Accumulation features of persistent organochlorines in resident and migratory birds from Asia

Kunisue T., Watanabe M., Subramanian A., Sethuraman A., Titenko A.M., Qui V., Prudente M., Tanabe S.

Ctr. for Mar. Environmental Studies, Ehime University, Tarumi 3-5-7, Matuyama 790-8566, Japan; Ctr. of Adv. Studs. in Mar. Biology, Annamalai University, Parangipettai 608502, Tamil Nadu, India; Plague Contr. Res. Inst. Siberia F., 78 Trillsser St., Irkutsk 664047, Russian Federation; Ctr. Nat. Rsrc. and Environ. Studs., Vietnam National University, 19 Le Thanh Tong Street, Hanoi, Viet Nam; Science Education Department, De la Salle University, 2401 Taft Avenue, 1004 Manila, Philippines

Abstract: Concentrations of organochlorine contaminants including polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane and its metabolites (DDTs), hexachlorocyclohexane isomers (HCHs), chlordane compounds (CHLs), hexachlorobenzene (HCB) were determined in the resident and migratory birds, which were collected from India, Japan, Philippines, Russia (Lake Baikal) and Vietnam. Accumulation patterns of organochlorine concentrations in resident birds suggested that the predominant contaminants of each country were as follows: Japan - PCBs Philippines - PCBs and CHLs, India - HCHs and DDTs, Vietnam - DDTs, and Lake Baikal - PCBs and DDTs. The migratory birds from Philippines and Vietnam retained mostly the highest concentrations of DDTs among the organochlorines analyzed, indicating the presence of stopover and breeding grounds of those birds in China and Russia. On the other hand, migratory birds from India and Lake Baikal showed different patterns of organochlorine residues, reflecting that each species has inherent migratory routes and thus has exposure to different contaminants. Species which have breeding grounds around the Red Sea and Persian Gulf showed high levels of PCBs, indicating the presence of areas heavily polluted by PCBs in the Middle East.

Author Keywords: Asia; Migratory birds; Organochlorines; Resident birds

Index Keywords: Chlorine; Impurities; Isomers; Pollution; Polychlorinated biphenyls; Breeding grounds; Migratory birds; Biodiversity; chlordane; chlorphenotane; hexachlorobenzene; hexachlorocyclohexane; organochlorine derivative; polychlorinated biphenyl derivative; chlorinated hydrocarbon; insecticide; pesticide residue; bioaccumulation; bird; migratory species; organochlorine; article; Asia; bioaccumulation; bird; chemical analysis; controlled study; nonhuman; species difference; animal; metabolism; population migration; Asia; Eurasia; Aves; Animal Migration; Animals; Asia; Birds; Hydrocarbons, Chlorinated; Insecticides; Pesticide Residues; Species Specificity

Year: 2003
Source title: Environmental Pollution
Volume: 125
Issue: 2
Page : 157-172
Cited by: 32

