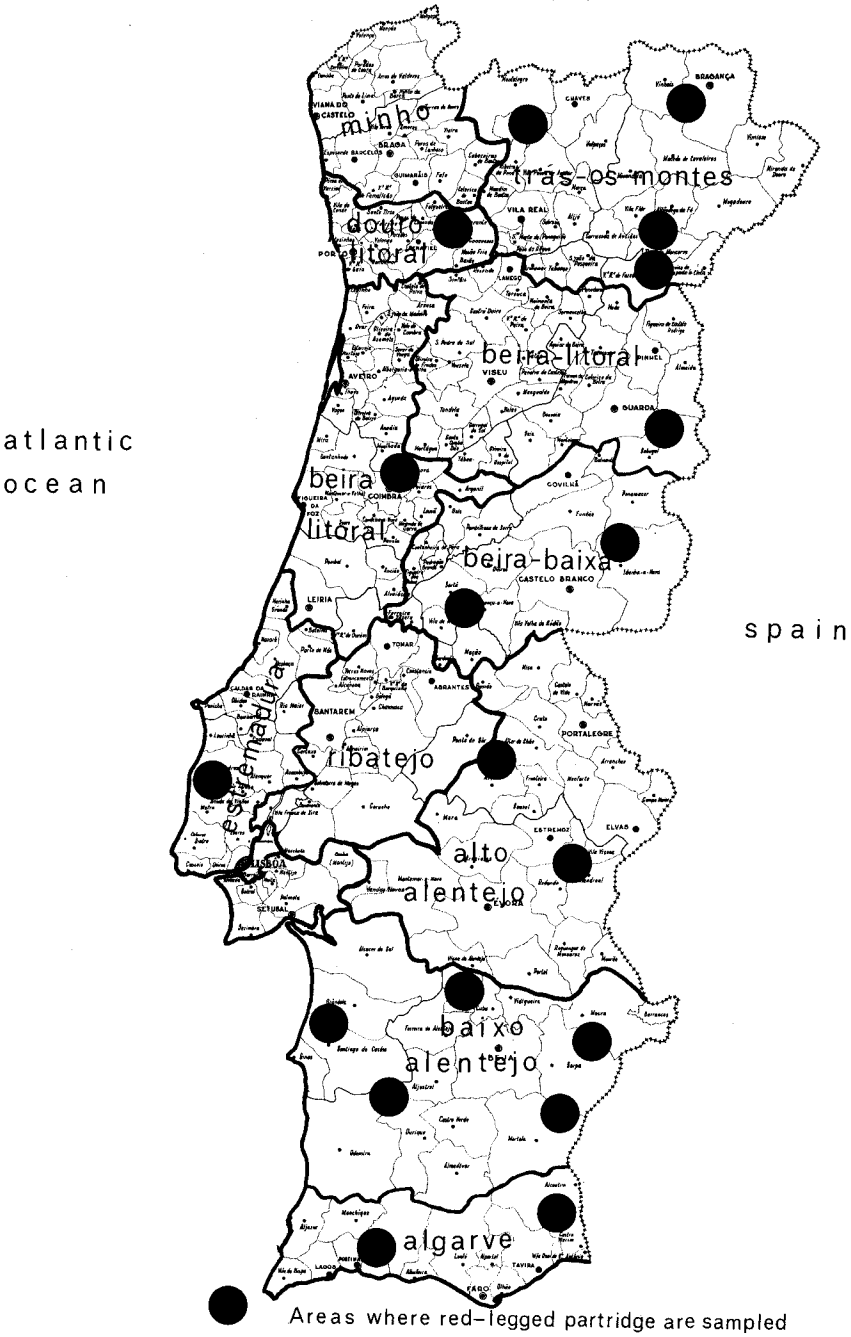
FIGURE 1




Areas where red-legged partridge are sampled

Residues were determined by gas chromatography. Two Perkin Elmer F-11 gas chromatographs with electron capture detectors and 6 feet glass columns, 1/4" ∅ were used. Two different types of packings were used in the columns viz. 6% QF1 + 4% SE-30 in Gaschrom Q 80/100 mesh with a 40ml/min flow of $N_2$ at a temperature of 195°C and 5% QF1 in Gaschrom Q 80/100 mesh with a 60ml/min flow of $N_2$ at a temperature of 190°C. The temperatures of the injectors and detectors were respectively 205°C - - 215°C and 205°C - 255°C. The method permitted determination of the whole range of organochlorine insecticides and PCBs, at the 0.001mg/kg level for the former and 0.01mg/kg for the latter.