Link: Scorpus Link
Chemicals/CAS: chlordane, 12789-03-6, 57-74-9; chlorphenotane, 50-29-3; hexachlorobenzene, 118-74-1, 55600-34-5; hexachlorocyclohexane, 608-73-1; Hydrocarbons, Chlorinated; Insecticides; Pesticide Residues
Correspondence Address: Tanabe, S.; Ctr. for Mar. Environmental Studies, Ehime University, Tarumi 3-5-7, Matuyama 790-8566, Japan; email: shinsuke@agr.ehime-u.ac.jp
ISSN: 2697491
CODEN: ENPOE
DOI: 10.1016/S0269-7491(03)00074-5
PubMed ID: 12810310
Language of Original Document: English
Abbreviated Source Title: Environmental Pollution
Document Type: Article
Source: Scopus
Authors with affiliations:
1. Kunisue, T., Ctr. for Mar. Environmental Studies, Ehime University, Tarumi 3-5-7, Matuyama 790-8566, Japan
2. Watanabe, M., Ctr. for Mar. Environmental Studies, Ehime University, Tarumi 3-5-7, Matuyama 790-8566, Japan
3. Subramanian, A., Ctr. of Adv. Studs. in Mar. Biology, Annamalai University, Parangipettai 608502, Tamil Nadu, India
4. Sethuraman, A., Ctr. of Adv. Studs. in Mar. Biology, Annamalai University, Parangipettai 608502, Tamil Nadu, India
5. Titenko, A.M., Plague Contr. Res. Inst. Siberia F., 78 Trillsser St., Irkutsk 664047, Russian Federation
6. Qui, V., Ctr. Nat. Rsrc. and Environ. Studs., Vietnam National University, 19 Le Thanh Tong Street, Hanoi, Viet Nam
7. Prudente, M., Science Education Department, De la Salle University, 2401 Taft Avenue, 1004 Manila, Philippines
8. Tanabe, S., Ctr. for Mar. Environmental Studies, Ehime University, Tarumi 3-5-7, Matuyama 790-8566, Japan
References:
1. Ali, S., (1996) The Book of Indian Birds, , India: Bombay Natural History Society
2. Calamari, D., Bacci, E., Focardl, S., Gaggi, C., Morosini, M., Vighi, M., Role of plant biomass in the global environmental partitioning of chlorinated hydrocarbons (1991) Environ. Sci. Technol., 25, pp. 1489-1495
3. Choi, J.W., Matsuda, M., Kawano, M., Wakimoto, T., Min, B.Y., Contamination of PCBs in Nakdong river estuary, Korea (1999) Toxicol. Environ. Chem., 72, pp. 233-243
4. Corsolini, S., Focardi, S., Kannan, K., Tanabe, S., Borrell, A., Tatsukawa, R., Congener profile and toxicity assessment of polychlorinated biphenyls in dolphins, sharks, and tuna collected from Italian coastal waters (1995) Mar. Environ Res., 40, pp. 33-53
5. Dave, P.P., India: A generics giant (1996) Farm. Chem. Int., pp. 36-37
6. Fedorov, L.A., Persistent organic chemicals in the former Soviet Union (1999) Environ. Pollut., 105, pp. 283-287
7. Guruge, K.S., Tanabe, S., Fukuda, M., Yamagishi, S., Tatsukawa, R., Accumulation pattern of persistent organochlorine residues in Common Cormorants (Phalacrocorax carbo) from Japan (1997) Mar. Pollut. Bull., 34, pp. 186-193
8. (1996) Handbook of the Birds of the World, Vol. 1 and 3, , J.D. Hoyo, A. Elliott, & J. Sargatal. Barcelona: Lynx Edicions
9. Ivanov, V., Sandell, E., Characterization of polychlorinated biphenyl isomers in Sovol and Trichlorodiphenyl formulations by high-resolution gas chromatography with electron capture detection and high-resolution gas chromatography-mass spectrometry techniques (1992) Environ. Sci. Technol., 26, pp. 2012-2017
10. Iwata, H., Tanabe, S., Ueda, K., Tatsukawa, R., Persistent organochlorine residues in air, water, sedimrnts, and soils from the Lake Baikal region, Russia (1995) Environ. Sci. Technol., 29, pp. 792-801