TABLE I - PROVINCES AND DISTRICTS

| REGION | DISTRICT |
|---|---|
| Douro Litoral | Amarante(5) |
| Trás-os-Montes | Boticas(5),Bragança(5), Freixo-de-Espada-à-Cinta(3), Moncorvo(2) |
| Beira Alta | Sabugal(5) |
| Beira Litoral | Coimbra(5) |
| Beira Baixa | Proença-a-Nova(5),Idanha-a--Nova(5) |
| Estremadura | Mafra(3) |
| Alto Alentejo | Ponte de Sôr(4),Monforte(5) |
| Baixo Alentejo | Alvito(5),Grandola(5),Serpa(5), Aljustrel(5),Mértola(5) |
| Algarve | Portimão(4),Castro Marim(5) |

() Number of birds collected

TABLE I

ORGANOCHLORINE RESIDUES IN RED-LEGGED PARTRIDGE

| Region | Nº of birds | Range (mg/kg) | Number of birds with residues within certain ranges | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | HCB | Dieldrin | DDE | TDE | DDT | T.DDT |
| Douro Litoral | 5 | <0.001 | 5 | 5 | 2 | 5 | 4 | 1 |
| | | 0.001–0.01 | | | 3 | | 1 | 4 |
| | | >0.01 | | | | | | |
| Trás os Montes | 4 | <0.001 | 16 | 9 | 12 | 16 | 11 | 11 |
| | | 0.001–0.01 | | 1 | 3 | | 4 | 3 |
| | | >0.01 | | | | | | 1 |
| Beira Alta | 5 | <0.001 | 5 | 5 | 4 | 5 | 5 | 4 |
| | | 0.001–0.01 | | | 1 | | | 1 |
| | | >0.01 | | | | | | |
| Beira Litoral | 5 | <0.001 | 10 | 10 | 3 | 10 | 2 | |
| | | 0.001–0.01 | | | 2 | | | 10 |
| | | >0.01 | | | | | | |
| Beira Baixa | 10 | <0.001 | 10 | 10 | 9 | 10 | 2 | |
| | | 0.001–0.01 | | | 1 | | 8 | 10 |
| | | >0.01 | | | | | | |
| Estremadura | 3 | <0.001 | 3 | 3 | 2 | 3 | | |
| | | 0.001–0.01 | | | 1 | | 3 | 3 |
| | | >0.01 | | | | | | |
| Alto Alentejo | 9 | <0.001 | 9 | 9 | 1 | 5 | 1 | |
| | | 0.001–0.01 | | | 7 | 4 | 5 | 5 |
| | | >0.01 | | | 1 | | 3 | 4 |
| Baixo Alentejo | 25 | <0.001 | 16 | 24 | 18 | 20 | 10 | 8 |
| | | 0.001–0.01 | | 1 | 3 | 4 | 12 | 11 |
| | | >0.01 | 9 | | 4 | 1 | 3 | 6 |
| Algarve | 9 | <0.001 | 9 | 9 | 8 | 9 | 6 | 2 |
| | | 0.001–0.01 | | | 1 | | 3 | 7 |
| | | >0.01 | | | | | | |
| TOTAL | 86 | <0.001 | 77 | 84 | 56 | 77 | 40 | 24 |
| | | 0.001–0.01 | | 2 | 24 | 8 | 40 | 49 |
| | | >0.01 | 9 | | 6 | 1 | 6 | 11 |

The recovery of HCB, dieldrin, DDE, TDE, pp'DDT and op'DDT ranged from 86% to 110% at the 0.001mg/kg level and from 85% to 100% at the 0.04mg/kg level (the recovery for PCBs ranged from 85% to 100% at the 0.01mg/kg level).

## RESULTS AND DISCUSSION

The samples comprised 46 male and 38 female birds and two whose sex could not be determined. Weight of the males ranged from 320 to 550gr. (mean 450gr.) and weight of the females from 348gr. to 470gr. (mean 419gr.). These mean weights were slightly lower than those determined by PINHEIRO (1970 a).

The percentage of fat extracted from the analysed muscular tissue amounted to only 0.5% in 7% of the samples and was lower than 0.05% in 19% of the cases. These values coincide with those obtained by the author in previous analyses of the same specie.

Table II summarises the results obtained by regions and shows the number of samples found to contain residues at the selected levels.

Contamination of this species by DDT and its metabolites occurs at low level since DDE residues exceeding 0.01mg/kg were found in only 6% of the samples, TDE in 1% and pp'DDT in 6%; 13% of the samples were found to contain residues exceeding 0.01mg/kg of the total DDT (DDE + +TDE+pp'DDT). This level was detected only in samples collected in Alto Alentejo and Baixo Alentejo, two regions in which, large areas of cork trees were sprayed or dusted in the near past with DDT against the Tortix viridana L.

PCBs were not detected in any of the samples up to the 0.01mg/kg sensitivity level.

Dieldrin residues were rarely detected; at the 0.001 to 0.01mg/kg level dieldrin residues were found in only 2% of all the samples, in birds collected in the Tras-os-Montes and Baixo Alentejo areas of the Country.

Residues of HCB were detected in samples collected in Baixo Alentejo at levels exceeding 0.01mg/kg in 36% of the birds while in 12% residues exceeded 0.1mg/kg. This is essentially a wheat-growing area and seeds treated with HCB are easily available to birds.

According to PINHEIRO (1970 b) partridges feed basically on seeds, roots, cereals, leaves, flowers and buds as well as on animal matter (mostly fragments of formicidae), the latter accounting for between 0 and 3.8% of their intake of food. The low residue level detected in these samples clearly reflects the birds' eating habits.

It may therefore be concluded from this study that local contamination of the red-legged partridge from both DDT and HCB, exists in the Alentejo region in contrast with a low contamination level in the other regions of Portugal.

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