11. Kajiwara, N., Niimi, S., Watanabe, M., Ito, Y., Takahashi, S., Tanabe, S., Khuraskin, L.S., Miyazaki, N., Organochlorine and organotin compounds in Caspian seals (Phoca caspica) collected during an unusual mortality event in the Caspian Sea in 2000 (2002) Environ. Pollut., 117, pp. 391-402
12. Kan-Atireklap, S., Yen, N.T.H., Tanabe, S., Subramanian, A.N., Butyltin compounds and organochlorine residues in green mussel (Perna Viridis L.) from India (1998) Toxicol. Environ. Chem., 67, pp. 409-424
13. Kannan, K., Sinha, R.K., Tanabe, S., Ichihashi, H., Tatsukawa, R., Heavy metals and organachlorine residues in Ganges River dolphins from India (1993) Mar. Pollut. Bull., 26, pp. 159-162
14. Kannan, K., Tanabe, S., Borrell, A., Aguilar, A., Focardi, S., Tatsukawa, R., Isomer-specific analysis and toxic evaluation of polychlorinated biphenyls in striped dolphins affected by an epizootic in the western Mediterranean Sea (1993) Arch. Environ. Contam. Toxicol., 25, pp. 227-233
15. Kannan, K., Tanabe, S., Giesy, J.P., Tatsukawa, R., Organochlorine pesticides and polychlorinated biphenyls in foodstuffs from Asian and Oceanic countries (1997) Rev. Environ. Contam. Toxicol., 152, pp. 1-55
16. Kannan, K., Tanabe, S., Quynh, H.T., Hue, N.D., Tatsukawa, R., Residue pattern and dietary intake of persistent organochlorines in foodstuffs from Vietnam (1992) Arch. Environ. Contam. Toxicol., 22, pp. 367-374
17. Kannan, K., Tanabe, S., Tatsukawa, R., Geographical distribution and accumulation features of organochlorine residues in fish in tropical Asia and Oceania (1995) Environ. Sci. Technol., 29, pp. 2673-2683
18. Kucklick, J.R., Bidleman, T.F., MacOnnell, L.L., Walla, M.D., Ivanov, G.P., Organochlorines in the water and biota of Lake Baikal, Siberia (1994) Environ. Sci. Technol., 28, pp. 31-37
19. Kunisue, T., Minh, T.B., Fukuda, K., Watanabe, M., Tanabe, S., Titenko, A.M., Seasonal variation of persistent organochlorine accumulation in birds from Lake Baikal, Russia, and the role of south Asian region as a source of pollution in wintering migrants (2002) Environ. Sci. Technol., 36, pp. 1396-1404
20. Lee, D.B., Prudente, M.S., Tanabe, S., Tatsukawa, R., Organochlorine residues in soils and sediments from Manila and nearby provinces, Philippines (1997) Toxicol. Environ. Chem., 60, pp. 171-181
21. Lee, J.S., Tanabe, S., Takemoto, N., Kubodera, T., Organochlorine residues in deep-sea organisms from Suruga Bay, Japan (1997) Mar. Pollut. Bull., 34, pp. 250-258
22. Li, Y.F., McMillan, A., Scholtz, M.T., Global HCH usage with 1???1?longitude/latitude resolution (1996) Environ. Sci. Technol., 29, pp. 2877-2885
23. Minh, T.M., Kunisue, T., Yen, N.T.H., Watanabe, M., Tanabe, S., Hue, N.D., Qui, V., Persistent organochlorine residues and their bioaccumulation profiles in resident and migratory birds from north Vietnam (2002) Environ. Toxicol. Chem., 21, pp. 2108-2118
24. Minh, T.M., Watanabe, M., Tanabe, S., Yamada, T., Hata, J., Watanabe, S., Specific accumulation and elimination kinetics of tris(4-chlorophenyl) methane, tris(4-chlorophenyl)methanol, and other persistent organochlorines in humans from Japan (2001) Environ. Health Perspect., 109, pp. 927-935
25. Monirith, I., Nakata, H., Watanabe, M., Takahashi, S., Tanabe, S., Tana, T.S., Organochlorine contamination in fish and mussels from Cambodia and other Asian countries (2000) Water Sci. Technol., 42, pp. 241-252
26. Muir, D., Braune, B., Demarch, B., Norstrom, R., Wagemann, R., Lockhart, L., Hargrave, B., Reimer, K., Spatial and temporal trends and effects of contaminants in the Canadian Arctic marine ecosystem: A review (1999) Sci. Total. Environ, 230, pp. 83-144
27. Nakata, H., Tanabe, S., Tatsukawa, R., Amano, M., Miyazaki, N., Petrov, E.A., Persistent organochlorine residues and their accumulation kinetics in Baikal Seal (Phoca sibirica) from Lake Baikal, Russia (1995) Environ. Sci. Technol., 29, pp. 2877-2885

28. Nakata, H., Tanabe, S., Tatsukawa, R., Koyama, Y., Miyazaki, N., Belikov, S., Boltunov, A., Persistent organochlorine contaminants in Ringed seals (Phoca hispida) from the Kara Sea, Russian arctic (1998) Environ. Toxicol. Chem., 17, pp. 1745-1755
29. Nayak, A.K., Raha, R., Das, A.K., Organochlorine pesticide residues in middle stream of the Ganges River, India (1995) Bull. Environ. Contam. Toxicol., 54, pp. 68-75
30. Nhan, D.D., Am, N.M., Carvalho, F.P., Villeneuve, J.P., Cattini, C., Organochlorine pesticides and PCBs along the coast of north Vietnam (1999) Sci. Total Environ., 237-238, pp. 363-371
31. Prudente, M., Tanabe, S., Watanabe, M., Subramanian, A., Miyazaki, N., Suarez, P., Tatsukawa, R., Organochlorine contamination in some odontoceti species from the North Pacific and Indian Ocean (1997) Mar. Environ. Res., 44, pp. 415-427
32. Ramesh, A., Tanabe, S., Iwata, H., Tatsukawa, R., Subramanian, A.N., Mohan, D., Venugopalan, V.K., Seasonal variation of persistent organochlorine insecticide residues in Vellar River waters in Tamil Nadu, south India (1990) Environ. Pollut., 67, pp. 289-304
33. Ramesh, A., Tanabe, S., Kannan, K., Subramanian, A.N., Kumaran, P.L., Tatsukawa, R., Characteristic trend of persistent organochlorine contamination in wildlife from tropical agricultural watershed, south India (1992) Arch. Environ. Contam. Toxicol., 23, pp. 26-36
34. Ramesh, A., Tanabe, S., Murase, H., Subramanian, A.N., Tatsukawa, R., Distribution and behaviour of persistent organochlorine insecticides in paddy soil and sediments in the tropical environment: A case study in south India (1991) Environ. Pollut., 74, pp. 293-307
35. Senthilkumar, K., Kannan, K., Sinha, R.K., Tanabe, S., Giesy, J.P., Bioaccumulation profiles of polychlorinated biphenyl congeners and organochlorine pesticides in Ganges River dolphins (1999) Environ. Toxicol. Chem., 18, pp. 1511-1520
36. Tanabe, S., Subramanian, A.N., Ramesh, A., Kumaran, P.L., Miyazaki, N., Tatsukawa, R., Persistent organochlorine residues in dolphins from the bay of Bengal, south India (1993) Mar. Pollut. Bull., 26, pp. 311-316
37. Tanabe, S., Madhusree, B., ??zt?rk, A.A., Tatsukawa, R., Miyazaki, N., ??zdamar, E., Aral, O., ??zt?rk, B., Persistent organochlorine residues in Harbour porpoise (phocoena phocoena) from the Black Sea (1997) Mar. Pollut. Bull., 34, pp. 338-347
38. Tanabe, S., Prudente, M.S., Kan-Atireklap, S., Subramanian, A.N., Mussel watch: Marine pollution monitoring of butyltins and organochlorines in coastal waters of Thailand, Philippines and India (2000) Ocean Coast. Manage., 43, pp. 819-839
39. Tanabe, S., Senthilkumar, K., Kannan, K., Subramanian, A.N., Accumulation features of polychlorinated biphenyls and organochlorine pesticides in resident and migratory birds from south India (1998) Arch. Environ. Contam. Toxicol., 34, pp. 387-397
40. Voldner, E.C., Li, Y.F., Global usage of selected persistent organochlorines (1995) Sci. Total Environ., 160-161, pp. 201-210
41. Watanabe, M., Tanabe, S., Tatsukawa, R., Amano, M., Miyazaki, N., Petrov, E.A., Khuraskin, S.L., Contamination levels and specific accumulation of persistent organochlorines in Caspian Seal (Phoca caspica) from the Caspian Sea, Russia (1999) Arch. Environ. Contam. Toxicol., 37, pp. 396-407
42. Wu, W.Z., Schramm, K.W., Henkelmann, B., Xu, Y., Yediler, A., Kettrup, A., PCDD/Fs, PCBs, HCHs and HCB in sedimens and soils of Ya-Er Lake area in China: Results on residue levels and correlation to the organic carbon and the particle size (1997) Chemosphere, 34, pp. 191-202
43. Zhu, X., Liu, J., Sodergren, A., Occurrence and distribution of organochlorine residues and metals in sediment, water and fish in the catchment area of Lake Baiyangdian, China (1999) Toxicol. Environ. Chem., 68, pp. 287-296